

# DIGITAL TEXTBOOKS WHAT'S NEW?

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# Digital Textbooks, What's New?

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# Prologue

*Prólogo*

Prólogo

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Even at the height of digital culture deployment, printed textbooks are still the quintessential teaching resource in most countries, education systems and classrooms. Their contribution to the organization and development of the curriculum and to teaching-learning processes is undeniable. All too often, they have been the most influential resource with more weight than official decrees or regulations for determining content, methodologies, learning and assessment in many classrooms, particularly in conventional elementary and secondary school. Precisely because of this, textbooks have also become the focus of much pedagogical criticism. In fact, textbooks and publishers have played such a determinant role in the curriculum, teaching, and packaged culture that students must work on and learn that the much needed autonomy and judgment schools and teachers should exercise with tact and wisdom has been seriously called into question. Without these elements, the quality of education can not be equitable because institutions and professionals are delegating those tasks, responsibilities and decisions without which education itself loses meaning, purpose and potential.

The social and cultural scene that is unfolding around digital developments is already having something of an impact on the current state of affairs and may well leave its mark in the middle and long term as well. Predictably, digital textbooks will surely enter with greater force in formal, informal and everyday learning systems. New technologies will continue to extend this trend by offering a wide range of contents and forms of production, encoding, distribution of knowledge utilized by individuals in multiple contexts via activities that could theoretically be better adapted to personal learning rhythms and strategies. But, again, digital materials do not in themselves deliver the changes that are promised and needed. Only through positive critical exploration, together with reflection and research in different contexts will authentic renewal be feasible for school culture, teaching and learning, teacher training and the relationship between education (with its broader modalities) and the experiences of childhood now and in the future.

In my opinion, the objectives of the chapters in this book are steps in the right direction. Recognizing that digital books must be considered more than mere tools, they are analyzed in the context of digital culture and also presented as a relevant, current and upcoming field of research and development. Digital books are addressed insofar as their production, and particularly appropriately, with regard to supervision processes to be carried out by public authorities, institutions and teaching staff, and users in alternative education contexts. As could be expected, some chapters are devoted to the delicate

issue of establishing criteria for educational use, which leads to questions and reflection on the redefinition of learning, pedagogical methodologies and relations, as well as student work both inside and outside the conventional classroom. Evaluating the innovative potential of digital books and the precautions that should be taken into account are relevant matters that are also discussed. All of the above makes this book a fundamental contribution both nationally and internationally for understanding the current state of digital books as well as their foreseeable future.

# Introduction

## Jesús Rodríguez Rodríguez

### Eric Bruillard

### Mike Horsley

**T**extbooks, paper textbooks, play for a long time a key role in the educational systems. They still are a widely used reading and working support for students. Many researches have been devoted to them (Johnsen, 1993; Mikk, 2000; Moeglin, 2005; Bruillard, 2005), reported in the successive IARTEM conferences and IARTEM eJournal<sup>1</sup>.

Textbooks play such a key role because education is profoundly based upon reading, writing and books. But, with the growing importance of digital technologies and their huge impact upon nearly all human activities, some changes seem unavoidable. Textbooks have to take into account digital technology.

This issue is not new, and digital technology (ICT) is used in education for more than fifty years. It provides new environments, used at home or in classrooms, opens new opportunities for teaching and learning... But for a long time, we can observe a sort of coexistence between textbooks on the one side and digital technology on the other side. Now, the encounter can be considered more intimate, as textbooks themselves become digital.

This current transformation raises many issues. We can quote some of them.

- Educational processes: Is the incorporation of digital technology into textbooks leading to changes in terms of teaching and learning processes? Is digital technology contributing to a paradigm shift in how the meaning and significance of textbooks is understood in the current educational context? What is the cultural impact of digital textbooks?
- Curricula: What are the implications for digital content? How is the digital nature of textbooks affecting curricular development?
- Teachers: What happens in terms of teacher training when digital textbooks are introduced? What will happen to traditional textbooks? Can the arrival of digital textbooks represent a new opportunity to develop educational models that foster a new role for teachers in which they become writers of their own material?
- Publishers: How are these changes affecting the publishing industry?
- Researchers: What is the future of digital textbooks? What lines of research have been developed up to now in relation to digital textbooks? What is happening with respect to digital textbooks in the educational spheres of different countries?

This book aims to provide an overview of the present situation and future outlook for textbooks, but also to analyze the consequences of digital development on the characteristics and use of textbooks. In putting this book together, we have had the cooperation of internationally renowned professionals who are focusing their attention

and research on digital textbooks. Throughout the book and the diverse views of its authors, we tried to answer many important questions, as these listed above. We have chosen to publish an ebook (not a paper book), in coherence with our subject. This ebook is organized in three parts.

The first part, "Digital textbooks: general reflections" provides some viewpoints and analyses on the digital phenomenon and their possible implications upon textbooks. Regueira & Rodríguez describes the current state of the art concerning digital textbooks. Their overview discusses several dimensions. Bufrem et al. remind us the importance of hypertext, and implications on digital contents and pedagogical change. Reiris explores new roles and changes with e-books in education. Antía González Ben offers a post-modern analysis of discourses (past, present and future) about digital textbooks in U.S.

The second part, "The Digital Textbook around the world", invites the reader to a journey in different countries around the Globe, in primary, secondary or higher education, sort of overview of the digital textbooks issues. This is not a comparison between countries, as the focus is not exactly the same in each case. But exploring contrasting situations can suggest interesting new ideas. We travel from Quebec (Éthier et al.) to India (Misra), though Brazil (Braga Garcia), Chile (Oyarzún & Quiroga), USA (Mardis & Everhart), Australia (Horsley & Martin) and France (Bruillard). These different case studies provide a list of situations and questions which covers a great deal of issues.

Other countries have been contacted through well known researchers, but they have not found sufficient time available to contribute.

The third part "Digital textbooks, specific studies" proposes to discuss some issues connected to digital textbooks. How to insure sufficient quality? Reints gives the state of the art in quality. Area et al; propose to go beyond textbooks and to explore new features such as gamification. Gonçalves et al. discuss future teachers' perceptions of the pedagogical use of digital textbook. Zapico reflects the image of aging in digital curricular materials. Flores et al. present methodological and didactic challenges for primary schools.

The book is of particular interest to all members of the education community, in particular, as a reference for researchers in the university context. The publication may also be of considerable interest to the publishing industry because it brings together a variety of ideas and researches that can help improve the quality of resources. Finally, this book should help teachers understand the meaning and significance of digital textbooks, thus, allowing teachers to adapt these materials to their own needs and to identify alternative work proposals.

Undoubtedly, this ebook is a first step and many questions remain open, for very different stakeholders: authors, publishers, teachers, students and parents, according to the traditional chain from design to use. But we know that new innovation processes are at work with digital technology, and teachers, individually or collectively, can be very good designers.

Other questions remain also open for curriculum designers and policy makers (curricular and economic consequences of digitalization) and for researchers, who have to identify the main lines of research and share and disseminate their main findings helping other

stakeholders to better understand educational changes.

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<sup>1</sup> <http://www.iartem.org/>

# First Part

Digital textbooks: general reflections

# The digital textbook. A look at the current state of the art

*El libro de texto digital. Una mirada a los últimos avances*

O livro de texto dixital. Unha mirada aos últimos avances

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**Abstract:** *This paper is a first review of the research, reflections and opinions that have been made and published in recent years involving digital textbooks. It should be pointed out that studies on this subject are a relatively recent phenomenon, thus, much of the work and research analyzed here ranges over the last five years. It is also a subject that is treated very differently across countries and continents due to the different levels of implementation and consideration of digital textbooks. Insofar as the structure of the chapter, we will start by examining some of the reasons for making a review at this time. Afterward, in order to define the significance of our work and potential offshoots in the field of research and educational practice, we will include the section entitled, What do we mean by digital textbooks, where we aim to specify the concept of digital textbooks. Later, there is a section entitled Research on digital textbooks, where we present a review of the main papers and research on the topic. This section is subdivided according to main study themes. We finalize with the section, What's new in the research on digital textbook? where we analyze and compare research on digital textbooks and traditional textbooks.*

**Key words:** *Digital textbook, traditional textbook, research.*

**Resumen:** *Este trabajo es un primer acercamiento a las investigaciones, reflexiones y opiniones que han sido realizadas y publicadas en los últimos años sobre los libros de texto digitales. Cabe señalar que los estudios sobre este tema son un fenómeno relativamente reciente, por lo tanto, gran parte de los trabajos e investigaciones analizados aquí se focalizan en los últimos cinco años. También es un tema que es tratado de manera muy diferente según los países y los continentes debido a los diferentes niveles de ejecución y examen de los libros de texto digitales. En relación a la estructura del capítulo, vamos a empezar por examinar algunas de las razones para realizar una investigación en este momento. Después, con el fin de definir la importancia de nuestro trabajo y posibles ramificaciones en el campo de la investigación y la práctica educativa, incluiremos la sección titulada ¿Qué se entiende por libros de texto digitales, donde pretendemos especificar el concepto de libros de texto digitales?. Más tarde, hay una sección titulada Investigaciones sobre los libros de texto digitales, donde se presenta una revisión de los principales trabajos e investigaciones sobre el tema. Esta sección se subdivide de acuerdo a los principales temas de estudio. Finalizamos con la sección, ¿Qué hay de nuevo en la investigación sobre el libro de texto digital? dónde analizamos y comparamos la investigación sobre los libros de texto digitales y los libros de texto tradicionales.*

**Palabras clave:** *Libros de texto digitales, libro de texto tradicional, investigación*

**Resumo:** *Este traballo é un primeiro achegamento ás investigacións, reflexións e opinións que se levan realizado e publicado nos últimos anos en relación aos libros de texto dixitais. Cómpre sinalar que os estudos sobre esta temática son un fenómeno relativamente recente e, xa que logo, gran parte dos traballos e investigación aquí a analizados enmárcanse nos últimos cinco anos. Tamén é un tema que se trata de maneira diferente segundo os diferentes países e continentes debido aos diferentes niveis de execución e exame dos libros de texto dixitais. No tocante á estrutura do capítulo, comezaremos examinando algunhas das razóns para realizarmos unha investigación neste momento. Despois, co fin de definir a importancia do noso traballo e as posibles ramificacións no campo da investigación e da práctica educativa, engadimos unha sección titulada Que se entende por libros de texto dixitais?, onde pretendemos especificar o concepto de libros de texto dixitais. Máis tarde hai unha sección titulada Investigacións sobre os libros de texto dixitais, onde se presenta unha revisión dos principais traballos e investigacións sobre o tema. Esta sección subdivídese de acordo os principais temas de estudo. Finalizamos coa sección Que hai de novo na investigación sobre o libro de texto dixital?, onde analizamos e comparamos a investigación sobre este tipo de libros coa dos libros de texto tradicionais.*

**Palabras chave:** *Libros de texto dixitais, libro de texto tradicional, investigación*

## Introduction

Since the nineties, we have seen a technological revolution characterized by a shift toward a digital world which has become apparent in diverse spheres of society and culture and is advancing at an ever quickening pace, at least if we go by the recent theoretical discourse. Another thing is what actually happens in practice. The reflections

in educational circles are not alien to this issue and it seems that schools will have to adjust gradually to the new demands of the “communication age”. Notebooks and pens are giving way to computers, blackboards to interactive whiteboards, and textbooks to digital textbooks. Concepts and tools such as iPads, e-books, and e-readers are familiar to us in many contexts and it no longer seems unusual to speak of their teaching applications whether for early childhood education or senior citizens. However, digital textbooks may currently be at the forefront of concern and are causing the greatest turmoil in politics, education, and publishing. Needless to say, textbooks are much more than an educational resource. They represent an artifact with strong political and ideological connotations and have been the subject of extensive analysis for decades. The way they are conceptualized and how they are used for the teaching function represents a way of defining the school and the role of teachers. For many, they are the only tool for concreting the curriculum. Others of us think that they should be seriously re-conceived and give way to more innovative educational approaches that focus more on teacher professional development and attention to student diversity. The suggestion of “transforming” the textbook into the digital textbook involves much more than a simple renaming of a signifier; it involves a reinterpretation of meaning, functions in school and the future. For some it may pose an opportunity to legitimize their power in the classroom and for others it will constitute yet another opportunity to highlight the need for a new type of school where textbooks no longer represent the main reference for teachers. This artifact presents some new opportunities, but brings little innovation to the educational work in schools. In any case, the present chapter aims to make a review of the literature to determine the current state of development and implementation of digital textbooks, and thus be able to incorporate new elements for reflection on digital textbooks. It should be noted that this review is complimented best by the accompanying chapters in this book. Although this review aims to collect a representative sample of the research specifically done so far on digital textbooks, the fact is that it has been written at a time when important work is being done on this subject which can not included.

### **What is meant by digital textbook?**

If we go by the reflections in various manuals and papers on educational technology (see Area, 1991, 2004), there is a need to specify the meanings of the terms used in the field. Moreover, reference is made to the difficulties arising from lack of a proper definition not only in relation to “digital textbooks”, but also regarding “textbooks” in general. Delving deeper into the terminological vagueness in different conceptualizations is a good opportunity for reflecting on the conceived role of materials and their relationship with other curricular components such as goals, contents, teaching-learning strategies, other resources, and their relationship with practice. Addressing terminological vagueness also means delving deeper into the relationship between teacher activities and the use of materials (Rodriguez and Montero 2004). In these times, the task to defining the digital textbook is not easy.

The definitions, types and characteristics of digital textbook to be presented in this section can be contextualized at different levels of education. Although we are aware that

these dimensions vary depending on whether we are referring to primary, secondary or university, the literature certainly make no distinction.

However, as discussed throughout this chapter, the type of digital textbooks used and the way that they are used vary from one level of education to another.

Furthermore, we have found a common confusion between digital content and the media it is hosted on, that is, we have found many texts in which the terms “e-book” and “e-textbook” are used indiscriminately to refer to digital textbooks and their contents (Cano Delgado 2004, 69; Observatory on reading and books 2010,3). We will now try to clarify the confusion.

Electronic or digital content are referred to in many different ways: for example electronic textbooks, digital textbooks, multimedia books, online interactive books, and e-textbook. These contents are stored in a certain format that can be viewed using different devices. Generally, a device specifically designed for reading texts is called an e-reader.

As for the difference between e-textbooks and conventional textbooks, we can say that in addition to their format, e-textbooks are also different in that they incorporate a variety of interactive and multimedia resources such as videos, images, and animations. In accordance with Jordi Adell (2012), we can point out the following distinguishing features:

- Copy-ability. There is an infinite ability to reproduce the original.
- Fork-ability. It allows us to branch off the subject and move on.
- Mix-ability. this refers to the ability to break down existing information to create new content.
- Interactivity. This means being able to work in conjunction with others.
- Rich media. Along with text and static images, there are contents like videos, animations, simulations.
- Collaboration. The digital format allows us to work collaboratively in diverse contexts: both elaborating materials and using them.
- Serendipity. These materials make it possible to discover things that were not intended. That is, while searching for specific information, something completely different may be discovered.
- Real time-ness. Materials can be created on the spur of the moment in real time.
- Anywhere. They can be used anytime and anywhere.

Through its Digital Textbook<sup>1</sup> website, the KERIS (Korea Education & Research Information Service) list the following defining characteristics that may help contextualize the meaning of what we are referring to:

Main features	Description of features
Textbook feature	Fulfilling the roles and functions provided by existing textbooks-> achieving the same educational goal as that of existing textbooks(taking notes, memo, slip and turning pages, etc.)
Multi-media feature	Multi-media materials are embedded/linked to hyperlinks (image, picture, video, voice/sound, animation and 3D, etc.)

Reference feature	Providing references/worksheets needed for self-led study.
Study dictionary feature	Providing the function of various study/vocabulary dictionaries (Korean, English, Chinese Writing and Encyclopedia, etc.)
Data search feature	Easily searching for the contents learners need (searching texts/multi-media of same courses in a different grade or other courses)
Hyperlink feature	Additional link to various resources needed for self-led study (private lesson type, simulation type, game type and learning by repetition type, etc.)
Interaction feature	Mutual exchange with experts or external institutions through the web (e-mail, web e-bulletin board and website links, etc.)
Study managing system feature	Study guide management for learners, learner's level diagnosis, learner's portfolio management.
Evaluation tool feature	Evaluation tools link in/outside the Digital Textbook system -> Providing supplementary/in-depth learning materials for each level utilizing evaluation data to assess whether study goals are achieved.
Authoring tools feature	Publishing/editing/printing out the contents learners want -> text, pictures, music and video editing, etc.
Link to various information resources feature	Linked to carefully selected national knowledge DBs of contents to study that political/economical/social/cultural institutions hold.
Other features	Linked to carefully selected national knowledge DB Feature needed for teaching/learning not included in the above feature.

Source: [www.dtbook.kr/renew/english/sub/dt\\_book\\_feature.htm](http://www.dtbook.kr/renew/english/sub/dt_book_feature.htm)

Pere Marqués (2010) made a classification of digital textbook features which distinguishes between those that are common to paper textbooks and those that are unique:

<b>DIGITAL TEXT BOOK CHARACTERISTICS IN COMMON WITH PAPER TEXTBOOKS</b>	
Technical, structural aspects	<ul style="list-style-type: none"> <li>• Clear and grammatically flawless text.</li> <li>• Very readable typefaces.</li> <li>• Illustrations that are clear and appropriate to the content and audience.</li> </ul>
Functional and pedagogical aspects	<ul style="list-style-type: none"> <li>• They provide information and guide learning.</li> <li>• They have a specific educational purpose beyond memorizing content and acquiring routine skills: they aim to facilitate basic competencies.</li> <li>• They target specific students.</li> <li>• Their informational contents are well structured.</li> <li>• They include exercises.</li> <li>• Their content and activities are built around an instructional design.</li> <li>• They tend to include study guidelines for students and guidelines for teachers (in separate sections or teacher books).</li> <li>• Activities can be continued at a later time where they were left off.</li> </ul>

<b>DIGITAL TEXTBOOK CHARACTERISTICS UNIQUE</b>	
Technical, structural aspects	<ul style="list-style-type: none"> <li>• Digital format: online access from the publisher's server (or DVD).</li> <li>• Include multimedia elements (video, animation, simulation, photo, audio).</li> <li>• Organization: environment-like with topics, sections, parts, resources ...</li> <li>• Hyperlinks that link to other contents in the book or on Internet.</li> <li>• Navigating through contents using: menus, index, search...</li> <li>• Environment configuration: remove, add and modify contents.</li> <li>• Virtual learning environment (VLE) to monitor each student's work.</li> </ul>

Functional aspects	<ul style="list-style-type: none"> <li>• Some allow you to configure the appearance of the environment (font), language and visible content (sections), thus facilitating curricular adaptation.</li> <li>• Many exercises are interactive with immediate correction.</li> <li>• The internal search engine makes it easier to find content based on interests.</li> <li>• Usable from any device with internet access (PC, mobile phone, ...)</li> <li>• Can be printed and often include printable worksheets.</li> <li>• Easy and quick for publisher to update.</li> <li>• Facilitates teacher presentations, as contents can be projected in addition to being use by students on a computer.</li> <li>• Teachers can configure the book that students will see.</li> <li>• Students can do exercises on a VLE which facilitates teacher control and monitoring of tasks.</li> </ul>
Pedagogical aspects	<ul style="list-style-type: none"> <li>• Multimedia elements are attractive and easier to understand and use by students with different learning styles.</li> <li>• Exercises can be made increasingly difficult and can adjust automatically according to circumstances and progress of each student (attention to diversity).</li> <li>• Greater interaction (dialogue) between students and contents, hyperlinks that expand information.</li> <li>• Immediate correction of exercises (self-evaluation) keeps the student alert and active. Usually can generate activity reports for each student.</li> <li>• Usually includes simulators for experiments.</li> <li>• May include support tools for the exercises: calculator, glossary, forums, collaborative work environments (blogs, wikis ...)</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• It is ecological because it uses no paper, but generates technological dependence: acquiring devices (expensive), using electricity, internet access ...</li> <li>• It may be more difficult to read on a screen, extended reading can be tiring.</li> <li>• Digital content is more vulnerable to piracy.</li> <li>• In general, do not allow annotation.</li> <li>• Speed problems depending on computer and internet connection.</li> <li>• The videos and animations can be distracting.</li> </ul>

Source: Marqués, P. (2010). *15 didactic models for using digital textbooks UAB - DIM group*  
<http://peremarques.blogspot.com/> (PPT)

With respect to the functions of digital textbooks the KERIS<sup>2</sup> classifies them into four types:

### Teaching–Learning Assistance Function

- Textbook function: writing, memos, navigating and viewing pages, bookmarker.

### Learning Support and Promotion Function

- Multimedia function: images, pictures, video clips, audios, animations 3D, etc. link to embedded contents or hyperlinks
- Data search function: searching other courses` textbooks and different grades textbook search
- Reference materials function: material or autonomous learning
- Hyperlink function: various resources linked through the worldwide web for easy references to assist self-directed learning
- Dictionary Function: most-up-to-date vocabulary references to include prior dictionary definitions as well as multiple language translations

### Learning Management Function

- Evaluation tool function: connection with evaluation tools inside and outside.

Digital textbook offered expanded learning materials to reach student's level of understanding

- Authoring tool function: draft, edit and print documents while editing text, music, pictures and videos clips.
- Learned Management System function: managing students' e-portfolio managing students' learning progress.

## Interactive Function

- Resource connection function: connection with national knowledge database connection of contents owned by various political social and cultural institutions.
- Interactive Function: interaction with experts, and other institutes through the Web.

As for the types of digital textbooks that exist, the proposal by the "Palm Center" may be helpful (Mardis, Everhart, Smith, Newsum and Baker 2010, 3) and proposes the following classification:

- Electronic textbooks (e-textbooks) specially created for readers like the Amazon Kindle and Apple iPad.
- Computer-based books on demand such as Google Books and NetLibrary textbooks.
- Digital textbooks printed on demand.
- Modular sets of audio, visual, interactive and text resources available through iTunes, wikis and digital applications.

Another interesting classification was elaborated by Rob Reynolds (2011) who identifies three types of digital textbooks depending on cost and functionality:

- "Medium-cost publisher XML e-book with some resource enhancements"
- This type of digital textbooks are based on traditional pre-existing printed books. They are offered by publishers on an LMS platform.
- "Low cost and free, flexible XML e-textbooks and resource collections" Reynolds refers in this classification to digital textbooks which are based on the "crowdsourcing" creation / authoring model. This model involves the collaboration of several people to create a certain resource. Another feature of this type of e-textbooks is that they represent a loss of money for publishers because most will likely be shared through social interactivity on the Internet.
- High-end, interactive XML e-books with significant, customized interactivity The type of digital textbooks offer, according to Reynolds, high levels of interactivity and assessment.

Den Visel (2003, in Adell and Bernabé 2006) identifies two different types of digital textbooks. This classification is quite similar to one previously listed. Visel distinguishes

the following:

- The “PDF-based” e-book model. It is basically a question of scanning content while maintaining the characteristics of traditional books. Generally this is a protected pdf file which does not permit “annotation, editing or sharing among users, does not permit easy embedding of other media (such as audio or video) and the same appearance for all audiences” (Den Visel 2003, in Adell and Bernabé 2006).
- The “browser-based” model. “It uses an HTML or XML language to label the different parts of the text structure” and can be displayed like a web page.

To this list we could add a third type of digital textbook, “open text books”. This type of book blurs the line between reader and writer because the former can take on the role of the latter by editing the text to suit needs. The term “open” mainly refers to the legal aspect of these books, as they are generally “Creative Commons” open license, which allows users to download, customize and print the textbook without express written consent of the author.

One issue that appears latent in the literature and shared by some authors (see Adell, 2010 or Tumin, 2012) is whether something that is not intrinsically a book can be called a digital textbook? Why use the word “text” if, as Visel points out, a book is something more?

It seems fitting to quote an excerpt from the article by Jordi Adell, “Letter to textbooks publishers”, where he expresses his opinion against using the term “books” to refer to this type of content:

“They are never going to find what they are “looking for”, the digital textbook, because it doesn’t exist. And it doesn’t exist because it might not make any sense for this day and age. At a time when access to information was costly and difficult, a textbook made sense: everything worth knowing for the course in one place, organized and semi-directed. A great aid for teachers. Today, in the Internet era, this is simply unthinkable. “(Adell, 2010). To a large extent, we could say that using the same definition to refer to this new way of structuring contents and traditional “textbooks” only serves to perpetuate the shortcomings of the latter.

This idea is shared by Zachary Tumin (2012) who calls digital textbooks the new “horseless carriages” (a term used to describe early cars). Throughout history there have been countless examples of how innovations seeking to resemble something similar that already exists and is popular. For example, when the printing press began to be used, published works were made to look as much as possible like the manuscripts by copyists.

To some extent, we could say that the term “textbook” refers to a reductionist view of school books as sealed sources of knowledge to be assimilated in a particular time and place. In addition, the name (digital textbook) connotes the preeminence of text over other media. We believe it is a term that does not clearly reflect the potential of the newborn we have been discussing. But, as with children, time will forge its personality and name.

## **Research on digital textbooks**

Although many questions exist regarding digital textbooks, we can say that relatively

little research on this subject is available. Nevertheless, it seems to be becoming an area of particular concern and study in the field of educational technology.

The following data sources have been used for the review of the papers, research and reflections regarding digital textbooks: ISOC, PSEDISOC, DIALNET CEDUS, RESH, REDINED, ERIC, DIALOG, Spanish educational journals and others internet sources. We also took into consideration the recent conferences, seminars and activities on textbooks that have taken place both nationally and internationally and have been particularly focussed on textbook research. We paid special attention to literature reviews conducted recently (see Rodríguez Rodríguez, Horsley and Knudsen 2011; Watt 2009). In addition, we looked at reviews and papers published in recent international conferences on textbooks and instructional materials organized by IARTEM<sup>3</sup> (Bratislava 2003, Caen 2005, Tonsberg 2007, Madagascar 2008, Santiago de Compostela 2009 and Kaunas 2011) as well as the international seminar on textbooks held in Santiago de Chile (2006). The recent conference organized by the IARTEM in Brazil gave us the opportunity to see some of the most recent work on digital books in the context of Brazil and in other Latin American countries. The book in which this chapter is included also contains contributions by several authors who participated in the meeting.

A considerable number of the studies here referenced are contextualized in the United States, which is positioned at the forefront of the publishing world. There are also studies that stand out from Japan and Korea, where the potential of digital textbooks have been analyzed and exploited for years (Stovall 2009). In addition, we have also taken into consideration articles, post, videos and experiences form of other countries identified through a review of the literature and internet.

In the field of educational research, issues involving digital textbooks constitute a relatively new phenomenon. Although in 1998 Geoffrey Nunberg and other authors gave a glimpse of the outlook for textbooks in the face of ICT in their book "The future of the textbook: will this kill that?", it was not until 2009 that the digital reading market became popularized with the launch of Amazon's "Kindle" and then Apple's "iPad" and a significant amount of research began to be carried out.

We will now go on to make a short summary of the main lines of research on digital textbooks. Some are fairly well established, while others are still in an emerging stage.

### **On the use of the digital textbook**

Within this first set of studies we have distinguished two subsections: (1) how to use e-books and (2) how digital content affect student learning.

#### **On the use of electronic/digital textbooks**

The first problem we encounter regarding the use of digital textbooks is, as pointed out by Slater (2010, 310) "to use an e-book, patrons must first be aware of their existence". That is, many people are unaware that digital textbooks exist, and even if they are, they do not know how to use them. On the other hand, those who do know of their existence often use digital textbooks for purposes other than printed textbooks (Slater 2010: 307). There is the assumption that people prefer digital books to select specific

excerpts while printed books are for inferring most of the content. In a literature review on digital textbooks in academic libraries (2010), Slater proposes that this idea be reconsidered. To support his claim, Slater cites a number of studies showing that in both cases, printed and digital materials, only portions of the text are read. As indicated by Marilyn Christianson and Marsha Aucoin (2009 in Slater 2010:308), it is very difficult to determine if a person uses a book reflectively or simply to search for something in particular.

Among the research identified by Slater, we would like to point out (because of its relevance for this paper) several studies focusing on the use of "NetLibrary" (Nelson and O'Neill 2001; Landoy et al., 2004; Silpigni Connaway and Snyder, 2005, Levine-Clark, 2006). The conclusions in all of these are very similar. Firstly, it was found that most users do not read entire chapters in the e-books that they access. The average time spent using an e-book on this platform was between 5 to 15 minutes, while an average of 6 pages were viewed. 92% of users gained access through academic institutions. In light of these results, as indicated by Conway and Clifton (2002 in Slater 2010:309), it can be concluded that "The Netlibrary ebook Collection is being used as a reference Collection, and the eBooks are not being read from cover-to-cover".

Netlibrary is not the only "online library" in which this phenomenon occurs; Leveine (2006 in Slater 2010, 309) conducted a study on the use of digital content by students at the University of Denver and concluded that 7.1% read an entire e-book while 56.6% read only a single chapter or article.

Another series of studies indicate that digital textbooks do not facilitate use by the visually impaired and present "significant barriers that keep people with disabilities from having full and equal access" (Bagnestos 2010, 14, cited by Mardis et al., 2010).

Similarly, we found studies showing that libraries find it difficult to provide e-books because those they want to acquire are not readily available electronically "because they are priced or packaged in a way that makes them less appealing than their print counterparts, or because acquiring e-books does not easily integrate into their normal acquisitions workflow" (Slater 2010, 305).

An especially interesting issue involving the use of materials is the type of training that teachers receive on how to use digital textbooks. This is an issue that requires further research. Mardis et al. (2010, 10) indicate that "the majority of school administrator respondents to the America's Digital School 2006 survey reported that they were concerned about their teachers' and librarians' abilities to seamlessly integrate new digital technologies into the existing curriculum (Greaves Group@ hayes Connection 2008). At about \$100 per student per year, districts often do not plan for the substantial time and investment in professional development they will need to make to ensure the success of their digital textbook programs" (Greaves Group 2006).

### **How digital contents affect student learning**

To address this subsection we will focus primarily on research that is contextualized in primary and secondary school. Textbooks in the context of university education are specifically dealt with in a later section of this chapter.

- The primary and secondary school context

Also in relation to this sub-block regarding the effect of digital textbooks on student learning, and focusing on primary and secondary school, we can mention the research by Torey Jones and Carol Brown (2011) who carried out a study to examine "the Reading engagement and comprehension of children as they read electronic books" (Jones and Brown (2011:9). They selected a group of 22 third-grade students (between eight and nine years of age) from southeastern United States, that were subsequently divided evenly into four groups according to reading level and sex. The study was divided into three phases: It began with the students reading three chapters of a print book chosen by the teacher according to the children's preferences. They used the "bump Reading" method. After that, the pupils did an activity to estimate their comprehension and prediction skills. The rest of the book was read in the several days for the teacher.

In the second phase, the students were provided with a laptop and access to a platform for reading books through Internet. After providing students the instructions on the operation of the platform, groups were re-formed and they began reading a new book. After completing the book, children were again assigned a comprehension activity by the classroom teacher.

The third and final phase followed the same procedure as the previous phases and at the end, children were given the opportunity to read any book on the shelf.

The results showed that students prefer digital books over traditional books, and also showed a preference for services related to e-books, such as pronunciations of words or reading aloud. The authors concluded that although children quickly adapt to digital books, they are not quite ready to leave printed books behind.

Kim and Jung (2010) conducted an analysis in the period 2008-2009 to estimate the influence of digital textbooks versus printed textbooks on learning attitude. The study consisted of 80 5th and 6th grade primary school classes (40 classes each) in 24 South Korean schools. The 5255 students who made up the sample were divided into two groups: experimental and comparative. Questionnaires were used to evaluate students' attitudes regarding five specific subjects: Korean, sociology, science, mathematics and English. The results showed that student learning attitudes improved by 7.5% in classes using digital textbooks compared to those using traditional textbooks.

The researchers found significant attitude improvement in Korean, sociology and science, but not in math and English. We would like to take a moment to comment on the situation of digital textbooks in South Korea, as no other nation has such an ambitious digital plan. On 8 March 2007 the Korean government announced a program to promote the use of digital textbooks in schools while pushing aside paper books. With an initial investment of 2.4 billion dollars, the aim was to digitize elementary, middle and high school classrooms so that by 2015 all schools would work with these materials.

The program began in 2006 with the development of a digital book model that was implemented in five schools. This number increased gradually over subsequent years (see tables).

### Progress of the Promotion of the Operation of Schools

Selecting '06 Digital Textbook Schools(5 Schools)

Selecting '08 Digital Textbook Schools(15 Schools) (Dec. 2007)

Selecting Open Source S/W-based Digital Textbook Schools (Aug. 2008) (Selecting and Operating 8 Schools among '08, 20 Schools)

Selecting '09 Digital Textbook Schools(92 Schools) (Jan. 2009)

Source: <http://www.dtbook.kr/eng/intro/intro.jsp?pagenum=m1>

## Pilot research and development plans for digital textbooks

Classification	2007	2008	2009	2010	2011
Grade 5	Development	Application in pilot schools			
Grade 6		Development	Application in pilot schools		
Grade 7			Development	Application in pilot schools	
Grade 10				Development	Application in pilot schools
Number of Pilot Schools	14 schools (including 6 u-Learning pilot schools)	20 schools	112 schools	112 schools	112 schools

But the plan has run into some obstacles (Na Ju Jeonj 2012) which is why the government should, before making a full transition to the digital world, explore the impact that the use of these materials has on students. Among the obstacles to the implementation of digital textbooks, it is pointed out that young people are currently immersed in a world dominated by digital devices where one in twelve learners between 5 and 9 years of age is addicted to Internet (Chico Harlan 2012); there is concern as to whether the use of these devices in the classroom would increase that dependence. Harlan also notes the concern of parents and teachers over students' attention span when it comes to studying with devices that are connected to the Internet.

The texts that are provided to students can be viewed from multiple devices such as mobile phones, tablets or computers. About 10 publishers are creating e-textbooks for this project. Some are mere copies of the traditional textbook while others are filled with 3D animations and video clips. They can also be updated in real time (we should remember that textbooks in Korean must be approved by the government and have bureaucratic authorization).

Finally, in the Asian context we would like to highlight the case of Japan, which despite being considered a pioneer in high technology is behind countries like South Korea,

Singapore and Britain in this field<sup>4</sup> Taking into account the data from the Association of Digital Textbook and Teaching" (DITT), in 2008 the ratio of computers per student in Japanese schools was 1: 7. 3 compared with 1: 3.8 in U.S., 1:57 in Korea and 1: 1.57 in the UK. In light of this setting, 2007 saw the birth of the DITT, a "consortium formed to research, develop and promote a conducive environment for all elementary and junior high school students in Japan to use digital textbooks" (<http://ditt.jp/en/>). This organization focuses its activities in four areas:

- Examining the requirements of Digital Textbooks and Teaching-aids
- Examining the business models and policies to promote this initiative
- Planning and executing user-studies and experiments
- Consolidating knowledge and proposing policy directions

Likewise, it should be noted that some studies such as Mardis et al (2010, 8) point out that "Digital media does not promote in-depth reading (Liu 2009). The Reading of fixed text is the dominant form of Reading in non-digital environments, but multimedia digital textbooks require a different kind of Reading across interactive layers consisting of visual cues, hypertext, digital paper, and "image, audio or even ideogram" (Thomas 2005, 3), p. 8 (...). Perhaps the greater reading effort required by digital texts explains why many students have remarked that digital textbook user interfaces do not seem designed for sustained reading (JISC, 2009) and they prefer to use them for shorter tasks like verifying facts".

Some research suggests there are differences in the degree to which textbooks are used depending on the format in which they appear. Thus, Mardis (2010, 10), makes the following observations,

"Mobile devices are often limited in their educational use by small screen size, lack of display clarity, limited image size and complexity, restrictive keyboard and mouse functions, and diminished spaces for interactive elements" (Churchill and Hedberg 2008).

Although access to the internet may be available through smartphones, data plans are expensive and some cell phone applications (apps) have an associated cost. The new 'digital divide' may be an 'app gap' in which high quality content cannot be used on mobile devices until a unique app is created for it."

Finally we would like call attention to a recent study conducted by the "Didactics and Multimedia" group at the Autonomous University of Barcelona under the direction of Pere Marqués<sup>5</sup>. This research aimed for "systematical experimentation in the classroom with EDUCALINE<sup>6</sup> educational content by performing multiple varied teaching and learning activities in order to identify the best didactic application models and the advantages they may provide" (Marqués 2012, 2).

The research carried out during the 2011-2012 academic year was with the participation of more than 100 teachers from 23 primary and secondary schools. These teachers "performed a variety of teaching and learning activities with the aid of EDUCALINE digital textbooks, which were available in Spanish, English and Catalan" for the subjects of Environmental Studies and Mathematics in 5th and 6th grade of primary school and

Natural Sciences and Mathematics for 1st and 2nd year of secondary school.

Participating teachers were able to combine or replace digital textbooks with paper textbooks, and in all cases students had access to content from their homes. The only requirement was that teachers “at least have interactive whiteboards in class, although it would have been preferable for them to work in classrooms 2.0 (where each student has access to a personal computer when needed).”

The findings of this study showed the following:

- most teachers used the paper or scanned format of traditional textbooks, and, therefore, the use of digital textbooks was lower. A significant fact was that “almost half of all teachers used EDUCALINE digital books in more than 25% of their classes (19% of teachers used these books in more than 50% of their classes).”
- As for the use of EDUCALINE digital textbook functions, what stands out are interactive whiteboard presentations, digital content to support teachers’ explanations, and student work environments. For this reason, the traditional didactic model is still the most used by teachers (lecture classes).
- We would also like to point out that the research has shown that while most students learn more, their marks are not higher. With respect to this, the authors claim: “We had already identified this paradox —students learning more without improving their academic marks— in other studies involving new classroom methodologies with the aid of ICT, and concluded that this phenomenon occurs because examinations continue to involve memorization and do not evaluate much of the competence learning facilitated by these resources and methodologies. Therefore, we are currently carrying out new research, such as the “bimodal curriculum against failure at school”<sup>7</sup>, which, without rejecting essential aspects of memorization, focuses more on the assessment of competencies, both general and subject-specific, that students develop.” (Marqués 2012, 19)
- The following advantage and disadvantages have been identified:

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none"> <li>• It provides new resources that enhance understanding, attention and student involvement, promoting methodological renewal oriented toward didactic innovation.</li> <li>• Facilitates the acquisition of ICT skills.</li> <li>• Improves visual memory.</li> <li>• Facilitates personalization and independent work by students, the development of imagination and creativity, carrying out experiments, continuous assessment, and attention to “multiple intelligences”.</li> <li>• Facilitates teaching, learning and achievement of educational goals, with increased teacher satisfaction, motivation and self-esteem.</li> <li>• 74% of teachers consider that students do not get more distracted in class.</li> <li>• 68% of teachers believe that students learn more.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of suitable digital contents to address the entire curriculum.</li> <li>• Prior teaching habits and resources.</li> <li>• A significant increase in work and time</li> <li>• Students do many exercises by trial and error without thinking.</li> </ul>

## Textbooks in libraries and digital platforms

The demand by teachers and students for platforms<sup>8</sup> with which to share and create digital textbooks brought about many technological innovations and a new type of “open textbooks” published and shared over the Internet. At the same time, libraries have undergone evolutionary change. While retaining their role as organizer of knowledge they have taken on new roles closely related to this new type of content.

Defined in this context are projects such as the “Community College Open Textbook” (CCOTP), created to share digital textbooks online that can be adapted by teachers and students to meet their specific needs. With this platform the Institute for the Study of Knowledge Management in Education (ISKME) examined the adoption and use by teachers and students of open textbooks.

The study showed the potential for new teaching and learning behaviors aligned to the use of open textbooks, including increased teacher collaboration on curriculum development and the interactivity of open materials as an enhancement of student learning. In addition, the study identified challenges for the sustainability of the open textbook model, including teacher technological efficacy and professional development that supports open textbook use (Peterdies et al. 2011)<sup>9</sup>

Another initiative along these lines was conducted by professors from Florida State College at Jacksonville who after working for five years on a project to develop low-cost educational materials (Sirio project), in 2010 published 20 general education books usable in digital format with the CaféScribe application<sup>10</sup> where “students can highlight passages, search on words in the text, take margin notes, and share notes with professors and peers.” Also carried out in Florida is the “orange grove text plus”<sup>11</sup> offering free open digital university textbooks and monographs.

The CourseSmart<sup>12</sup> company platform could also be included on this list. It was created in 2007 by the major North American higher education textbooks publishers and currently “includes over 90% of core higher education textbooks in use today as eTextbooks, and we have the largest catalog of eResources and digital course materials available for instant Access” (<http://www.coursesmart.com/overview>)

Another online platform is smARThistory<sup>13</sup> created in 2005 by Beth Harris and Steven Zucker. Originally, this platform offered audio guides for use in the Metropolitan Museum of Art and the Museum of Modern Art in New York , but eventually began to include such things as video, audio guides, mobile applications, and social networking, making it a good example of what a digital textbook should be. It is noteworthy that this platform is often referred to as “the textbook of the future” (Seed 2012), “a multimedia web book” ([collegeopentextbooks.org](http://collegeopentextbooks.org)), and “multimedia art history book open” (Shank 2012 ).

Furthermore, smARThistory receives about 65,000 visitors per month (Perry, 2010) and has received several awards. In 2009 it won the Webby Award for Education<sup>14</sup>; a year later they obtained an honorable second place at the Mindshare Awards for history<sup>15</sup>. More recently, in 2012, they won the “Award for OpenCourseWare Excellence granted by the Open Courseware Consortium<sup>16</sup>.

With regard to smARThistory, this was given a scored of 4.8 out of 5.0 in the review by Kate Joradahl, professor of photography and digital imaging at Foothill College (see table of results)

Category/Rating	Avg*	1.00	2.00	3.00	4.00	5.00
Clarity&comprehension	4.5					
Accuracy	5.0					
Readability	4.6					
Consistency	4.7					
Appropriateness	4.7					
Interface	4.8					
Content usefulness	4.8					
Modularity	4.9					
Content errors	5.0					
Reading level	4.9					
Cultural relevance	4.7					
Overall Average	4.8					

Source: <http://www.collegeopentextbooks.org/opentextbookcontent/thereviews/art>

From the UK, we can highlight “The e-books for FE Project”<sup>17</sup> an online library that provides around 3000 digital textbooks to all schools of continuing education for an initial period of five years. The books in the collection are subject to the JISC model license and are hosted on ebrary (free platform for e-books). John Cox, Laura Cox and Mark Carden (2010 in JISC 2011) conducted a study regarding this platform and concluded that over 50% of students were enthusiastic about using e-textbooks while only 14% showed no interest. Despite this growing interest, only 12% of learners would be willing to pay for access to these resources. This proportion goes up to 29% if the price is included as part of the tuition.

To conclude this section, we would like to recall the reflections by Bjorkeng (2009 in Igarza 2010, 82) on the need to take two aspects into account when reconceiving libraries:

- “The younger generations will download content from libraries as they download music today, which means the industry will have to do more to penetrate library services from the perspective that remote access to contents will replace access in person.
- Users find that there is too much information on internet suggesting that libraries could play a role as curator, ensuring the selection, organization and navigation through quality content.”

### Digital textbooks in the university context

Much of the research involving digital textbook focuses on the analysis of university textbooks, and we will go on to point out some important examples. In 2001, California State University conducted a pilot project on e-books. The university made e-books available to students (through libraries) and studied the how introduction of this technology in learning environments was accepted and used. Although the results were positive, the study did not foster much deployment of digital textbooks in university classrooms (Langston 2003).

Another study, conducted at the University of Auburn (Bailey 2009) measured the use of

these books in its Montgomery library between 2000 and 2004. They found that the use of digital textbooks increased by 22% compared to traditional textbooks. Furthermore, it was discovered that students were more likely to work with these books in certain degree programs such as: business, literature, social sciences and medicine. Other studies along these lines include those by Alan D. Eno (2010) who analyzed medical students' perceptions of e-textbooks. The results show that while students had high expectations regarding the use of digital textbooks prior to the study, most of them ended up using the printed version (75% used only the paper version). This reveals that the use of digital textbooks did not prompt students to change their habits. This author also claims that the use of these devices can be very beneficial to students with reading difficulties as long as they receive "adequate instruction on how to use the digital textbook." Another interesting point was that many students abandoned the use of digital textbooks because they felt frustrated by the technical difficulties they encountered. Eno states that it is necessary to close the technology knowledge gap, and that students cannot take full advantage of the potential of digital textbooks if they are not previously instructed on their use. Thus, the inclusion of a new technology in an institution must go hand in hand with instruction on the technology. Finally, the study highlights the need to bridge the gap between what students actually know about technology and what they are supposed to know when they start university.

Among the authors who most repeatedly focus their studies on digital textbooks in the context of the American University system is Rob Reynolds. Until August 2011, Reynolds published his research and reflections on the blog "The Xplanation", then he switched to a new blog, "Next is now: how education is changing technology," under which he publishes the digital book entitled "The future of learning content: Digital textbooks, open content, Apple and beyond". This book contains an overview of the current situation in the U.S. of digital textbooks and other digital content.<sup>18</sup>

Also analyzing the university context is the research by Mark R. Nelson (2008) and the report "CDW-G 21st-Century Campus Report" (2011). The first seeks to clarify how the incorporation of digital textbooks into college classrooms will take place by giving a broad view of the current situation. Nelson explains that one of the main barriers to the adoption of digital books is the reticence by members of the university community. Moreover, he points out that student behavior regarding digital textbooks depends largely on teacher perceptions of these resources. Thus, the data collected by Nelson shows that even though students may prefer digital books, they will not acquire or use them if teachers are believed to prefer the print edition. Nevertheless, in line with many studies in this field, Nelson suggests the incorporation of digital books on university campuses will become a reality in the near future and concludes by saying that "denying the future will not make it disappear".

As for the second, "CDW-G 21st-Century Campus Report" is a report based on interviews with students and professors from various universities in the United States. The report notes that new technologies are an important aspect that students take into account when choosing a university; moreover, the results show that virtually all the teachers and students surveyed see the benefits of digital content as an alternative to textbooks. The

most tangible benefit, as identified by 81 percent of the students, are the cost savings.

Also at university, but in the context of London, the "National E-book Observatory" (Estelle and Milloy 2009) has been studying market trends in digital textbooks since 2007. More specifically, it focuses on the impact open digital textbooks have on sales of traditional textbooks and on libraries. The study that gives rise to the report, involves providing students with 36 free access digital books. The findings included the following:

- Using this kind of book was closely related to the academic calendar. The summer months had the lowest peaks. According to the authors, this finding would suggest the need to reevaluate digital textbooks in terms of demand.
- Another important fact, already mentioned in previous research, is that students do not read these books in full, but instead access only the information they need and spend an average of 22.8 seconds per page. Thus, e-books become "just in time" tools for specific queries while, students use the printed version if they want to read in a linear fashion. On the one hand, this suggests that the availability of an electronic version has no impact on sales, and on the other, that digital content in university libraries could help relieve pressure on short-term loans.
- As a final conclusion, it is claimed that digital books are not a threat, but instead can provide a new market, though many shortcomings still exist.

Among the studies that focus on how the use of digital contents affect student learning, the research by Abilene Christina University (ACU) stands out. This institution has a scholarship program called "Mobile- Learning ACU" under which a number of studies involving digital textbooks have been carried out, of which we can highlight the following: Phyllis Bolin in her study "Learning Mathematics: It's at your Fingertip" (2012), attempts to show that the using an interactive textbook that is customizable by students encourages an increase in hours of reading and study and, therefore, improves performance in class and on exams. The study is still underway, so conclusive results can not yet be presented. In his study entitled "Chapter 0: A Student-Created Online Textbook" (2011), Mark Phillips investigates how undergraduate students can develop and implement their own digital textbooks and thus optimize their knowledge. To this end, students were provided iPads and iPhones and created the digital textbook, "The Edge". Among the results the following stand out:

- Almost 60% of students NEVER printed THE EDGE.
- 40% of students believed that The Edge was conducive to studying the material before class, while 25% thought it was no different from traditional books.
- Most of the students stated that the digital textbook reduced study time, that is, they study faster and more effectively.
- As for credibility, this aspect is greater for traditional textbooks.

As a conclusion to the study, Phillips states that digital textbooks created by students must overcome several obstacles such as content accuracy, ease of use and the

perceived cost of these books (the latter aspect is difficult to assess because the digital textbooks provided for the study were free). Some students noted that the design variations among chapters of "The Edge " led to distraction during the study.

Another interesting ACU study was a pilot on the use of digital textbooks carried out by Scott, Perkins Michael Mayrat and Nihalani Priya (2010). The Austin-based educational software company, GYLO, inspired the study. In 2008 this company got started with the analysis and classification of educational materials that could be used with the Apple Store and concluded (as a result of this research) that most educational applications do not make effective use of the technological advantages of Apple products such as the iPhone or iPad touch and, specifically, are not academically worthwhile. Given these findings and wishing to go a step further in their research, in 2009-2010 they created a digital textbook for an introductory course in statistics for first-year college students. The application was designed for the two devices mentioned above and included lessons, quizzes, vocabulary flashcards, a glossary, list of formulas, and a variety of graphic organizers and simulations. During those years, in conjunction with Abilene University they tried to assess the following: (1) application usability (2) use patterns (3) educational effectiveness and (4) user feedback.

Insofar as results, the students chose to use it as their main source of study, rather than the traditional textbook (with an incidence of 75%). They pointed out that these devices made it possible to use the application in situations where they would not normally do so. In addition, easy access to resources motivated them to study. The authors noted that student motivation with the application was closely related to their final marks in the course.

### **The economics of digital textbooks**

The emergence of digital textbook in classrooms has fueled the debate regarding the capacity of publishers to adapt to this new format and the economic impact it will have on the professions associated to the publishing industry. A number of studies have focused on analyzing this issue specifically.

As we have already discussed, the U.S. publishing industry is at the head of the global market and has a great capacity to assimilate advances in technology. Insofar as Europe, the UK stands out by reaching 6% eBook sales, which by the end of 2010 had grown 38% over 2009 levels (ICEX, 2012:8).

The International Publishers Association (IPA) in collaboration with the University of Sheffield (UK) recently released the "Global Map of the Publishing Market". According to this map, the 10 strongest publishing markets in the world are (in descending order): The United States, China, Germany, Japan, France, UK, Italy, Spain, Brazil and India.<sup>19</sup>

We can safely say that the market for eBooks, and eTextbooks in particular, is booming. As an example in the Spanish context, the Federation of Publishers Guilds indicates that eBooks sales in 2010 reached 70.5 million euros, which represents an increase of 37.5% over the previous year. They claim that the presence of digital textbooks can not be considered significant because it "has grown from sales of € 347,000 in 2009-2010 to € 7,613,000 in 2010-2011, which though an important figure, represents only 0.9% of educational book sales" (ANELE 2011, 14; ANELE 2012, 7).

Also in Spain, the eBook catalog "has gone from 107 listings in 2010-2011, to 1080 listings in the 2011-2012 academic year. Most digital textbooks are for primary school (500) and secondary school (407) (ANELE 2012, 14).

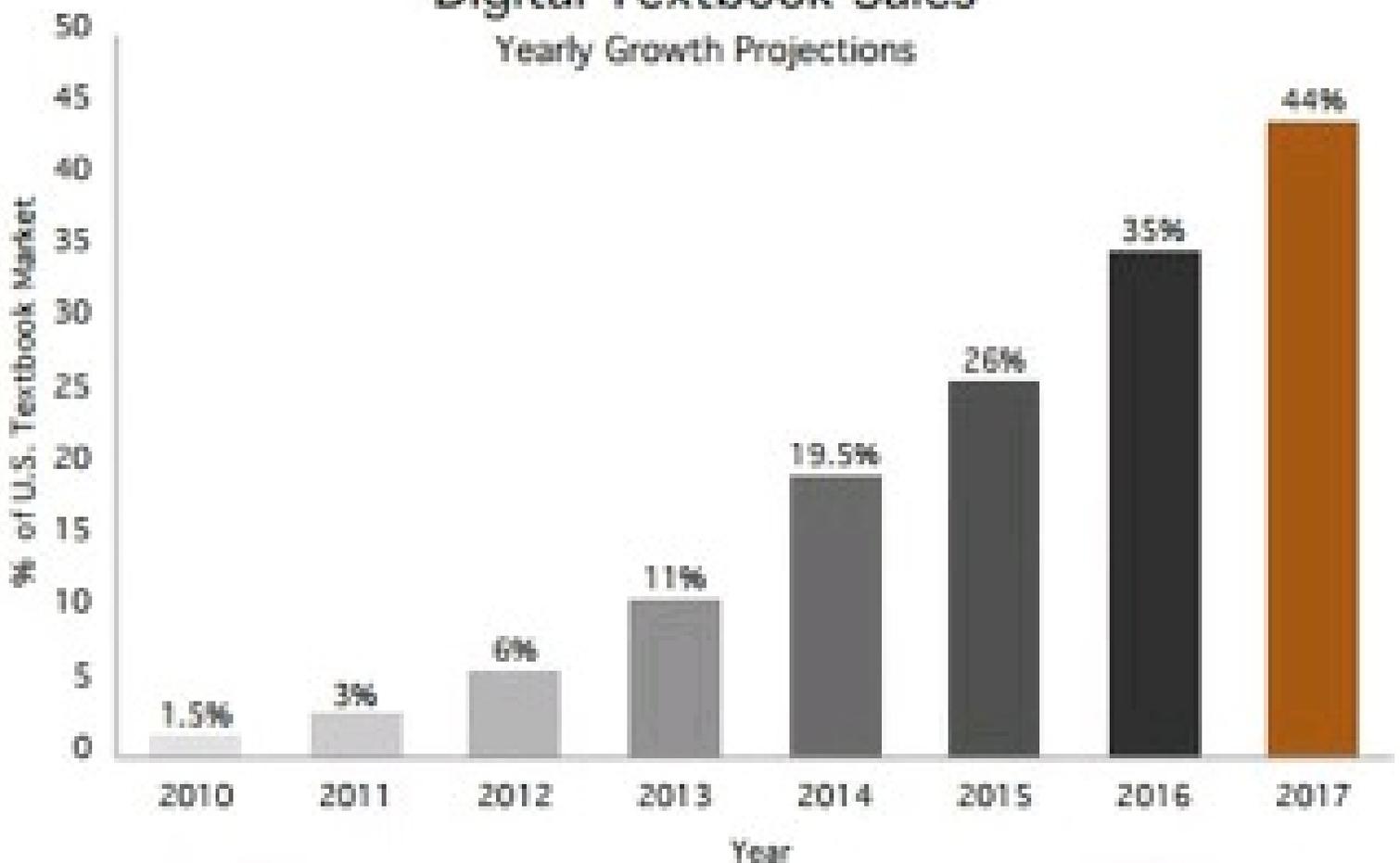
In the period 2010-2012 in Spain there was a 25-fold increase in digital textbooks, which currently represent about 20% of the manuals that students can access (ANELE 2012, 15).

The following table illustrates the growth of this industry in Spain (ANELE Catalog and Domestic Book Trade 2011, from FGEE in ANELE 2012, 15).

	2009	2010	2011	2012
Books Published	----	107	1,08	2,69
Sales in euros	347	7,213,000	9,321,000	
% of total sales	0.04%	0.88%	1.07%	

Similarly in the U.S., the sale of digital textbooks is expected to increase up to 25% (in 2011-2015) with an average annual increase in sales of approximately 80% in the period 2012-2015 and, a growth rate of 25-40% over the next 5 years (2016-2020) (Reynolds 2011)

## Digital Textbook Sales Yearly Growth Projections



Source: Rob Reynolds (2011): *Digital textbooks reaching the tipping point in U.S. higher education: A Revised Five-Year Forecast*

Reynolds claims that the sale of digital textbooks will be influenced by the following factors:

The price of textbooks and other learning materials

- The availability of digital textbook contents.
- The continued growth of for-profit and online learning institutions
- An increase in open textbooks
- The textbook rental market
- The popularity of online retailing and distribution options
- The popularity and development of tablet devices and smartphones
- The advancement of e-reader software and hardware technology
- Format standards for digital textbooks
- The growth of e-books in trade publications

Getting back to the Spanish context, it could be said that “the textbook market is a broken market” (Adell 2012) because end users (students) are not the ones choosing the book, those who do choose (teachers) are not the ones paying for it, and price is not factored into the decision of the purchasers (parents). This causes textbooks to have an exorbitant price, less than adequate quality, and a high concentration in the business. However, with the advent of digital textbooks (especially open textbooks) a significant change is taking place in which students are starting to have a voice.

In the midst of this background, publishers must renew or die. As with the recording and film industries a few years ago, the book market should adapt their formats and contents to the demands of technological transformation. Yet this is no easy task, Rob Reynolds (2011) notes that they are faced with challenges such as:

- Operational shortcomings
- The breakneck speed of change from print to digital
- The need to transform revenue and profitability models
- The importance of using distribution channels as much as possible to maximize revenue
- The importance of price

In 2008 the Consumer Psychology Research Unit at the University of Santiago de Compostela presented a study analyzing the situation of textbooks in education and their continued existence in light of digital textbooks and ICT (2008). Some of the conclusions reached include that the passivity of the publishing industry to these changes meant that the weight of producing contents fell on teachers, educators and even companies like Microsoft, all of which led to a low level of quality. To solve this problem two solutions are proposed: first, for the publishing industry to “catch up”, and secondly for more research to be carried out in the field.

In following table shows the income distribution of eBooks and traditional books by creators and subsequent distribution channels:

	Tradicional books	Ebooks
Price that you pay	\$ 26	\$ 12.99
Printing, storage, distribution	\$ 3.25	-
Design, editing	\$ 0.80	\$ 0.50
Marketing	\$ 1	\$ 0.78
Payment to author	\$ 3.90	\$ 3.25
Share for the bookseller	\$ 13 dólares	\$ 3.90
Share for the publisher	\$ 4.05	\$ 4.56

*Source: Pilar Girma Llorente (2010) El mercado editorial en EE:UU. ICEX*

To adapt to technological change, some publishers propose a digital textbook hosted on the publisher's server and for which parents pay access (see SMLIR-interactive book on the web of the Spanish publisher SM or eBooks on Digital-text). These books are visually the same as the traditional textbooks, the proposed exercises are very basic and the modifications to them that can be made are minimal.

The main competition against publishers are projects such as Wikichicos<sup>20</sup>, Textos Marea Verde<sup>21</sup> and Global Text Project<sup>22</sup> that are based on the Open textbooks format.

As we can see, this is an internal debate presided over by financial concerns. It is a market discourse which seems to pay no heed to concerns over value, textbook quality and possible implications for practice. To the contrary, it seems to be a question of a dispute over a booming market.

### **Regarding the future of digital textbooks: printed books or eTextbooks?**

A burning issue surrounding digital textbooks is to what extent they will replace traditional textbooks. The question which is used as the title of this section is difficult to answer and there are opinions to suit all tastes. We should point out that this controversy does not only involve textbooks but books in general.

As Goral said (2005, 17), there are many who think "that digital textbooks are the wave of the future" and will replace traditional textbooks while others believe that the latter will not be replaced. Regarding the this issue, the conclusions of the TICSE 2.0 project ( which includes a report on the aforementioned School 2.0) highlight that around 60% of teachers think that the traditional textbook will remain in the classroom.

The importance of paper in our culture is undeniable but we must remember that before its invention other media were used for writing such as stones, leather, papyrus scrolls. The plant origin of paper and the deforestation caused by its production has given rise to an ecological argument advocating the use of eBooks. On the other hand, some people think that paper textbooks are more durable because no one can guarantee that digital content will last. We should remember that many historic discoveries have been the result of finding age-old manuscripts.

Another area of controversy around this issue are the economic considerations. The implementation of eTextbooks implies significant changes both in the publishing industry

and related professions (booksellers, distributors, printers and editors). It is assumed that while publishers will continue to earn money, the same may not be true for related professions.

The following is an interesting comparison between these types of books done by the Korean website dtbook.kr:

Digital Textbook		Printed Textbooks
	VS	
Multi-media learning materials like video and virtual, etc	Type of materials	Text and image centered flat, linear learning materials
Fast reflection of new facts and knowledge	Conversion of data	Difficult to convert since data are fixed
Link to various educational materials or DBs	Data collection	Much time and cost required to find data outside textbooks
Information devices (TPCs' and desktop PCs, etc.)	Contents delivering media	Printed media
Possible study between other grades in the course or linking to other courses	Relationship to other courses	Individual learning materials separated between courses
Possible multi-directional study among teachers, students and computers	Learning method	Knowledge delivery-centered one-directional learning
Student-centered class activities and self-leading study experiment	Effect of lessons	Simultaneous lesson in which it is difficult to have class for each learner's ability

Insofar as the advantages of digital textbooks, the following are mentioned (Mardis et al. 2010):

- They support students in the 21st century. Students are more motivated to study.
- They increase opportunities for learning by helping teachers manage time better; in addition, they provide access to a large amount of information anytime and anywhere.
- They promote good teaching. Teachers can adapt the books to the specific needs of each class and each group of students. Digital textbooks can provide real-time access to news, thus, connecting students with their immediate surroundings.
- Lower costs. eTextbooks represent savings for families and can last indefinitely (beyond the duration of e-readers) as they can be updated by publishers without having to buy a new book.
- They protect children's health and safety. The use of digital textbooks would reduce the weight of schoolbags. In fact, we could even do without schoolbags because books can be accessed online books from schools.
- They protect the environment. The plant origin of paper and the deforestation caused by its production provides an ecological argument in favor of using eBooks over traditional books.

With respect to the disadvantages of digital textbooks, the following are mentioned:

- They exclude visually impaired students. The elaboration of these materials must take into account students with special educational needs. Regarding visual impairment, the contents of eBooks should be available in audio format.
- They perpetuate socioeconomic gaps in education because not all families can assume the cost of acquiring devices for accessing these resources (i.e. tablets, computers, smartphones, internet access).
- Current internet connectivity does not allow the use digital textbooks. Although we live in a society where internet can be accessed from almost anywhere (areas exist with free wifi) many households do not have this service available.
- Teachers are not trained to exploit the full potential of digital textbooks. To make effective use of these materials, investment must be made in teacher professional development in this area.

Considering the advantages and disadvantages of both types of material (digital textbooks and paper textbooks) and that textbooks are the most widely accepted classroom teaching material, we wonder what will become of them in the coming years. Will they maintain their hegemony over other materials, or will they remain the “preferred” material under a new format?

Both are difficult questions to answer especially if we keep in mind the history of previous innovations. Many assumed that painting would disappear with the advent of photography, and photography with the appearance of film. Something similar happened with radio and television. Therefore, predictions about the future of textbooks are more a matter of personal opinion than irrefutable fact.

In the debate between paper and digital textbooks, we must take into account the concept of transliteracy; this concept refers to the new forms of literacy skills that are required for a digital context. It is important because this concept is used to describe and understand connections between paper, electronics and others.

We can define transliteracy as “the ability to read, write and interact across a range of platforms, tools and media from signing and orality through handwriting, print, TV, radio and film, to digital social networks” (transliteracy.com)

As Sue Thomas (2010) explains, “the word is derived from the verb “to transliterate”, meaning to write a letter or word using the closest corresponding letters of a different alphabet or language”

About its history, transliteracy originated with the “cross-disciplinary Transliterations Project group, headed by Alan Liu from the Department of English at the University of California-Santa Barbara” (Association of colleges and research libraries 2010) who studied online reading and are, still now, particularly focused on the technological, social and cultural aspects of online reading. In 2005 this group organized a “Transliteration conference” and Sue Thomas (a research professor of new media at the Faculty of Arts, Design and Humanities, at the De Montfort University in Leicester) attend to it and has since built upon their research group in 2006. It is known as PART (Production and Research in Transliteration).

The majority of the research in this area involves the library, but a line of research

around the topic of transliteracy at school is beginning to emerge with force. However, as Alexandre Serres (2011, 5) said, "the transliteracy idea covers a set of research projects on broad topics. It includes the effects of the digital revolution on reading, writing, literature, arts and sciences"

Taking into account the above discussion, the term reflects such things as students' ability to share, participate, connect, re-discover, construct knowledge, and personalize experience (Hamilton 2011).

What we want to convey is that the mechanisms activated by reading digital or paper textbooks are different, and the potential of each are also very different. This must be taken into consideration when comparisons are made.

### **What's new in research on digital textbooks?**

As a final summary, we will briefly review some past research and reflections regarding textbooks and see how they relate to the main findings in the research on digital textbook. The idea is simply to try to identify the main developments from the standpoint of didactics and the curriculum that have taken place with respect to the design and use of textbooks. As a reference point, we will allude to one of our earlier studies (Martinez Bonafé and Rodriguez 2010) which dealt with the state of research on textbooks, primarily in Spain but also referring to several reviews from other countries. We highlighted some of the problems that have been marring textbooks in recent years and also analyzed the need to adopt measures in textbook policies. Thus, we will turn back to some of the issues discussed in that paper and see how they relate to the situation of digital books.

- Textbook characteristics<sup>23</sup>. One of the commonly discussed textbook characteristics involves their formal aspects and the need to improve them. Indeed, although to date some materials and books stand out for their quality and the integration of digital technology in their design (see for exemple Rives 2011, 78-82), in general publishers have not substantially improved the quality of digital textbooks from a formal point of view, beyond some aspects of interactivity and readability (Smith 2000). Considerations such as the difficulty of recruiting quality staff to join publishing teams due to cost and training as well as the need for a real quality culture in the processes of elaborating didactic materials currently represent weaknesses in the publishing industry. Similarly, much of the recently published research continues to show the poor quality of textbooks both in print and digital format, despite small improvements in terms of of interactivity (see De Paiva 2008; Smith 2000; Zapico 2012 and Vicente 2010). Some of the noteworthy formal improvements in textbooks bear relation to the ability to explore information, problem solving, and positive effects on student metacognition. Nevertheless, it is not difficult to find studies claiming that digital textbooks tend not to provide the same idiosyncratic content and quality images as printed textbooks, which leads students to prefer printed books (Hee Yoon-Young Kim and H. Jung 2010). Similarly, the remarks by Mardis (2010, 7) in relation to the

characteristics and use of textbooks are worth noting, "Even when curriculum developers and teachers are given the option to choose in-depth instructional materials over more visually appealing, engaging materials, they choose the less challenging content (Duth 2005)".

- The use of digital textbooks. Many of the studies and meetings involving textbooks in recent years have stressed the need to improve their use along with disseminating best practices and alternatives (Braga and Auxiliadora 2011; Martinez Bonafé and Rodriguez 2010; Rodriguez 2009). Textbooks produced in digital format could make a positive contribution by providing a variety of activity proposals, adapting to diverse situations and learning contexts, and addressing the specific needs of each student. However, recent research regarding the analysis of attention to diversity in both printed and digital textbooks reveals a scant attention to the diversity of pupils with special educational needs (De Paiva 2008, Mardis et al. 2010). In addition, recent research continues to underline the high degree of dependence that teachers and students seem to have on textbooks (Rodriguez 2011; Rodriguez and Montero 2012; Vicente 2010; Watt 2009). Especially significant is the lack of alternative teaching and learning models available to show how digital textbooks can be used in different ways. The study by Byun et al. (2006) (cited in Hee Young Kim and Yoon Jung 2010), indicates that very few instructional and learning models exist for using digital textbooks. Other research on the same topic has shown that students prefer to print the information from textbooks and prefer to handle the resource in printed format (see the reflections appearing in Douglas, Daniel and Baker (2010) or Jones and Brown (2011).

Some of the research we have analyzed focuses on comparing the results of using textbooks in digital or printed formats<sup>24</sup>. Some research approaches have analyzed the process of reading in both formats. Along these lines, the study by Mardis et al.(2010, 9), indicates that "One of the main concerns with this program is its potential to negatively impact students from low socioeconomic backgrounds or children who lack equipment and connectivity at home. Over a fifth of students (22%) find reading on a screen uncomfortable and may resort to printing partial or entire texts (Allen 2008). Printers, paper, and ink can be added to the list of hidden costs, that may, by necessity, shift to the school districts. Some less affluent districts may not be able to afford these costs, resulting in another type of digital divide for students from low-income families".

The electronic nature of digital textbooks could help to personalize attention to student needs, yet so far the research seems to show that textbooks are generally contributing to the replication of old teaching practices. Despite the potential that some of these materials offer, no substantial differences have been detected in terms of the classroom dynamics. Kim and Jung (2010 260) suggest that collaborative working methods have been designed and developed for use with standard textbooks. The findings of some studies indicate that the format in which children read the material is not an important indicator for study. For example, the study by Jones and Brown (2011, 19), suggested

that the e-book format does not significantly increase understanding, pleasure or “engagement”.

-Textbooks, curricular discourse, teacher professionalism and control policy<sup>25</sup>.

Much of the research reviewed highlights the clearly subordinated role of teachers with respect to the educational project that is reflected in textbooks and materials. Likewise, control issues suggest a standardization and interiorization of life in the classroom and in that sense the textbook seems to occupy a privileged position (Martinez and Rodríguez 2010). Digital textbooks seem to continue conditioning teachers practices and that does not seem to be changing.

Similarly, the use of digital books should go together with teacher training to ensure proper adaptation and use of textbooks as well as proposing other alternatives. The truth is that recent research reveals no significant pedagogical changes with respect to either printed textbook or digital textbook. (See Rodriguez, Horsley and Knudsen 2011; Vicente 2010 and Zapico 2012). It is cause for concern that, while in some countries there is a tendency to develop training initiatives in this regard, in others we do not detect any specific training initiatives<sup>26</sup>.

Where are we heading? Insofar as the needs evidenced in the research analyzed which should be addressed in the coming years regarding digital textbooks, we can highlight the following: the decisions and reflections involving the publishing industry can not focus only on the need to provide more textbooks and scan them, but should instead develop another type of discourse in relation to the quality of use, adaptation and integration into the classroom. Materials development teams should include professionals able to pedagogically include digital aspects into the design and use of didactic materials. It is essential for didactic materials and digital textbooks to go through experimentation processes, seeing as many of the textbooks produced seem to skip this step.

In conclusion, we would like to stress that the debate around digital textbooks should not mean other positions and approaches regarding textbooks fall into oblivion. We should emphasize the idea that “another type of school” is possible and not solely dependent on textbooks. We need a school where teachers are able to analyze and reconsider the meaning and significance attributed to textbooks in schools. We run the risk that the discourse regarding the selection, study and role of textbooks will continue to be led by large multinationals and publishers, and that the discourse on digital textbooks will become a mere showcase to help us to cover our eyes to an obvious reality. We do not doubt that the digital nature of textbooks can substantially enhance their characteristics and potential, but it is also true that it has been quite some time since so much was at stake from a financial standpoint regarding textbooks. The possible implementation of digital textbooks will surely inspire abundant research in relation to their arrival at schools, however, we should remember that there are still many “vital” questions about textbooks which are pending response. What has been the impact of free textbook programs? What perception do students have of materials? What impact are “new” school resources having on organizational dynamics? What changes do materials bring about in teacher practice? What training do advisers, inspectors and other teacher support professionals have regarding materials? Another area of particular interest,

mentioned in the School Research monograph(2008), involves the study of the dichotomy between didactic research findings and the meager impact they have on educational practice: Why does this dysfunction occur? What do researchers, teachers and the administration think about this distance? Why does dissemination of educational research not reach schools? Are publishers interested in research on materials? What solutions could be proposed? These are old questions that could provide important clues regarding the use of textbooks in schools, and which are surely no less relevant whether referring to printed or digital formats.

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<sup>3</sup> International Association for Research on Textbooks and Educational Media

<sup>4</sup> <http://phys.org/news204526480.html>

<sup>5</sup> <http://peremarques.net/educaline/>

<sup>6</sup> EDUCALINE is a portal with digital educational curricular contents. For more information see their website:

<http://aulatecnia.es/educaline/8/1/c17/>

<sup>7</sup> Investigation by Pere Marqués on the bimodal curriculum against failure at school (2012-2013)

<<http://peremarques.net/telefonica/>>

<sup>8</sup> According to Marqués (2010), educational content platforms are Internet portals, created by publishers or institutions, where multiple digital educational content are collected in an orderly manner by subjects and levels, (some are specifically didactic while others are informational or recreational but readily usable for education).

<sup>9</sup> A full report can be found at the following link: <http://www.tandfonline.com/doi/abs/10.1080/02680513.2011.538563>

<sup>10</sup> <http://www.cafescribe.com/>

<sup>11</sup> You can find an informational video on this project at: <http://www.youtube.com/watch?v=kIsCs1XGC-s>

The project's website is: <http://www.openaccesstextbooks.org/index.html> Also you could check this website

<http://florida.theorange grove.org/og/access/home.do>

<sup>12</sup> <http://www.coursesmart.com/>

<sup>13</sup> <http://smarthistory.khanacademy.org/>

<sup>14</sup> For more information see the following link <http://www.webbyawards.com/index.php>

<sup>15</sup> <http://www.mindshareworld.com/who-we-are/awards>

<sup>16</sup> <http://www.ocwconsortium.org/>

<sup>17</sup> <http://fe.jscebooks.org/>

<sup>18</sup> <http://www.nextisnow.net/book.html>

<sup>19</sup> The full report is available at:

[http://www.internationalpublishers.org/images/stories/PR/2012/global\\_statistics.pdf](http://www.internationalpublishers.org/images/stories/PR/2012/global_statistics.pdf)

<sup>20</sup> <http://es.wikibooks.org/wiki/Wikichicos>

<sup>21</sup> <http://textosmareaverde.blogspot.com.es/> <http://www.apuntesmareaverde.org.es/>

<sup>22</sup> <http://globaltext.terry.uga.edu/es>

<sup>23</sup> To delve deeper into the characteristics, advantages and disadvantages of digital textbooks in terms of their design, we recommend for example the research by Mardis et al. (2010) and Warlick (2004).

<sup>24</sup> Reading this book provides the opportunity to get to know some of the most significant.

<sup>25</sup> For more information on this issue see the work by Apple (1984, 1989, 1993), Cantarero (2000), and Martínez Bonafé (2002), among others.

<sup>26</sup> In this respect, the minutes from the international seminar on textbooks held in Santiago de Chile (2006), where we had the opportunity to see the diversity of ways governments understand training in the area, may prove helpful.

# Textbooks and hypertextual technology: digital contents and pedagogical change

## *Libros de texto y tecnología hipertextual: Contenidos digitales y cambios pedagógicos*

## Libros de texto e tecnoloxía hipertextual: Contidos dixitais e cambios pedagóxicos

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**Abstract:** *This chapter centers on the issue of how the concrete relationships between textbooks and hypertextual technology have been occurring. It presents the Brazilian reality of the National Program of Textbooks (PNLD) – 2014, which foresees the distribution of digital textbooks to public schools in the country. This chapter presents the possible consequences of this policy and based on the idea that the digital textbook should not be structured as a mere extension or succession of the printed textbook. As a conclusion, it can be affirmed that there should be a change in the pedagogical posture in facing digital textbooks, not only in regard to the teacher, but also to the student, especially in what concerns the alternative trajectories in the forms of textual composition and knowledge (re)construction.*

**Keywords:** *Digital textbook. Hypertext. Pedagogical trajectory.*

**Resumen:** *Este capítulo se centra en la cuestión de cómo se han venido produciendo las relaciones concretas entre los libros de texto y la tecnología hipertextual. Presenta la realidad brasileña del Programa Nacional do Livro Didático (PNLD) 2014, que prevé la distribución de libros de texto digitales en las escuelas públicas del país y las posibles consecuencias de esta política. Admite que el libro de texto digital no debe ser estructurado como una mera extensión o la sucesión del libro impreso. Concluye que el cambio en la postura pedagógica en relación a lo libro texto digital debe ocurrir no sólo en relación con el profesor, sino también a los estudiantes, sobre todo en lo que refiere a los caminos alternativos de las formas de composición textual y (re)construcción del conocimiento.*

**Palabras clave:** *libro texto digital. Hipertexto. Trayectoria pedagógica.*

**Resumo:** *Este capítulo céntrase na cuestión de como se viñeron producindo as relacións concretas entre os libros de texto e a tecnoloxía hipertextual. Presenta a realidade brasileira do Programa Nacional do Livro Didático (PNLD) 2014, que prevé a distribución de libros de texto dixitais nas escolas públicas do país e as posibles consecuencias desta política. Admite que o libro de texto dixital non debe ser estruturado como unha simple extensión ou a sucesión do libro impreso. Conclúe que o cambio na postura pedagóxica en relación ao libro texto dixital debe ocorrer non só en relación co profesor, senón tamén en relación cos estudantes, sobre todo no que refire aos camiños alternativos das formas de composición textual e (re)construcción do coñecemento.*

**Palabras chave:** *libro texto dixital. Hipertexto. Traxectoria pedagóxica.*

## Introduction

New perspectives regarding the teaching-learning processes have been indicated, based on the hypertextual compositions which can be set up using digital books. These innovations suggest a new perspective on the way through which the educator interacts with the students, gradually allowing them to master independence in their cultural development. The changes related to students' autonomy cannot be reduced due to the choices they have regarding pre-established trajectories typical of the printed textbooks.

Although the digital textbook allows relationships between different content in different formats, allowing for structuring plots differentiated learning, a simple framework transposition is currently being undertaken. The printed textbook is changed to a digital format, disregarding the potential that hypertext can provide to the readers. This can be seen when we analyze the format of e-books commercialized around the world. The majority are presented in a static way, restricting the texts to .pdf files, or with interactive options below the hypertextual potential.

According to this, it is necessary to discuss how much the technology applied to the elaboration of educational materials is kept apart from the specific processes related to students' formation, surpassing a merely instrumental approach.

This touches on the main theme of this research: The understanding that textbooks are fundamental for the construction of school knowledge – at all teaching levels, as facilitation between specific knowledge and their application in the classroom. This is connected to the evidence of their ephemeral nature. This relationship is presented, not only through what is thought to be the necessary transformations in content, especially regarding the technology that has provided “competitive” construction manners, be it through its value in the economy of symbolic goods or its market value. Taking this into consideration, the main question to guide this research is: **how has the relationship between textbook and hypertextual technology been occurring, and how are the possible pedagogical changes being produced?**

One of the presuppositions for this study is to consider the digital textbook as an advance in the perspective of developing a medium that is not just the mere extension or succession of a printed textbook. This emphasizes the need for a wider comprehension, not only about the utility of the textbook as a pedagogical instrument, but also of its importance as a historic testimony of the evolution of the fundamentals and practices inside the classroom.

Therefore, the objective of the research is defined as the analysis of how the relationship between textbooks and hypertextual technology occurs, and how the pedagogical changes are configured as results of this evolution.

### **Textbooks and the Editorial Market**

Terms such as book, textbook or school book have been used to represent a concept whose scope has been enlarged concurrently with the innovations in the production processes of the so called textbook. This scope has been significantly enlarged with the application of electronic resources to the editorial production provoking, even misleading, concepts resulting in the interpretations related to the term electronic book (the e-book, as it has been called).

Although the purpose of this paper is not to discuss this terminology – which is already being done, as can be observed through a preliminary exploration of the available literature on the topic – it is important to situate the term in its contemporary context, as it does not always have a singular meaning. This is due to different interpretations related to the specific modes of production of this object. Nor have we intended to analyze its approximation to daily life in the classroom and pedagogical practices. Instead, it is our intention to analyze the meaning of the textbooks while revealing

sources of the school culture, and the value they have acquired in the economy of editorial publications, including in this analysis the modes of production and distribution. In this context, we have included studies related to the publishing companies, the market, reading habits and the attraction exerted by books based on image semiology, reader psychology and culture sociology studies.

Apple (1995) has highlighted the commercial aspect of the textbooks in the studies, not only in the production processes, but also in the publicizing, circulation and use of the books. Since 1971, when twelve publishing companies participated on the first Textbook Fair, in Petrópolis (Hallewel 1985, 30), efforts have been made to adequate this cultural market product to pedagogical fundamental precepts and the innovation opportunities of new digital formats. In that decade, the Brazilian editorial market had surpassed the mark of one book per person a year. This rate was due to two factors: the drop in illiteracy rates from 39% to 29% of the population above 5 years of age, and the growth of the number of university students from a hundred thousand to almost a million people in that period (Reimão 1996, 61).

Ever since, the happenings in the publishing processes impelled the efforts in favor of an expansion of profits obtained with books as an object of consumption and use. Thus, the national and international book fairs that happened in the following period highlighted the exhibition of new electronic formats, as well as their virtues. This constituted a warning for editors, teachers, libraries, books distributors and sellers, who were all active subjects in this market, with more or less involvement in it.

Their value, in the market of symbolic goods, is highlighted among the arguments used to consider the aspects related to the economy of textbooks. This type of material, validated by authorized structures of power, has been considered "legitimate" knowledge and therefore, endowed with symbolic value in the economy of cultural goods. This is clearly exposed by Bourdieu (1987, 100), more specifically regarding the diffusion instances, whose selection operations are invested by a properly cultural legitimacy.

The fact that the textbook, a standardized and specific material, is considered a good with symbolic value, consecrated and destined to occupy a place in the cycle of the editorial economy, elevates its importance as a teaching instrument used in the classroom. This importance has been proved in studies and experiences by researchers in Brazil and abroad.

When analyzing the aspects related to the economy of textbooks, it is important to note that the textbook is considered a reference work, although it also possesses a transient character, due to its fast deterioration and little permanence in the shelves of bookshops and libraries. This condition does not diminish the value attributed to the textbook, and even justifies the increasingly present application of technology in its production processes. This absorption would be a way to keep pace with the material production processes, which are intense and in constant renewal – due to its dynamic application in the classroom – and with extensive circulation – as it is required as a pedagogical instrument almost universally, being in the market for four or five years maximum per edition (Santos 2007).

This is one of the reasons which have led "traditional" publishing companies to

overcome the marks of printed culture. This culture's complexity is already emphasized by authors as Silva & Correia (2004), who point to factors such as "the devices of organization of the contents to be studied, constant in the curriculum and programs", as well as the commanding and controlling legislation derived from the pedagogical principles that guide its construction. It is important to highlight that "the text is constructed in the interaction with other authors, books, models, countries and institutions" (Silva and Correa 2004, 615).

The users of textbooks, as reported by Santana (2012, 134) long for the changes in digital technology, while at the same time questioning their realization. Although some projects incorporate the technologies so students and teachers can re-signify the school experience with digital support, "the technological resources are still used in the same massive way as the printed textbooks or the blackboard and chalk."

In the specific case of Brazil, the National Program of Textbook (PNLD) of 2015 is the first to allow for the inclusion of digital textbooks. They should include educational content such as videos, simulators, games and other digital resources. The application must be accompanied by the printed version to preserve the right to a fair competition between publishers. This is because the editorial Brazilian reality is quite different, for the reason that only a fraction of publishers is capable of working with digital content and new technologies. That is, in PNLD 2015, the digital textbook will be an accompaniment of traditional publishing that will still be the basis on which the assessment is made.

Many questions are still without answers regarding the use of digital textbooks in Brazilian public schools. If on one hand there is a government attempt to promote equal chances of learning to students, or at least similar, with the education offered in private institutions, the other a total ignorance of the reality of these students. It is acknowledged that most of the digital content can only be accessed by using the internet, which can be a problem to set up for a sizable portion of students. In recent survey by the Brazilian Institute of Public Opinion and Statistics (IBOPE), less than half (47.5%) of the population has access to the worldwide web.

In summary, the digital textbook can be an attractive tool allowing for a new look at reading, but it can also turn on the old dusty book on the shelf and forgotten library. This digital alienation is the result of lack of access and its consequences can be even more catastrophic than the known lack of interest in reading in the school library. In this context, there is a danger that the social and economic differences become even more glaring. While the private school student's network will have access to digital content not only at school but also at home, the public school student may be restricted by not having public access in the school environment to the internet or, for failing to own a computer.

Another major problem that arises is the exclusive use of the digital textbook rather than many others in print. Here we do not intend to defend the idea of a digital library, but rather present an opportunity to expand the horizons of both students and educators. The current institutionalized system by PNLD abuts the school public reading of works acquired and distributed by the program. In this sense, the American initiative of Open Educational Resources (OER) allows multiple copyrighted works to be purchased by the government and made available to the public. This would allow the teacher to not restrict

his class to a single book, but to a few. In Brazil, there is a project in progress that provides this type of provision of educational content. Obviously, the Brazilian Association of Publishers of School Books (Abrelivros) has already expressed concern that if this model goes into effect, it will be charged an appropriate value for availability.

In a recent news item presented in the Brazilian press, the minister of education, Aloízio Mercadante, preparing the way for the PNLD 2015, related the high number of youngsters between 15 and 17 years old (16.7%) who are not enrolled in schools to the disinterest in the formal contents presented in the classrooms and the competitive job market. Mercadante believes that the distribution of 600 thousand tablets (until the end of 2012) could be attractive for the students and could encourage them to complete a High School education. This perspective corroborates the idea that the resignification of teaching could happen – only and exclusively – as a consequence of inserting new technologies in the school context. However, it is believed that what should be discussed is not just the change in the framework of textbooks (printed to digital format), but the transposition of contents under a different perspective. (Cobucci, 2012).

This statement is based on the fact that it is necessary to consider that both the editorial process and the digital textbook choice made by the teachers are covered by a series of peculiarities. As for the editorial process, in Brazil we can identify that the digital textbook is part of a context in formation, when considering its contemplation among public policies. The textbook was only featured in guidelines as of the year of 2011, and even then, it only encompassed the DVD format. The prevision is that the National Program of Textbooks (PNLD) 2014 and the PNLD countryside 2013 distribute digital textbooks in public schools across the country. Unfortunately, the purchase will be made through fixed packages of content. This means that nothing can be altered, adapted to local realities or improved, neither by teachers nor by students. (Santana, 2012). These packages are called educational objects, understood here as information structures organized in different platforms, not solely digital ones, in a way to allow and facilitate the interaction of the user with the available content. Any interposition or restraint in this interaction impoverishes the cognitive processes, which constitute the basis of any educational object. Even in a different reality, in which there is integration and interposition between educational objects and participants who comprise the classroom environment, the need for available and updated computer labs cannot be disregarded, including qualified tutors and teachers inserted in the initial process of construction of this knowledge.

Nevertheless, what is observed in Brazilian practice is far from transforming the digital textbook in a real learning object, encompassing all of its potential. The appropriation of such technology touches on the need to break the structural and historical boundaries latent in daily school life. However, what is observed is that new exclusion devices will be created, in a pedagogical perspective as well as on the level of knowledge constitution.

The idea of a digital educational object as a poorly explored possibility puts teachers and students in the position of mere spectators of the educational process. This fact reaffirms the already overwhelmed physical paradigm of communication, which foresees information stocks being transmitted to the other through a medium, without any

interference or collaboration from the receiver. According to Certeau (1994, 260-261), "(...) the mutation which provoked the passage from school archaeology to the technocracy of means has not diminished the power of the postulate of a passivity, typical to consumption, (...) the productivist logic itself (...) took them to suppose that there is no creativity in the consumers".

The textbook, be it digital or printed, must be an organized and structured undertaking with the intention of offering new perspectives on the most diverse contents, surpassing the idea of consumer students and restoring the collaborative practice for the construction of knowledge inscribed, and not circumscribed, to the textbook.

As the textbook has, as its main function, the organization and presentation of this knowledge, it is an indispensable material for pedagogical practice. It is a fundamental piece in the construction of both students' and teachers' knowledge, working as an assistant to plan and execute their daily tasks (Choppin, 2004, Bittencourt, 2004). It is important to note that this perspective is not a utilitarian vision of the textbook; however, it is believed that it is only in the school environment that the textbook gains its significance. Through the study of the uses and applications of textbooks, it is possible to understand the actions originated from the people who use them.

If, on a macro-perspective, the Brazilian state is still taking the first steps toward digital textbooks, it is then not surprising that a large part of the Brazilian editorial market still does not present defined editorial policies regarding the feasibility of pedagogical projects involving the digital textbook.

With regard to this context, it is possible to mention the following factors that make this reality even more complex: the cost of the digital textbook; the distribution patterns; the different possibilities related to the technical apparatus to access the contents; the design; and the relational functionalities connected to the cover, to the table of contents, the images inserted in the text, the bibliography, the footnotes, among others.

We understand it is necessary to consider the digital textbook based on the pedagogical potentialities presented according to the different hypermedia used as hypertextual resources. Firstly, because the textbook is a fundamental element in the composition of teaching and learning strategies, considering a tradition that is mostly placed on specific spaces and levels of learning. Secondly, because the textbook is inserted in the curricular culture, having a preponderant role in the organization and correlation of times, spaces and learning strategies.

Another aspect to be highlighted is that the textbook serves as a guide to the teacher in the chronological organization of their work, proposing and incorporating other ways of knowledge acquisition by the students. Therefore, the textbook in digital format also needs to be selected under a different perspective. This is because the possible relationships developed by students in the moment they use and relate to the information presented in the textbook exceed the limits of the discipline taught. This is precisely where the possibility of teachers working the contents in an interdisciplinary approach resides.

The textbook is understood as a genre which has a clear communicative purpose: the transmission of socially established and validated knowledge. This transmission of the

"official knowledge" is given in a prototypical manner in the textbook, in so far as it is presented as an established body of facts which are delivered through explications and other cognitive functions, such as comparisons, categorizations and nominations. In the words of Edge & Wharton, the textbook is "(...) a discursive genre whose objective is the dialogue about pedagogical principles through suggestions of practices" (1998, 300).

Characterized as a proposal for specific social construction, the textbook seeks to make viable activities established in accordance with the appropriation of a determined content. Its utilization is supported by a characteristic intentionality related to possible information systematizations, which appertain to the people, involved in teaching-learning processes.

It is important to note that, even though the digital textbook allows the establishment of relationships not experienced by the student with printed materials, what is being proven in practice is that the development of educational objects with a similar structure is still evidenced. This establishes a navigation course that makes the alternatives for the reader to relate to spaces that exceed the limits of this new tool unviable.

This appears to be a central problem to the extent that the potentialities of textual composition are minimized, as the reader does not face a condition of autonomy. This requires the digital textbook to be thought over, not only based on hypertextual choices restricted to the text composed for the reader (a text with focus on the forms of fixation and composition of the specific contents), but also as a bridge between the formative processes and the flow of the cyberspace. We are back at questioning whether students and teachers are capable of dealing with this possibility in another way which is not a massive reproduction of the blackboard and chalk.

The book structure is translated as a fundamental element to the didactical activities, as the apprehension of knowledge is directly associated to the multiplicity of proposals presented by the teacher in relation to the most adequate learning strategies. In reference to the structural issues related to production, to the editing of the e-book and to the pedagogical potential, Cavalcante (2010, 204) affirm that:

(...) the collaborative quality of this support can be explored by e-book users, exalting the learner as an active subject in the teaching-learning process, considering that their individual reading trajectory can course several routes. This makes other visions possible, based on several media, and supported by these interactions the links promote connections between information blocks (other texts, information fragments, words, paragraphs, addressing, etc.) known as nodes. However, these blocks do not need to establish a relationship between the signs; thus, the possible connections do not necessarily form the threads of that specific text, but instead promote the opening to other texts, related to each other, but never any text.

In relation to the fragment above, it is possible to mention that this intention of connection between textual blocks not only allows the composition of a hypertext, but also lays the foundation for a visual graphic arrangement that has, in its structure, the possibility to group the use of different languages.

It is believed, then, that the textbook is the material which will be used in classes and courses, and which was probably written, edited, sold and bought considering this scholar and systematic use. Its importance grows even bigger in countries like Brazil, where a very precarious educational situation has the textbook determine contents and condition teaching strategies, decisively defining what is taught and how it is taught.

It must also be highlighted that the textbook is directed, simultaneously, to two readers: the teacher and the student. This double function is manifest, for example, in the fact that certain versions of the textbook are called teachers' books. This object presupposes the interaction between the teacher and the student, aiming at achieving two common goals regarding the teaching-learning process.

Furthermore, the textbook is a space where several conceptions are defined: conceptions about the valid knowledge, correction criteria, authority, ethics, as well as the presentation and adequacy of the information in the socialization process of the different disciplines. In the textbook, we can find the theoretical and methodological options of the educators, presented based on the choice of these materials. This represents the way through which the teacher assists the student in composing cognitive trajectories regarding the knowledge to be constructed.

Such considerations, when related to the digital textbook, surpass these ideals as far as hypertextual compositions allow interpretive trails to be composed by students in the moment they use the hypermedia devices. However, what we emphasize here is that the elaboration of the digital textbook should aim at achieving new forms and possibilities of learning, and not merely reproduce the format of the printed book in a different medium.

Another important aspect related to the constructions that the student will develop regarding the use of the digital textbook, due to the possibilities of information changes, insertion and direction. If, on the one hand, the digital textbook brings in itself (based on its contents) legitimate knowledge, on the other hand it is necessary to think about it as a questioning alternative for the student. This perspective points toward a new dynamic in material elaboration, as it includes different options for questioning, doubt and uncertainty as part of the learning process (Morin, 1999). This process deconstructs the role of students as consumers of information and offers them the possibility join actively in the construction of their formal knowledge. Students can only construct new knowledge based on the school and the textbook founded on the knowledge they already possess about the world.

The essential idea is that the textbook should not only be a device, but should be understood by the student as an alternative among vast learning possibilities and, whatever the case might be, the information endorsed or contested must be founded. As the school is not detached from its social context, both the learning patterns and their elaboration patterns must satisfy the expectations of the school public (meaning the students, their families, their communities) at the same time as meeting the guidelines of the educational system.

As for the textbook selection process and their use, it is necessary to consider the perspectives of the issue based on a dialogue between the teacher, the student and the information universe encountered in the virtual medium. It is important to note we are here to discuss issues related to the use of the digital textbook conceived as a hypertextual manifestation included in a specific field of tension and power relationships – education – and surrounded by criteria that allow this material to be used in a specific discipline. As we consider such manifestations as specific conjectures in themselves, we next discuss the concept of hypertext and its importance in the structuring of shapes and

contents that make up the digital textbook. We defend the concept that such materials must exceed the off-line composition and must be based on fluid possibilities, proper for the web environment, through the composition of hypertexts open to external spaces, so we do not refer merely to the change in the support of textbook.

## **The Importance Of Hypertext In The Digital Textbook: Autonomous cognitive trajectories**

The notion of hypertext is historically connected to the integration of parts of texts among which the references are maintained. It is indispensable to highlight beforehand that the hypertextual relations were not founded together with the development of the computer-mediated communication (CMC), which means there are manifestations in these textual constructions that translate technological advances according to functionalities found in different information resources and in the web, among them the textbook.

In this perspective, both the hypertext and the textbook can be conceived as devices that allow the elaboration of systems of intertextual relations, not exclusively conceived on computer-mediated communication. Although, according to the common sense, the use of term hypertext is arbitrarily associated to the connections between text fragments through links, outlining nexus between different lexias<sup>1</sup>, the notion of hypertext contributes to the relationships found in other documents, related to the approximations between non-linear reading and writing and the processes of collaborative textual construction.

Lemos (2002, 130) contributes to this topic by presenting a significant definition of hypertext, while discussing the importance of such manifestations based on textbooks, due to the possibilities of connection, the hypermedia convergences and the different uses for the students. He affirms that:

The hypertexts, be it online or offline, are textual information combined with images, sounds, organized in a way to promote a non-linear reading (or navigation), based on indexing and association of ideas and concepts, in the form of links. The links work as virtual doors which open paths to other information. The hypertext is a material with several entrances, where the reader/navigator chooses their route through the links.

Regarding the historical context in which the term hypertext was coined, we must emphasize that Ted Nelson designated the reading and writing non-linear systems, explained in more complex in his *Dream Machines Computer Lib* dated 1974, and the same discussion resumed in *Literary Machines* in 1981. According to the author, hypertext is a non-linear structure that combines parts of texts through directional structures. In this sense, an analogy is needed regarding the website be construed as a repository of cognitive possibilities, due to its structure, allowing the reader to extrapolate the notion of browser textbook because of cognitive choices based on their prior knowledge.

Nelson (1974) refers to hypertext as non-sequential writing, which forks a text that allows the reader to elect to read better in a spreadsheet, a series of interactive text blocks connected by links that form different paths for the user. Regarding pedagogical practices that consider the use of hypertext as a way to compose the digital textbook, these new itineraries are realized as possibilities for constant restructuring of educational activities, so allowing more flexibility about the options that may be made between

teachers and students as a way of learning, relativizing traditional power relations.

Landow (2009, 341) points to a series of changes in educational relationships, the fact that "hypertext teaching redefines the role of the master transferring some of the power and authority to the student." Furthermore, it allows different degrees of multidisciplinary connections complexities, approaching students who are at different levels of training and information sharing between them. Links to this question and observation about the learning time of each student, unlike what is predetermined on the printed textbook.

Because the digital textbook is based on relationships between text blocks, teaching methods and assessment methods need to identify the individual cognitive constructs. There rearrangements in the roles of students in order to construct their knowledge and conceiving it as a process embedded in a particular community. If the network is structured so students can hypertext and so much faster access a larger universe of sources of information, this presupposes the search for a greater range of information, composing his own knowledge and relativizing boundaries between the digital textbook and network.

Some highlights must be identified regarding the frontiers of authorship and reading which are altered by the use of links, considering that the reader has the role of intervening in the process of constructing permanently open texts.

The links are the essence of the hypertext. It is expected that in the future all hypertext systems will allow the establishment of links with lexias on which one has no right to make exchanges, verbal or otherwise, not having analogies with the printed materials. One of the effects of the links is that they create an intermediate domain between writer and reader, blurring the distinction between the two roles even more (Landow, 2009).

The link, understood as a pedagogical strategy, allows the reader to have in their hands the possibilities to migrate to other informational sites inside a restricted context. The reasons for the linkages are an important aspect to understand the quality of the digital textbook. On the other hand, it is possible to infer that the links inform the behavior of who composes them and to the real objectives of such enterprise. In this sense, this device makes an emancipatory process likely, as far as the student directs the trajectories in an autonomous manner, creating possibilities of incorporation, acceptance and refutation of the knowledge inscribed in these materials.

This reality requires new perspectives from the ones involved in the process of elaboration and transposition of digital textbooks. This new technology is opposed to the current production practices of scientific textbooks, which are part of the circuit of material selection performed exclusively by the teacher. These purposes point to the craft and practice of teaching as a one way street, in which teachers transmit information and students receive it. We highlight that this posture is the standard rule in the educational process; however, independently of the support used to transmit and systematize contents in the classroom, there are exceptions that believe in the education as an act of construction, and not only of reproduction and assimilation. In fact, this idea dismisses the changes in textbook support and is focused on the alterations in its practices and uses.

We defend that the core of these potentialities resides in the fact that the hypertext allows intertextual and intratextual links to be effectively composed. We believe the ways

to compose content must exceed the notion of roles historically determined – authors, editors, designers, teachers and students. This (re)signification would allow the transposition of an offline text to the online format, prioritizing the quality of the textual relationships established by students themselves, in such a way that the hypertext has continuity in other spaces.

### **Final Considerations**

The reflections presented previously indicate the possibility of reconstituting the contents for the individuals who intend to compose the hypertext found in the digital textbook. This exceeds the mere notion that the student must inherit only the route used by the author. It is necessary to consider that the role of mere spectator must not be attributed to the active reader – expression used by Landow (2009) –, as this reader is a fundamental piece in the intervention and the feedback of the cognitive process.

Consideration should be given to the path options proposed in the moment of writing (regarding the options connected in the moment of reading) are determinant for the reader to navigate the web according to their choices, being the core in the reorganization of the author function. This perspective puts the responsibility of the text written by someone else in the hands of the reader. Furthermore, it translates into emancipation possibilities for the subjects, because it allows the reconstruction of power relations in the literary field, understanding this field as a political arena through which the learning processes are manifested and consolidated.

At last, it is believed that disregarding the format of the textbook –digital or printed–, the propositions presented in this paper presuppose a change of conduct. These perspectives are related not only to the teacher, but also to the student, especially concerning the relationships established by them regarding textual re-composition and knowledge (re)construction.

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<sup>1</sup> Lexia is the expression used by Roland Barthes to name the unity of lecture. Landow also uses this expression in order to design the interconnected text blocks that characterize the hypertexts.

# Exploration On New Roles And Changes in E-Books In Education<sup>1</sup>

## *Exploración de los nuevos roles y cambios presentes en los E-Books en Educación*

## Exploración dos novos roles e cambios presentes nos E-Books en Educación

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**Summary:** *Paradoxically, in contradiction with the alluvium of critics that the textbook receives from academic sectors, both professors and students showed in most cases a good opinion regarding this instrument. In general, professors are not very aware of the obvious criticism that wraps the academic analyses of school books. The criteria for their selection and evaluation are usually personal and diverse paying bigger or smaller attention to their contents and activities but with a positive or very positive appreciation on them. From the educational point of view, the textbook acts as a sailing map that reduces the uncertainty and complexity of teaching. Our goal is to open a discussion about the role the digital schoolbook will plays in the classroom, analyzing the possibility of improvement, which eventually leads to consider a genuine educational reform.*

**Keywords:** Selection - Evaluation - Role - Digital Textbook - Educational Reform

**Resumen:** *Paradójicamente, en contradicción con el aluvión de críticas que el libro de texto recibe de los sectores académicos, profesores y alumnos han mostrado en la mayoría de los casos una buena opinión respecto de esta herramienta educativa. En general, los profesores no son muy conscientes del evidente criticismo que envuelve los análisis académicos sobre los libros escolares. Los criterios para la selección y evaluación suelen ser personales y diversos prestando mayor o menor atención a sus contenidos y actividades, pero con una valoración positiva o muy positiva general. Desde el punto de vista educativo, el libro de texto actúa como un mapa de navegación que reduce la incertidumbre y la complejidad de la enseñanza. Nuestro objetivo es abrir un debate sobre el papel que el libro de texto digital jugará en el aula, analizando la posibilidad de mejora, lo que finalmente conduce a considerar una verdadera reforma educativa.*

**Palabras clave:** Selección - Evaluación – Rol - Libro de Texto Digital - Reforma Educacional

**Resumo:** *Paradoxalmente, en contradición coa chea de críticas que o libro de texto recibe dos sectores académicos, profesorado e alumnado mostraron na maioría dos casos unha boa opinión a respecto desta ferramenta educativa. En xeral, o profesorado non é moi consciente do evidente criticismo que envolve as análises académicas sobre os libros escolares. Os criterios para a selección e avaliación acostuman a ser persoais e diversos, prestan maior ou menor atención aos seus contidos e actividades, pero valóranos positiva ou moi positivamente en xeral. Dende o punto de vista educativo, o libro de texto actúa como un mapa de navegación que reduce a incerteza e a complexidade do ensino. O noso obxectivo é abrir un debate sobre o papel que o libro de texto dixital vai xogar na aula, analizando a posibilidade de melloralo, o que finalmente conduce a considerar unha verdadeira reforma educativa.*

**Palabras chave:** Selección - Avaliación – Rol - Libro de Texto Dixital - Reforma Educacional

## Introduction

Several programs are being implemented in Argentina, as in other countries. Model 1:1. In the case of "Conectar Igualdad", it was proposed to distribute 3 000 000 free netbooks between 2010 and 2012 to students and teachers from Argentinean public High Schools, Schools of Special Education and Teacher Training Institutes. The main purposes were focused on promoting social inclusion and also promote the improvement of teaching and learning.

For this purpose, they are provided a set of actions such as: the introduction of several curricular areas of use of ICT in initial teacher training, free supply of ICT training courses (both general and for different areas of the curriculum), broadcast media print and digital experiences, innovative use of netbooks in the classroom, the publication and distribution of Texts about pedagogical uses, etc.

At the beginning of 2013, nearly two and a half million netbooks had been distributed.

The objectives that will be harder to achieve are those related to the quality of teaching and learning. These would involve a major change in the organizational culture of schools, and the roles of teachers and students, to give rise to networking, distributed cognition, or connective intelligence.

Another basis of the Program "Conectar Igualdad" is the ongoing evaluation of its progress, and to make any adjustments to it that become necessary. Although, for over a decade, different parts of the world have had massive programs introducing ICT into schools, the set of assessments available is scarce, most tend to be descriptive of the implementation process omitting the inquiry of how to use ICT in the classroom devices and do not yield consistent results (Valiente, 2010)

In Argentina, supported by several universities, the final evaluation report and monitoring progress is a preliminary exploratory study on perceptions about the program and its potential, the link between youth, learning and netbooks, teaching practices in institutions and introduction of netbooks in homes (AA.VV., 2011)

We believe the continuity of efforts and a holistic view on these policies are two points to avoid the known effect ICT: maximize the good or evil that already exists

Historically, the central figures in modern educational reforms since the time of Comenius have been training teachers and textbooks. In the current scenario, the main discussion shift is still in training and teaching performance, but teaching materials and learning have been shifted to the synergy of centralized ICT in computers, but does not exclude the use of devices such as tablets, cell phones, cameras and digital music players, etc.

Educators, authors, and publishers of digital textbooks seem to have the challenge of responding to the current trend, transforming the traditional, and relatively uniform mass audience, into groups much more fragmented and individualized that demand more interactivity and participation to capture their overwhelmed and labile attention.

In societies with written cultures, historical bonds between book and education have been considered an actuality. Against this background, the book itself has played a key role, though not overpraised by education renewing currents.

From our perspective, the digital textbook could become a navigation map but is not to be kept in the closed and predictable format of its predecessor; it will have to radically change structure and no longer guard against changes to its role in the hierarchy of learning.

Throughout the present work, readers will not be exposed neither to the formulation of any utopic or distopical predictions nor to any discussion concerning prospects that might have been conjectured in the last decades. Instead, we are going to devote ourselves to synthesize main conclusions of the research work on printed textbooks we made a decade ago (Fernández Reiris 2004, 2005). We will outline some preliminary and generic questions about probable continuity or breach that could take place due to media and digitalization convergence.

After five centuries of printed letters, we now witness the so-called computerized revolution. However, there are more questions than answers at present.

## **How will current society reports will be transmitted to future generations?**

Scrutiny of distortions and ideological prejudices presents an attractive issue in studies on textbooks. Discourse or contents analysis, made in various countries, show an agreement on the pre-eminence of a patriarchal, gender conscious, European views supporter, standardized and simplifying ideology biased against age, gender, people's origins, social class or psychophysics traits.

Furthermore, textbooks themselves give rise to strong dialectical arguments on the transmission of official stories, subjects' direction, and historical or political interpretations. More than once, these dialectical arguments reach newspapers' pages or even can start diplomatic conflicts like USA vs. Brazil, Argentina vs. Chile, or Japan vs. China/South Korea.

The presentation of contents, according to varied studies and research work summarized, curricular emphasis lies on subjects themselves, logical organization, and a neither non-controversial nor conflicting treatment of information. This information should be transmitted through a language with supposed neutrality as a new' journalistic genre, avoiding any explicit consideration for the authors' metadiscourse. Most texts' contents are presented as exempt from any ideologies. In fact, the prevalent view on the matter is one that considers "social reality" as an external circumstance to people that might be "uncovered" though scarcely likely to be modified.

If we define ideology as a worldview, nobody is exempt from ideology or axiological certainties. Furthermore, considering people as being possessed rather than having an ideology of their own is almost an axiom. Therefore, being conditioned by an ideology turns knowing someone's thoughts into an almost impossible task.

Concerning this first issue, we ask ourselves: could this new base and format overcome the prevailing, simplifying, and unique report?

Firstly, we could ponder over an affirmative answer to the question above given the fact that new information and communication media have eagerly encouraged dissolution of a traditional reading style and a communicative interactivity/interconnection. Secondly, this dissolution is contemporary with an increasing sense of individualization and the appearance of, at least on a rhetorical and public opinion level, an intercultural, gender diversity, social integration and inclusion discourse as well as recoveries of traditionally hidden groups that have been taking place since the last decades of twentieth century.

Hegemony creates against-hegemony. It is possible that there is better scenery for an ideological polyphony, affirmations, and refutations on each topic. However, digital textbooks try, by vocation, to restrict thoughts dialectical pendulum. In so doing, these textbooks, give rise to a biased kind of thoughts, no matter how diverse "roads" could there be to be followed. Thus, we should be conscious of that apparent multi-direction position.

Will "Procusto's bed or Occam's knife" from the hidden curriculum survive? This could be observed in the future or present analysis of digital textbooks that are already in the market and undoubtedly are going to be kept there.

## **What changes are going to take place as regards learning and teaching propositions 'structures, communication, contents 'didactic and psychopedagogical adaptations?**

Once design, development, and production, together with its pre-established structure for a school course have been carefully examined, we conclude that "constructivism and printed textbook" is an oxymoron despite advertising the opposite. To exemplify this, we refer to methodology based on project work and ask the following questions: Is it possible to guide, in a pre-established and detailed way, a school research process? Is it possible to guide and construct in an out of context way?

After analysis and other research work results, contents approach and consideration as well as their characteristic simplified and fragmentary propositions have been strongly criticized.

There are some outdated similarities between the way topics are dealt with and the journalistic genre. Contents are so narrowly classified that they turn summarizing into a quite difficult task. Thus, true analysis is overcome by memorizing.

Textbooks have been thoroughly analyzed from a didactic point of view. Most of them had outdated approaches, inexactness, simplifications, distortions, outstanding omissions, lack of depth and problematical situations, etc.

Given the fact that textbooks have been used with misstatements, as the ones just listed, even after having passed official examinations in different countries, we cannot avoid asking a question like "Will epistemological watchfulness become more intense as regards e-books?"

Indeed, university research teams play an essential, though not often properly assumed, role concerning e-books academic considerations. Textbooks, often taken too much for granted, opening readings deserve we do our best to improve. Efficient criticism made by studies of textbooks' readable features, as well as sexism, ended in good results throughout the last decades.

Regarding the tasks themselves, it can be said that most activities are based on the textbook used at present, lacking any connection with other school curricula's materials, opposite resources, or sociocultural background. Textbook's chapters have a straight and repetitive design that prevents learners from reaching any level of challenge.

Most activities display little complexity and leave almost no room for any teachers/students' initiative. Questions, as part of given exercises, offer a low inference level, and included pictures are just ornaments. Orthodox school activities support individual work with little or no relationship to other subjects, school itself, parents, or community in general. Getting out of school or background consideration as activities in themselves are never thought of. Thus, distance between school and out of classroom experience becomes larger.

Will the coming of the digital and hypertext era be able to overcome some of the above inadequacies? Will it be possible that regularization codes be more effective in their conjecture that both contents and learning/teaching's activities should be simplified?

In reality, textbooks cannot go on holding their historical hegemony. These must adapt to the multimedia resources convergence that characterize the essence of the digital era. Editing companies are slowly trying to do ensure that this process takes place so create

the means for most teachers to achieve digital teaching competence. These companies wish to be the suitable entities to select, organize, and systematize the hypermedia web. This will be the consequence of their unique role, successfully played till now, of being the syllabus's controlling and hegemonic means.

Taking into consideration the hypertext format, we can say that its advantages and disadvantages gave rise to serious debate, though this has decreased as time goes by. Indeed, such format fits in with neural circuits network style, has neither pre-determined beginning nor pre-determined end. This is a multiplicity provider though it lacks depth structure and, consequently, this format might give place to remarkable decrease in attention and even the loss, distortion or dissolution of meanings. As expected, this led to debate on the incidence on the increase of attention, and concentration difficulties, concerning the youths themselves given the intense and exclusive use of these media made by the later.

According to our point of view, one of the valuable didactic features of computerization lies in its intense and renewed invitation to interactivity, writing, and re-writing as in ancient palimpsests. On the contrary, printed text features are those of a product that seems a complete and closed product in itself. Furthermore, the emphasized possibility and necessity of a bi-and multi-directional communication plays a key role in advantageous breaks concerning repetitive teaching and learning ways. Here we should ask questions about didactic and methodological changes that took place at long-distance universities which are already making use of computerized platforms and textbooks.

Nevertheless, we are interested in knowing if those activities that claim people's larger participation and freedom on education and society's field will become true, despite just formal changes. Being able to be part of so many expression and participation means: are we going to stop being just onlookers? Will passive, consumer-like, non-critical, and pro-individual work attitudes, typical features of a vast quiet majority, be overcome?

To be honest, I have been a FaceBook user for about a year by now, and I could guess that most of those who come from orthodox format books' reading, like I myself, just upload images we really like, to be shared by other FaceBook friends, with a remarkable tendency to avoid expressing any private thoughts or feelings. Meanwhile, youths advocate freedom by using the web to express opinions, feelings, likes, etc. That generational gap which is sometimes characterized by outdated attitudes deserves being seriously researched.

### **What political strategies will be adopted by governments to control schools' curriculum?**

Printed texts have proverbially been the main, and sometimes monopolistic sources, to introduce and express the official curriculum's design. To illustrate this, we could recall an anecdote concerning a French civil servant who, given the fact that textbooks were being excessively used, boasted that he could know exactly what students of a given class were doing at a given time.

Currently, a countries' control over textbooks ranges from state's design (Mexico) to state's supervision (Spain) or no rules observation at all (Argentina). However, control over textbooks has been recently transferred to national and international assessment

policies.

Taking into account that printed textbooks were originally created as tools to reinforce standardized school development and still keep on playing a key role in the curricula's homologation, we could ask ourselves the following questions: How will state deal with digital contents? Will studies syllabuses and evaluations' resolutions be reinforced or dealt with in detail and intensified?

In fact, the new formats and bearings are probably being observed, watched, and even censored. This can be seen in constraints like those applied in Cuba, Iran or China as well as in the adoption of already made digital platforms where communicative exchanges are restricted to school ambit.

Even though planning and evaluation policies have been emphasized, there are rather vague new or renewed ways to be adopted by democratic governments concerning the joining together of consistent and coherent educational systems' curricula taking into account the challenge put forward by the evanescent feature of digital texts.

### **Which profile will textbooks' market have in digital publishing houses' world?**

This is a key question for educational sector publishing companies. They are doing their best to survive in digital society's business world. Commercial publishing is based on good sales and profits. These, in turn, become strong due to a centred and concentrated publishing houses' market. Today, given the fact that we are going through an advanced capitalism stage, the market of cultural publishing houses and audiovisual device industries is characterized by conglomerates' prevalence that leave little if no room for small or average companies.

A school edition is a profitable subsection intended for an audience that used to be captive within a large and homogeneous market that did not encourage innovation, or the plurality of the offer. The biggest profit was achieved where the more general the reception was. For instance, an editorial representative in the late 90's spoke of the need to develop "an European textbook". In this sense, some key questions would be: How far will the limits of globalization be in the face of increasing access and the variety and diversification of sources of information? How will it be reconfigured by the power of media conglomerates? Will the mega-mergers continue? Will new companies emerge? What new business opportunities will arise from the conversion of liquid content?

Concentration and accumulation, which is the basis of capitalism, is present in the digital world, examples of Google and Microsoft speak for themselves, but it is not so clear for the future considering the gaps left by the system in liquid condition.

The publishing industry is in tension between the business logic and the pedagogy logic. The first one prevails on the decisions of the editorial staff because the conception of the recipients relies on abstract profiles of the "average" student and teacher. Beyond the work of marketing departments, there is no research tradition and innovation in the sector. There is a standard model of the book, which is produced in a relatively short time, usually not more than a year. It seems competitive products design their own.

The challenge posed nowadays is like the classroom is transferred the educational centre from teaching to learning, publishing accent goes from offer to demand. To have a good response to this, varied and rigorous studies will be needed as well as a genuine

self-assessment culture, feedback, and continuous improvement of the products. The rapid rate of technological change leaves us little loopholes to think their pedagogical implications and we face the rigor of trial and error.

For example, in recent years several leading publishing companies have launched their e-book, web books, or digital textbooks conceiving them in this transition time as a complementary tool of printed textbooks, which seem to integrate the new ICTs. In them it can be seen the same canonical structure now digitalized, with hyperlinks and instead of "activate previous ideas" with fixed images, it is now done with videos.

Similarly, manufacturers of digital reader appliances are having trouble leaving the codex format and they design devices in order to seduce a generational audience that has grown up with the printed book. How will the formats and artifacts be when they start gaining prominence young people who are more familiar with the internet roll, audiovisual surround of their phones and tablets?

The turbulent publishing scene is reaching a climax with the development of digitizing and convergence from the last fifteen years creating increased complexity. The recomposition that impels the publishing world indicates that there will be new players on the scene and some dealers, printers and Booksellers are seeing in danger their jobs.

The authorial team identification, with some exceptions, has never been very noticeable and neither that condition gives academic prestige or promotion in their careers. In modern times, the debate over the authorship and copyright has tangled lines and controversies that do not give us a clear vision of where we are going: A return to the anonymity of the medieval world? Widespread collective productions? How far will the public domain advance?

With the shortening of the production, which eliminates high amounts for distribution, storage and sale, the reduced cost of the anatomy of textbooks will define cheaper prices: Will the unwritten law of the supply and demand st them? Will be free offers? Will more or less covert advertising be introduced? Do limits apply?

It will be interesting to see the progress of programs Model 1x1, with the Free State distribution of netbooks to students and teachers in recent years being implemented in countries like Israel, Korea, Portugal, Uruguay, Argentina, etc. In many cases, universities have requested the accompaniment in research and training in order to meet and strengthen teaching reception and the use of the devices by teachers and students.

**How it will be define its impact on the new roles of teachers and students in the classroom?**

The link between teachers and textbooks is complex. From early Modernity discussions have begun about whether it would be more important and convenient to make better teachers or textbooks, and usually the cheapest bet (i.e. optimizing the books) has prevailed. This means that the relationship teacher-textbook has been fraught with tensions.

According to the record that we have about the state of the art, there are not many studies on the use of textbooks in classrooms. It has not addressed as much as half in his decisive context of use. According to the limited research that we have achieved, we can identify that teachers move between the extreme lines of dependence and autonomy

from textbooks, with many nuances found in study cases that noted different styles coloured by their approaches and pedagogical models. Simultaneously, the use of books varies depending on the type of subjects taught and the developmental level of the students.

Teacher criteria for their selection and assessment tend to be personal as well as diverse paying more or less attention to their contents and activities but with a favourable or very favourable assessment on them. From the standpoint of teachers, textbooks act as a navigation map that reduces uncertainty and complexity of teaching and from the perspective of the students, they also decrease the uncertainty, time, and effort required in the study. In general, parents appreciate these same utilities.

School culture is not configured directly by the textbook, but it responds to the set without trying to change it, camouflaging it. In order not to lose the interest of the greatest number of teachers, is not usual for publishers and authors to radically change the ways of communication between faculty, staff and students, and plot-class relational groups that can be framed in predictable sequences and repeated tasks (routines), and in several books, with more instances of individual fulfilment of that group.

Uniform modelling of teaching and learning, and repetitive structured detail joins the institutional grid with school times and bounded discontinuous rigid and impersonal spaces. Therefore, the authority emanates through the textbook and strengthens the institutional mechanisms and the authority of the teacher who chooses them and gives them relevance. This interplay can be identified even when, for economic reasons, photocopies are used because they are usually drawn from textbooks and emerge a "textbook invisible" with traditional patterns such as those published.

Inbreeding and customary closing school? Respond positively to the challenge of lean digital interconnection and network thinking? Does the availability of diversified media and accessible facilitate the desired break with outdated uniform imperative? Pop up? Participatory and collaborative culture of all members of the educational community?

## **Conclusion**

From our point of view, the focus of analysis of the issues here will be if they put into question the discursive practices and specific academic models and / or that have prevailed largely technocratically in schools that better accommodate and respond to the mandate homogenizer founding of the modern school and the context of capitalism.

The power and pervasiveness of the new technologies of information and communication can offer us greater opportunities for both emancipation and autonomy as well as conditioning and coercion.

To emphasize the apocalyptic vision is enough to retrace dystopian novels 1984 by George Orwell or Brave New World by Aldous Huxley. They have also been translated and illustrated cinematically, or the earlier films of Charles Chaplin Modern Times or Fritz Lang's Metropolis. However, adopting the integrated view, or optimistic about the potential of the introduction of audiovisual and computer tools may involve getting worried in naivety.

We believe that, given this predicament, we need to escape from technological determinism in either direction. Social transformations are built by individuals in

interaction with the political, social, cultural, and institutional contexts. We are immersed in them and we need to think and act thoughtfully and collaboratively to enhance the positive implications and decrease negative changes. Investigate and operate on the means of teaching is, undoubtedly, an attractive and enriched matter to begin to fulfil that need.

Once again, the rhetoric that usually covers the speeches of reformation of education, only outlined in vertical direction, showed its failure. In spite of the recommendations of international organisations, digital textbooks cannot improve the quality of education by themselves. Politicians that support attempts in curricular innovation, should also support the dissemination of changes through substantial improvements in the conditions of schooling, the initial and continuous educational preparation, the provision of educational resources, etc. We believe that it is impossible to ignore the fact that improvements, besides the external impulses, should include as axis a current from the interior of the schools that constitute the analysis and innovation unit for any reformation attempt.

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# Digital textbooks in U.S. K-12 schools: A socio-historical exploration

## *Libros de texto digitales en el sistema escolar estadounidense: Una aproximación socio-histórica*

## Libros de texto dixitais no sistema escolar estadounidense: Unha aproximación socio-histórica

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**Summary:** *This chapter presents a historically situated exploration of United States' discourses around the use of digital textbooks in non-collegiate education. After an outline of the chapter's framework of analysis centered on postmodern social theory, the reader will find a review of the long tradition of American exceptionalism and the technological sublime in which the current digital textbooks' adoption craze may be situated. This trend will then be looked at in relation to an ongoing process of commodification of the U.S. public education in order to show how this process planted the seeds for a powerful textbook industry. The chapter then makes an overview of the current digital textbooks' adoption process drawing from two 2012 blueprint reports: Digital Textbook Playbook and Out of Print. Finally, the reader will find an analysis of some of the overt and covert implications of the U.S. digital textbooks' adoption process. The study will close signaling some ways in which we may think differently about the adoption and uses of digital textbooks in U.S. public schools.*

**Keywords:** *Digital textbooks, K-12 education, United States of America, commodification, American exceptionalism, technological sublime.*

**Resumen:** *El presente capítulo realiza una exploración histórica de los discursos sobre el uso de libros de texto digitales en la educación no universitaria estadounidense. Tras delinear el marco teórico del capítulo, centrado en la teoría social posmoderna, se revisarán los mitos culturales del "excepcionalismo americano" y el "sublime tecnológico" en los que es posible encuadrar la actual tendencia de los Estados Unidos a adoptar libros de texto digitales. Después, se relacionará dicha tendencia con el proceso de mercantilización de la educación pública que está teniendo lugar en los Estados Unidos y también se expondrá cómo dicho proceso sentó las bases para la creación de una poderosa industria del libro de texto. A continuación, se revisará el actual proceso de adopción de libros de texto digitales en base a dos planes estratégicos de acción publicados en 2012: Digital Textbook Playbook y Out of Print. Se cerrará el capítulo señalando posibles formas de reenfoque dicho proceso de adopción y los usos actuales de los libros de texto digitales de formas más inclusivas.*

**Palabras clave:** *Libros de texto digitales, educación no universitaria, Estados Unidos de América, mercantilización, excepcionalismo americano, sublime tecnológico.*

**Resumo:** *O presente capítulo realiza unha exploración histórica dos discursos que existen arredor do uso de libros de texto dixitais na educación non universitaria estadounidense. Tras delinear o marco teórico do capítulo, centrado na teoría social posmoderna, revisaranse os mitos culturais da "excepcionalidade americana" e mais do "sublime tecnolóxico" nos que é posible encadrar a actual tendencia dos Estados Unidos a adoptar libros de texto dixitais. De seguido, relacionarase dita tendencia co proceso de mercantilización da educación pública que se está a desenvolver nos Estados Unidos e tamén se exporá como este proceso sentou as bases para a creación dunha poderosa industria do libro de texto. A continuación, revisarase o actual proceso de adopción de libros de texto dixitais a partir dos dous plans de acción estratéxica publicados en 2012: Digital Textbook Playbook e Out of Print. Pecharase o capítulo sinalando posibles maneiras de reenfoque este proceso de adopción e os actuais usos dos libros de texto dixitais de maneiras máis inclusivas.*

**Palabras chave:** *Libros de texto dixitais, educación non universitaria, Estados Unidos de América, mercantilización, excepcionalidade americana, sublime tecnolóxico.*

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**Feedback:** *Comments and critiques related to this piece are welcome. Please, feel free to address any correspondence to Antía González Ben, Dept. of Curriculum and Instruction, University of Wisconsin-Madison, 225 N. Mills Street, 53705 Madison, WI (USA) or, otherwise, to <[gonzalezben@wisc.edu](mailto:gonzalezben@wisc.edu)>.*

Some technologies surely have an education role,  
but they are often, in my view, an answer in search of a question.  
Jim Zellmer

## Introduction

Since 2011, in the United States (U.S.) both public and private institutions have carried out a strong and coordinated drive for the introduction of digital textbooks in kindergarten to grade 12 (K-12) public schools. Yet, such momentum did not come out of the blue. Using Foucault's (1971/1972) notion of "history of the present" as a methodological tool, in the current chapter I offer some of the past and present systems of reasoning that made the current digital textbooks' craze possible, rendering its rationale coherent and logical to most people's eyes. In the process, I disclose some of the main initiatives that are being developed in the U.S. in relation to the introduction of digital textbooks in K-12 schools. I will focus on two seminal reports: the Digital Textbook Playbook, underwritten by the Federal Communications Commission and the U.S. Department of Education and Out of Print, a document sponsored by the State Educational Technology Directors Association. This association is a non-profit, national member association that "serves, supports and represents the interests of U.S. state and territorial educational technology leadership" (SETDA 2008). In addition, I conduct a critical analysis of the recommendations and guidelines meant to guide the school's, district's and state's digital textbook adoption process during the following years. In that analysis, I evaluate some of the positive and negative implications of the digital textbooks' initiative. As a whole, this piece tries to introduce some disruptions into current seemingly seamless discourses around digital textbooks in U.S. education. It attempts to evidence their transience and mutability, in order to create new possibilities of discursive formation that will enrich the current debate around the introduction and use of digital textbooks in U.S. K-12 schools.

Given its time and space restrictions, the present work disowns any pretension of exhaustiveness. I therefore encourage readers who may be interested in delving into some of the issues raised in this chapter to refer to the references' section for further detail.

## Framework of analysis

The theoretical foundation for this work is grounded in postmodern social theory. Postmodern social theory emphasizes that dominant discourses are neither neutral nor universal. On the contrary, they are the result of historical contingencies. With the passage of time, these contingencies tend to be seen as "natural." However, they still privilege certain ways of thinking, communicating and acting. In effect, dominant discourses tend to favor particular groups and individual's perspectives while silencing others. Postmodern social theory attempts to deconstruct these dominant systems of reasoning, in order to establish evidence on the politics of knowledge behind them. By doing so, this approach opens up epistemological spaces for potential alternatives where it was initially unthinkable, due to the unquestioned authority of common sense. More specifically, the present piece will draw on a number of key concepts, such as the history of the present, reception theory, governmentality and the politics of knowledge as analytical tools that will help me deconstruct the systems of reasoning in place.

The "history of the present" (Foucault 1971/1972, Popkewitz 2005, 2010) accounts for a particular strategy of analysis that explores heterogeneous discourses coming from social, political, cultural and epistemological sources. These sources have come together in the present time, in order to make possible, to think of and act on particular events (Popkewitz, Khurshid and Zhao 2012). Moreover, those same discourses that determine how we think of and act in the world right now also impact the way in which we interpret our past and plan the future ahead of us, which were/will be not simply there. On the contrary, they get constructed through narratives that we, the societies, create.

On the other hand, reception theory (Foucault 1990, 99-100, Koza 2003, 4) underlines that texts are open to multiple readings. Some of these readings tend to prevail over others, according to the systems of reasoning that operate in the discursive communities in which they appear. Moreover, reception theory also unveils that dominant readings are not neutral. They tend to have social and political ramifications. In accordance with these statements, the present study assumes that the texts somehow echo a way of thinking that is characteristic of a particular society at a specific point in time. This entails in turn various socio-political implications. Otherwise, if texts did not reflect their community's systems of reasoning, people would not be able to relate to them and, therefore, the texts would never achieve their ultimate communicational goals.

In addition, the Foucaultian notion of governmentality (Foucault 1991a) alludes to how power gets exercised through systems of reasoning. This approach examines knowledge as principles of "reason" by means of which the objects of the world are organized for reflection and action. It alludes to the social production of "mentalities" that order the objects of the world and generate purpose, choices and possibilities. In this vein, Foucault used the word "apparatus" to refer to the network that can be established among "a thoroughly heterogeneous set consisting of discourses, institutions, laws, administrative measures, scientific statements, philosophical, moral, and philanthropic propositions" (1980, 194-96). Within that network, elements merge and combine with each other in particular ways producing specific outcomes with important consequences in terms of governance. This means that they determine what is made possible and what courses of

action become thought of as "reasonable" in opposition to what it considered outside the reasonable (Sobe 2013).

Finally, this study also resorts to the politics of knowledge (Popkewitz 1999) in order to deconstruct the systems of reasoning detected through the previous analytical tools. To that end, I will analyze both what the texts say and also what remains unstated in them (Apple 1985, 157-158), so as to unveil their social, economic and political implications. There is tactical productivity attached to challenging the naturalness of dominant discourses and dismantling the power structures behind them (Foucault 1990, 102). In this sense, my work might be especially useful for those who are most coerced by dominant discourses. It is meant to challenge their apparent inevitability, and open up paths to think in new positive and powerful ways.

Postmodern social theory decenters its focus of study from actors to the systems of reasoning that condition the ways in which people think and act. Yet, it stays away from relativism, rather it pretends to

deny that people act to change the world. In fact, the opposite is true. The consequence of this method is to open the possibility of action through problematizing the system of reasoning that interns and encloses our subjectivities and actions. (Popkewitz 1998, 32)

Additionally, whereas "deconstruction cannot found a political project of any kind" (Andreotti 2009, 221), it is equally true that any solution, despite the good intentions it may have, will eventually present new dilemmas rooted in the limitations of the discursive practices that we use to make sense of the world around us. Thus, postmodern social theory tries to supersede the impasse of thinking that the solutions we currently give to our problems are the only possible ones. Instead, it fosters an ongoing process of critique and acknowledgement of the partiality and temporary nature of everything that we think or do.

Although I focus on the systems of reasoning that are situated beyond particular groups and individuals, I do not intend to occupy or make others think that I am epistemologically situated somewhere outside of culture. In effect, "there is no objective, neutral or independent space 'outside' or uncontaminated by cultural assumptions or metaphysical enclosures that one can use to launch an objective and independent 'critique beyond critique'" (ibid.). In line with this, I recognize that all perspectives, mine included, are socially and historically constructed. Therefore, they are also partial, situated, contingent and provisional. My scholarly work has an overt socio-critical orientation; it challenges the naturalness of dominant discourses and dismantles the power structures behind them.

As for its methodological design, this paper presents a critical analysis of existing discourses about the adoption of digital textbooks in U.S. schools. It employs a diverse set of documents comprised of historical texts, books, journal articles, pieces of news and strategic reports. This collection of documents is taken as a representation of Foucault's concept of archive. In other words, it is interpreted as a compendium of events, things and even monuments that help to understand the rules that define what can be said, preserved, reactivated and institutionalized at a particular moment in time (Foucault 1991b). By doing so, I situate myself close to those historians who no longer worry about

the expressive value of their sources, as they work the sources in its interiority and within a relational space (Ramos do Ó, Martins and Paz 2013). These texts were examined using the previous theoretical framework and the conclusions of such analysis, although mutually interconnected, will be ultimately presented in this paper under five different thematic strands.

### **The awes and fears of the technological sublime**

Ostensibly, the U.S. society is currently exhibiting awe for new technologies in general and the adoption of digital textbooks by K-12 schools in particular. This circumstance might certainly be interpreted as a brand-new phenomenon born of the digital age at the turn of the 21<sup>st</sup> century (Hargreaves 2003). Some people have pointed out that the present time, with its dramatic changes in the ways that people work, learn and even enjoy themselves through digital media, constitutes one of the greatest human revolutions since the invention of the printing press by Johannes Gutenberg in the 15<sup>th</sup> century. Karen Campbell (2012) has said in this respect: "It is as if everyone had a printing press and everyone could author books and share them with people across the globe. And also songs and photos and videos".

Yet, this named fascination with new technologies can also be interpreted within the long cultural tradition of American exceptionalism. Born from Enlightenment's ideas of universal reason and social progress, as well as from Protestant themes of the New World as the Promised Land for "the chosen people," American exceptionalism accounts for a redemptive salvation narrative. This narrative believes in the U.S. nation as a unique human experiment in the progressive development of a universal cosmopolitan society (Popkewitz 2008). Within this narrative of extraordinary moral grace the U.S., unlike Europe, did not have a long history in which to project agrarian and pastoral images of society. Thus, the U.S. society opted for portraying itself as the most advanced civilization on Earth through what Perry Miller (1961-62) termed the "technological sublime." In the advent of industrialization, modernity came to be defined as that historical period when humans focused their efforts on acting over and controlling nature. As a result, the great awe and fear that people traditionally felt for the superior force of nature started to shift toward its command by human technologies. Such wonderment of the U.S. society with new technologies still persists nowadays:

The technologies we use as proxies to overcome our biological limitations, such as powerful telescopes to see into the reaches of our solar system, and mathematics to observe Hubble-type expansion in the redshifts of galaxies to see into the origins of time and space, provide means of transcendence. (Striker 2012, 31)

Hence, the U.S. society did not only marvel before the natural power of the Niagara Falls or the Grand Canyon, but it was also awed by the technological marvels of the railroad, the electricity, the city's skyscrapers and, later on, the computer. In other words, all these technologies came to be seen as triumphs of the young U.S. republic (Nye 1994).

For a long time, technology played a central role in the formation of the U.S.' sense of selfhood. Yet, unlike natural sublimines, all new technologies have a rapid obsolescence. Every new technology able to amaze a generation eventually fades into ordinary experience after a few years, making room for the next technological wonder to dazzle the next generation. This constant need for new, more intense artificial experiences,

which is nurtured by a permanent longing for amazement, produced a parallel consumer's sublime that is perforce attached to the technological one (ibid.). Quite naturally, the consumer's sublime became an essential part of U.S. society's sense of self, given the prevalent place occupied by market economy in the U.S. ethos. The U.S. Constitution planted the seeds for a liberal "hands free" government, which proved very propitious for the expansion of the young U.S. republic toward the West coast, the industrialization of its increasingly vast land and, ultimately, the development of a strong capitalist economic system. In opposition to European social-democracies, where social rights occupy a privileged space in the common imaginary, the U.S.' faith on capitalism as a source of social progress and a guarantee of happiness is rooted in a particular understanding of democracy and the republic. These two constructs are seen as sources and curators of staunch values such as individuality, innovation and freedom of choice. These ideas became deeply rooted in the U.S. national identity especially after the Cold War, and the fall of Communism. This, combined with Reagan's drastic economic policies to reaffirm the U.S. as a (neo)liberal power, both internally and outwardly, where the laws of the market are the ones that ultimately determine the country's wealth and its society's fate (Puelles Benítez 2006).

### **The commodification of U.S. public education**

Education has always been a central issue for the U.S. society since colonial times. This can be seen in Massachusetts' Old Deluder Satan Act of 1647, which advocated for a public school system managed locally by the people, as well as in Thomas Jefferson's attempt in 1779, while he was governor of Virginia, to provide a basic education to everyone. The fact remains, however, that U.S. education especially flourished in times when the country was experiencing an economic expansion. This was the case after World War II, when education came to be regarded as the best platform for social, technological and economic progress. This would, in turn, situate the country in a position to lead the entire world. At that time, both great hopes and abundant resources were poured into education. Yet the situation changed after 1957, when the Union of Soviet Socialist Republics (U.S.S.R.) launched satellite Sputnik 1. The launching of that orbital rocket was immediately read by the U.S. society as a sign of the Soviet block's avant-garde progress over the U.S. in the space race that was taking place during the Cold War period. Thus, in a pendular movement, education came to be blamed for all U.S. nation's failures. That situation became especially critical during the 1980s, when the country's economic situation worsened after the 1970s' oil embargo. Such a widespread attitude of general blame on education is clearly exemplified in *A Nation at Risk*, an executive report released in 1983 by the National Commission on Excellence in Education. Under President Ronald Reagan's mandate, this report stated, in alarmist and bellicose language, that the U.S. was falling behind in the global economic race because of the incompetence of its public schools and schools of education:

Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. This report is concerned with only one of the many causes and dimensions of the problem, but it is the one that undergirds American prosperity, security, and civility ... [T]he educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation

ago has begun to occur—others are matching and surpassing our educational attainments. If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. As it stands, we have allowed this to happen to ourselves. We have even squandered the gains in student achievement made in the wake of the Sputnik challenge. Moreover, we have dismantled essential support systems which helped make those gains possible. We have, in effect, been committing an act of unthinking, unilateral educational disarmament. (NCEE 1983, 5)

As it too often happens, that state-of-exception's discourse, capable of portraying a time that could justifiably have been described like every other as outwardly unique (Koza 2010, 89), was used by the government to advance its own political agenda (Agamben 2005). Pres. Reagan's National Committee outlined a dramatically decadent scenario within a discourse of global competitiveness and pointed to the inefficiency of bureaucracy and the monopoly of teachers' unions as causes of that critical juncture. The committee sort to advance a conservative educational reform based on the need for more market competition and accountability. The entrance door to private for-profit corporations in education was now open, whilst some of the social rights that had been so painstakingly gained over the years were simultaneously curtailed (Apple 2000).

Little has changed in the state of U.S. education since then. The current national elementary and secondary education act, known as No Child Left Behind, was promulgated in 2001 by Pres. George W. Bush's administration and is now awaiting its reauthorization since 2010 under Pres. Barack Obama's mandate, relies on a similar rationale. The law was modeled after the experimental actions carried out by Pres. Bush in the education field during his previous charge as governor of Texas. Not surprisingly, those policies were in turn aligned with Reinventing Education, a set of recommendations made by Lou Gerstner and other private sector CEOs. The recommendations boldly refer to schoolchildren as human capital, teachers as sellers in a marketplace and the public school system as a monopoly that needs to be broken in order for the market's self-regulation to improve the service that is been provided nowadays. Reinventing Education has significantly reshaped the ways in which people understand the U.S. public education system, the economic system, and the connections between the two. It has altered the basic categories used up to that point to make sense and evaluate both spheres. This has been so much so that few people raised their eyebrows when Harold McGraw, current chairman of the publishing conglomerate McGraw-Hill, stated the following during Pres. Bush's gathering of "education leaders" (most of them Fortune 500 CEOs) to celebrate his first day in the White House: "It's a great day for education, because we now have substantial alignment among all the key constituents—the public, the education community, business and political leaders—that results matter" (Metcalf 2002). The alliance between the current education reform and the business sector is, thus, patent.

## **The role of textbook conglomerates within the U.S. education reform**

According to Reynolds (2012, 8), “[t]he construct we know as a textbook may have been in existence in the United States since the 17<sup>th</sup> century,” yet modern textbooks as we know them today, which first appeared in the 1960s with the universalization of public education, might be better understood if we take into account the above-mentioned education reform and the incursion of private corporations into education. Certainly, the current reform was designed, for its most part, with little or no participation from teachers, parents or educators (Miner 1999). It was actually a reform made in spite of teachers. It considered that teachers, the primary professionals in the field of education, were a central part of the problem, not a part of its solution. Thus, given that teachers were no longer seen as trustable agents, there appeared a need for additional measures to guarantee that students were taught a set of contents that politicians and businesspeople considered to be valuable for the job market. Among those additional measures, there were “teacher-proof” textbooks, the widespread establishment of educational standards and the current testing craze.

To begin with, the causes of textbooks’ steady evolution from being used as a discretionary teaching aid to being used as the one and only source of curriculum content in most U.S. classrooms can be largely traced to the fact that “[t]he big players now at the education table, some with a considerable financial stake in the new regime, believe that money is best spent on testing and textbooks, rather than on introducing equity into the system over the long term” (Metcalf 2002). Private corporations’ ultimate goals are not social, but economic. They do not care as much about the student’s interests as they do about their own profits, and social justice matters would not imply as much profit for them as textbooks actually do.

In the last decades, there has been a rise of a handful of publishing conglomerates that monopolize the entire U.S. textbook industry (Reynolds 2012, 9). Consequently, as Apple and Christian-Smith (1991, 32) have pointed out, “while there is no official federal government sponsorship of specific curriculum content in the United States ... the structures of a national curriculum are produced by the marketplace and by state intervention in other ways.” This is mostly due to a powerful dynamic at play, established between the leading publishing companies and the largest states that have lists of approved textbooks, such as Texas, California and Florida. These states often select a range of three to five state-approved textbooks for each school subject, from which each school may then choose. And, although schools are given the option to opt out of those lists, states do not fund any other materials, which in practice forces the constantly under-resourced public schools to comply with the state’s lists of textbooks (DeFattore 1992). Clearly, those big states have an enormous purchasing power and the publishing companies, which are ultimately market driven, try to please them, so that “[s]chool boards, especially those controlling state-wide adoptions, are the customers whose choices control textbook sales” (ibid., 121) and, consequently, their content as well. As a result, U.S. school curricula are materialized in series of one-size-fits-all textbooks that often consist of collections of unconnected and non-polemical facts. Therefore, and despite some punctual praiseworthy exceptions (Apple, 2000), in their attempt to please

everyone, most U.S. textbooks tend to reproduce dominant discourses and, by doing so, they reinforce unequal social structures that are already in place. In Koza's (1994, 145-146) words, "popular textbooks are cultural artifacts that can reflect and reinforce dominant cultural discourses ... Thus, curricular materials can serve as barometers, as indicators of existing power relations in the dominant culture." Although it is true that texts and, therefore, textbooks might provoke different kinds of readings, such as dominant, negotiated and oppositional ones (Apple 2000, 58), it is also true that, as reception theory has pointed out (Koza 2003, 4), they are particularly predisposed to certain kinds of interpretations.

The economic dynamics that exist around textbooks are not isolated. Conversely, the relations among textbooks, standards and standardized tests are close, as demonstrated by one of the most repeated buzzwords in education circles today: "curriculum alignment." Not only are textbooks designed in such a way that teachers are reduced to mere administrators of pre-packaged materials (i.e., teachers are told not only exactly what to teach, but also how to teach it), but these textbooks are also closely paired with a set of learning standards that limit teachers' and schools' academic freedom. Finally, children are also being subjected to a heavy amount of standardized testing. Those tests confirm that teachers have successfully administered the set of pre-determined learning contents meticulously detailed in their textbooks, which are, in turn, perfectly aligned with a set of curricular standards (Darling-Hammond 2004). Not surprisingly, the same companies that have traditionally dominated the textbook publishing market are now looking to expand their profit margins by pushing forward the extensive use of standardized tests in education and entering the testing market themselves:

[I]n today's publishing scene, textbooks and tests go hand in glove. Not only do textbook publishers profit from the sale of textbooks that are aligned with the standards, but in addition, these same publishers dominate the testing market. Giants McGraw-Hill, Harcourt, Pearson and Houghton-Mifflin publish tests as well as textbooks. (Koza 2002, 4)

The consequences of these corporate incursions into education are severe. In effect, should teachers decide to step off the conveyor belt that has been prepared for them, high-stake consequences will be awaiting behind the corner:

Today, NCLB requires every state to test students annually in grades three through eight in reading and mathematics. Due to technological advances, many states and districts have the capacity to attribute the test scores of specific students to specific teachers, and ... many will use this information to hold teachers accountable for the rise or fall of their students' scores. If testing inspires a degree of loathing, it is because it has become the crucial hinge on which turns the fate of students and the reputations and futures of their teachers, principals, and schools. (Ravitch 2010, 151-152)

Indeed, the accountability system currently in place in U.S. K-12 schools has been designed in such a manner that students' scores in standardized tests influence not only students' academic progress, but also their teachers' positions by means of linking teachers' salaries, contract continuity and tenure eligibility to their capacity to "add value" to their students' learning (Banchemo & Kesmodel 2011, Otterman 2011) and even the schools of education where teachers are formed (U.S. Department of Education 2011). In the same vein, influential scholars such as Linda Darling-Hammond (2012a, 2012b) are advocating for the implementation of common statewide standards and performance-

based assessments for pre-service and in-service teachers. As a result, initiatives such as edTPA, a third-party nationally available pre-service teaching performance assessment for professional licensure developed and distributed by Stanford University, the American Association of Colleges for Teacher Education (AACTE) and Pearson PLC, are currently being adopted in many states, (Sharon P. Robinson, Raymond L. Pecheone & Linda Darling-Hammond 2012).

Along the process, in-service teachers get deskilled, at the same time as their work gets intensified. Similarly, with the extensive introduction of standardized testing into education, the high-stakes usually attached to them force teachers to focus most of their time and energy on teaching for the test and, consequently, the learning curriculum gets narrowed (Ravitch 2010, 30). In the meantime, only a few people are able to stand up to the swirl of reforms in which they are immersed and question who gets to decide those standards, as well as if they are or not sensitive to equity, multiculturalism, gender and other crucial issues necessarily attached to the teaching profession (Apple, 1989).

However, the impacts of this education reform are not confined to the U.S. The threat of loosing influence in an increasingly competitive global economy has prompted many other countries to also jump on the bandwagon of testing and accountability, thus giving birth to what is known as Global Education Reform Movement, or GERM (Sahlberg 2011). In effect, influential education stakeholders such as the publishing companies, along with other important for-profit and non-profit organizations related to education, have animated a generalized sense of urgency with regard to education reform that “promotes the viral spread of GERM globally” (ibid., 99), despite of its many drawbacks.

## The digital textbooks' adoption race

In recent years, but especially since 2011, the U.S. has experienced a decisive push coming from both the public and the private spheres for the adoption of digital textbooks in schools. Although still modest, amounting for less than five percent of the entire market share in 2011 (Bock 2012, Reynolds 2012b), analysts such as Rob Reynolds predict that the incipient digital textbook market will amount for more than 70% of the overall U.S. education market by 2018 (2012a, 98). Official sources such as the State Educational Technology Directors Association (SETDA) aim that states and districts complete a total shift from print to digital instructional materials by no later than the 2017-18 school year (Fletcher, Schaffhauser and Levin 2012, 3), their argument being that purchasing "duplicative print and digital instructional resources is wasteful and expensive" (ibid., 37). What is more, even two of the most influential figures in U.S. education such as President Barack Obama and Secretary of Education Arne Duncan can be quoted stating, respectively: "Within the next five years, we'll make it possible for ... a student who can take classes with a digital textbook" (Office of the Press Secretary of The White House 2011) and "educators [should] move away from traditional texts and toward online books" (Niederberger 2012). In contrast, some experts such as Nigel Newton, CEO of Bloomsbury Publishing PLC, predict that printed and digital books will simply form a mixed market, "[j]ust as it has been for 40 years for hardback and paperback formats" (Bock 2012). As we see, although it is possible to find discordant predictions, most people buy into the extended alarmist rhetoric that, as it was previously the case with *A Nation at Risk*, justifies the sudden haste toward the adoption of digital textbooks with arguments such as, "[i]f we are serious about offering a college and 21<sup>st</sup> century career-ready education for all students, we do not have the luxury of further delay" (Fletcher, Schaffhauser and Levin 2012, 39). Therefore, instrumental statements that directly link the education system to the job market serve again to support the current digital textbooks' trend.

Although apparently arbitrary, this blunt push for the introduction of digital textbooks in schools that is taking place since 2011 was far from a coincidence. On the contrary, it was the result of joint circumstances that had been taking shape over the years:

The era of digital textbooks and the promise of reusable digital objects that will transform learning content are events that have been hyped as imminent since the late 90's. Why didn't the revolution happen before 2011? For starters, as often occurs on the innovation curve, the vision of the inevitable was seen before the demand and technology for it actually existed. Specifically, it took more than a decade for us to realize the proper nexus of devices and software to make the vision reality. In the end, it seems that all we needed was a decent tablet. (Reynolds 2012a, 59)

The current digital textbook boom occurred after numerous pilot programs had been developed by hard copy textbook publishers. These were part of a defensive strategy to ensure that they would remain competitive in the new digital era. Furthermore, it was also due to the advent of user-friendly tablet devices; namely, Amazon's Kindle, which was first released in November 2007; Barnes and Noble's Nook, which appeared in November 2009 and, above all, Apple's iPad, which came to light in April 2010 (Ash 2012a, Striker 2012, 7).

The eventual appearance of feasible digital textbooks in 2011 may have occurred quite

unpredictably, after an uneven but steady evolution of previous prototypes along three decades (Michael Hart, who died in September 2011, was widely credited as the creator of the first e-book back in 1971). However, the current digital textbooks' adoption program certainly responds to a much more calculated strategy (Grimes 2011). In effect, both public and private institutions have carried out strong and coordinated drives for the introduction of digital textbooks in kindergarten to grade 12 public schools. As a result, two seminal reports have been released, which give guidelines for K-12 educators and administrators to accelerate the transition from printed to digital instructional materials (Tomassini 2012b, Venugopal 2012). Such reports are the Digital Textbook Playbook, published in February 2012 by the Digital Textbook Collaborative, and its sequel, Out of Print, a report released by SETDA in September 2012. These two documents are meant to act as a roadmap for states, districts and schools in their seemingly imminent digital textbooks' adoption process.

The Digital Textbook Playbook report focuses on providing recommendations to schools about their future hardware needs. More specifically, it "offers information about determining broadband infrastructure for schools and classrooms, leveraging home and community broadband to extend the digital learning environment, and understanding necessary device considerations" (Digital Textbook Collaborative 2012, 3). On the other hand, while the Out of Print report expands on these same topics, it specially "highlights some of the policy barriers that must be knocked down in order to get there" (Venugopal 2012). Thus, it provides guidelines on how to eliminate impeding regulations and enact supportive digital policies. In addition, both reports take into account intellectual property (IP) considerations, and they also describe some good practice ideas from state departments of education, school districts and individual schools that have engaged in successful transitions to digital learning materials.

In this vein, it is worth noting that, since the U.S. public school system does not have a common set of regulations at the national level, and given the country's high degree of administrative decentralization in education, the digital textbook adoption process is taking place at an uneven pace, as shown in the following figure:



(i.e. states that have a closed list of approved materials for each school subject) such as “Texas and Indiana have changed their role to one similar to Utah’s, producing an advisory list that districts can use for advice but aren’t compelled to follow” (Fletcher, Schaffhauser and Levin 2012, 27). Similarly, the OER option also entails an interesting series of ramifications in terms of authorship that will be further explored in the following section. As for 2011, in total “22 states ha[d] introduced either definitional or funding flexibility, launched a digital textbook initiative, and/or launched an OER initiative” (ibid., 2).

### **Lights and shadows of the digital textbooks’ initiative**

Both the Digital Textbook Playbook and the Out of Print reports include sections in which they list different advantages to increasing the use of digital content in today’s schools. For instance, the Playbook mentions potential benefits such as more teaching effectiveness, more student engagement, richer and more personalized classroom experiences, richer and more updated content, equity issues in terms of access, and cost-saving expectations (Digital Textbook Collaborative 2012, 9-12). Similarly, SETDA alludes to an increase in student learning and engagement, the ability to better accommodate the special learning needs of certain students, the possibility to facilitate the search and discovery of unbundled resources, and more support for educators to personalize learning (Fletcher, Schaffhauser and Levin 2012, 8). By reading these accounts, it may seem that digital textbooks, for and by themselves, will solve a good number of the most pressing problems faced by current U.S. schools and, thus, trigger a ultimate school reform. Yet, given the complexity of any teaching and learning situation, many other things may need to happen apart from the provision of digital textbooks in order for those predicted outcomes to become a reality. Larry Cuban (2001, 18) delves into this issue in the following terms:

[T]echno-promoters across the board assumed that increased availability in the classroom would lead to increased use. Increased use, they further assumed, would then lead to efficient teaching and better learning which, in turn, would yield able graduates who can compete in the workplace.

Both the Digital Textbook and Out of Print assume that there exist a positive correlation between the introduction of digital textbooks in schools and their extended use in classrooms, as well as between the use of digital textbooks and student learning’s improvement. However, the likability of such chain of events to happen is far from certain. In fact, history evidences that this has not been the case in many of the previous technology-based school reforms (Cuban 1986). My intention here is not to disclaim that, over time and with good implementation, digital textbooks might provide many positive outcomes. However, as mentioned when talking about the technological sublime, every new phenomenon might arise two kinds of reactions, positive ones and negative ones. Like the natural sublime, new technologies have the ability to both fascinate and threaten us. Stated in a different way, technologies have endless benefits, but they may also have an unpredictable destructive potential. Neither the Playbook nor Out of Print take the last possibility into account. Likewise, neither of them present a single counterexample; they simply do not talk about failing attempts to implement digital textbooks in educational environments. These attempts could be very illustrative in terms of “mistakes to avoid”

for stakeholders planning to embark in similar endeavors. Additionally, no potential risks related to the digital textbook adoption are reported. These blatant absences are evidence that both reports were written from an over-optimistic standpoint.

Digital textbooks are presented by these two reports as a win-win alternative to paper textbooks, as well as the panacea in terms of the introduction of flexibility in teaching and learning. It is equally important to note that digital textbooks are being portrayed as the only possible and logical alternative for the future of public schooling. In the Out of Print report, we read, “[i]t is not a matter of if reimagining the textbook will permeate all of education, only a matter of how fast” [emphasis in the original] (Fletcher, Schaffhauser and Levin 2012, 6). Thus, although there is no formal imposition and, therefore, the reader gets an illusion of choice out of reading the reports, no other curricular option is even considered. Similarly, since 2010, the Alliance for Excellent Education, which constitutes an important stakeholder in the U.S. digital textbook adoption process, has published two reports with the striking titles: *The Online Learning Imperative* and *The Digital Learning Imperative*. In these reports they give “recommendations” (or should I say “orders”?) on how to use digital learning and technology to help improve current high school graduation rates and students’ college and career readiness.

As it happens at a more general level, where the 21<sup>st</sup> century individual has generally been denied the choice not to be technological, digital textbooks are being presented as the silver bullet of the current education reform from which nobody in their right mind would renounce. Digital textbooks are portrayed as the solution to all present problems, even though they do not entail any straightforward measure—at least for now—to subvert the very structures that cause those problems in the first place. Thus, for example, digital textbooks are expected to contribute to equality by improving “the opportunity to learn for ALL students by ensuring access to a full range of tools, resources, content, and courses regardless of zip code or socioeconomic status” (Digital Textbook Collaborative 2012, 10). And still, the causes that produced the existing inequalities, such as the reasons that make the area of residence and the family’s income relevant to the education received by any student, remain unquestioned. Similarly, digital textbooks are supposed to enrich and diversify curriculum content. In this respect, SETDA highlights, “[t]here may be hundreds of potential resources to use for any given lesson when the teacher has the entire World Wide Web to choose from” (Fletcher, Schaffhauser and Levin 2012, 12). However, right after stating this, the report also points out “another strong advantage of digital content—greater ability to align and tag content to the CCSS” (ibid.). CCSS stands for “Common Core State Standards,” which is a set of learning goals for mathematics and English language arts created by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO) in order to make the historically disparate state school curricula more homogeneous and, therefore, more easily comparable. In line with the traditional U.S. ideal of freedom, CCSS were made voluntary for states, yet the U.S. Department of Education has ever since pushed the accountability reform forward by requiring states to adopt CCSS in order to be eligible for federal Race to the Top grants. Therefore, the unbounded flexibility assumed by the adoption of digital textbooks is dramatically restricted by a set of pre-determined

standards to which they are supposed to relate to. Why the Common Core Standards are being so strongly promoted, or who got to define them in the first place is left, once again, out of the digital textbook debate.

Although we like to think that we have total control over our lives, most of what we end up doing over the years is, in one way or another, imposed by the systems of reasoning in place, and this significantly restricts the range of options we have to give sense and meaning to what we think and how we act. Therefore, the people who have a say on what is or will be reasonable for us in the future are the ones who really hold power in society. It is therefore quite alarming to realize that a small handful of “experts” (being almost none of them educators) are the ones actually shaping how the future of education will look like for the rest of us. For instance: “My intent in this book is to help you understand what that future means for you and how you can take advantage of it” (Reynolds 2012a, 1). The practice of planning the future in order to make sense of the present is not original, though. It can be traced to the Enlightenment’s belief in rational planning as a means for social progress and pursuit of happiness. In this context, the chapter’s initial quote, used by parent, publisher and Internet entrepreneur Jim Zellmer in a weekly newsletter from his [www.schoolinfosystem.org](http://www.schoolinfosystem.org) blog (2013), acquires a special relevance. It states: “Some technologies surely have an education role, but they are often, in my view, an answer in search of a question.” In effect, digital textbooks are being proposed as the solution for most of the current main problems of U.S. public education, even though existing analyses of those same problems hardly ever point to digital textbooks as part of the solution. Given the obvious mismatch between the detected problems and the proposed solution, it is therefore predictable that the transition into digital textbooks will hardly make any significant contribution to the overall quality of U.S. K-12 education. In fact, there have been previous cases of similar wonderment with a new technology in the K-12 stage that, after a short period in vogue, ended up fading away without leaving any significant improvement in terms of student learning, the system’s equity or any other relevant criteria. This was the case, for instance, of Audio-Visual Media (AVM) during the 1960s, when they were first introduced in most U.S. public schools (Area Moreira 2002, González Ben forthcoming). It also includes most other “silver bullet” technology that has been introduced in U.S. classrooms since the early twentieth century:

[T]he search for improving classroom productivity through technological innovations has yielded very modest changes in teacher practice without any clear demonstration that instruction is any more effective or productive after the introduction of radio, films, instructional television, or computers. (Cuban 1986, 109)

Popkewitz (2008) uses the expression “processes of abjection” to refer to those phenomena such as the one I have just described, by which the very same discourses and actions intended to solve a problem invariably produce the opposite outcome. For instance, by saying that digital textbooks will contribute to provide “a college and 21<sup>st</sup> century career-ready education for all students” [emphasis added] (Fletcher, Schaffhauser and Levin 2012, 39) and to also increase the level of equity of access to new technologies in K-12 U.S. public education, the very existence of those differences has been re-inscribed. In other terms, as it happens with natural and technological sublims, the

gestures of hope implied in those statements necessarily overlap with fears of those students who do not fit into the norm, who are neither college nor career-ready, and who ultimately pose a threat to an ideally harmonic whole.

The differences in access to new technologies, also known as “digital divide,” constitute a complex phenomenon. Nowadays, “digital divide” does not only refer to differences in terms of access to new technologies. Contrarily, the term has been broadened to also entail demographic differences in relation to the uses that people give to the above-mentioned technological devices:

In the 1990s, the term “digital divide” emerged to describe technology’s haves and have-nots. It inspired many efforts to get the latest computing tools into the hands of all Americans, particularly low-income families. Those efforts have indeed shrunk the divide. But they have created an unintended side effect, one that is surprising and troubling to researchers and policy makers and that the government now wants to fix. As access to devices has spread, children in poorer families are spending considerably more time than children from more well-off families using their television and gadgets to watch shows and videos, play games and connect on social networking sites, studies show. This growing time-wasting gap, policy makers and researchers say, is more a reflection of the ability of parents to monitor and limit how children use technology than of access to it. (Richtel 2012a)

Regardless of its nuances in meaning, the point at issue is that none of the current initiatives for the introduction of digital textbooks in schools brings to the fore the social, cultural, educational and economic reasons that lie behind the divide. Nor do they offer any specific proposals to address those causes. What those reports actually do is to propose temporary solutions that contribute to maintain the flawed systems of reasoning by which we all live. This is achieved by making promises of a better future to people who find themselves in the least favored positions and induce them to keep operating within a system that is actually detrimental to them. In other words, the solutions proposed ultimately guarantee that the unfair system that is in place will keep running. Still, some instances do not even attempt to provide palliative solutions. They simply ignore, or even contribute to increase, the existing digital divide. This is the case of Indiana, for example, as evidenced by the following statement by John Keller, Assistant Superintendent for technology in Indiana’s Department of Education: “We’re not trying to use the limited funds that we have to help folks catch up. We have made it a priority to invest in corporations that are clearly demonstrating a local commitment and urgency to improvement. This is about helping people who are running fast run faster rather than helping folks catch up” [emphasis added] (Keller 2011). Fortunately, cases like Indiana’s are a minority.

Although dispossessed groups may not come out especially favored, there certainly is tactical productivity attached to the maintenance of the status quo for certain people (Foucault 1990, 102). A good example might be the agents involved in drafting the aforesaid reports. The Digital Textbook Collaborative, author of the Playbook report, accounts for a group of industry stakeholders, school officials and non-profit leaders convened by the Federal Communications Commission and the U.S. Department of Education. Their brief was to design a strategic plan for the introduction of digital textbooks in schools. The three parties were not evenly represented, however. In fact, the private sector accounted for almost three quarters of the participant organizations, including some of the biggest U.S. broadband and telecommunications companies (such

as AT&T, Sprint and Verizon), major computer and software corporations (including Microsoft, Dell, Hewlett-Packard, Apple and Intel) and global publishing conglomerates (as for McGraw-Hill, Pearson and Houghton Mifflin Harcourt), among others. The Out of Print report, which was released by the State Educational Technology Directors Association seven months after the Playbook, presents a similar composition. In this case, brand names such as Apple Inc., Intel or Pearson appear under the credits heading, along with a number of state departments of education and a handful of influential non-profit organizations. It is through the non-profit organizations, such as the Bill & Melinda Gates Foundation and The William and Flora Hewlett Foundation, that the top information technology companies (in this case, Microsoft Corp. and Hewlett-Packard Corp.) expand their tentacles into education. Therefore, “[w]hile it’s great that the Federal Communications Commission is launching a campaign to promote digital literacy, the fact that companies like Best Buy and Microsoft are funding it make it unlikely that weaning kids from their products will be a priority” (Linn 2012). In other words, and building upon ideas already presented in this piece, digital textbooks may ultimately constitute the next cash cow for the U.S. publishing industry, as well as for many information technology companies that have joined the education market more recently.

The reasons for private companies’ participation in the production of both reports were far beyond altruistic purposes. They certainly have serious economic interests attached to the adoption of digital textbooks by K-12 public schools. In fact, from a business standpoint, it is not the companies’ duty to serve the school system, but instead, the school system is expected to provide corporations with new opportunities for profit:

Education as we know it is going to experience an extraordinary transformation throughout the current decade. This transformation will require an innovative response from both the learning content business as well [sic.] the educational system that feeds it. [emphasis added] (Reynolds 2012a, 1)

The ultimate intentions for the participation of private sector corporations in this initiative are not obvious right away. Although the existing initiatives to stimulate the adoption of digital textbooks in K-12 schools may respond to an overt strategy that guarantees sustained profits for the involved organizations in the following years, they always get publicly portrayed as totally disinterested initiatives that take students’ interests first: “It certainly makes for a fascinating future in which the ultimate winner is the consumer!” (Reynolds 2012a, 5). In other words, dominant discourses around the introduction of digital textbooks in schools advance certain readings of the process over others. They make it particularly difficult for people to perceive the entire net of interests that lie behind this initiative. Not only that, these discourses make it almost impossible to think of alternative realities that might be more propitious for students in general and for those in the least privileged positions in particular.

We may be skeptical about the genuine intentions of private corporations when they decide to expand their scope into social services such as education (Soros 2002), yet the fact remains that they carry out those practices because the U.S. government is propitious for it to happen. Thus, as with many other educational trends taking place today (such as standards-based learning, high-stakes testing, back-to-basics curricula, voucher plans and merit pay for teachers), the digital textbook initiative may be better

understood when situated within a trajectory of legislative measures that favor the commodification of the U.S. public education. It is precisely the existence of this tradition what makes the current events seem possible, reasonable and even “natural” for the agents involved (Popkewitz 1999). For instance, Peter Cohen, CEO of Pearson School, justifies the U.S. government’s corporate-friendly approach to the introduction of digital textbooks in K-12 schools recurring to two common myths deeply rooted in the U.S. national imaginary. He specifically refers to the privileged place that capitalism occupies in the U.S. notion of a democracy (Apple 2006), which looks favorably to the establishment of alliances between the private and the public sectors, as well as to the classic notion of the technological sublime. It is worth quoting Cohen at length here:

Why is the federal government focused on this? America and every other country has used technology to improve outcomes in business—in health, in airlines, in manufacturing, Amazon. Every business and every structure has used technology except for education. It seems obvious and intuitive that you can apply the same lens to what we do with 54 million kids and probably do a better job than what we’re doing today. That’s one reason. The next reason is you have a lot of new people in the White House looking to do something different. Technology is engaging, it’s the hot new science. (Tomassini 2012a)

As we see, it is not only the private sector nor the state that ultimately get to determine how things get done, but both of them certainly have interests at play. Power is therefore exercised not by the agents themselves, but through the systems of reasoning in which they participate. These systems get to define our past, our present and our future, thus mapping the field with possible paths for action (Foucault 1979, 1991a).

Although certainly important, the implications of the digital textbook adoption campaign are not only monetary. The new ways in which we interact with technologies in order to seek information seem to also be restructuring our brains (Potter 2011). In this regard, whereas the above-mentioned reports show outright enthusiasm with respect to the benefits of digital textbooks, there are plenty of skeptical voices that stress the negative impact of new technologies in our high order cognitive skills (Striker 2012, 38). For example, Nicholas Carr (2010), Andrew Keen (2007) and Mark Bauerlein (2008) believe that the ways in which we interact with information using the Internet is often shallow and devoid of context, deeper contemplation, analysis, or true understanding. Harvard’s psychologist Howard Gardner has pointed out that, although “individuals seem to be able to use multiple sources of information agilely, which is good, [they] may have less patience and less ability to go into things deeply and stay with them, which is not good” (Campbell 2012). Gardner’s fear that younger generations will have increasingly shorter attention spans is a fear quite common among teachers and students, as well (Richtel 2012b).

Despite contradictory opinions, scholars who study the role of media in society say no long-term studies have been conducted that could conclusively determine if students’ attention span has changed because of the use of digital technology (Richtel 2012b). Stated in a different way, it is still too soon to produce concluding scientific evidence to support either of the existing positions. Some experts have even taken that cautious stance a step further, pointing to the fact that the impact of digital technology in people’s mechanisms to process information will not be ultimately determined by technology in itself, but by how we use that technology:

[W]hile it is a growing trend to give students iPads, there is no evidence to show that doing so will help improve student learning, motivation, or other academic outcomes. Unfortunately, the misconception that throwing technology at an educational problem will automatically produce better learning outcomes is not only unsupported by research, but plain wrong. It's not about giving the students a piece of technology, but rather about how that technology is used that makes a difference. [emphasis in the original] (Junco 2012)

Certainly, as emphasized by reception theory, texts in general—and digital textbooks are no exception—are far from neutral. On the contrary, they tend to emphasize certain readings over others. In other words, they have dominant readings that are more likely to occur. Of course, those readings often serve their author's interests. And, among those interests, in the publishing industry, economic factors end up playing an important role: "After all, the business of education is business, right? To put it plainly, thinking, and other sorts of reflection, constitute a serious threat to all efforts to meet hardware/software sales quotas, especially in the huge and growingly lucrative education market" (Fitzhugh 2012). Moreover, when it comes to digital textbooks, not only the content, but also the medium plays a crucial part. In this sense, "[c]urrently, tablets, particularly the iPad—not laptops, nor netbooks, nor smart phones—dominate the conversation in education" (Fletcher, Schaffhauser and Levin 2012, 29) and, unlike laptops—which are designed for content production—tablets "are unapologetically content consumption devices. That is, they are not designed to create content but to consume it" (Junco 2012). Again, the digital textbook landscape does not seem very encouraging. And still, we must remember that, although technologies in general, and digital textbooks in particular, might have been built to privilege certain uses over others, they will never be completely determining (González Ben forthcoming). Conversely, they will always offer possibilities for non-conventional, even subversive, uses.

In any case, whether scientists eventually prove that digital textbooks have a positive, negative or indeed any impact over students' learning will ultimately depend on how the different variables under study get defined. In this vein, Kristen Purcell, associate director for research at Pew Research Center, has already called attention to the fact that what we tend to label as "distraction" may indicate a failure, from the adults' perspective to understand how children process information nowadays; i.e. the label "distraction" constitutes a category that is being imposed by adults over the younger generations (Richtel 2012b). Purcell's thesis does not seem to be misguided. In fact, cases in which people who did not grow up using a new media consider it as a threat have already happened before. One of the most famous examples is that of Ancient Greece's philosopher Socrates, who rejected to use the written word in the belief that it will supposedly cause forgetfulness and it will always represent a semblance of wisdom instead of true wisdom (Plato 1995). Nowadays, the shift from printed to digital textbooks is causing a similar yet opposite move. "Just as the shift from orality to literacy—and the subsequent rise of book culture—reshaped how and why and what things people should remember, the age of Google, with its ubiquitous information, begins to reward analytical thinking and information literacy over the talent for rote memorization" (Striker 2012, 12). What is more, current patterns of rapid communication tend to resemble those of oral storytelling, the medium that Socrates considered to be more complex and trustworthy (Bonegru 2008).

An additional implication of the introduction of digital textbooks concerns how open, free and low-cost learning contents, as they become more prevalent and stable in the mainstream, pose serious challenges to the traditional textbook industry. I am referring here to the rise of Open Educational Resources (OER), which account for:

[T]eaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. (Atkins, Brown and Hammond 2007, 44)

As we see, OERs are meant to subvert commonly accepted copyright (or ownership) and licensing (or sharing) notions. By doing so, they put traditional understandings about authorship to the test (SCORE 2010). In effect, “the recent evolution of technology, digital publishing, and textbook formats has made it possible for anyone, or any group, to publish their own content and/or to aggregate valuable content created by others” (Reynolds 2012, 77). As said at the beginning of this chapter, we may now be experiencing one of the greatest human revolutions since the invention of the printing press. Thus, the concept of authorship, which we tend to regard as solid and fundamental, is in reality a product of human cultural evolution. In other words, the modern notion of “author,” defined as someone who has the capacity to “characterize the existence, circulation, and operation of certain discourses within a society,” came into being at a particular moment. Consequently, a day could come when the concept will similarly become obsolete (Foucault 1977, 124). Yet, Foucault’s notion of authorship differs from the most common one. For Foucault, authors are not creators, but interpreters of their time; they are products of the culture in which they are born. This is why “Foucault’s observations about the agency of the author take on new significance in light of the rise of participatory media and the democratization of publishing tools, such as Facebook, Twitter, YouTube, Wikipedia, and blogging software” (Striker 2012, 21). OERs suggest a reconceptualization of the traditional textbook as open-ended, connected, and nonlinear. In the digital sphere, information flows in multiple directions, building a net of non-hierarchical interconnected nodes that may be considered a “rhizomatic” structure, following Deleuze and Guattari’s (1976) nomenclature. The rhizomatic textbook therefore accounts for a multimodal material with a thousand plateaus that allow for each person to interact with it in a singular way. In this new context, the conventional notion of authorship tends to fade away, whereas the role of writer acquires a fresh and new meaning (Barthes 1977). Certainly, the traditional frontier between reader and writer blurs.

OERs are a very recent phenomenon. The movement actually began in 2001, when Charles Vest, Massachusetts Institute of Technology’s President, announced that MIT would establish OpenCourseWare, a groundbreaking program that consisted of publishing free and open digital educational materials, organized as courses (Plotkin 2010, 3). Given its lack of commercial value, the movement has received scant attention from the media. Nevertheless, due to the fact that OERs “stress learning value over commercial value” (Reynolds 2012, 78), they are meant to disturb the way in which the textbook publishing industry is currently set. For instance, in 2009, former Governor of California Arnold

Schwarzenegger “launched the nation’s first digital textbook initiative to provide California’s students and teachers with free, high-quality open educational resources” (California Learning Resource Network 2010). Similarly, Texas (another pivotal state in the K-12 textbook scenario) is considering legislation to fund open content, in order to reduce the huge budgetary allotment it pours into printed textbooks and, therefore, drive down the costs of their public education (Reynolds 2012, 83). Even “the federal government advocates for digital and open content by encouraging its use and by requiring or incenting its inclusion as a component of select grant programs (Fletcher, Schaffhauser and Levin 2012, 23). Indeed, it is becoming preembedded in almost every federal grant, such as the Department of Education’s Race to the Top (RTT) and Investing in Innovation (i3) funds, that the resulting curricular products must be shared as an OER (Ash 2012b). Ironically, the very same privatization processes of K-12 education that the public administration has indulged in during the last decade have eventually pressed it to promote non-commercial alternatives, when faced with a severe shortage of funds to pay all the privatize services it needs to properly operate.

All together, the above-mentioned OER initiatives point to a trend in which publishers will yield lower revenues from their textbook materials, as they transition into the digital format. However, leading publishing companies do not expect to suffer profit stagnation. On the contrary, they expect that the shift will wipe out the used textbook market and will allow for limited-time access or ownership licenses. Together, these measures will keep their revenue balance positive (Graydon, Urbach-Buholz and Kohen 2011). At the same time, global publishing conglomerates will keep entering the highly profitable standardized testing field, which will contribute to “offset diminished revenues from open and lower priced materials” (Reynolds 2012, 5). The standardized test market will in turn assure a perennial market for the digital textbook products that are aligned with them. In short, OERs may imply a restructuring of the textbook publishing industry, but they will never threaten their paramount market share. Peter Cohen, CEO of Pearson School, has been quoted saying:

[T]here are some brave souls who want to do everything from scratch, and do everything with [OER] and hope what they end up with will actually deliver the outcomes that they expect when they go into it. I think that last part is the reason why companies that develop coherent programs will be around for awhile. The stakes for delivering achievement are pretty high ... And if you fail at that you stand at risk—you don’t make [Adequate Yearly Progress, or AYP], you’re in the bottom 5 percent, you get fired as state administrator, or principal or teacher. So that’s a risk and you can take those. We spend somewhere in the neighborhood of \$800 million a year at Pearson across the world developing technology-based programs that we test—we do research on them beforehand, we do research after they are out—to make sure that they will deliver the result we promised up front. (Tomassini 2012a)

Even though digital textbooks may disrupt existing notions of authorship, the market system that surrounds them will always find means to limit their adoption, such as the high-stakes standardized testing to which Cohen alluded.

The increasing popularity of OERs goes beyond purely economic reasons, though. “While the cost savings of OER may initially draw interest from policymakers and state education officials, there are many reasons why OER fits well with the common core” (Ash 2012b). Certainly, the widespread process of adoption of CCSS also accounts for the increasing popularity of OER, given that it forces states and districts to reevaluate and realign their

existing curricula, and situates them in a more favorable attitude toward new curricular initiatives. Reginal J. Leichty, from education law and policy consulting firm EducationCounsel, reflects about this phenomenon in the following terms: "I think the common core has been a catalyst for OER— for examining it, for discussing and developing and adopting OER" (ibid.). The positive impact of CCSS on OER does not end there. "With everyone on the same page about standards, it's going to be more and more about sharing resources, which is what OER is all about," says Fasimpaur, the president of K12 Handhelds, a company that focuses on mobile computing in education (ibid.). Thus, as CCSS keep spreading nation-wide, they will simultaneously make the OER materials that are aligned to them more easily sharable among schools and districts across the U.S. The education organization Achieve has already launched a set of eight rubrics designed to help states, districts, teachers, and other educators evaluate both the quality of OERs and their alignment to the common standards. It has also partnered with OER Commons, an online repository for open educational resources, to help users apply these rubrics and evaluate the quality of instructional resources (CCSSO 2013, 6).

On top of that, when we talk about digital products, there is an additional aspect that deserves to be considered. Unlike printed materials, digital content is not device agnostic. Thus, educators and administrators need to think thoroughly about the technology they choose in order to access learning contents. They may consider each device's possibilities and limitations. What is more, the private sector knows how to act wisely concerning that aspect. In fact, "companies such as Apple and Microsoft offer 'free' or 'discounted' prices on their proprietary software licenses, so that students become 'hooked' on their platforms and have to pay for them at home or at work whenever they graduate from school" (Steinhafel 2012). As we see, educators and administrators need to consider the indirect and even ethical ramifications of each device when making a decision on what equipment they are going to use in the classroom.

Similarly, whereas in the past students who could not afford specific learning materials could still have access to them through a library, in the digital era those students face an additional barrier: they not only need to get access to the contents, but they also need a digital device in order to access them. Therefore, those schools, districts and states (such as Texas) that have implemented Bring Your Own Device (BYOD) initiatives trying to reduce the upfront costs of providing technology to every student, also needed to come up with a solution for those students who do not own a digital device. Many administrations and institutions have addressed the problem by "having loaner devices available for students that may not be able to afford a device" (Digital Textbook Collaborative 2012, 55). The roots of the inequity of access are once again overlooked.

Although the U.S. education system implements initiatives aimed to palliate the most blatant consequences of the digital divide, by ignoring the grassroots causes of those inequities, it tends to reinforce the divide in itself. Thus, the different ways in which the U.S. public education system faces the problem of the digital divide may be seen as another good example of Popkewitz's (2008) notion of the "processes of abjection."

As we see, the introduction of digital textbooks in U.S. K-12 schools has been set so that the ones who have had leading roles in the traditional textbook industry will continue

to do so under the new circumstances. And yet, as Apple has pointed out (González Ben forthcoming), no scenario is ever completely pre-determined. Conversely, there will always exist possibilities of change, and there will always be opportunities for creative action, using the cultural elements that are given to us in new and original ways. This is precisely how dominant discourses get disrupted, allowing for some people to create more favorable circumstances for themselves within a system imposed to them by the systems of reasoning in place. As Raymond Williams (1961) has pointed out, this is precisely how power relations fluctuate over the years. In effect, the lights and shadows of the digital textbooks' adoption delineated in this section may contribute to unmask some of the arbitrariness and limitations of the current discourses around digital textbooks for K-12 schools in the U.S. By doing so, I tried to open doors to think and define the digital textbook phenomenon in new and alternative ways.

### **Final Thoughts**

In this piece, I have tried to present and critically analyze some of the official and public discourses that circulate around the processes of adopting digital textbooks in kindergarten to grade 12 schools in the United States. My ultimate goal was to disclose these discourses' presumed naturalness, evidence its contingency, and point to some of their limitations. Yet, my focus on the processes' limits was neither to argue against the digital textbooks' learning potential benefits nor to deny their promoters' good intentions. On the contrary, I wrote this piece with the conviction that to make what seems natural contingent and provisional is to open new possibilities of schooling, teaching and learning in the current digital age. This piece is, therefore, meant to be a political strategy of change (Popkewitz, 2008).

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<sup>1</sup> I opted for using the term "digital textbook" herein, given the title of the present volume.

# Second Part

# The Digital Textbook around the world

# E-textbooks in Québec

## *E-textbooks en Québec*

### E-textbooks en Québec

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**Abstract:** *This chapter describes how electronic textbooks are used in Quebec schools, and surveys some relevant cases. One of the main media for e-textbooks in Quebec is the iPad, and reading an e-textbook is the main application of the iPad used in classrooms. It appears that e-textbooks are gaining in popularity in private schools, but are still marginal in public schools. In most cases, it does not seem that they are being used effectively or systematically. Cost, usability, and lack of teacher training are amongst the strains on e-textbooks use.*

**Keywords:** *history teaching; Québec, Canada; electronic publishing; secondary school students*

**Resumen:** *Este capítulo describe cómo los libros de texto electrónicos son usados en las escuelas de Quebec. Además, se presentan unos casos relevantes. Uno de los principales medios para los e-textbooks en Quebec es el iPad, siendo la lectura de libros de texto su principal aplicación en el aula. Parece que los e-textbooks están ganando en popularidad en los centros privados, pero su uso sigue siendo marginal en los centros públicos. En la mayoría de los casos, no parecen usarse de modo efectivo o sistemático. El coste, la facilidad de uso y la falta de formación de los profesores destacan como principales desafíos en el uso de los e-textbooks.*

**Palabras Clave:** *enseñanza de historia; Québec, Canadá; edición electrónica; estudiantes de educación secundaria.*

**Resumo:** *Este capítulo describe como se usan os libros de texto electrónicos nas escolas no Quebec. Ademais, presentanse uns casos relevantes. Un dos principais medios para os e-textbooks no Quebec é o iPad, cuxa principal aplicación na aula é a lectura de libros de texto. Parece que os e-textbooks están gañando en popularidade nos centros privados, pero o seu uso segue sendo marxinal nos centros públicos. Na maioría dos casos, non parecen usarse de xeito efectivo ou sistemático. O custo, a facilidade de uso e a falta de formación dos profesores destacan como principais desafíos no uso dos e-textbooks.*

**Palabras Clave :** *Ensinanza de historia, Québec, Canadá, Estudiantes de educación secundaria.*

## Context

In 2014, in North America, e-books' presence on the market already defies what specialists had predicted in 2010. Some commentators venture so far as to predict that by 2018 e-textbooks could represent as much as 50% of all textbooks used in North America<sup>1</sup>.

In Quebec (a mostly French-speaking Canadian province with jurisdiction on education), this projected growth in e-textbooks' popularity is not yet clearly evident either in market shares for electronic books in general (which remain marginal) or in the purchase and use of electronic textbooks for schools. In spite of the fact that textbook editors have completed the conversion of existing collections, most elementary and secondary school classes still use traditional print textbooks, even in those subjects and contexts where teachers systematically turn to digital resources like the Carrefour Éducation or RECIT en Univers Social.

The digital material phenomenon is nonetheless, in certain ways, on the rise. In 2011, the Quebec government announced that all elementary and high schools were to be fitted with digital whiteboards by 2016. While the programme was cut in 2012 after the

government changed, a number of classes, varying from 40 to 60% according to region and school type, are now equipped with a digital whiteboard. In 2011, two school boards had already announced pilot programmes aiming to provide every student with digital tablets by 2016. These announcements generated little enthusiasm. In the fall of 2012, a prestigious Montréal private school made headlines when it became the first secondary school to go completely digital when it adopted the digital tablet for all its classes. The private college's initiative managed to seduce a number of families and increase requests for admission, and had a domino effect on other private establishments which share a commercial vision of education and hope to increase their share of the school market.

### **Nature and exploitation of e-textbooks use in Quebec**

However, electronic textbooks used in Quebec schools do not differ greatly from traditional textbooks. It must be pointed out that more often than not, Quebec textbook editors only offer PDF versions of their textbooks. Students who have access to e-textbooks must most often be content with reading fixed text of already existing pages, without any notable multimedia enrichment (although there are some variations from one subject matter to another). Digital textbooks have thus fallen short of their promise of interactive learning and of student engagement with course material. In addition, as many schools have opted for the iPad digital tablet (or, more rarely, other small hardware), reading has been made more difficult. To make the page readable, it must be enlarged and moved from left to right, which constitutes an irritant oftentimes seen as outweighing the tablet's advantages. Furthermore, on the basis of survey responses administered to 6057 students and 302 teachers, in addition to 44 group interviews conducted with 6 to 9 year old students, 16 group interviews with teachers, and 18 filmed class lessons, Karsenti & Fevez (2013) were able to show that email and social networks diverted the attention of students using touch-screen tablets in class period. Fewer than 3% of the students actually used the tablets to read books.

On the other hand, e-textbooks lighten students' schoolbag load and, in certain cases, the bill handed to parents by school – but not by that much. Electronic versions of textbooks may be rented or purchased (as a complete book, not by chapter) and updated regularly. While this new renting practise is on the rise, another practice seems to be discarded to the disadvantage of schools. Up to now, in part through a system which is particular to Quebec, schools in the province may used to « try out » the teaching resources during a two year trial period before deciding whether to purchase the material. If they are satisfied with the material, after a one-year trial period, schools may purchase it immediately. If the material fails to meet their expectations or needs, they may try out resources published by another publisher for another year. Electronic materials seem to follow a separate path, however.

## **Actors in the Digital Textbooks market**

Since the last two curricular reforms took place in 1982 and 2004 (while programme reform is implemented every seven to ten years in Canada) in Quebec, e-textbooks may look like the means to escape financial problems (or satisfy the desire for increased profit shares and profit margins) for some publishing houses' stockholders, neither mergers and acquisitions, nor rationalisation efforts seem to have done the job in an increasingly fragmented and rigid market. In fact, while consumers appear to prefer works from local authors, digitalizing textbooks has enticed Quebec's three publishing giants (UK-based Pearson, Transcontinental and Quebecor) to evaluate such an enterprise as a worthwhile business venture, likely to reduce production costs.

The distinction between the production of basic teaching material and supplemental material constitutes another key feature in textbook publishing, if one wants to understand the potential the industry sees in e-textbooks. As has previously been mentioned, basic teaching material conforms to most if not all curricular needs and injunctions, while supplemental material aids in reaching curricular objectives and the development of competency, without being directly and completely oriented by the curriculum. Consequently and can buy to may purchase. Consequently, schools can buy any electronic supplemental material aid. Fortunately, in addition to published resources, schools have access to electronic material elaborated by the Ministry of Education, school boards and schools themselves. Teachers oftentimes find such resources through the Internet, from various organizations which sometimes provide freeware or shareware. Alternately, teachers put together websites and other digital resources that they share with other teachers . These resources are submitted to official restrictions regarding use, updates, modifications and adaptations. It is more difficult to quantify their use by teaching staff, because retracing internal costs of resources is more complicated that retracing funds dedicated to outside resources. Nonetheless, this can influence which purchases are made though publishing houses, especially in times of budgetary restrictions and cutbacks. These digital resources have become a phenomenon of increasing importance. As a general rule, though, their real costs in human resources, printing and reproduction are not processed as teaching material expenses.

## **The textbooks market and the state**

In Quebec, the Ministry of Education evaluates and reviews its programmes, then indirectly allocates funds to schools so that they may procure the most up to date teaching materials and resources, a practice which accentuates the cyclical nature of teaching resource acquisition. It is no wonder that, during its implementation, curricular reform affords publishing houses the opportunity to generate considerable annual profits. Since students have a (provincial) right to the free use of textbooks and other instructional material required for the teaching of programs of study, it is estimated that the general market for school textbooks in Quebec reached between 80 and 85 million dollars Canadian in 2008. In a five-year period, and in the wake of the 2004 curricular reform, a total of 350 million Canadian dollars had been spent in the purchase of new teaching materials and resources.

It may be said that there exists, there exists a paradox between approval processes for

teaching and didactic material, which is highly centralized, and purchasing and acquisition processes, which are completely decentralized. The Quebec Ministry of Education approves the resources that schools will be allowed to purchase (for refund purposes), and draws up a list of such approved textbooks and instructional material or series of instructional material. School boards and private schools then proceed with purchasing the instructional materials used in schools, which have been chosen by teaching staff or educational advisors from among these approved choices. In fact, publishing houses specializing in textbook production in Quebec deal with their clients – school boards and individual schools – directly, or through the intermediary provided by independent bookstores, to sell teaching resources which conform to curricular guidelines and are approved by the ministry.

### **Conclusion**

To date, no research has provided an accurate assessment of this phenomenon's magnitude: we do not yet know how far e-textbooks have penetrated socioeconomically disadvantaged or affluent schools, the quantity and nature of the electronic textbooks used in schools, or how they are used and their impact on social interaction in class. Research is also needed to establish how student learning outcomes differ according the type of textbook used. In fact, characteristics associated with good textbooks, good teacher guidance or good teaching practices remain unknown.

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<sup>1</sup> Sweney, M. 2014. E-books on course to outsell printed editions in UK by 2018. *The Guardian*, June 4. [<http://www.theguardian.com/books/2014/jun/04/ebooks-outsell-printed-editions-books-2018>].

# Digital Textbooks in India: Emergence, Promotion and Future predictions

## *Libros de texto digitales en India: Emergencia, promoción y predicciones del futuro*

## Libros de texto dixitais en India: Emerxencia, promoción e predicións do futuro

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**Abstract:** *The use and importance of textbooks is and will remain a curve in progress in India, as present youth population (13-35 years) that is 459 million is expected to reach 574 million by 2020. The emerging change from print to electronic has also affected the textbooks sector in India, and now digital textbooks are slowly becoming a known entity in Indian education system. In this backdrop, present paper tries to detail about the contributing factors and reasons for emergence of digital textbooks; emerging initiatives and concerns regarding promotion of textbooks; and promising trends and predictions about future of digital textbooks in India.*

**Keywords:** *Digital textbooks, Digital textbooks in India, India*

**Resumen:** *El uso y la importancia de los libros de texto es y continuará siendo una curva en progreso en la India, con una población joven (13-35 años) de 459 millones, que se espera alcance los 574 millones en el año 2020. El cambio del formato impreso al digital ha impactado también al sector del libro de texto en la India y ahora los libros de texto digitales se están convirtiendo en algo conocido dentro del sistema educativo. En este contexto, el presente trabajo persigue la identificación de los factores y razones que contribuyen al auge del libro de texto digital, así como las iniciativas emergentes y problemática en torno a la promoción de los libros de texto. Del mismo modo, se abordan las tendencias halagüeñas y algunas predicciones sobre el futuro del libro de texto digital en la India.*

**Palabras clave:** *Libros de texto digitales, Libros de texto digitales en India, India*

**Resumo:** *O uso e a importancia dos libros de texto é e continuará sendo unha curva en ascenso na India, cunha poboación nova (13-35 anos) de 459 millóns de persoas, que se espera que alcance os 574 millóns no ano 2020. O cambio do formato impreso ao dixital impactou tamén no sector do libro de texto na India e agora os libros de texto dixitais estanse convertendo en algo coñecido dentro do sistema educativo. Neste contexto, o presente traballo persegue a identificación dos factores e razóns que contribúen ao auxe do libro de texto dixital, así como as iniciativas emerxentes e a problemática en torno á promoción dos libros de texto. Do mesmo xeito, abórdanse as tendencias favorables e algunhas predicións sobre o futuro do libro de texto dixital na India.*

**Palabras chave:** *Libros de texto dixitais, Libros de texto dixitais na India, India*

## Background

Ancient writings and epics is a testimony that books have always been regarded as an important media for the development and promotion of human values in India. Among different type of books, textbooks have been given a special importance and consideration in Indian society. Emphasizing about the role and place of textbooks, Committee of the Central Advisory Board of Education (2005, 7) underlines, "Textbook is a major educational tool for the students. In India, textbooks occupy most of the educational space in schools. They are not just teaching manuals, they shape the minds of children in their formative years, and have a profound influence on how young minds interpret reality." The use and importance of textbooks is and will remain a curve in progress in India, as present youth population (13-35 years) that is 459 million is expected to reach 574 million by 2020 (Shukla 2010). Besides, the new demands of knowledge economy and lifelong learning have also ensured the growing consumption of textbooks for future progression and learning purposes. In India, textbooks are used by mainly three types of students- school students, students of higher education, and those appearing for different competitive examinations to get entry into specialized courses or to get jobs.

As per latest estimates, about 230 million students are enrolled in different recognized schools in India ranging from Class I to XII (National Council of Educational Research and Training 2009) and about 18 million students are enrolled in higher education institutions encompassing Under Graduate, Post Graduate and research courses (University Grants Commission 2011). There are no estimates about the number of students preparing for different competitive examinations and jobs. But one can very well imagine their numbers by simply considering that majority of 40 million students enrolled in secondary education prepare for admission in various courses of their choice and majority of 18 million students enrolled in higher education appear for different competitive examinations to get jobs in public or private sectors. A nationwide survey by National Book Trust of India revealed that one-fourth of the youth population, a staggering figure of 83 million, identify themselves as book readers. Of these, 58% are either at or below university matriculation level (Shukla, 2010). These figures clearly spell about a huge demand for textbooks in India.

There are mainly three types of schools in India- Schools by central government, schools by state governments and private schools. Central government run two types of schools- Central Schools (Kendriya Vidyalayas-KVs) that function from classes I to XII, and Navodaya Schools (Navodaya Vidyalayas -NVs) that function from classes VI to XII. Both these schools are affiliated to the Central Board of Secondary Education (CBSE). These schools follow the syllabus prescribed by CBSE and books for the students of these schools are published by a central government organization named as National Council for Educational Research and Training (NCERT). The second category is of schools run by different state governments. These schools function from class I to XII, and majority of children in India study in these schools. These schools are affiliated to their own State Boards and use textbooks prescribed and prepared by their own state bodies, usually the State Institutes of Education or SCERTs. The third category is of private schools. These

schools are either affiliated to CBSE or State Boards or ICSE Board (a board offering International Baccalaureate). These private schools are free to recommend the textbooks from any publisher with a condition that textbooks will be based on the syllabus of affiliating boards. Besides, there are large numbers of private, unrecognized primary schools in all over the country for pre-school to class V/VIII. These schools either use government textbooks or textbooks by private publishers. As alternative schooling measure, there is a National Institute of Open Schooling. This school provides alternative schooling to students via distance mode. This school has its own Board of Examinations and prepares its own textbooks (Central Advisory Board of Education 2005).

The above discussion makes it clear that in India textbooks in print are published by many publishers including government owned publishing houses and private publishers. As per available details, there are 16,000 publishers which publish books in 30 languages. India today stands as the third largest publishing country in the English-speaking world and seventh largest in the whole world. There are two factors aiding the flourishing book publishing industry in India. First, a large proportion of the country's population comprises of the youth. Second, increasing literacy rate of the country, which at present is around 65%. The industry publishes over 80,000 titles, of these, 60% are educational, 40% trade, folk, religious and spiritual (Bang 2013). Majority of the textbooks in India are published in print ranging from low priced books from government editions to highly priced textbooks of private publishers. According to an estimate, 70% of textbook publishing in the country is done by the government. With the literacy rate going up, along with the growth of the economy and the increase in spending power, the demand for textbooks is on the rise and publishing industry is the main beneficiary from this situation.

The new technologies have impacted the Indian society in many ways, and their presence is also witnessed in the textbook markets in form of digital textbooks or e-books. In present times, efforts are taking place to introduce digital education in the schools and Universities across the country, and digital textbooks are considered as an integral part of these initiatives. A report from Netscribes (2012) underlines that in India, digital books (E-books), was an unknown area to tread even few years back, but, as new technology creates new readers, technology enthusiasts began to opt for e-books and read them on a regular basis. E-readers along with the recent addition of smartphones and tablets have emerged as the supporting platforms that work in conjunction with e-books. Talking about the efforts to introduce digital textbooks in Korea and India, a teacher and author, Pilkington (2013) observes, "Across the globe, paper textbooks are slowly being relegated to "thing of the past" status to make way for enhanced digital textbooks. South Korea has already put into place an initiative to digitize all textbooks in public schools and higher education. India has rolled out several models of minimalist cost-effective tablets aimed at public school students, even in outlying areas." At this juncture, it will be interesting to know about the emergence of digital textbooks in India.

## **Emergence of digital textbooks: Contributing factors and reasons**

It is true that emerging change from print to electronic has positively affected the textbooks sector in India, and now digital textbooks are slowly becoming a known entity in Indian education sector. In other side, we cannot say that evolution of digital textbooks is a totally new phenomenon in India, as substantiated by (Kowk 2012, 405), "The idea of electronic instructional materials is not new: texts in e-book form, as well as online supplements, teaching tools and homework systems have been available for years. But as tablets and e-books become more popular, publishers are increasingly placing equal or greater importance on the digital product rather than considering it as an add-on to the printed book. Some publishers are moving towards electronic only textbooks." The main difference is that digital textbooks are becoming more and more visible on educational radar of India these days. There are many factors that have contributed for emergence of digital textbooks. These factors range from technology to economy and from education to politics. A detailed discussion about these factors and reasons will help one to clearly understand the continuously rising presence of digital textbooks in Indian educational system.

Technological advancement of Indian society may be termed as the foremost factor and reason behind the popularity of digital textbooks. There is a huge and rapid increase in the number of internet users in India. Based on the statistics provided by Internet World Stats, a global website that monitors and records the internet usage across the world, India is in the third position in terms of internet usage with about 120 million internet users, which forms 11.4 per cent of India's population and 5.7 per cent of world's internet users (Internet World Stats 2012). Among these internet users, majority belongs to those youths that are prominent consumers of textbooks. The availability of the internet connection helps them to use internet for searching and downloading useful reading materials including digital textbooks. These, internet empowered and tech savvy students are aware of the capabilities of digital textbooks that include embedded videos, full-colour graphics, easy search and annotation capabilities (Pilkington 2013). In fact, accessibility of internet helps these students to search, download, and share the textbooks of their choice and need.

The other reason is that use of mobile phones and tablets has increased a lot in India. India's telecommunication network is the second largest in the world based on the total number of telephone users (both fixed and mobile phone). India is also the second-largest mobile phone user with over 892 million users in the world accounting for over 10% of the world's online population, and 70% of Indian population (Telecom Regulatory Authority of India 2013). Like internet, youths are the biggest users of mobile phones in India. According to an estimate, 500 million people under age 30 live in India and one in 5 of the world's mobile owning youth is living in India (Brown, 2011). With the launch of low-cost devices running on Google's Android platform by local firms, sales of tablets and smartphones have grown rapidly in the last two years. A slew of global makers of tablets have also entered the market, for example, recently Amazon has announced the availability of Kindle and Kindle Paperwhite e-readers in India starting for INR 5,999 (approximately 110 USD). These devices help youths to easily browse, read, and store e-

contents including digital textbooks.

Perceived educational benefits of electronic over print may be termed as other responsible factor helping the rise of digital textbooks in India. At present, there are no substantial research evidences to support this claim but on the basis of personal interviews and views of parents and educational experts that are appearing in the print and electronic media, it can be said that Indian academic community has a belief that digital textbooks help the students to understand and learn the matter in a better way. While, parents feel that digital textbooks are of great advantage since it will encourage the students to study even without compulsion from the part of the parents. The media reports further claim that e-textbooks explain the concepts in a better way by giving pictorial representation and this helps the students to understand and grasp the content in an easy way (India Times 2012). The other perception is that digital textbooks have more advantages than the traditional ones as they include animations and illustrations that are not possible with the printed textbooks. One other notable claim is that distinct features of these books like capability to hold the entire syllabus; opportunities to learn in multiple ways of using audio, video and text; and inclusion of assessments and tests make them more appealing for students, teachers and parents as well (Abhinya 2012). These reports and claims are creating positive vibes and helping the cause of digital textbooks in India.

The other important factor is economics of publication and distribution. Like other parts of the world, publishers are realizing the economic benefits of digital textbooks promotion in India. The benefits includes the ability to easily refresh out-of-date content, functionality that allows books to be dissected, more interactive content, metrics that can measure the usefulness and popularity of resources, and of course pricing (Lossius 2013). Considering the fact that technology is increasingly becoming a means for empowering students, and is a method for communication, educational publishing industry is rapidly evolving with newer forms of electronic publishing for education (Cognizant technology solutions 2010). The publishing industry is eyeing many benefits from digital textbooks, as observed by a media analyst, Krishna (2012), "Digital publishing has finally come to India, and it will reduce costs and improve distribution of Indian books both globally and within the country. One would expect ebooks to be cheaper than print editions because publishers save on costs to print books, store them in warehouses, and display them at retail outlets. Apart from providing global reach, ebooks will also solve the problem of distribution within the country."

The other very unique and promising reason is that distribution of free laptops/tablets has become a new electoral promise for political parties in India. For example, during electoral campaign, the present ruling party of Uttar Pradesh (biggest state of India in terms of population, 201 million) has promised that if they come into power, the government will distribute free laptops to students of schools and universities. The party came to power on March 15, 2012 and invested about Rs. 2,858 crore for purchasing 15 lakh (1.5 million) laptops. At present, the free laptop distribution is taking place in different parts of Uttar Pradesh (<http://www.uplaptop-tabletdistribution.in/>). Explaining about this new trend in Indian politics, a media specialist, Prashant (2013) comments,

“With elections around the corner, we are seeing the state governments and the central government distributing free laptops and tablets. Tamil Nadu, Uttar Pradesh, Chhattisgarh, and Rajasthan have already taken the lead and many other state governments are in the process of finalizing vendors for free laptops and tablets. Even the central government is in the process of coming up with a global tender to provide low-cost Aakash tablets to 220 million school children... The free laptop and tablet scheme helps the government in 2 ways. First, it helps in eliminating digital divide and second, it helps in getting voters attracted to the ruling party for the upcoming elections.”

In backdrop of these observations, we can say that rapid increase of information communication technologies (computers, tablets, smart phones, internet, etc) is bringing a new culture of using electronic medium for different purposes and activities. As this culture is progressing, students are increasingly becoming familiar and opting digital medium for different educational tasks including reading of books. This increased availability and usability of digital medium for reading is helping the emergence of digital textbooks in a big way. At this moment, the expectations about digital textbooks are high, and there is lot of excitement over the easy availability and other features of these textbooks. Banking on these trends and enthusiasm of stakeholders, publishing industry is gearing up to promote digital textbooks in India. Both public and private sectors are coming with new initiatives and ideas to publish and distribute digital textbooks. In other side, there are also a number of concerns about the popularity and benefits of these books for instructional purposes. A discussion about these initiatives and concerns will help us to understand the present scenario of digital textbooks in India in a better way.

### **Promotion of Digital textbooks: Emerging initiatives and concerns**

At this moment, both public as well private publishers are trying to promote digital textbooks. The National Council for Educational Research and Training (NCERT), one of the biggest publishers of school textbooks in India offers online service for easy access and download of textbooks. The service covers textbooks of all subjects published by NCERT for classes I to XII in Hindi, English and Urdu. The Entire book or individual chapters can be downloaded provided the terms of use as mentioned in the Copyright Notice are adhered (<http://ncert.nic.in/NCERTS/textbook/textbook.htm>). Similarly, the Central Board of Secondary Education (CBSE) is also considering about the possibilities to introduce digital textbooks in the schools affiliated to them. According to the media reports, CBSE is of the view that digital textbooks are interactive and interesting and encourages students to learn (India Times 2012). The Government of India has also launched a very significant project called Digital Library of India (DLI) to digitize books of educational significance. Talking about this initiative, (Ambati, et al. 2006, 1) write, “With a vision of digitizing a million books by 2008, the Digital Library of India (DLI) project aims to digitally preserve all the significant literary, artistic and scientific works of people and make it freely available to anyone, anytime, from any corner of the world, for education, research and also for appreciation by our future generations. Ever since its inception in November, 2002 operating at three centers, the project has been successfully digitizing books, which are a dominant store of knowledge and culture.”

Considering the fact that India is one of the fastest growing markets in terms of printed

textbooks, new initiatives and experiments are regularly taking place in private sector too to promote digital textbooks. According to a news report, published in India Times (2012), Attano, an online market space for educational content and e textbooks, introduced e-textbooks in 2009 in India. This company converted text books into interactive books with figures and diagrams. The company offers digital textbooks from primary grade to 12th grade and claims that the product they have developed is user friendly and even a six year old child can use these books. As other initiative, in 2011, major electronic company Sharp announced that it would work with Indian Institute of Technology (Hyderabad) to run a proof-of-concept trial for electronic education. Under this initiative, Sharp provided its new Galapagos eReaders, as well as digital textbooks and interactive whiteboard touchscreen LCD monitors to test an integrated and interactive system that ties together the Galapagos eReaders, the LCD monitors, as well as remote servers over the network. The main purpose of this experiment was to explore the possibilities of remote education via different technologies and digital textbooks (Hoffelder 2011).

In one side new efforts and initiatives to promote digital textbooks are coming into picture regularly, and in other side there are number of concerns about the available digital textbooks in Indian market. The first and foremost concern is that available textbooks are merely a replica of printed books and hardly offer any interactivity in terms of audio, video, assessments and other information sources such as Wikipedia and online dictionaries. A glance at available textbooks give one a feel that he/she is reading a contents based novel or fiction rather than a book offering opportunities to navigate and interact with text, pictures, and references. Talking about the low adoption of digital textbooks in general, Pilkington (2013) observes, "Several factors play a role in how the attitudes translate into real-time use of digital texts. If a textbook has simply been formatted for an e-reader, tablet, or smartphone, where is the increased value for the user? Why should a student pay full price for a digital edition that doesn't offer anything more than its print counterpart? Why pay for a full-price ebook if it won't do the very things that make it an ebook"? More or less, this trend also exists in India. The tendency of publishers to produce merely an e-version of exiting printed textbooks is affecting the promotion of digital textbooks in India as well.

The other main concern is that end user adoption levels of textbooks are relatively low. It is claimed that E-books are not as popular as other types of e-publications, such as e-journals and e newspapers (Anuradha and Usha 2006). Similarly, Tryble (2010) suggests, "However, despite the publishing industry and aggregators' efforts to convert print buyers to digital, the average student still has an affinity for the printed book. Printed books outdo e-books in portability, ease of use, and as a gadget-free experience, while the price of e-readers is still considered high for the average student." This observation is also true for Indian students. The other concern is that technology for creating/ accessing e-books (both hardware and software) is not yet matured in India, and it is too early to introduce digital textbooks at this stage. Besides interactivity and availability of cost effective technologies such as e-readers, the other main concerns are how to raise awareness, how to change students' perspectives about digital textbooks, how to help the students to

have the right technology at their fingertips, and how to support them to choose and use appropriate digital textbooks to meet their different learning needs. Above all, the institutional and policy support to promote digital textbook is lacking and there is hardly any research about digital textbooks.

### **Future of digital textbooks: Promising trends and predictions**

There are enough reasons to believe that in future, the reach and popularity of digital textbooks will certainly increase in India. The most obvious reason is that mobile and wireless connections continued to drive the growth of internet penetration in India. India is the world's third largest Internet population having 124 million internet connections by the end of 2012. Taking into account multiple users for a single wire line connection, the number of internet users reached 174 million in 2012. By the end of 2012 there were 124 million internet connections in India. The internet is accessed by 3.7 percent of the youth (7.7% urban, 1.3% rural), for e-mails and chatting in more than half of the cases. It is used for entertainment in 14 percent of the time, for reading books online in 4 percent of the cases and also to search for new book titles in 1.2 percent of the cases (Shukla 2010). A report from FICCI-KPMG (2012) affirms, "Taking into consideration a 15 percent penetration of e-book reading apps amongst tablets in India and 5 e-book downloads annually per user by 2017, Indian e-book sales could reach 15 million units per year with further upside expected from consumption on smartphones."

Beside technological advancements, the growth of digital textbook in India will be influenced by factors like digital textbook and e-content pricing, availability of digital textbook content, advances in technology specifically related to digital textbooks, increased growth of online learning, and rise in open educational resources and their use. In addition, the increase in e-textbook sales will be driven by a series of hardware and technology trends such as success of the iPad and the tablets, sales of netbooks, proliferation and continued popularity of e-reader devices and e-reader platforms, and growth of the smartphone market (SiliconIndia 2010). The eReaders are going to play an important role for future of digital textbooks in India. Therefore, the challenge for makers of eReaders would lie in the design of eBooks to be less exhaustive and more cognitively intuitive. They have to consider the fact that readers must understand the best device (including paper formats) for the best medium. Long narratives might be best in paper while comics and visually heavy magazines will be better on tablets (Tran 2013). These considerations will certainly help the promotion of digital textbooks.

A news report from Press Trust of India makes a very interesting observation about future of digital books in India. According to this report, "It is a general perception that sales of digital books will pick up in future but that will not impact the aficionados love for hardcover books. India may see good rise in sales of digital books as downloading them on mobiles becomes a possibility but their growth trajectory may not be same as in the West" (PTI, 2011). More or less, future scenario of digital textbooks will look similar. Discussing about the future of digital textbooks at global level, Fielko (2012) suggests that developments like heterogeneous classes and learning groups and non-school educational markets will be the driver of digital conversion in future. Textbooks will convert into operating systems; parallel developments will cause high investments with

uncertain ROI; new revenue sources will be tested and implemented (e.g. flat fees; subscription; online lending; freemium offers); new players will come; old players will disappear from gate keeper to service provider (content and/or marketing); and the traditional selling copies will be replaced by providing access books. Instead of the fact that these observations are general in nature and not specific to any country, it clearly mirrors the future of digital textbooks in India.

## Conclusion

A recent survey that was conducted on 5106 Indian students to know about their reading preferences came up with following results: 62.5% students think that textbooks are too expensive; 82.1% refuse to buy the required textbook, and more than half of them (54.1%) prefer digital textbooks instead of printed textbooks (Bookboon.com, 2012). Although, the sample taken for this study is very small and can not be hold equally true for a country like India having vast differences and inequalities in terms of economy and society, but it still indicates about the choices of digital natives of today and tomorrow. It is certainly an uphill task in India to replace textbooks with digital textbooks. In fact we hardly see a future where all the textbooks will be replaceable by digital textbooks. The safest prediction is that print version will still dominate and digital ones will play a supplementary role. This prediction is based on the argument that more has to be done in terms of the infrastructure and even developing meaningful content for the devices. The good news is that different actors like schools, government, publishing industry, technology providers and above all society is joining hands to bring digital education to schools and institutions of higher learning. Slowly, India is marching towards a scenario where heavily loaded school bags of Indian students that are always in their backs will be replaced by a light, playful and internet enabled eBookreader that will be in front and in their hands.

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# From Print to Digital: Changes in the Brazilian Textbook Program

## *Desde la impresión a lo digital: Cambios en el programa de Libro de texto brasileño*

### Dende a impressão ao dixital: Cambios no programa de Libro de texto brasileiro

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**Abstract:** *Technologies are present in Brazilian public and private schools, in different ways and with varying degrees of use, with diverse conceptions regarding their purposes and usage. There is a large incentive from the Brazilian government for computers to be transformed into "cultural products" to be consumed by more Brazilians. There are incentives for the production of more digital content to feed the school usage of portable computers – and digital books will soon be in the list of textbooks approved by the National Program of Textbooks. Based on the analysis of the official documents of this Program, some aspects about digital textbooks were approached, especially in regard to their relationship with the internationalization of educational services and the didactical models established by a certain "school form".*

**Keywords:** *Digital Textbooks; Digital Educational Objects; National Program of Textbooks (PNLD); internationalization of educational services; School form and didactical models.*

**Resumen:** *Las tecnologías están presentes en las escuelas públicas y privadas brasileñas, de diferentes formas y en diferentes grados; ellas son utilizadas con diferentes fundamentación y, por lo tanto, con diferentes objetivos. Por medio de incentivos y acciones, el gobierno del país intenta transformar las computadoras en productos culturales. Edictos del Gobierno han sido publicados para incentivar la producción de contenidos digitales para los programas oficiales y libros digitales estarán incluso brevemente en el Programa Nacional de Libros Textos (PNLD). Con base en análisis de los documentos oficiales, presentase elementos acerca de los libros digitales, particularmente en sus relaciones con la internacionalización de la educación y con el modelo didáctico definido por determinada "forma escolar".*

**Palabras clave:** *Libros digitales; Objetos educativos digitales; Programa Nacional de Libros Textos (PNLD); Internacionalización de la educación; Forma escolar y modelos didácticos*

**Resumo:** *As tecnoloxías están presentes nas escolas públicas e privadas brasileiras de diferentes formas e en diferentes graos; utilízanse con diferentes fundamentos e, daquela, con diferentes obxectivos. Por medio de incentivos e accións, o Goberno do país intenta converter as computadoras en produtos culturais para o consumo da sociedade brasileira. O Goberno fomenta a produción de contidos dixitais para os programas oficiais, e os libros dixitais hanse incluír brevemente no Programa Nacional de Libros Textos (PNLD). Tras analizar os documentos oficiais, debúllanse algúns aspectos acerca dos libros dixitais, particularmente nas súas relacións coa internacionalización da educación e co modelo didáctico definido por determinada "forma escolar".*

**Palabras chave:** *Libros dixitais; Obxectos educativos dixitais; Programa Nacional de Libros Textos (PNLD); Internacionalización da educación; Forma escolar e modelos didácticos*

## Introduction

The entrance of two large business groups into the market of digital books in Brazil at the end of 2012 rekindled the debate surrounding the issue. Topics such as price, accessibility, e-readers and the formation of readers have occupied an important space in both printed and digital media. A debate conducted about the future of the editorial market in the face of this "new invention" during an event that took place in a room named Johannes Gutenberg – which does not seem to be only a coincidence or act of chance.

In an article published in the media about this event, which had gathered editors and representatives of associations including the Brazilian Book Chamber, the journalist Leonardo Pereira affirms that:

Just like Gutenberg's invention, the digital book gets information to those who have difficulty accessing it.

Before the types (basically stamps in the shape of letters), the culture of writing was extremely restricted, but became more open through the facilitation of reproduction. It is the same thing with the e-books: the consumer does not need to wait for the recently released piece to get to the nearest bookstore. The consumer does not even need the bookstore (Pereira 2013).

Besides the large bookstores, which have already commercialized books in the e-pub format, the presence of these new groups creates the expectation of a drop in the price of the digital books – which had until then, been almost the same as those of printed books – as well as the expectation of more accessible prices for the e-reading devices. Despite these changes, an evaluation made by Silva (2012) on the current state of the Brazilian publishing market of digital books states that a “revolution” should perhaps not be expected in the short-term.

In partial agreement with this statement, this text intends to focus on digital books and schooling based on two themes which have been the object of academic research and intense public debate. The first theme relates to the data on books and literature in Brazil, which is considered a country of few readers – according to the Brazilian Book Chamber, 470 million books were sold in 2011, to a population of circa 200 million inhabitants.

Being considered a product of elevated cost for the Brazilian standards of life, the book is still seen as an object of luxury, or an “elite product” (Pereira 2013), despite the State’s actions to stimulate the formation of readers, such as the National School Libraries Program financed by the Federal Government.

Research about the theme has been conducted by different groups and academic centers. It has been used to clarify the constitutive elements of the cultural processes involved in the formation of readers, as well as analyze the role performed by the school in this process, especially based around the teaching of reading and writing. The concepts of literacy and lettering, although polemic<sup>1</sup>, have been used to evaluate and distinguish different ways of appropriation and the use of writing by the subjects, encompassing different degrees, varying from the simple domain of the code to the comprehension and use of writing in their wider and more complex social functions. This distinction is highlighted by Magda Soares:

(...) it is necessary to recognize that literacy – understood as the acquisition of the conventional system of writing – is different than lettering, which is understood as the development of behaviors and abilities of competent use of reading and writing in social practices (...). On the other hand, it is also necessary to recognize that, although distinct, literacy and lettering are interdependent and inseparable: literacy is only meaningful when developed in the context of social practices of reading and writing and through these practices, which means: in a context of lettering and through lettering activities. Lettering, by its turn, can only be developed in the dependence of and through the learning of the writing system (Soares 2004, 1).

In this view, it is not enough to learn the writing system in order to become a “competent reader”, and this is an argument frequently used to explain the small number of readers in the country. Along with the unsatisfactory results obtained by Brazilian children and teenagers in international tests evaluating their competencies in reading and writing, recent market research does not indicate a significant growth in the number of readers, when compared with previous research. Considering research performed by the Instituto Pró-Livro in 2011, the following information is highlighted:

- 50% of the participants are considered readers, for having read one book in the last three months;
- The average of read books, among the readers, is 1,85 book in the last three months, half of which were indicated by their schools;
- 28% affirm to read in their free time, and for over 60% of participants reading was associated to knowledge, study and professional formation, highlighting schooling as the main factor of stimulation for reading.

The close relationships between the school space and reading, in the Brazilian case, can be understood based on other data. About 50% of the participants affirmed to read the books indicated by the school, and the two genres most read are the Bible (42%) and textbooks (32%), followed by religious books, novels, comic books etc. The predominance of schoolbooks, including textbooks, may clarify another figure: 56% of the interviewed people affirmed to have never bought a book, and 80% indicated they have not bought any books in the last three months.

Thus, from the point of view of reading as a leisure activity, it can be said that the data indicates that Brazilians prefer other activities, such as watching TV (85%), listening to music or the radio (52%), resting (51%), seeing family and friends (44%) or watching movies and videos (38%). Reading is predominantly associated with school, knowledge acquisition and professional formation, which also explains the strong presence of textbooks as the most read genre by the population of readers, according to the research.

There is therefore a background issue to be considered regarding the incorporation of books as an object of culture and consumption, with consequences for the books market: reading is an activity of the school life and the State is the largest consumer of schoolbooks, through the National Program of Textbooks. Besides defining the desired standards, Brazilian government annually buys a significant volume of books for the students of public schools. This policy, originally implemented for printed books, is now being extended to digital books.

The second theme, which constitutes a reference for the analysis executed in this text, refers precisely to the presence of information and communication technology in Brazilian culture. The growing use of cell phones, for instance, indicates changes in user profiles and the access that a big part of the population now has to the "new cultural products" derived from these technologies.

Research conducted in 2011 by the Center of Studies on Information and Communication Technology (CETIC.br) points out that cell phones are present in the lives of about 87% of Brazilians. It is important to note that in rural areas this number drops to 67%, which is still a relevant number. In the case of mobile phones, there is almost no significant difference between the most developed regions in the country and the least developed ones.

Regarding the presence of computers, however, there is relevant data to consider when the issue in discussion is digital books. The research indicates that 40% of the houses in urban areas and 13% in rural areas have desktop computers, and the number of portable computers is 20% and 5%, respectively. In this case, the difference to the least

developed regions is clear – only 10% of the houses in the Northeast region have portable computers.

We can add to this data the information that 43% of the houses in urban areas and 10% in rural areas have internet access. The high costs (45%) and service unavailability in the place of residence (18%) are the two main reasons which obstruct access, and 18% reported accessing networks in other places. Among the interviewed people, 53% of affirmed to have accessed the internet at some point; from these, 66% affirmed to access it on a daily basis, with the main purposes being to communicate, getting informed and using on-line services. Of them, 29% declared to use the internet for shopping, especially electronic devices, and 22% of the users have purchased books, magazines and newspapers on-line.

Therefore, internet access is still restricted, being related to the unequal distribution of development between Brazilian states, as well as between the rural and urban areas. This produces different results in the conditions of access to the technologies and processes which are already available in the country. Although the institutional efforts at several government levels have been producing changes, the access to digital books is still considered a restricted possibility: in the research performed by the Instituto Pró-Livro, numbers showed that, among the internet users (46% of the interviewed people), only 7% indicated to use the internet to read or download books.

In regard to the characteristics of the users of digital books, the research highlighted 52% of the readership to be female, with a higher concentration in the age range of 18-24 years, among them students with university degrees. Thus, according to the parameters of the research this would be around 9,5 million readers, more than half of them in upper and upper middle social classes and a little less than half in the Southeast region of Brazil (constituted by the states of São Paulo, Rio de Janeiro, Espírito Santo and Minas Gerais).

In comparison to the concerns with readers' formation and printed books, the issue of reading and digital books is only now starting to become present in the field of academic research. When searching the CAPES database of dissertations and thesis presented in Brazil<sup>2</sup>, it was observed that, although the theme of educational technologies has been solidly represented for over a decade in several research groups, digital books have only just now started to become a reference. There are few concluded research works and they refer specifically to the analysis of the editorial market of literature books.

It is important to note that the technologies are present in the Brazilian school space, public and private, in different ways and with varying degrees of use, with diverse conceptions as to their purposes and usage. As an example, we can point to the program of the Federal Government named "One computer per student", which distributes portable computers to students of public schools in some cities in Brazil<sup>3</sup>. In June 2012, an Act was passed to systematize this program (PROCURA) and the Special Regime of Incentives for Computer Use in Education (REICOMP), which suspended the incidence of some federal taxes on computers as well as on their raw materials.

Based on these elements, it must be acknowledged that there is a large incentive from the Brazilian State for computers to be transformed into "cultural products" to be

consumed by more Brazilians. As a knock on effect, and as highlighted in this text, there are incentives for the production of more digital content to feed the school usage of portable computers – and digital books will soon be in the list of textbooks approved by the National Program of Textbooks.

From this perspective, it can be said that despite the contradictions and tensions presented, we are inevitably part of a digital culture which provokes changes in the production and reproduction of social life, and not only in the information and communication processes. For the schooling and teachers' formation, this constitutes an urgent and complex issue for debate.

As previously affirmed, research is only starting to indicate the details which compound the issues of techniques, processes and the configurations of new forms of relationships with knowledge that result from the presence of technology in school life. In the context of the discipline of Didactic, the debates about teaching and learning demand new approaches and perspectives. In this sense, didactic resources such as textbooks become sources of new issues to be discussed.

With the recognition of the challenges posed by such undertakings, the theme of digital textbooks will be approached according to the perspective of its gradual entrance into the National Program of Textbooks (PNLD), as instituted by the Brazilian Federal Government. Based on the data of research which used the official documents of this Program as empirical material, some aspects about digital textbooks were approached, especially in regard to their relationship in the internationalization of educational services and the didactical models established by a certain school form.

### **The National Program of Textbooks: changes and permanence of didactic models**

In order to analyze textbooks, be they printed or digital, there are choices for certain conceptual fields that can contribute to explaining elements of this subject, whose complexity lies "under an apparent banality and deceitful familiarity" (Choppin 2008). Its plural functions determine and are also determined by a set of relationships which reveal diverse research possibilities, inserted in different knowledge fields.

The relationship of books or manuals with the school form (Vincent et al. 2001) has been constituted as one of the theoretical options through which to orientate the analysis presented here. When examining the constitution of school in France, through a social-historical analysis, the authors coin school form as a configuration originating in the 16<sup>th</sup> century, in European societies – but which is also present in other societies through the context of a "way of school socialization" which "was imposed on other ways of socialization" at a certain historical moment (Vincent et al. 2011, 11).

According to the authors, the pedagogical relationship has become autonomous in regard to other social relations with which it remains connected, through and in the institution of a specific and distinct place for teaching and learning. The "invention of the school form" is performed in the production of school disciplines, which become the responsibility of a master and are organized in defined spaces and times, ordered and sequenced, developed through activities derived from rules and principles based on an impersonal relationship. In this sense, we can talk about a "unity", a particular historical configuration which was imposed in the school as an institution, but one that modifies,

retakes and recreates elements throughout time.

What is the relationship the textbooks – or school manuals – have with this historical process? These artifacts of school culture can be understood as a “concretization” of the school form which simultaneously established teaching as a way to teach, that is, organizing the space and distributing students in classrooms, distributing activities and defining the materials and books necessary for the organization of the processes of teaching and learning.

Although school manuals have changed, in terms of content and shape, throughout the centuries, it is important to note the permanence of certain characteristics which have resisted the successive proposals of educational renewal. It is not without reason that books have been cyclically accused of hampering the advances suggested by diverse pedagogical theories, which value student activities, especially in light of the belief that teachers usually “follow” the books, settling for the path designed by the author of the book.

It is therefore possible to use the concept of school form to discuss how varied textbooks have become and in which aspects the books have been effectively modified, especially throughout the 20<sup>th</sup> century. Many transformations happened the previous century: the processes of editorial and graphic production, result of the technological development in this field of activity; the educational systems in different countries, expressed through their educational reforms; and the “technological and informational revolution”, which created new products and cultural and social forms.

In the Brazilian case, the almost thirty years of the PNLD has produced significant changes in textbooks. It has also generated other models, which will be evidenced next in a search to clarify the relationships with the most recent curricular forms, as well as with the school form which, despite these changes, still exists and is expressed in the permanent “education crises”. Besides pointing out changes and consistencies from 1980 onwards, with the consolidation of the National Program of Textbooks - PNLD, elements of the gradual insertion of textbooks into this Program are also analyzed, starting from 2013.

### **General characteristics of the Program**

In order to situate the issue of textbooks in Brazil, it is necessary to highlight that it is a country with a vast territory, with a population around 200 million inhabitants, distributed over big cities such as São Paulo (with 11 million inhabitants) and small towns like Borá, in the state of São Paulo (with a population of less than 1000 inhabitants). The country has extremely industrialized areas and other regions with populations who live of agriculture, gathering fruits, among other subsistence activities. Therefore, diversity and inequality are two essential concepts in the analysis of any process within schooling.

From the point of view of the educational system, three levels are articulated to offer schooling: federal, state and municipal. Curricular public policies emanate from these three levels, which are also responsible for the creation and maintenance of public schools. Fundamental initial schools are predominantly kept by the municipalities (1<sup>st</sup> to 5<sup>th</sup> grade); states predominantly keep the final grades of fundamental school (6<sup>th</sup> to 9<sup>th</sup>); and High School (1<sup>st</sup> to 3<sup>rd</sup> grades), professional school and university are predominantly

kept by the Federal Government.

Public policies are therefore a result of actions taken on these three levels, including the policies referring to textbooks, demanding centralized and local action, both for production as well as distribution of books. The National Program of Textbooks - PNLD, for which the Ministry of Education is responsible, assures free distribution of textbooks for all students, in most school disciplines, throughout the twelve years of schooling. It is presented as a problem due to the financial resources needed, logistical and operational features, as well as pedagogical and didactical factors, which pose a challenge not only to the Federal Government, but also to editors, authors, evaluators, and finally schools, teachers and students.

Although Brazilian textbooks have earned the attention of national governments since 1938, the PNLD was started in 1985. In 1996, the Act of Direction and Basis of National Education was approved, which restructured schooling in the country. The National Curricular Parameters were released in 1997. From 2004 onwards, the acquisition and distribution of textbooks for the disciplines that traditionally compound the High School curriculum was started. Every three years, teachers of one of the segments of Elementary School choose books, which are then used by students until the next selection process. The choices are intercalated in a way that every year there is a selection process to be executed.

Amongst the fundamental elements of the Program, we find the criteria for the evaluation of the books, which influenced the process of editorial production and established which books can – or cannot – be a part of the didactic materials to be used in public schools. In 1993, the evaluation of textbooks started to be understood as an essential element of the Program; a commission of specialists was charged with evaluating the quality of the most requested books by the teachers, as well as establishing general criterion for the evaluation. By the end of the decade, the Federal Government instated the policy of the evaluation of textbooks for the fundamental school by guest specialists, establishing a partnership with the universities to execute the process.

The program, therefore, universalized the presence of textbooks in public schools, as before this only a few schools for wealthy people in urban centers were able to request the purchase of books by the students. As a result, the State consolidated a safe market for publishing companies and authors, with guaranteed profit due to the high number of children and teenagers enrolled in public schools – in 2012, about 130 million books were purchased, and in the previous year 164 million<sup>4</sup>.

### **Constitutive elements of a model for textbooks in the PNLD**

The construction of textbook models is intrinsically related to the assessment processes established within the Program. In every new Notice which summons the commercial publishing companies to present books for evaluation, the specialists in each field of knowledge establish parameters which must be considered by the authors in terms of science concepts and their teaching.

Alongside the specific criteria, general criteria are also established, including those which have an eliminatory character and, therefore, will define the approval or non-

approval of the books presented. This aspect is relevant for the digital books, in graphic and editorial aspects including the type of support, and is also defined in the Notice.

Thus, throughout the years, a general model for books has been constructed for the two initial grades of Elementary School, named "consumable textbook". The students, in the literacy phase, can do exercises and activities in the book, and the Program replaces the used books every year, maintaining the choice made by the teachers. For all other grades, the books are not consumable: they have texts and activities, which cannot be done in the book itself, as the materials, are to be used by other students in the next two years – in this case, the books belong to the school, not to the students.

In this general model, the activities notebooks, as they are called, and other additional resources of individual usage by students have always been forbidden within the Program. At the same time, considering the methodological criteria, and based on teaching conceptions supported by the idea that students must construct knowledge, the authors have been requested to propose activities which, amongst other, stimulate debate, demand interaction between students and groups and stimulate the performance of investigations in local contexts about themes and issues of the contents presented.

Therefore, this characterizes a model of printed textbook, which has been adjusted and consolidated in the last two decades, resulting from an assessment process by the National Program of Textbooks. Through different forms, the Program managed to influence the totality of the editorial production of this genre, and not just that of textbook production for public schools. Certainly, this refers to a model which differs from those observed at the beginning of the 20<sup>th</sup> century, which were basically conceived for lecture or use by the teachers.

Besides the new themes which were aggregated to, or replaced, traditional contents, the questions and exercises, which were activities typical of textbooks until 1970, were also gradually affected by the new requirements of the Notice and the evaluators of the Program. These undertakings were supported by theoretical and methodological presuppositions, particularly the ones with a social-interactionist basis, and the advances, which occurred in the research of specific didactics. Debates and group work, research, interviews and other forms of schoolwork started to compound the repertoire of the didactical activities.

From the graphic and editorial point of view, the printed books also underwent evident transformations in the last forty years, be it as a consequence of the technologies of production and printing, or the concern of making textbooks more compatible with other genres and languages. Among these transformations, the use of images in all school disciplines with different functions, the creation of icons and/or other visual elements, highlight spaces, different fonts and colors and graphic design resources which stimulate the possibilities to read beyond the written text can be pointed out in particular.

Whilst recognizing the changes that have occurred, it is possible to be in agreement with some specialists who point to the fact that, despite these changes, textbooks have kept certain morphologic and stylistic traces related to school knowledge, which effectively constitute the brand of the school form in which they participate – and which they helped construct – over four centuries ago. After all, the textbooks were created to

organize and systematize knowledge in a way to teach these same contents in different situations, to different and multiple subjects simultaneously, coordinated by the master.

Although thought of in its origin as a material common to everyone, today the capacity of the textbook to universalize and homogenize has been constantly provoked by the idea of serving diversity, particularities and different realities, incorporating local cultures into the teaching of universal contents. As highlighted by Gimeno (2011, 29), the biggest issue today lies in the paradox of accepting the textbook, in schools, as the only source of knowledge, in societies which recognize themselves as globalized societies of information.

In this aspect, the issues about printed and digital textbooks get intertwined. Has the availability of computers at schools and to the students produced changes in the models of schooling? Is the expansion of access to virtual networks affecting the production, circulation and use of printed books in the Brazilian case? What changes can digital textbooks provoke in the national programs of book distribution to public schools? Is this a "revolution", capable of contributing to the institution of a new school form, of which digital textbooks would be the cause and expression?

The intention of this article is to point out elements of the trajectory, inside the public system of schools, towards communication and information technologies, evidencing how this has been materialized in the documents of the National Program of Textbooks. This evidence announces the possibility of the companionship of printed and digital textbooks, and creates specific demands to be met not only by the traditional editorial groups, but also by the companies working with the technologies, which produce educational objects and who are being asked to enter partnerships with the Federal Government.

### **Towards a "virtual world" in schools: projects and programs of the Federal Government as inductors of the market of digital products**

The expansion of the conditions of access to virtual networks has received high investments from the Brazilian government, supported by the state and municipal governments<sup>5</sup>. The state of Paraná (Southern Brazil), for example, has been structuring projects with this purpose since the second half of the 1990's. Through the National Program of Informatics in Education (PROINFO), for instance, the Federal Government "brings computers, digital resources and educational contents to schools. In return, the states, Federal District and municipalities must guarantee the adequate structure for the labs and train education professionals for the use of the machines and the technology"<sup>6</sup>.

These partnerships between the different levels of educational administration have produced an expansion in the use of networks and computers in the school environment, although still with an unequal distribution throughout the different states and municipalities. Be it in rural or urban areas, schools have been equipped with informatics labs, computers and printers for students' and teachers' use. Even though the access to the networks is not democratic, the expansion has been occurring gradually, which allows the assumption that the universalization of access is only a matter of time – and not much time either.

Therefore, the debates about digital culture, digital books and virtual learning networks are no longer issues for the future, and demand the attention from researchers, as

presented in the next points.

### **Making educational objects available for teachers**

The production of portals designed for schools, teachers and students has been stimulated in the last decade, with the support of public resources. In these spaces, it has been possible to observe the gradual inclusion of digital educational objects, especially in the form of databases whose purpose is to give pedagogical support to teachers' work.

One example to be highlighted is the case of the state of Paraná, which implemented the "Project BRA/03/036 – BASIC EDUCATION AND DIGITAL INCLUSION IN THE STATE OF PARANÁ" in the first decade of this century, developed by the Education Secretariat of the State of Paraná (SEED) and the United Nations Development Programme (UNDP). According to Menezes, the project

foresees the stimulation of the formation of virtual communities, based on the knowledge of teachers in public schools, and seeking the publication of pedagogical contents. The intention is that these materials can be freely used by internet users as a reference to studies and as an elaboration on classes in disciplines of basic education. It is also the intention that these materials are complemented and extended by these users (Menezes 2008, 58-59).

For the author (2008, 79), the production of the Portal Educacional Dia-a-dia Educação<sup>7</sup>, one of the actions of this project implemented in 2003, assumed that this virtual space could be a vehicle for the dissemination of educational policies. Furthermore, it would allow the introduction of educational actors into the information society, not only through the access to the networks, but through the possibility of teachers producing, and making available, the results of their work with school knowledge on the net.

Another virtual space to be highlighted is the Portal do Professor<sup>8</sup>, launched in 2008 by the Ministry of Education in partnership with the Ministry of Science and Technology. Its objective is to "support the formation processes of Brazilian teachers and enrich their pedagogical practice. On the homepage, the possibilities of access are visualized with seven icons, among which we can highlight: Espaço aula, in which teachers can consult or include class scripts; and Conteúdo Multimídia, an educational objects database which teachers can use.

Beyond these functions, there are spaces for interaction and collaboration, like the chats, and platforms to take free courses for initial and continued education for teachers. This evidences the different ways through which the Brazilian State is acting to democratize the access to computers and to virtual networks, as well as stimulating the induction of teachers and students of public schools into the digital culture.

The verification of the existence of such portals is important data, but not enough to evaluate the circulation of these objects in school space. While the portals created spaces for teachers to make their productions available – including class plans or didactic materials specific to teaching curricular subjects –, these same spaces were constituted as repositories of resource databases for teaching, and need to be assessed regarding their effective contribution.

In an investigation performed in the case of a specific school discipline, Barbosa (2012) analyzed the resources available at the Portal do Professor which could be used for physics teaching. According to the author,

The main objective of the study was to analyze if the resources are made available in an easy and accessible way to the teacher, even if one is not too familiar with technologies; and to verify if its use is adequate to the target audience. Considering the aims of the Federal Government for the elaboration of the Portal do Professor, it was possible to verify the accessibility limitations, as well as the need to enlarge the offer of resources of this nature for their use in physics teaching (Barbosa 2012, 13).

In the research, the author evidenced a set of problems which limit the access of teachers to educational objects. Some of them are related to the language (most parts of the instructions are in English), but there are also problems regarding the cancellation of the contract between the provider company and the Government, or problems still regarding the difficulties to download the necessary applications, among others. The research needs to be enlarged in order to approach other school disciplines, but it already presents a constellation of problems which must be considered if the use of digital educational objects for teaching intends to be expanded.

The actions taken are justified with the intention of the gradual incorporation of digital educational objects in Brazilian public schools. However, these particular cases emphasize that the actions have a low potential of effectively producing such incorporations within a short period of time – be it because of the limitations to network access, the technical limitations of the available objects or the different ways school life is affected by digital culture. Considering the discussion is focused on public schools, there are still big challenges to be faced.

Alongside these difficulties, a structural question also interferes in these projects and programs: the objective conditions of school work, which limit the amount of available time and the ways teachers can access such objects. The assessment of these problems was not publicly discussed by the Ministry of Education, which indicates the focus of researchers when analyzing the last Notices for the National Program of Textbooks, which have started to incorporate digital books.

### **From educational objects to digital books in the PNLD**

In the course of an event which discussed the presence of digital textbooks in Brazil, Hubert Alquères, vice-president of Communication of the Brazilian Chamber of Books (CBL), affirmed that, in the future, the book market will be reorganized around big companies of content designed around print and digital materials. He then turned the attention over to the State as a consumer: "(...) even the government, the main buyer of books in the country, is already migrating to digital" (cited by Pereira 2013). The vice-president was referring especially to news reports, which were released around the same time, among which was the following piece:

#### **Students of the public school system will have access to e-textbooks**

Starting today, publishing companies can register the books they want to bring to schools

January 21<sup>st</sup> 2013 | 14:43

Starting this Monday, the 21<sup>st</sup>, the publishing houses are free to apply their books in the National Program of Textbooks PNLD so they can be used by High School students and teachers of the public school system from 2015 onwards. This year, the PNLD has some news: books in digital format will also be allowed in the competition. In order to participate, the e-book must come with the printed version and have extra content, which means the student who owns a tablet or computer will be able to access videos, animations, simulators, images and even games related to the book.

According to Agência Brasil, it is estimated that 80 million books will be acquired for 2015, to be used by more than 7 million students.

The introductory role of the Brazilian government regarding the production of digital textbooks at this moment is therefore evident. The numbers involved in the commercialization of textbooks are not irrelevant, when related to the data about reading and readers presented in the introduction of this text. The digital news in the field of schoolbooks also reinforces the role of the State in the purchase of computers and e-readers and, at the same time, opening up spaces for the creation, strengthening or reconfiguration of companies in “content production”. There is a high probability of the large publishing companies taking over this activity.

It is important to highlight that the production conditions – in regard to content and shape – will be defined by the 2015 Notice, which is one of the documents analyzed in the research. In order to investigate the processes of incorporation of digital textbooks into the PNLD, a chronological preliminary analysis of the contents of the Notices available on the MEC/FNDE website was developed. The analysis aimed at:

a) locating elements which indicate the opening of the Program to digital objects and textbooks;

b) identifying when the changes occurred in the Notices regarding digital textbooks.

The Notices, which summon the publishing companies to present books to be assessed by the specialist teams happens two years before the actual implementation of the books. Thus, for example, the PNLD Notice 2007, to assess and purchase books for the students of the 1<sup>st</sup> to 4<sup>th</sup> grades of Elementary School, was released in 2005.

Notices from 2007 onwards and their Appendixes were located and examined, as well as complementary documents and news published by the Communications Office of the Ministry of Education. After the initial phase, categories were defined to structure the final analysis of the empirical material. Finally, after the analysis, some questions were elaborated to orientate the research about the results of the inclusion of digital objects and books in the Program in the next years.

The first aspect verified by the documental analysis regards the concept of textbook, being gradually modified by the effect of the inclusion of digital objects. Until the 2007 PNLD Notice, the official concept of textbook accepted the following definitions:

**1.1. Consumable books** – books with blank spaces which allow the execution of proposed activities and exercises, or that use the space between questions and texts for students to answer them in the book itself, making it unviable to reuse the book.

**1.2. Non-consumable books** – books with no blank spaces which allow the execution of proposed activities and exercises, making it viable to reuse the book.

**1.3. Multigrade books** – books which combine, in one single volume, contents of more than one grade.

**1.4. Books destined for cycles** – books which present, in one single volume, content and activities with the purpose of attending two or more grades which compound one teaching-learning cycle.

**1.5. Supplementary books** – auxiliary books to the minimal official subjects, such as: books for consultation, reference, literature, exercises, games, etc.

**1.6. Collection** – a set of volumes designed for the teaching of grades 1 to 4, organized around a single pedagogical proposal and a sequence articulated for grades or cycles of this segment.

**1.7. Pullout** – consumable printouts, complementary to a textbook, attached to the student’s book (Brasil 2007, 15).

In the 2007 Notice, activities notebooks were not allowed; the pullouts were allowed

only for the initial stage of schooling. It was understood that the books – and their appendixes – should meet the needs and specificities required in the acquisition of writing by students, and could be consumable, but incorporated into the student book at no additional cost.

In the 2011 PNLD Notice, textbook collections were assessed and selected for the curricular components of Portuguese, Mathematics, Sciences, History, Geography, and Foreign Languages (English and Spanish) for students of 6<sup>th</sup>-9<sup>th</sup> grades of Elementary School. Some changes were significant and should be pointed out as an indication of adjustments in the concept of a textbook, at least in regard to the type of support. For the first time, the possibility of attaching an audio CD to a printed book was considered.

Differently than the other curricular components, consumable books were required for Foreign Languages, accompanied by an audio CD which was considered a constitutive part of the material. The audio CD must “mandatorily accompany both the student book and the teacher book” (Brasil 2011, 3). Activities notebooks were still not allowed in this Notice.

Thus, in the Appendix I of the 2011 Notice, two elements were added when presenting the definitions regarding textbooks. Both these elements were related to the new forms of presentation of textbooks, which pushed the concepts of a textbook beyond the printed book:

**1.15. Variation of collection** – A collection is considered a variation when presenting – totally or partially – the same owners of authorship rights, while also presenting the same or a similar didactical project, in terms of content selection, logic in the organization of the collection according to the teaching methodology and theoretical perspectives adopted with diverse or similar graphic-editorial projects.

**1.16. CD (Compact Disc)** – Optical disc designed to store information in a digital format, which can be read by an optical device, such as a laser (Brasil 2011, 15).

Another change was occurred in the 2012 PNLD Notice for High School books, in which textbooks for the curricular components of Portuguese, Mathematics, History, Geography, Physics, Chemistry, Biology and Foreign Languages (English and Spanish), organized for each grade (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>), were assessed and purchased. The textbooks for Sociology and Philosophy were to be mandatorily organized in single volumes, encompassing all three grades.

The textbooks for Foreign Languages, Philosophy and Sociology had been authorized to have blank spaces for the student to execute activities and exercises in the book itself, which previously was allowed only for children in the phase of literacy. In the case of Foreign Language books, the audio CD must accompany both the student and the teacher book, and is considered a constitutive part of the material. Activities notebooks were not allowed in the 2012 Notice.

Regarding the digital textbooks, the first reference was located in the 2011 Notice, in which the definition of audio CD was introduced and an item called Accessibility was included. Through this item, the Ministry of Education informed that it would request from the publishing houses that books should also be presented in digital media, in order to attend to students with special needs. It also authorized the publishing companies to produce and distribute the textbooks approved in Sign Language, assuring their acquisition through specific contracts.

In the 2012 Notice, other particularities were added to the Accessibility item, specifying data in digital format:

**7.2.** Blind students and teachers of the public school system will receive the same books, distributed to the participating schools in the digital format DAISY, as follows:

**7.2.1.** The publishing companies should convert the student and teacher books of the curricular components of Portuguese, History, Geography, Sociology, Philosophy and Foreign Languages (English and Spanish) to DAISY format. The material should be produced in accordance with the methodology of content transcription into DAISY and presented as DVDs to be distributed as collections to the schools in specific batches, with posting date of latest January 20<sup>th</sup> 2012.

(...)

**7.2.5.** The remuneration regarding the material in DAISY format will be object of specific negotiation, which will consider both the costs of content adaptation and the reproduction of physical copies (Brasil 2012, 5).

The Notice informs that there will be a specific remuneration for the materials of the disciplines of Humanities and Portuguese, and requests both the student and teacher book in DAISY format. In the case of Mathematics, Physics, Chemistry and Biology, the printed books should also be presented in PDF or .docx format, so they can be translated into Braille.

It is, therefore, a change of large relevance, but one that occurred only through the consideration of a specific purpose, inside the programs of Inclusive Education and Accessibility that the Federal Government has been developing in the last decade. Similarly, the 2013 Notice requested books in digital format and bilingual, in Portuguese and Sign Language. It is therefore concluded that, until this Notice, there was no change in the concept of book; there was only an adjustment, due to a demand for translation into another language, which also imposed the opening of the Notice to the digital supports.

The most substantial difference was located in the 2014 Notice, which assessed textbook collections for the curricular components of Portuguese, Mathematics, Sciences, History, Geography and Foreign Languages (English and Spanish), designed for students in the 6<sup>th</sup> to 9<sup>th</sup> grades of Elementary School. This is the moment when the Notice actually authorized the inclusion of multimedia content in DVD ROMs. Two options were given to the publishing houses to present their books for assessment: a) set of printed books; b) set of printed books and multimedia content. This change has produced significant transformations in the Notice, some of which are highlighted here.

Just like in the previous Notices there was a section with definitions about textbooks, this Notice is accompanied by a specific appendix for multimedia content – Appendix IV – including one item with related definitions. The curricular themes, which refer to the national curricular orientations, guide the main definition:

**Multimedia content:** these are curricular themes handled through a set of digital educational objects designed for the process of teaching and learning. These objects must be presented in the categories: audiovisual, educational electronic game, simulator and animated infographic, or be an aggregate of all or some of these categories in the hypermedia style. Every object must be individually identifiable, storable in media and able to be made available in a virtual environment (Brasil, 2014, 69).

In following with the document, other definitions are stated: **Digital educational object** (audiovisual, educational electronic game, simulator, animated infographic); **Audiovisual** (movies captured in video or from stock; animations captured in video, from

stock or produced digitally, including those made with 3D – CGI software – image generated by computer). **Educational electronic game** (category of entertainment software of which the purpose of interaction involves accomplishing a task, winning a challenge, obtaining the highest score, defeating a real or imaginary adversary or to stay in the game for the longest time possible, all having the aim of transmitting contents and concepts which are part of the school curriculum, of subjects of specific or general knowledge). **Simulator** (software or interactive graphic which demonstrates a process or mechanism and allows the user to observe or interact with it in an analogous way to the process simulated, obtaining realistic results). **Animated infographic** (graphic resource which uses visual elements to explain a subject to the reader).

The expression digital educational objects appears, then, for the first time in the Notices of the National Program of Textbooks. These objects are complementary to the contents presented in the printed volumes and teachers and students should be orientated, through the printed books, so as to the functions and moments of use of the multimedia content. The Notice still specified: the form of storage in DVD ROM, the amount of multimedia content themes in every DVD – between 10 and 20 – and the amount of digital educational objects in every content theme – between 1 and 5 – which cannot be repeated in different volumes or collections.

In order to guide the publishing companies regarding these new possibilities in communication and information technologies, the Notice presents detailed references about how the digital educational objects included in the textbook collections will be assessed. The Appendix IV – Technical specifications and criteria to assess multimedia content – is comprised of ten pages (69-78) which contain orientations concerning the form of presentation of the DVD ROM, Menu characteristics, type of computer and operational system in which the objects must function (established by the PROINFO).

The Notice also informs that the publishing houses should make multimedia content available, at no additional costs, at the Portal do Professor of the Ministry of Education – or other indicated official spaces – through links to the webpages of the publishers, which should also be made available and presented according to certain specifications.

It is therefore in the 2014 Notice that it is possible to verify the incorporation of digital objects as a resource which demands other assessment criteria. Although still understood as complementary material, they gained their own space once the Program demanded different types of guidelines from the publishers and authors for the use of these objects, which are different from those already established for printed textbooks.

The ending of this trajectory towards digital books is in the 2015 PNLD Notice, which requests two types of material for the assessment (in 2013), designed for High School students: a) multimedia material: composed of digital books and printed books; b) printed materials, composed of printed books and in PDF format. Art (in its different languages) is presented for the first time as a curricular component, and its book can be in the consumable format, like the English, Spanish, Philosophy and Sociology materials.

The expression digital book appears for the time in this Notice, characterizing the ending of a gradual transition phase to a textbook conception which includes new elements. As verified by the documental analysis, up until the previous Notice the concept

of book had been restricted to printed material, with digital objects as a complement or addition; despite the inclusion of technologies, the main content was presented in the printed volume, to which students and teachers only had physical access.

The 2015 Notice lays out that “digital books should present the same content as the corresponding printed books, integrated into digital educational objects” (item 4.2.2, p. 3). The educational objects – videos, images, audios, texts, graphics, tables, tutorials, applications, maps, educational games, animations, infographics, webpages, etc. – “should be accessed both via the reference index and the icons on the pages where they are referred to” (item 4.2.5, p. 3). They should present parity of pages with the corresponding printed volume, but can be presented in different formats.

As for the access to the book classified as “multimedia material”, some elements required by the Notice must be highlighted for indicating a change in the concept of textbook:

- the materials should be available free of cost to students and teachers, in the virtual domain of the publishing company, for at least three years;
- if the school chooses a printed book, it should also have free access to the corresponding digital book which, once accessed, can be used again without having to connect to the internet;
- for all printed material, there will be a corresponding login and password, provided by the publisher;
- the books should be accessed via multiplatforms and via the main operational systems, “such as Android 2.3 or later versions, IOS, Linux (buntu) and Windows 7 or later versions, for devices such as laptops, desktop computers and tablets” (item 4.2.19, p. 4).

The Notice maintains the assurance of free access, for blind students and teachers, to the books chosen by the school in DAISY format. It also assures that schools can access the Guide for textbook selection via the internet – it is important to bear in mind that this Guide presents the results of the assessment of textbooks by the specialists, pointing out their characteristics, highlights and restrictions (if any).

Even if briefly presented, these elements are sufficient to evidence that there is a change in course in the model of Brazilian textbooks and that the State has increased the investment in the expansion of technologies in schools. In order to structure the conclusions of this work, we ask if this trajectory can actually produce such a transformation in textbooks, allowing the supposition that there is a new school form being generated – or a new revolution, as some technology scholars announce.

## **In conclusion: new books, new didactical models, new school form?**

The analysis of the PNLD Notices showed that, in the case of Brazilian public schools, the path to the creation of textbooks in different supports is open. Obviously, the conditions of access to virtual networks, fast and efficient internet, computer and tablet democratization, etc., are necessary conditions so schools and teachers can opt for textbooks in the digital format. However, changes are already underway and soon schools will be selecting multimedia materials according to the official criteria.

New forms of reading and school work will be derived from this interaction between printed and digital books, with questions to be elaborated and investigated in the field of General and Specific Didactics. When digital and printed textbooks are offered as options for the public schools, how will teachers respond to this possibility of choice? How will these materials be incorporated into school dynamics and, in particular classes, dynamics between students and teachers? Will new relationships with knowledge be possible? To which extent will the presence of digital books affect the organization of activities based on the relationship between a teacher and a (large) group of students?

In the same perspective, we can also inquire about which didactic models will be favored in the digital textbooks. It is important to highlight that, despite the emergence of different theories about teaching and learning, throughout last century printed textbooks have always maintained certain elements constitutive of the school form – such as the presence of descriptive texts to present contents, followed by activities to explore each theme. Considering the power of the existing models, regardless of the possibilities offered by technology, will school culture maintain the privilege of these traditional elements over more innovative elements?

In the Brazilian case, the path opened by the PNLD for digital books therefore allows for a privileged space for the development of investigation, over the next years, enabling a follow up and assessment of the effects of these transformations. Beyond the substitution of one technology for another, the main issue remains to perform quantitative and qualitative assessments of the processes and products which result from the insertion of digital textbooks into the Brazilian educational system and the democratization of access to computer networks, encompassing digital inclusion in a close relationship with social inclusion.

Another point to consider is how rapidly the changes towards digital textbooks occurred, as up until 2010 the concept of textbook referred only to printed books. The new Notices opened up space for the presence of technologies in public schools in a perhaps excessively hasty manner, when one considers the long periods of time it usually takes to perform state actions towards educational change. This verification suggests that one must get beyond issues such as if the digital books will produce more or less readers, or if we are seeing the end of printed books, which are frequently debated in the media and in scientific events.

It is necessary to insert the issue of digital books into the fabric of relationships between the educational field and other fields. A first aspect to discuss is that the shift towards digital books for the National Program of Textbooks is occurring in a context in which Brazilian education is under pressure because of the results of the national exams,

especially those referring to international standards (like the PISA). In this case, the answers to the issue of education quality tend to incorporate the models suggested, tested or debated in other countries and contexts.

In this context, the majoritarian participation of publishers with international capital in the Brazilian editorial market might stimulate the production of models which meet a universal standard of competencies and abilities, which will then guide the production of contents to be translated into any particular situation. Even though the discourse about local realities has been consolidated as one of the evaluation criteria for printed textbooks, it is important to be attentive to the transformations that may happen when the principles of business in education and the internationalization of education start to guide the aims for public policies in this field<sup>9</sup>.

One concrete example to be presented, in the Brazilian case, is the strengthening of certain editorial models, which not only define the manner in which textbooks are explored and presented, but also establish ways of cultural production and work relationships. In some editorial groups, textbooks have no authorship. There is one person responsible for the editorial project, identified as the coordinator, and professionals of different areas are hired to produce the book's contents or parts of the same book. These books are named Projects.

Book models, therefore, are being rethought in this new configuration of the PNLD. Thus, the production of digital books and the concept of content production are aspects which should deserve the attention of researchers interested in the discussion on books through more complex approaches. Through these researches, it will be possible to investigate and analyze the results of such processes which see teachers and students less as subjects and more as users and consumers of these contents and products.

In this perspective, it is also necessary to examine the process of introduction of digital books into schools regarding the complex nature of docent work. Will the digital books and objects be means or resources for teachers to accomplish tasks previously defined by other professionals, being applied to any particular situation of teaching? Digital books can be thought of as a tool to simplify teachers' work, optimize time and assure that what needs to be taught will be taught – echoing the arguments used by Comenius when he idealized books for students and teachers.

Thus, while the PNLD Notices are enlarging the conception of textbook as an artifact of digital culture and opening spaces for new providers of educational content, public policies are incorporating models of teachers' formation which, in the sphere of the internationalization of educational services, are being cast as faster, more interesting and technologically adequate alternatives to the so-called global society of information.

One cannot and does not desire to deny the technological advances and their contributions. However, to recognize the possibilities of interaction of students with knowledge through new technological means does not imply transferring all teaching regulation to these technologies. It can be inquired if this type of relationship really announces the emergence or a new school form in which the pedagogical relationship will not need the master, individualizing the learning process – this question will also demand the attention of educational researchers in the next decades.

Beyond being an innovation in the PNLD, textbooks and their presence in Brazilian schools have a complex meaning. It questions the purpose of schooling itself, the didactic models, as well as the meaning of the work of the docent when facing inequalities – both local and global – in a country where digital exclusion is only one of the many faces of social exclusion.

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<sup>2</sup> Database provided by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), post-graduate assessment agency in the country. [www.capes.gov.br](http://www.capes.gov.br). Accessed in December 2012.

<sup>3</sup> The project OLPC was presented to the Federal Government during the World Economic Forum in Davos – Switzerland, in January 2005. In July, Nicholas Negroponte, Seymour Papert and Mary Lou Jepsen came to Brazil to meet the President, who initiated an inter-ministerial group to examine the issue. During 2007, five schools were selected as initial experiments, in São Paulo-SP, Porto Alegre- RS, Palmas -TO, Piraí-RJ and Brasília-DF. In 2010, the consortium CCE/DIGIBRAS/METASYS was given the contract to provide 150.000 educational laptops to around 300 public schools previously selected in the states and cities.

<sup>4</sup> Available data on <http://www.fnde.gov.br>.

<sup>5</sup> On the strategic importance of the State in the processes of making technology and resources available, please refer to Castells, Manuel. A sociedade em rede. São Paulo: Paz e Terra, 2000.

<sup>6</sup> Information available, only in Portuguese, in [http://portal.mec.gov.br/index.php?option=com\\_content&view=article&id=244&Itemid=462](http://portal.mec.gov.br/index.php?option=com_content&view=article&id=244&Itemid=462)

<sup>7</sup> <http://www.educadores.diaadia.pr.gov.br/>

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# Digital textbooks: current developments in Chile and challenges for teachers<sup>1</sup>

## *Libros de texto digitales: acontecimientos actuales en Chile y desafíos para los profesores*

## Libros de texto dixitais: acontecimentos actuais en Chile e desafíos para os profesores

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**Abstract:** *The chapter analyzes the development of digital textbooks in Chile and the challenges this kind of resource implies to teacher training. First, public policies designed for their promotion and the scarce effect they had are analyzed. Then, both publishers' market and researchers' initiatives are characterized. Finally, this study evaluates the challenges that this kind of innovations demand to educators, and the requirements they entail for the training of future and in-service teachers.*

**Keywords:** *digital textbooks, publishing market, teacher training, ICT, educational public policies.*

**Resumen:** *El presente capítulo analiza el desarrollo de los Textos de Estudio digitales en Chile y los desafíos que implica este tipo de recurso para la formación de docentes. En primer lugar, se describen las políticas públicas que han sido diseñadas para promover su uso y se comenta el escaso impacto que tuvieron. A continuación, se analiza la oferta del mercado editorial y las propuestas que han surgido desde el ámbito académico. Finalmente, el estudio evalúa los desafíos que este tipo de innovaciones demanda a los educadores y las requerimientos que implica para la formación inicial y continua de docentes.*

**Palabras clave:** *textos de estudio digitales, mercado editorial, formación docente, TIC, políticas públicas educativas*

**Resumo:** *O presente capítulo analiza o desenvolvemento dos Textos de Estudo dixitais en Chile e os desafíos que implica este tipo de recurso para a formación de docentes. En primeiro lugar, describíense as políticas públicas que foron deseñadas para promover o seu uso e coméntase o escaso impacto que tiveron. A continuación, análízase a oferta do mercado editorial e as propostas que xurdiron dende o ámbito académico. Finalmente, o estudo avalía os desafíos que este tipo de innovacións demanda aos educadores e os requirimentos que implica para a formación inicial e continua de docentes.*

**Palabras chave:** *textos de estudo dixitais, mercado editorial, formación docente, TIC, políticas públicas educativas*

### Summary

This study is concerned with the development of digital textbooks in Chile and the road ahead in teacher training for the use of this kind of resources. It begins with a brief overview of public policies that were design in 2008 to promote the use of digital textbooks in public schools and in private schools that receive subvention from Chilean State. The impact of these policies was not as expected: teachers gave little use to this resource in classrooms and, since 2013, digital textbooks provided by the State are no longer be available.

This chapter describes the initiatives that both publishers and researchers are developing in order to incorporate new technologies to textbooks. All main companies have added some kind of digital resource to their printed editions, but they differ from publisher to publisher. Meanwhile, researchers are seeking new platforms for designing and commercializing digital textbooks.

Finally, this study considers the challenges that this kind of innovation implies to teachers. The national test that assesses ICT skills of recently graduate teachers has

shown that one of the key points of a successful digital textbook policy is to train future and in-service teachers in the use of this resource.

Nowadays, there is consensus on the contribution that ICT can make to teaching and learning in schools. However, to promote effective learning they must be integrated pedagogically to curriculum and not be just part of classrooms' "21st century decoration". Effective learning will not occur by simply using them; qualified teachers that know how to use technology to promote learning in their subject and proper management from schools that encourage ICT use (Román 2010) are needed.

In this context, digital textbooks appear as a key tool to promote 21st century skills in students from around the world. Compared with the First World, here in Latin America the situation is different. Whereas in the former, ICT is seen as a means to improve the quality of the education students receive, in the latter, besides quality, the core issue has to do with equity: they are a way to close the digital gap and promote development of the region (Sunkel 2012).

The aim of this chapter is to analyze the attempt to incorporate digital textbooks into the Chilean school system. It begins with a brief overview of public policies that promote the use of digital textbooks and a discussion of their impact. It then describes the initiatives that both publishers and researchers have developed and, finally, it considers the challenges that this kind of innovation implies to in-service and future teachers.

### **Chilean State attempts to introduce digital textbooks in the school system**

One of the main scopes of Ministry of Education of Chile (MINEDUC), through its Curriculum & Assessment Unit, is to develop policies that promote learning of all students. In order to encourage effective teaching and learning directly into classrooms, MINEDUC suggests the use of textbooks in all school levels (PK-12).

Chilean State public policy establishes free access to all students and teachers from both public schools and private-subsidize schools to textbooks for the priority subjects of the curriculum. These textbooks are subsidize by the Chilean State<sup>2</sup>. To achieve this aim, since 2009 the Textbooks Department of MINEDUC has invested more than 18 millions dollars every year in textbooks. Its catalog holds 66 different titles and increases every year. The schools that benefit from this policy (public and private-subsidize) attend approximately 93% of all students of the school system<sup>3</sup>. During 2010, 14,904,215 printed textbooks were in use by these students and teachers used 558,238 Pedagogical Guides that complement these textbooks.

In 2008, bids to design digital textbooks for six subjects (Science, History, Math, English, Language and Physics) went out to public tender as part of this mission to provide material to use directly in classes. The idea was to design textbooks to be used from 2009 to 2012 that would complement printed versions. Therefore, they were not an independent resource but part of a pedagogical proposal of each publisher.

The process of developing and designing these digital textbooks was not an easy task. By 2008, MINEDUC had no clarity about the features these textbooks would have but the name they will give them: "Hypertexts". Most publishers were recently exploring the possibilities offered by ICT and they did not have that kind of product in their catalogues. However, it was established that hypertexts should follow these requirements:

- Free access and use for both students and teachers during the 4 years each textbook is available. The publisher has the responsibility to manage the copyrights and the massive use of this resource with educational purposes.
- The multimedia "Hypertext" should have the same graphic, topics and contents of the printed textbook.
- It should stimulate students to work autonomously.
- The activities need to be consistent with the learning goals of each level and with the cognitive abilities that are expected to be developed. Exercises without a specific purpose should be avoided.
- Clear and precise instructions to all activities should be given.
- Learning should be connected to real life whenever feasible.
- Activities should be complementary to the ones designed for the printed textbook. Both resources must work the same content and learning outcomes in a different context and they should not repeat the same information.
- Activities should be interactive. All Hypertext activities, including assessment, must give feedback to students.
- Hypertext features must be consistent with functionalities of a digital tool (interactivity, visual effects, feedback, etc.) and must avoid activities that could be better resolved in a printed version or out of the digital realm.
- Activities should be provided to develop skills of different levels of complexity, especially those of higher order (as analysis, interpretation, synthesis, generating ideas, solving problems, systemic understanding of processes and phenomena, etc.). They must also be aimed at enhancing and strengthening the development of concepts, attitudes, procedures and skills according to the subject and the level they are designed for.

These hypertexts were hosted on the website of the textbook department of the Ministry of Education<sup>4</sup> and were freely available: no key was required to access them. This material was characterized by the same organization of the printed version, but it was involved with resources such as web site suggestions, drag and drop activities, quizzes, and some games and audio activities in the case of English as a second language.

In preparing this material, most publishers incorporated free web resources (e.g. YouTube) and only a small number of publishers included material specially designed for the Hypertext. This is why it is common to find embedded advertising in some of the material; advertising that does not correspond to the educational context. In most cases Hypertext offer activities very similar to the task that offers the printed textbook. Notwithstanding, one of their key features is that they offer feedback to the student.

In order to obtain information about the evaluation and use of this resource in the school system, MINEDUC requested a study by Diego Portales University in 2009. Through surveys and focus groups, the aim was to find out how this resource had been used by teachers and students. The study detected that 71% of teachers in 2009 never used the hypertext with their students and only 11% used it once a week. The group that used the

Hypertext declared its conformity to the quality of the activities. Nevertheless, the study showed that 45.9% of the teachers did not know that this resource existed. This alarming rate shows that investing in developing digital textbooks is not enough; policies to introduce them effectively in classrooms are needed.

The study yielded interesting results about students' use of Hypertext. 40% declare to know the existence of this resource and 36% reported the use of it at least once during 2009. Most of the students that used the Hypertexts did not get to know them through school, but through personal web navigation. They remarked that this resource helped them to study for tests and for homework. Students who did not use them said it was mainly because no one told them at school that this resource was available.

As can be seen, limited diffusion and unawareness constituted the major explanation of the scarce use of the Hypertexts that complement printed textbooks.

In the focus group, students proposed some features that Hypertext should have in order to improve their quality. Firstly, they should have sounds and animations to make the more attractive. They are too "plain" and static. Secondly, they should have a search-engine; that would improve their usability. Finally, students remark that their web-based condition limits their use. They propose that Hypertext should come in a CD because not everyone had Internet connection.

It is striking that the educational community do not use a free resource to plan the school year. This situation points out the need for training teachers and communities to incorporate ICT. The mere existence of digital textbooks —or any other resource or innovation— does not ensure its use. Policies to encourage their incorporation to schools are imperative.

In 2013, Hypertexts will not be available any more. MINEDUC's purchases of textbooks for 2013 and 2014 do not include digital textbooks. Therefore, this public policy that used to benefit 93% of the population will be interrupted. The next four years MINEDUC will purchase only printed textbooks; this means that all the schools that are subsidized by the State will no longer have access to this resource.

One of the reasons of this interruption is that MINEDUC's investment in these resources was not attractive enough to the publishers because, being cost-free on the web, prevents publishers selling Hypertext to private schools.

Despite not having hypertext, students in the subsidized sector can access hypermedia resources available through the ENLACES ("LINKS") program. This program —created by the MINEDUC in the 90s'— aims to incorporate ICT in the school system in order to improve the quality and equity in education.

Currently this program provides PC and technological resources to all subsidized schools in the country, and training to teachers in the use of new technologies. ENLACES web site provides digital resources for all levels of education; however these are not linked to the textbooks in use<sup>5</sup>.

Regarding the provision of PC and Internet access, the ENLACES program has made an important contribution, as currently 75% of charter schools in the country have Internet connection. National research has pointed out the relevance that ICT have in learning achievements (Oteíza 2010). In this context, one of the key elements of successful and

effective schools is that their leaders are committed to support the incorporation of new technologies. These leaders promote the use of educational resources —such as digital textbooks or ICT— and are constantly monitoring and giving feedback of its incorporation in classrooms. School leaders must assume that not only teachers are the responsibility of students learning, but they are too. (Román 2010).

A comprehensive public policy, that not only focuses in availability but in training and promoting their use by all the school community, can be the key to reinstall digital textbooks in Chilean schools.

### **Chilean publishing industry and the development of digital textbooks**

Another story is told for the private-paid school system. The students of this system — who account for about 7% of the Chilean school population— do not benefit from free textbooks delivered by the State, and have to buy the ones required by the private school that they attend.

The three main publishers —the transnational companies SM, Santillana and Pearson— are the ones preferred by private schools and usually their textbooks are the better evaluated by MINEDUC when they present them to the bidding process.

These publishing companies develop digital resources both as complement to printed textbooks and as independent products. Schools that use their printed textbooks have access to digital resources, which are available on the web, recorded on a CD or in pen drive.

Publishers are aware that they depend on specific devices: printed textbook and computer. Even though tablets are becoming increasingly massive and they are seen as the device of the future for textbooks, here in Chile, schools and teachers are still anchored in computer and data show as main technologies.

Publishers have not yet put in the market digital textbooks for students, mainly because there is no standard for the kind of devices students will use in the future. Nevertheless, this kind of resource is under development. Textbooks for tablets are in design process. The aim is that students can edit information, navigate the text more fluently and use electronic applications. In addition, the leap to tablets will avoid carrying large numbers of books every day to school. SM is now designing an iPad App, but it is basically a PDF viewer for High School students.

According to the Assistant Manager of Technologies from SM, even though tablets would be a great revolution in the use of the textbooks, printed textbooks will not die because they are irreplaceable for most teachers. “It’s their Bible”, he says, “they feel confident in using the printed textbooks”. Anyway, many years shall pass until tablets became massive and change the paradigm of pedagogical resources.

Currently, rather than an interactive text, publishers offer a project consisting in a printed textbook that is supplemented with a digital version of the textbooks that incorporate drag-an-drop activities, quizzes, games, web windows that broadens the information in the text, etc. Other publishers have designed learning modules that independent; for example, a virtual science lab in which students can experiment.

The three major publishers in Chile —the transnational companies SM, Santillana and Pearson— agree that the products placed on the market are rather timid; they are

responding to schools demands more than developing experimental products.

Santillana offers digital complements to their printed textbooks. Teachers who work in schools that have acquired Santillana's books can be part of an online community that gives them access to interactive activities, digital versions of textbooks, multimedia, content capsules, tutorials and news bulletins. All these resources complement the printed textbook that schools have acquired and depend on an Internet connection.

Pearson also offers online resources that complements textbooks and many of the printed editions come with a CD with multimedia content. Despite this CD being free—in other countries teachers have to pay for it—, its use is limited. "Many teachers ask for the CD that complements the text. However, they do not use it in classes, except when they have to fill time".

The main project of SM consists in an enriched PDF file that works as digital textbook. The main difference from other publishers in Chilean market—as its Assistant Manager of Technologies explains—is that the text comes in a pen drive. Even though in other places CDs are out of date, here in Chile they are still an important medium for carrying data. The idea of using a pen drive is not only because many laptops do not have CD drives anymore, but also because pen drives allow content updates: add activities, resources and links, fix bugs, etc. The product, therefore, is not finished in March—when the school year starts—but is expanded during the year.

This digital textbook is for the teacher. It contains activities and exercises that are not in the student's textbook. The idea is to use this digital resource as an interactive whiteboard. As one scrolls through the PDF, a mouse icon appears every time an interactive element is available: drag-and-drop activities, multiple-choice questions, image galleries, 3D images, a microscope, multimedia files, a glossary, etc. The idea is to privilege activities that imply learning by demonstration. For example, Math teachers can show students how to use a protractor and a set square interactively and Geography teachers can go across interactive maps.

Another feature is the possibility for teachers to take notes on the textbook to customize it. This is possible only because it comes in a pen drive. Even though using a pen drive is more expensive than a CD, it has these kind of benefits.

As the Assistant Manager of Technologies says, what they do is to take Student's Textbook and add interactive resources to help teachers to make a motivating and enjoyable class. The layout is still "paper-base" and lineal, mainly because this is how teachers think.

The reception of this product has been very positive, mainly because of the efforts to train teachers in the use of this digital textbook. They not offer just the textbook; they offer a pedagogical project that includes in-school assistance. For example, they show teachers how to do a class using this resource. As the Publishing Manager of SM says: "Teachers must see the potentialities, benefits and possible impact of the product. They must see that is simple and useful, otherwise they will not use it".

Publishers say that there is a widespread belief that developing digital textbooks is cheaper than printed textbooks, but is not. When developing a printed textbook, an author and a designer are needed. For a digital textbook, you must add a programmer

that raises the price of the product. This is one of the reasons publishers think the “Hypertexts” project of MINEDUC fails. It was too expensive for publishers to develop them. Other than this economic reason, they also claim there is resistance of teachers to use the Hypertext.

Publishers are interested that public and subsidized schools can use their digital resources, but they depend on MINEDUC’s policies. The problem, they say, is not only the costs, but the continuing changes in Chilean curriculum.

Since 2009, two reforms have been in development. Their gradual implementation implies that three different curricula are in use by this moment

### **New fields of research**

Not only publishers are interested in developing digital textbooks. Researchers in universities have seen the potential for learning of this kind of resource and are developing projects to promote their use. In 2011, FONDEF (Fund for the promotion of Scientific and Technological Development) funded a project of Universidad de la Frontera in Temuco which intent to develop a framework for the design and use of interactive digital tablet-based textbooks. The aim of this project -that started in 2011 and ended in 2013- is to take advantage of the skills of new millennium students in the scenario of 1 on 1 computing in classrooms. The three main educational improvement researchers expect are more curriculum coverage, ICT skills improvement and effective learning.

This research will pilot in Middle and High School students of the Araucanía region the pedagogical benefits of TEDI —Spanish acronym for Digital an Interactive Textbooks. One of the key elements of this project is the feedback that TEDI give to students. As a student moves forward, exercises become more complex. If the student has difficulties with some exercise, TEDI offers him exercises of similar complexity to support his learning. Teachers can follow the performance of their students on their own tablets.

This project not only has public funds through FONDEF; the industry is also participating with funding and companies such as HP and some national publishers (LOM) are part of this initiative.

During 2013, TEDI will be piloted. After assessing the educational benefits, the idea is to commercialize the product. The aim is to create an online store using a business model similar to iBooks Author.

### **Are teachers prepared to use this kind of resources?**

In the last decade, the importance of the quality of teachers became a core issue of public policies that aim to improve the quality and equity of education. Standards for initial teacher training have been design in order to give future teachers the skills needed to work in 21th century schools.

Besides Pedagogical and Disciplinary Standards, there are ICT Standards that define five dimensions of skills that future teachers must acquire: 1. Pedagogical; 2. Technical; 3. of Management; 4. Social, Ethical and Legal; 5. of Professional Development and Responsibility. The Pedagogical dimension includes key competences that are directly related to the incorporation of digital textbooks into schools: “Integrating ICT in planning learning environments and experiences in curricular subjects to add value to students’ learning and development”.

Since 2009, a test is applied to future teachers that have just finished their studies in order to assess these Standards. Besides pedagogical and disciplinary content test, a writing and an ICT skills test were design to assess competences needed by all future teachers.

The ICT skills test assesses two levels of achievement (acceptable and insufficient) in five dimensions: Use of computer and file managing; Use of text processor; Use of Spreadsheets; Design of presentations; Use of information and communication tools. 2011 results show that 42% of future teacher's skills are insufficient. That is, almost half of future teachers do not have basic competences to use ICT. These results make clear that is urgent to enhance ICT skills both in future and in-service teachers. Universities must take account for their responsibility in educating future educators.

### **Final considerations**

Although teachers show enthusiasm when publishers present their digital products, we are far from seeing digital textbooks been used in classrooms. The problem, as has been shown, is not of availability.

Evidence shows that the integration process of new technologies to schools is not particularly fluent. There are barriers associated to conditions (rigidity and isolation in schools), traditional practices and beliefs (Sunkel 2012). Most teachers show resistance to use new technologies in the classroom and schools do not encourage their use. This scenario will not change as long as teachers do not find more incentives for using ICT that for not using it (Pedró 2012).

The incorporation of ICT not only needs a coherent public policy and curriculum, but viewing them as an essential part of the learning-teaching process. Teachers cannot be alone in a task that directly affects our country's development.

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<sup>1</sup> This chapter was ended in january 2013

<sup>2</sup> The catalgoue of textbooks in use by the Chilean school system is available at <http://portal.textoscolares.cl>.

<sup>3</sup> Private-paid schools represent the other 7%.

<sup>4</sup> They were available until the end of 2012 at [http://portal.textoscolares.cl/website/index5.php?id\\_contenido=27](http://portal.textoscolares.cl/website/index5.php?id_contenido=27)

<sup>5</sup> [www.enlaces.cl](http://www.enlaces.cl)

# The Promise and Challenge of Digital Textbooks for K-12 Schools: The Case of Florida's Statewide Adoption

## *La promesa y el desafío de libros de texto digitales para las escuelas K-12: el caso de la adopción en todo el Estado de la Florida*

## A promise and the challenge of digital textbooks for K-12 schools: the case of adoption in the entire state of Florida

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**Abstract:** *The textbook is the single most defining source of instructional content in U.S. public schools. In the current challenging economic climate, school administrators are looking for ways to control rising textbook expenditures by shifting paper to digital textbooks. In this chapter, we explore a range of digital textbook formats and applications and weigh their potential benefits and pitfalls. Florida, the first U.S. state to pass a mandatory digital textbook law, provides a context in which to examine many of these factors. We conclude with recommendations for school administrators and educators, with particular attention to the leadership role the school librarian can play in digital textbook implementation, management, and innovation.*

**Keywords:** *digital textbook, e-reader, school libraries, school librarians*

**Resumen:** *El libro de texto es la fuente más definitoria del contenido educativo en las escuelas públicas de los Estados Unidos. Durante el período actual de dificultad económica, los administradores escolares están buscando maneras de controlar el aumento de los gastos de libros de texto por el cambio de libros de papel para libros digitales. En este capítulo, exploramos una amplia gama de formatos de libros de texto digitales y aplicaciones, y medimos los posibles beneficios y riesgos. Florida, el primer estado de los E.U. que ha aprobado una ley que requiere el uso de los libros de texto digitales, proporciona un contexto en el cual se puede examinar muchos de estos factores. Concluimos con recomendaciones para los administradores escolares y los educadores, con especial atención a la función de liderazgo que el bibliotecario escolar puede jugar en la implementación digital de libros de texto, la gestión y la innovación.*

**Palabras clave:** *libro de texto digital, lector de libros electrónicos, bibliotecas escolares, bibliotecario escolares*

**Resumo:** *O libro de texto é a fonte máis definitoria do contido educativo nas escolas públicas dos Estados Unidos. Durante o período actual, de dificultade económica, os administradores escolares están buscando maneiras de controlar o aumento dos gastos de libros de texto polo cambio de libros de papel para libros dixitais. Neste capítulo, exploramos unha ampla gama de formatos de libros de texto dixitais e aplicacións, e medimos os posibles beneficios e riscos. Florida, o primeiro estado dos EE.UU. que aprobou unha lei que require o uso dos libros de texto dixitais, proporciona un contexto no que se poden examinar moitos destes factores. Concluimos con recomendacións para os administradores escolares e os educadores, con especial atención á función de liderado que o bibliotecario escolar pode xogar na implementación dixital de libros de texto, a xestión e a innovación.*

**Palabras chave:** *libro de texto dixital, lector de libros electrónicos, bibliotecas escolares, bibliotecario escolares*

Digital textbooks will soon be part of every classroom in the United States. This trend accompanies an imperative for schools to facilitate 21st century learning in which educators prepare students to learn and live productively in a global society where accurate and current information is a meaningful part of everyday learning. School librarians, especially those in Florida, can be key players in the successful implementation of digital textbooks to foster a sensible, balanced solution for educators and learners.

In U.S. public schools, textbooks are important supports for a number of teaching and learning activities. Textbooks help to standardize the material teachers present in content areas; ensure that classroom content is aligned to mandated curricula; provide a focal point for instructional activities; support pedagogical approaches; and give structure to homework. As technology and the Internet have gained presence in classrooms,

instructional materials and activities have become digitally rich and the use of digital textbooks is rapidly gaining ground in education at all levels.

Despite a projected decline in enrollment, Florida spent \$209.2 million USD on instructional materials for its public schools, making it the fourth highest spender behind California, Texas, and New York (Mickey & Meaney 2011). Currently, in many districts across the state, students and teachers access digital versions of their current textbooks (Surdin, 2009). With the passing of Florida legislation not only allowing school districts to use textbook funds to purchase digital content and other online educational resources (Manzo 2009), but a mandate by the 2015-16 school year to spend at least 50 percent of their textbook budget on digital materials, the nation will increasingly look to Florida to take the lead in the process of digital textbook adoption (Mardis, et. al. 2010).

In this chapter, we explore various types of digital textbooks and weigh the benefits and drawbacks of each format for U.S. elementary and secondary schools in the state of Florida. We examine the advantages and challenges of the growing use of digital textbooks and make recommendations for school librarians' roles in the digital textbook implementation process.

### **Textbooks and U.S. Public Education**

The textbook is the single greatest driver of the classroom experience in U.S. public schools (Greaves & Hayes 2008; Schmidt, McKnight, & Raizen 1997; Tulley & Farr 1985) and the ways in which teachers and students interact with the information contained in textbooks is a key definer of the learning experience.

Textbook adoption is most often considered a statewide activity; all states mandate some sort of state-level review of materials used in the classroom (Hitchcock, Hendricks, Johnson, Christensen, & Siller 2010; Tulley 1989). State level textbook adoption was formed in response to widespread practices in the early years of public education when children used the books available in their own homes. For the most part, textbook adoption processes are long-standing, often dating back to Civil War Reconstruction because "Southern states...did not want their children to read the Yankee version of what that conflict had been all about" (Mathews 2005 ¶10). As Figure 1 suggests, in the U.S. South, textbook adoption remains an important guide to the public education experience.

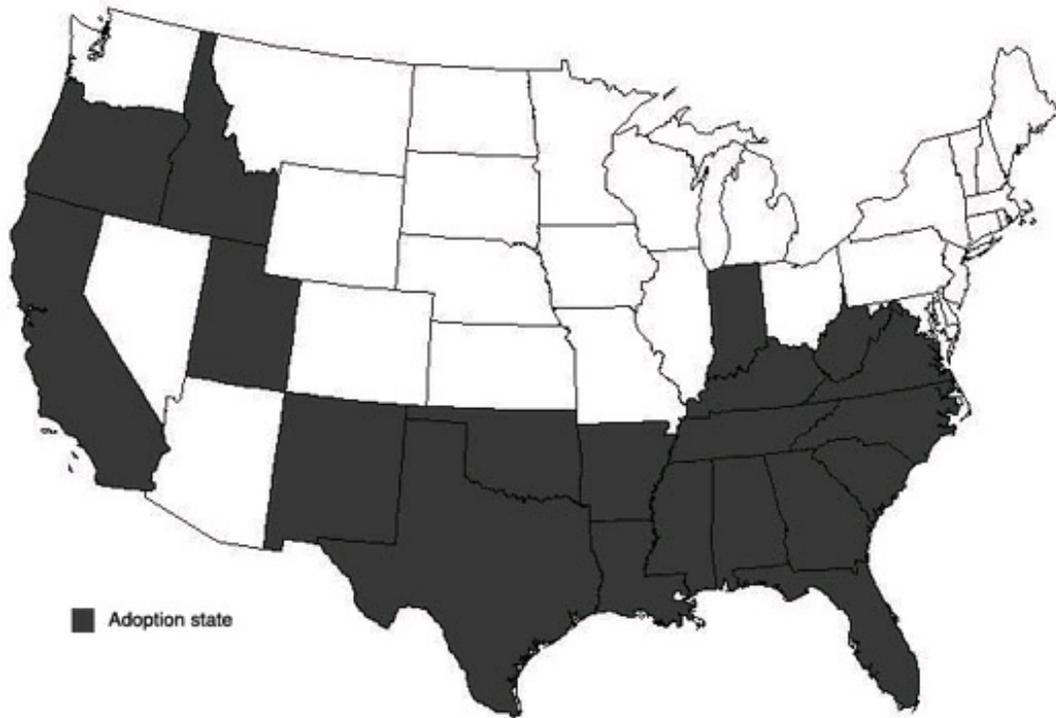


Figure 1. Map of current textbook adoption states

Once graded instruction became standard practice in public schools, teachers and parents demanded uniform instructional materials. By 1925, textbook adoption had become a state level activity in over half of the states and this adoption approach has remained stable in ensuing years (Follett 1985). Table 1 lists the current textbook adoption states depicted in Figure 1.

Table 1. Textbook Adoption States

Alabama	Georgia	Louisiana	Oklahoma	Texas
Arkansas	Idaho	Mississippi	Oregon	Utah
California*	Indiana	New Mexico	South Carolina	Virginia
Florida	Kentucky	North Carolina	Tennessee	West Virginia

\*California adopts textbooks for grades K-8 only.

It should be noted that not every state takes the same approach to textbook adoption. While Texas fully funds the costs of textbook adoption, most states only provide a per-pupil allocation to districts for the purchase of instructional materials. Utah and Oregon do not provide funds for the purchase of recommended textbooks and in Indiana, parents pay a textbook rental fee to school districts. Regardless of the funding scheme used in an open territory state, statewide adoption from a core adoption state provides a de facto endorsement of a textbook, making it more likely to be used in other states.

In many instances, districts are given some discretion over some of the materials selected. While historically, this process tended to result in disjointed curriculum at odds with state curriculum goals, effective technical assistance to aid local adoption of

curricular materials and this technical assistance has evolved (Dole, Rogers, & Osborn 1987). Therefore, state-level positions on instructional materials have an overriding influence even in states that promote local control.

Publishers not only benefit from statewide textbook adoption, the real benefit to publishers is in replacement cycles. Publishers' profits often follow textbook replacement cycles in core adoption states, with replacement years for science, reading, and mathematics accounting for most textbook sales. Adoption states generally adopt textbooks on a six-year cycle which contributes to fluctuations in industry sales performance. However, economic challenges have led many states to extend their textbook replacement cycles, drastically reduce the funding available for textbook and supplementary materials purchases, or look for low cost alternatives like digital learning resources.

In public schools in the United States, textbooks are important supports for a number of teaching and learning activities. Textbooks help to standardize the material teachers present in content areas; ensure that classroom content is aligned to mandated curricula; provide a focal point for instructional activities; support pedagogical approaches; and give structure to homework. And, with the movement to common core curriculum state standards (CCSS) in mathematics and English/Language Arts by almost all U.S. states, the interest in pairing high quality standardized learning materials with high quality curriculum is growing (Samuels 2012) despite the current mismatch between CCSS-linked textbooks (International Reading Association Common Core State Standards (CCSS) Committee 2012; Jobrack 2012).

### **Momentum is Growing for Digital Textbooks**

As technology and the Internet have gained presence in classrooms, instructional materials and activities have become digitally rich and the use of digital textbooks is rapidly gaining ground in education at all levels. With an industry average of almost \$56 million in wholesale sales in the U.S. in 2009 (Maneker 2010), the trend towards digital books is strong. While colleges and universities have moved headlong into digital textbooks as a means to reduce costs for students, K-12 education is also increasingly considering digital textbooks.

State laws, many of which have been rewritten to include digital content as an acceptable use of state textbook funding, will serve as catalysts that spur the transition to digital textbooks. Already, major advancements in, and support for, digital textbooks have occurred in Indiana, Virginia, West Virginia, California, Texas, and Florida. Representatives of the U.S. Department of Education, the Federal Communications Commission, and a members of the instructional materials and educational technology industry joined together as the Digital Textbook Collaborative and in 2012 produced the Digital Textbook Playbook which lays out many of the justifications for school administrators and policymakers to move to digital textbooks. The Playbook also hints at some possible challenges that will need to be addressed.

In an effort to chart these challenges and associated tasks to effecting a transition to digital textbooks, the State Educational Technology Director's Association (SEDTA) is currently surveying their members in attempt to form a coalition that will identify

and work to overcome policy and practice barriers to pursue the use open digital content. This is part of their broader strategy to rethink textbook and traditional instructional materials policies and practices in a digital age (Fletcher, Schaffhauser, & Levin 2012).

However, the move to digital textbooks may mean more than a format change for large textbook publishers. To offset the costs of acquiring and maintaining equipment, districts are increasingly focusing on open digital content. Open content is comprised of high quality free resources that may have been created with grant funded or by a vested organization. Educators are free to use, adapt, and in many instances, combine them for various learning applications. Open content comes in a range of file formats from java applets, interactives, simulations, videos, audio clips, images, and text-based files. The Open Educational Resources (OER) movement has been growing in the United States for a decade with projects like the National Science Digital Library (<http://nsdl.org>) and the OER Commons (<http://oercommons.org>) that aggregate the descriptions of the resources, also known as metadata, into searchable digital libraries (Mardis 2003; Mardis & Hoffman 2006). Users search the repositories and locate the OERs through links embedded in the metadata records.

This collision between old and new ways of learning presents a range of challenges for school systems. This policy and literature analysis will explore the extent to which schools are ready and the key areas likely to affect the impending digital textbook adoption in Florida.

### **Theoretical and Conceptual Perspectives**

Two main perspectives have guided the examination of technology adoption in schools and therefore underpin this exploration of digital textbook adoption in Florida. Organizational adoption theories concern “top down” adoption that is instituted and promoted by state government or school or district administration. User adoption theories concern bottom up or end user-based facets of technology use and integration. Often, these theories are not mutually exclusive. In many situations, aspects of organizational adoption interrelate with dimensions of user adoption. In this section, the two areas will be explored separately, but in the literature and policy analysis, theories will often be presented in an integrated way.

### **Theoretical Base in Organizational Adoption**

Diffusion of Innovations theory (Rogers 2003) posits that an innovation must be widely adopted in order to be sustained within an organization. Regardless of the rate of adoption, an innovation can be sustained when it reaches critical mass. The rate at which an innovation is adopted depends upon its progress through adopters. According to Rogers (2003), adopters fall into four categories: innovators, early, early majority, late majority, and laggards. This theory is helpful when looking at digital textbook adoption because it can help to explain the rate at which educators are able to integrate digital resources into their instructional strategies and the rates at which technology and library personnel are able to master chosen digital textbook approaches in order to lead or support others.

Digital Divides theory (Mardis, Hoffman, & Marshall 2008) builds on the idea of technology access “haves” and “have nots” with three additional levels: skills, policy, and

motivation. These additional levels allow the examination of technology adoption to encompass both the individual and organization units of analysis. According to this theory, if one of the four quadrants of divide (access, skills, policy, and motivation) is not supported in an adoption, then the adoption will not be successful. In the case of digital textbooks, of course, user access to equipment and resources is important, but user skills and professional development, organizational policies that enable and support technology use, and user motivation to adopt the technology are equally as important.

### **Theoretical Base in User Adoption**

The Apple Classrooms of Tomorrow (ACOT) model (Apple Computer 1995) emerged from longitudinal research that was centered on changes in teacher and student behavior that result from ubiquitous access to technology and digital learning resources. Educators who participate in adoptions experience entry, adoption, adaptation, appropriation, and invention phases of personal transformation. While the findings from 10 years of classroom technology infusion included phases very similar to those reported by Rogers (2003), in ACOT, professional development and organizational support are key but only insofar as these forces are driven by the technology users' personal experiences. In the case of Florida's digital textbook adoption, many implementations will rely on educators' commitment to making it work.

The Concerns Based Adoption (CBAM) model (Hall & Hord, 1987, 2001, 2006) proposes that learning brings change, and that supporting people in change is critical for learning to be effective. CBAM illustrates the ways in which educators progress personally and professionally through their careers. Fuller (1969), Fuller and Bown (1975), Mardis (2007, 2013), Rutherford and Hall (1990) affirmed a concerns-based model for teachers' and school librarians' careers in which three stages occur. In their views, the three stages can be described as: concern for self-image; concern for instructional tasks; and concern with instructional impact. These stages develop along an outward trajectory from self to impact. CBAM is deceptively uncomplicated. Teachers' acceptance of change is influenced by a range of personal and environmental factors that not only influence the pace at which educators develop, but also influences their decisions to stay in the profession and their local schools.

### **Digital Textbooks: A Boon to Learning?**

The interest in and growth of digital textbooks can be attributed to several perceived advantages for learners. Some possible advantages are obvious: digital textbooks are compact and light, making them easy to transport and store; many have search, highlight, and note-taking features convenient for studying and quick reference; content can be updated instantaneously; and digital textbooks are immediately available anytime, anywhere. Digital textbooks are also appealing for the ways in which they support learning, teaching, and technology integration as well as their potential to enhance the health and welfare of children.

## **Digital Textbooks Support 21st Century Skills**

There have been major changes in teaching and learning styles in today's digital world and in the way students engage with materials. Digital technology has transformed how our students communicate and should influence the way teachers teach. Differentiation of instruction demands that teachers adopt a more interactive approach to delivering content through the use of multimedia and collaboration. This approach to delivering content will help to keep students motivated and engaged in learning.

**Digital textbooks increase opportunities to learn.** The use of digital textbooks can help teachers avoid wasted instruction time due to the distribution and collection of textbooks, students with forgotten or lost textbooks and incomplete homework. The convenience of the online format means that the student textbook is always at hand.

Digital textbooks can provide access to a wealth of information that is readily retrievable from the Internet. Digital texts can make access to information expeditious and mobile, and convenient for students who have been absent. The appeal of this convenience can be seen in higher education where many universities have provided digital textbooks to students. Princeton University began selling textbooks usable on Amazon's Kindle in 2008 (Taylor 2008). This move was so wildly popular that just one year later, in the Fall 2009 semester, Amazon partnered with Princeton and five other universities to provide new students with the devices (Williamson 2010). Other examples of digital textbook adoption have shown that whether in K-12 schools or higher education, users appreciate the convenience of digital textbooks because they use digital resources for the majority of their work (JISC 2009).

Rather than just providing versions of traditional textbooks, many companies are striving to provide schools with textbook reading devices that allow digitally-enhanced interactive functionalities. Publishers, anxious to provide schools with enticements for children to read their books, often offer companion websites that are graphically-rich and able to engage readers in numerous ways. Along with the content on the page, children can access online videos and games, win prizes, and engage in safe social networking (Lowman 2010).

## **Digital Textbooks Can Promote Good Teaching**

While print textbooks are designed to support multiple state standards, forcing teachers to dissect and analyze the pages of textbooks to create lessons pertinent to their local needs (Schachter 2009), teachers can use digital textbooks and materials to receive customized curriculum to complement and extend their state's standards. Though information is ever-changing and can be quickly outdated in print textbooks, students using digital textbooks can access news about current events and link to information and media that enriches a learning encounter. And, teachers are encouraged to collaborate with one another to select complementary online resources and to update and refine classroom content.

Digital textbooks enable differentiation. All teachers have an imperative to differentiate their instruction to meet the needs of all learners, but often they lack the resources and skill to do so (Gable, Hendrickson, Tonelson, & Van Acker 2000). Digital textbooks provide support for students with various learning needs through flexibility and

multimedia. Those students who have low vision or who are physically unable to hold a book or turn pages may find a digital textbook easier to use and read. Students who are easily distracted can take advantage of the multimedia capabilities of the digital textbook to stay active and focused. This variety of supports is particularly helpful to English Language Learner (ELL) students, a student population that has more than doubled in the past 15 years from approximately 2 million to well over 5 million students, or about 150% (Waters 2007). Students can use video and audio to augment the text, thus increasing the likelihood they will grasp concepts.

### **Digital Textbooks Can Promote Improved Technology Integration**

Schools must show a return-on-investment with technology expenditures and digital textbooks help schools demonstrate the need for more and better technology and Internet connectivity (Lewin 2009). Adoption of digital textbooks may serve as an impetus for schools to invest in 1:1 computing because all students will require a device to access learning materials. Schools that already have 1:1 laptop initiatives can maximize their investment in laptops by also using digital textbooks. In schools where 1:1 computing is mature, teachers already have the skills they need to integrate digital content into their instruction (Drayton, Falk, Stroud, Hobbs, & Hammerman 2010). The combination of laptops and textbooks proved effective in digital textbook forerunner, Forney Independent School District (Texas), where teachers integrate technology seamlessly. 1:1 computing environments are uniquely suited for digital textbook adoption because ready access to digital content may already be ingrained in school culture (Greaves Group & Hayes Connection 2008) and is part of the vision of almost all school administrators (Project Tomorrow 2010).

### **Digital Textbooks Can Make Financial Sense.**

Billions of dollars are spent on print textbooks every year. Florida, California and Texas, accounted for more than \$1.1 billion in textbook spending in 2009 (Baumann 2010). The National Association of College Stores stated the average price of a new textbook for the 2008-2009 school year as \$64; the price of a used textbook as \$57 (Riddle & Traylor 2010), though some textbooks can cost close to \$200. As textbooks become more readily available in multiple formats, the difference in cost between the various formats can be quite significant.

While school districts vary, new textbooks for the K-12 curriculum are typically replaced every 5-6 years in each subject area (Tulley & Farr 1985). Textbooks must be replaced in order to obtain current information, particularly in the subject areas of health, science and social studies. Student textbooks in use today, perhaps adopted in 2005, will not contain information about President Barrack Obama's first day in office in 2009, Hurricane Katrina in 2005, or the downgrade of Pluto from planet to dwarf planet in 2006. Schools using digital textbooks can receive updated information by the publisher, without having to replace the entire textbook series (Reynolds 2010).

**Digital textbooks improve local control over curriculum.** The textbook industry currently functions as an oligopoly in which a few companies control the market. In some instances, these companies are not operating in the best interests of the school districts and work to perpetuate the perception that their content is superior to any open content

that may be available. They offer different pricing to different districts and force districts into replacement schedules and format limitations. Locked into long term relationships with textbook publishers based on long-standing replacement procedures and schedules, many states have been restricted to only review publishers' offerings rather than a wide range of material in a variety of media (Thevenot, 2009).

Slick marketing campaigns, promises of convenience, and a familiar publisher's representative can sell textbook adoption committees on adopting a new series. As a result, large textbook producers continue to get larger and guard their market share fiercely. The ways in which textbooks are actually used in the classroom are studied infrequently or linked to student outcomes. So, in many ways, the ultimate impact of textbook adoption committees' decisions is never seen and classroom shortcomings might be attributed to any number of other factors (Follett 1985).

The tension between textbook rigor and textbook appeal is decades old and seemingly unresolvable. Efforts to standardize adoption of rigorous instructional materials have been blamed for constraining learning and narrowing curriculum. Even when curriculum developers and teachers are given the option to choose in-depth instructional materials over more visually appealing, engaging materials, they choose the less challenging content (Dutch 2005). On the other hand, the elimination of state-level controls, whether in favor of local control or no control, threatens to leave educational resources subject to the vagueness of community funding, local priorities, and socioeconomic variations among districts and students (Tulley & Farr 1985).

Digital content has the potential to offer better material and the expanded range of content (Ezarik 2005) while preserving the best practices of collaborative decision-making on quality content. With some digital textbook companies, students and teachers will have the ability to create custom textbooks in which they add chapters from a variety of selected books, other relevant articles and resources, and even their own materials (Fiorello 2010).

## **Digital Textbooks May Protect Children's Health and Safety**

The Accreditation Council for Occupational Therapy Education (ACOTE) recommended that a child not carry more than 15% of his or her body weight (Hoffman 2009), yet studies have consistently found that children are carrying up to 18.4 pounds, or 17% or more of their body weight in backpacks ("Backpacks for Kids: Backpack, Child Products, School" 2008)! Bookbags with textbooks that are too heavy or are worn incorrectly can cause physical harm for children and teenagers. In addition to poor posture, damage can be done to muscles and joints, leading to back, neck and shoulder pain (American Academy of Pediatrics 2010; Dale 2004), back strain and altered gait (Forjuoh, Schuchmann, & Lane 2004) and scoliosis and abnormal curvature of the spine (Sebastian 2006). The U.S. Consumer Product Safety Commission projected more than 13,260 injuries related to backpacks were treated at hospital emergency rooms, doctor's offices, and clinics in 2000 (Dale 2004). A study of backpack use and back pain in 1122 children showed 74.4% of them were classified as having back pain associated with the use of backpacks (Sheir-Neiss, Kruse, Rahman, Jacobson, & Pelli 2003). Digital textbooks would decrease the physical burden placed on students who use print textbooks. They are also accessible to students online at home or at school, eliminating the need to transport heavy print textbooks in their backpacks for use to do homework assignments.

**Digital textbooks can protect the environment.** A transition to digital textbooks may also have environmental benefits. The report, *Environmental Trends and Climate Impacts: Findings from the U.S. Book Industry* (Borealis Centre for Environment and Trade Research 2008) included estimates of environmental factors of publishing including high energy use and pollution related to printing and transporting books, deforestation, and other costs related to textbook production, disposal, and recycling.

## **The Challenges of Digital Textbook Adoption**

Despite possible advantages, a move to digital textbooks poses many challenges. The cost of hardware and software licenses as well as updating the technology infrastructure and bandwidth capacity of schools is costly. Putting a laptop or other e-reader device in the hands of every student could cost millions of dollars. The executive director of the Association of American Publishers, Stephen Driesler, conceded that "it is likely to be funding, not logistical issues" that will prevent the adoption of digital textbooks in schools (Colin 2005) and many parents and educators feel if a child does not have a traditional textbook, then learning cannot be taking place (Baker 2005). For now, the financial savings and educational advantages of digital textbooks remain aspirational and may pose hidden costs for learning, teaching, and implementation.

**Digital textbooks may compromise comprehension and engagement.** A decade of research has consistently supported the conclusion that children "perceive Web text reading as different from print text reading" (Sutherland-Smith 2002, 664). Digital media does not promote in-depth reading (Liu 2009). The reading of fixed text is the dominant form of reading in non-digital environments, but multimedia digital textbooks require a different kind of reading across interactive layers consisting of visual clues, hypertext, digital paper, and "image, audio or even ideogram" (Thomas 2005 ¶3). This balance of focal and peripheral attention while reading digital media is not easily accomplished (Liu

2009). And, despite improvements in e-reader devices, users read 20-30% more slowly; use more effort; and are more tired than when reading on paper (Aamodt 2009). Perhaps the greater reading effort required by digital texts explains why many students have remarked that digital textbook user interfaces do not seem designed for sustained reading (JISC 2009) and that they prefer to use them for shorter tasks like verifying facts.

Administrators, teachers, and school librarians will need to carefully consider students' reading levels in the selection of digital textbooks. The methods for calculating comprehension in digital reading are evolving and cannot be accurately calculated for measures like the Lexile Framework for Reading (Rowse & Burke 2009)

Furthermore, a lack of comprehension can affect students' research and writing habits. Young readers seek immediacy when performing searches for answers to classroom assignments and homework. They may resort to copying, pasting, or plagiarizing text when attempting to synthesize ideas into writing (Sutherland-Smith 2002).

As one elementary school principal pointed out, there is a need to make adoption decisions based on learning improvement data. She says she'll wait for the next round of scores from the state standardized test given in the spring before spending more money on any devices (Perez 2010).

**Digital textbooks can exclude visually-impaired learners.** Accessibility of learning materials remains a concern for persons with disabilities. The current e-reader devices present significant barriers that keep people with disabilities (Bagnastos 2010 para. 4). The National Federation of the Blind (NFB) and the American Council for the Blind (ACB) successfully filed suit with the United States Department of Justice Civil Rights Division to intervene in e-reader textbook replacement pilot projects at six major American universities (Dorn & Stein, 2010). While many e-readers have text-to-speech capabilities, most notably menu selection, voice activated navigation, note taking, and bookmarking features are inaccessible to visually impaired users. Images are excluded from screen readers, thus obscuring a significant portion of digital content to low vision users. The settlement reached between the universities and the Department of Justice required an end to the recommendation, purchase, or promotion, of any e-reader devices until the e-readers are fully accessible to all students. E-reader manufacturers are required to bring the devices into compliance with the Americans with Disabilities Act (ADA) (United States Department of Justice, 2010). In June 2010, the United States Department of Education affirmed the Department of Justice position and urged any schools considering the adoption of digital textbooks delivered via e-readers to seek for technical assistance from either agency (Schaffhauser 2010b).

**Digital textbooks may perpetuate socioeconomic gaps in education.** California Governor Schwarzenegger's 2009 California Free Textbook Initiative substitutes open source digital resources for state-adopted science and math textbooks. This move attracted national attention (Lewin 2009). One of the main concerns with this program is its potential to negatively impact students from low socioeconomic backgrounds or children who lack equipment and connectivity at home. Over a fifth of students (22%) find reading on a screen uncomfortable and may resort to printing partial or entire texts (Allen 2008). Printers, paper, and ink can be added to the list of hidden costs, that

may, by necessity, shift to the school districts. Some less affluent districts may not be able to afford these costs, resulting in another type of digital divide for students from low-income families.

**Digital textbooks can exacerbate the digital divide, especially in rural areas.** Home connectivity is also an issue. It is estimated that about a third of Americans have no access to high speed Internet service because they cannot afford it or choose not to have it (Stelter & Wortham 2010). Although continuity of the school-to-home learning experience is essential when students do not have printed textbooks to rely upon, schools cannot afford to absorb this cost for parents and many parents do not understand the importance of the investment or are not in a position to make it. (Greaves Group 2006). Children in rural areas have disproportionately low access to computers and high speed Internet access (Boris 2005). While rural school districts may offer adequate school day access to technology, few rural children have the ability to travel to and from school beyond the school day (Brown & Stommes 2004).

Although some research has suggested that issues of broadband accessibility have been circumvented by the use of mobile devices like smartphones among urban poor and minority students, it is becoming clear that "not all digital experiences are created equal" (Watkins 2009, 68). Mobile devices are often limited in their educational use by small screen size, lack of display clarity, limited image size and complexity, restrictive keyboard and mouse functions, and diminished space for interactive elements (Churchill & Hedberg 2008). Although access to the internet may be available through smartphones, data plans are expensive and some cell phone applications (apps) have an associated cost. Despite the fact that groups like Comcast are now making data plans accessible to low income users (Comcast 2012), the new "digital divide" may be an "app gap" in which high quality content cannot be used on mobile devices until a unique app is created for it.

**Ancillary costs of digital textbooks can erode savings.** School administrators cite cost savings as the main reason to select digital textbooks over print and expect to see savings of 50% or more (Allen 2008). Even though this may be true, the cost of a digital textbook goes beyond this initial investment. Digital textbooks require student access to computers or other mobile devices, Internet connections, and hardware systems that require periodic upgrades and maintenance. And, in many instances, schools must absorb at least part of the cost of making materials accessible to all students through printing and reformatting. In *Eliezer Williams, et al., vs. State of California*, Superior Court officials found that districts were responsible for ensuring that "students receive printed instructional materials that are identical in content...or by providing those students with the electronic equipment and/or active Internet connections they need at home to access the materials" (California Learning Resource Network, 2008 ¶3).

For many schools, investing in digital textbooks results in duplicate expenditures. Learning management systems (e.g., Blackboard and Moodle) are used by an increasing number of districts. They come populated with digital resources which can be as comprehensive as digital textbooks (Greaves Group & Hayes Connection 2008). Teachers may already have integrated these systems into their teaching and may be reluctant to revise current pedagogy to switch to digital textbooks. Until a standard format for digital

text is created, schools may have to invest in multiple readers. Some digital texts are formatted for specific e-reader devices; some others work on computers only. Reading devices, or e-readers, are available for netbooks, mobile devices, and tablets as well as dedicated e-book platforms and they continue to expand (JISC 2009), leading schools to invest in multiple devices to provide content to learners and educators.

**Current school Internet connectivity cannot support digital textbook use.**

Despite superintendents' support for 1:1 computing and digital curricula, curriculum directors reported skepticism that their technology infrastructures were ready to handle the demands of digital materials and the accompanying growth in devices (Greaves Group 2006). The majority of curriculum directors surveyed for the America's Digital Schools 2006 report admitted that expenditure in digital materials were likely to triple in the next five years, but they did not see bandwidth and device availability keeping pace (Greaves Group 2006). That five year forecast is rapidly coming to fruition. The subsequent America's Digital Schools 2008 report confirmed the growth of 1:1 and mobile computing as major trends in education, making bandwidth a continuing critical concern (Greaves Group & Hayes Connection 2008). Web-based learning resources demand high levels of bandwidth to ensure adequate speed and connectivity. Many schools are simply unprepared to handle the volume of network traffic volume and "experience the thwarting effect of inadequate connectivity on instructional innovation" (Everhart & Mardis 2012).

**Many teachers are not prepared to make best use of digital content**

Adequate professional development is key to the success of digital innovations in schools. The majority of school administrator respondents to the America's Digital Schools 2006 survey reported that they were concerned about their teachers' and librarians' abilities to seamlessly integrate new digital technologies into the existing curriculum (Greaves Group & Hayes Connection 2008). At about \$100 per student per year, districts often do not plan for the substantial time and investment in professional development they will need to make to ensure the success of their digital textbook programs (Greaves Group 2006). The successful integration of technology into everyday classroom practices must be sustained by ongoing professional development. The investment in infrastructure enhancements, hardware upgrades, and mobile learning initiatives has yet to be matched with an investment in human capital (Kirsch, Braun, Yamamoto, & Sum 2007).

## **Digital textbooks will not resolve flaws in traditional curriculum**

Regardless of format, on the whole, textbooks emphasize “familiarity with many topics rather than concentrated attention to a few” (Schmidt et al. 1997, 2). This lack of content rigor has been linked to lackluster U.S. performance on international tests of mathematics and science, declining student motivation, and even lack of high school completion (Koretz 2009). Before digital textbooks can be credited with enhancing learning, curricula must be reformed to focus in depth on key topics and give students a common set of educational concepts upon which to build. In the pressure of daily instruction in a high stakes environment, textbooks become an essential tool of enacted curriculum and, as a result, teachers cover numerous topics shallowly in an effort to complete the range of material contained in the textbook. Splintered adoptions of digital textbooks without national, or even statewide, agreement upon the uses for and content in digital textbooks may only exacerbate this issue further.

### **Florida’s Statewide Adoption**

Despite a decline in pupil enrollment from 2007-2008 to 2011-2012, Florida spent the fourth highest amount on instructional materials for its public schools behind California, Texas, and New York (Market Data Retrieval [MDR] 2009). With the passing of Florida legislation allowing school districts to use textbook funds to purchase digital content and other online educational resources (Manzo 2009), the nation will look to Florida as one of the states to take the lead.

In June 2011, Florida’s governor signed a bill that mandates that all public schools in the state use entirely digital textbooks and digital assessments by 2015. Later that year, this bill was rolled into education statute as the Digital Learning Now Act. This move is significant because not only is Florida one of the states that benchmarks textbook adoption for the nation, but also because the law is the first of its kind. Only two other states have similar laws. California’s legislation encourages, but does not mandate, digital textbooks in public schools by 2020. In 2010, Illinois passed legislation that redefined textbooks to include digital formats. In Texas, a bill was recently signed into law allowing school districts greater flexibility to spend instructional materials funds on digital content, professional development, and technology support. However, Florida’s mandate is the most ambitious measure, requiring full implementation of digital textbooks and state standardized assessments within three years. This move will put pressure on schools not only to provide adequate devices and digital resources, but also to ensure that school bandwidth is robust and that home access is possible (Everhart & Mardis 2012).

Currently, in many districts across the state, students and teachers access digital versions of their current textbooks (Surdin 2009). Florida educators will want to pay particular attention to discussions of digital textbooks because policymakers are often attracted to the perceived cost savings that are linked to their adoption. The textbook adoption process in Florida has had a long tradition and one that includes digital textbooks. An established state initiative, Orange Grove Texts Plus, provides textbook titles free to higher education students who go online to view them. Students can download and print the books, or they can buy bound volumes at about half the cost of

normal textbooks. For example, students using the an introductory calculus textbook can read, download and print some or all of the pages for free while comparable textbooks retail for \$100 to \$160 at bookstores (Travis 2010). Orange Grove Texts Plus, geared to college students, proved enticing to Florida's high schools due to its free content. Clearwater High School in Pinellas County is a frontrunner in the digital textbook movement. They established a 1:1 initiative putting a wireless reading device into the hands of each of its 2100 students for the 2010-11 school year. The school issued e-readers to all of its teachers - who are pleased with them (Catalanello 2010).

However, the largest consumer of digital content in Florida, the Florida Virtual School (FLVS), relies on other forms of digital content, not digital textbooks, to date. Florida Virtual School is the largest in the nation and expanding rapidly. In 2008-2009 the school's enrollment climbed to over 124,000 which represented a 25% increase over the previous school year (Center for Digital Education 2009). According to the FLVS Chief Development Officer (Smith 2010),

We use digital textbooks...only in our AP courses, when/if required. We really try to limit the amount of external resources we include in our courses because of recurring costs/licensing fees often associated with the resource. We also sell our courses outside the state of Florida and external resources can create licensing issues for our clients (i.e. the client would have to purchase a license to use the external resource in addition to purchasing the course)...We do have a former [school librarian] on our team who works with our curriculum specialists, project managers, etc. to help us select, contract and license external resources.

In 2011, the Florida legislature passed House Bill 7197 which mandates that, as of the 2011-2012 school year, all Florida students must have taken an online course prior to high school graduation. The growth of virtual schooling exacerbates the challenges virtual school educators and learners face in accessing digital content. The results of a 2010 survey conducted by Blackboard, Inc., and Project Tomorrow suggested that demand for online learning for credit forward, credit recovery, and curriculum supplementation is skyrocketing in all secondary grades (Blackboard Inc. & Project Tomorrow 2010). And, as Table 2 illustrates, virtual schooling is widespread and the lessons learned from FLVS' handling of digital content will set a noticeable example.

**Table 2. Existing state-led virtual schooling programs (Barth, Hull, & St. Andrie 2012; Center for Digital Education 2009).**

Alabama	Kansas	North Dakota
Alaska	Kentucky	Ohio
Arizona	Louisiana	Oklahoma
Arkansas	Maryland	Oregon
California	Massachusetts	Pennsylvania
Colorado	Michigan	Rhode Island
Delaware	Minnesota	South Carolina
District of Columbia	Mississippi	South Dakota
Florida	Missouri	Tennessee
Georgia	Nevada	Texas
Hawaii	New Hampshire	Utah
Idaho	New Jersey	Virginia
Illinois	New Mexico	Washington
Indiana	New York	West Virginia
Iowa	North Carolina	Wisconsin
		Wyoming

## **School Librarians are Key to Florida’s Digital Textbook Implementation**

Digital textbooks represent another opportunity for school librarians to enhance their vital leadership in teaching and learning. As the builders and maintainers of the schools’ learning resource base, these professionals have pivotal roles to play in technology and digital resource adoption (Everhart, Mardis, & Johnston 2011). Librarians are experts at identifying, collecting, and organizing the best content, free or for a fee, and a move to open content learning resources may even free up funds to create stronger digital collections. Because digital content for the expanding array of technology tools in K-12 classrooms comes from a variety of providers, but predominantly free or open-source resources from websites (Raugust, Mickey, & Meaney 2012), school librarians have a vital role to play in adopting primary or supplementary instructional materials.

Although school librarians are being cut in many public school districts in the U.S., Florida’s school librarians have experienced fewer cutbacks. In an age when many school librarians are not sure about the continued relevance of their promotion of reading and love of books, e-books and digital textbooks may represent a fresh way to continue advocacy for the importance of reading (Peters 2009) as well as for the school librarian’s crucial leadership role in technology integration. Noted author-editor Marc Aronson wrote recently on his blog, *Nonfiction Matters*, “Out of the rubble of the economic crash is coming this great moment of opportunity, we just have to figure out how to seize it” (Aronson 2009 ¶ 3).

Librarians at Clearwater High School near Tampa, Florida, were involved from the early stages of their school’s move to digital textbooks. The librarians, with the aid of English teachers, use e-readers with their “Battle of the Books” team so that they can read the

required books over the summer. The librarians are also hopeful that the e-readers will assist lower level students reading of textbooks by using the read aloud feature. They are also going to keep detailed data on students' yearly gains in order to determine if this is the case. The U.S. Department of Education has urged the district to seek technical assistance in their plan for deployment to remain in compliance with the Americans with Disabilities Act (ADA) (Schaffhauser 2010a)

Perhaps pilot projects led by school librarians, like the one at a high school in Palm Beach County, are the answer. There, the librarian purchased five e-book readers to determine if students in an intensive reading class would demonstrate an increased interest in reading when using electronic readers as opposed to traditional books. The pilot project was evaluated using teacher observation and student comments through an end-of-year student survey. The teachers, reading coach, school librarian, and principal monitored the progress of the program, discussed challenges that arose, and brainstormed solutions.

**Table 3. Challenges and solutions to e-reader adoption faced by a Florida high school**

Challenge	Solution
Students' ability to purchase additional e-books charged to the school	Load e-books and then unregister the device from credit card account
Devices freezing	Keep devices charged between 35%-95%, and set them to airplane mode to save power. When the devices freeze, hold down the power button or take out the battery and plug into a power source.
Providing classroom sets of e-books at a discount similar to print editions	E-book supplier is investigating solutions.

Students who participated in the pilot project were surveyed at its conclusion and an average of 80% enjoyed using an e-book more than a traditional book and it helped them to concentrate or raise their comprehension level (McTigue 2010). Teachers were also positive.

As for my observations, my students really enjoyed reading on the [e-reader]. They actually arrived early to class because they wanted one of the five I had. Usually I have to remind the students that they should be reading their books, not looking around the room, but since they have been reading off of the [e-readers], I haven't had to remind them – they were engaged in the reading. I also liked that they could each put their own bookmarks for where they left off whereas sometimes in class with the traditional books, some of their bookmarks get lost or removed. Another teacher noted that incorporating audio would be beneficial for students' fluency and students also wanted audio in future e-books. (McTigue 2010).

For school librarians who currently manage physical textbook circulation, digital textbooks will not eliminate this important duty or cause a shift to classroom resource collections over library collections. Digital textbooks will represent an important transformation in the way school librarians are involved with the resource base of the school. As School Library Journal editor Brian Kenney (2009), pointed out, "The digital textbook could be media specialists' Trojan horse, stealthily moving materials from the library into the classroom. We could infuse these textbooks with different points of view in multiple formats, customize them to address diverse learning styles, and make them the launching point of Guided Inquiry" (¶3). The tedious work of inventorying and shifting piles of weighty texts will be replaced by carefully thought-out circulation strategies that

integrate digital texts with the resources already available through the school library. Just imagine how a school's textbooks could be augmented with deep links to an array of content from database articles to streaming media to books (both "e" and print) to open-source content from resources like the Library of Congress. Digital textbooks will justify continued subscriptions to the high quality supplemental resources we promote to teachers and students every day. Marcia Mardis, an assistant professor at Florida State University's School of Library and Information Studies who studies how school librarians can successfully integrate digital content into their collections and services maintains, "Teachers don't have the time to spend searching websites for these resources and then learning how to use them in the classroom. They need a single integrated approach—the type that a school librarian can create" (Whelan 2009).

Two leaders in the digital book movements for schools, Forney Independent School District in Texas and Cushing Academy in Massachusetts, included their school librarians in the shift to digital texts. Forney, an early adopter of digital textbooks in 2004, included an extensive library of e-books on its district-purchased student laptops along with eight digital textbooks. Forney's technology director says district librarians helped review the over 2000 e-books including novels, historical documents, and major speeches to identify sources that related to the curriculum (Ishikuzo, 2004). Cushing Academy is a partner institution with the James Martin 21st Century School at Oxford University. They have transformed their library into a learning center complete with e-readers, flat screen TVs and laptops (Block 2009). Surveys conducted by the school showed students were not turning to printed materials for research, instead they were going online. So, instead of a 20,000 volume collection of print books, Cushing now has a database of millions of digital textbooks from which students will access materials using e-readers or laptops. In an interview on National Public Radio's All Things Considered, Suzie Carlisle, Dean of Academics, stated, "Part of our desire to move in this direction is to meet the students where they are most comfortable, and it's our responsibility, as well, to help students understand the emerging technologies that they are going to be faced with" (Block 2009). According to Cushing Academy's headmaster, the change has already increased the library's circulation numbers (Block 2009).

School librarians can provide school-wide leadership to assist students, teachers, and parents to tackle these concerns when transitioning to digital textbooks. Working in collaboration with teachers, school librarians promote comprehension through questioning, clarifying, seeking meaning, and discussion. Librarians play a significant role in reading comprehension instruction in order to enable students' creation and application of new knowledge.

### **Implications for Policy and Practice**

In addition to considering the possible benefits and drawbacks to digital textbooks outlined above, educational stakeholders have considerations unique to their roles.

## **For Educational Policymakers**

The research and analysis presented here suggests that policymakers at national and state levels may wish to work closely with education researchers to determine the extent to which digital textbook project design mimics what has been shown to work in technology adoption. Particularly, attempt to promote design models that take into account phases of organizational and personal change as well as barrier levels that might prevent educators and learners from taking advantage of the innovation digital textbooks offer.

An effective way to determine the efficacy of digital textbooks is to pilot the use of digital textbooks in a limited number of school districts in various parts of the country or state. Once the kinds of learning that results from print textbook-based activities are compared to the results to similar activities based on digital texts, realistic expectations for the impact of the digital shift can be made.

A key battleground established by common standards and instructional materials is to balance federal desires for standardization with local adoption of digital materials. Because local district officials have more details knowledge about the readiness of their teachers, students, and parents, they may be in the best position to define the kinds of instructional materials that will be most effective for learning and economy. For this reason, OERs may be a sensible choice for many school districts because they offer flexibility as well as the cost savings traditional textbooks do not (Tulley 1989; Tulley & Farr 1985). However, local adoption succeeds with technical assistance and this type of support should be provided.

But, a movement to open content requires strategic planning and leadership. It will be important for national policymakers and professional organizations to establish guidelines for the adoption of open content. Having no national guidance on content adoption threatens to return public education to the late 1800s-style of uncontrolled, unvetted, and often unrecorded educational resources. Work currently underway by groups like The Institute for the Study of Knowledge Management in Education (ISKME), the parent organization of the OER Commons, can help curriculum developers and other district officials to evaluate the quality of OERs and determine the extent to which the digital objects meeting curriculum goals and how best to combine OERs for educational application with their free tools

The U.S. Department of Education is taking the lead on encouraging of a national or statewide clearinghouses of digital educational material that can be located through its Learning Registry (<http://www.learningregistry.org/>). Support continued funding for these resources and development of tools that allow school librarians and teachers to access them more readily and contribute content that they develop.

One aspect that requires high level leadership is an effort to ensure that content is usable by students with disabilities and English Language Learners. Adopted content should provide supports and scaffolds to support independent learning by diverse student populations. While in general, digital textbooks that require printing will counteract cost savings, a printing option should be available for students without home access to the Internet or a computer.

## **For School Administrators**

As American school district officials look for sustainable ways to adopt any platform of digital textbook on their campuses, there are many hardware, content, and human factors to consider.

### **Hardware Considerations**

Many schools are considering Bring Your Own Device (BYOD). In BYOD schools, students are responsible for providing their own devices upon which to display digital content. While BYOD may offer cost savings by requiring parents to purchase and maintain devices, digital content may not be compatible with all devices and student-owned devices are not subject to the mandatory content filtering of school-owned devices (Intel IT Programs 2012) and, of course, not all students are in a position to purchase their own devices and will still require equipment provided by the district (Nielsen 2011).

An often overlooked aspect of implementing any educational technology application of a broad scale is the pressure that simultaneous use puts on district network infrastructure. Researchers for SETDA (Fox, Waters, Fletcher, & Levin 2012) have benchmarked necessary bandwidth to support district-wide implementations of digital textbooks and related activities and found that many school districts fall far short of the necessary connection capacities; in Florida, connectivity is also lacking, particularly in rural areas (Mardis 2011). For school administrators, a hidden cost of moving to digital textbooks may be the need to upgrade the district bandwidth to the maximum possible to ensure that content remains readily accessible, even in peak use times (JISC 2009).

### **Content Considerations**

Once content is decoupled from the physical confines of a print textbook, school administrators will likely have to assert leadership in new areas relating to content. For OERs or even commercial resources that are purchased, administrators will need to understand that the intellectual property considerations around adopted materials. Any restrictions on how the content can be combined with the content of other providers, including at the section, lesson or unit levels, should be explored and noted for teachers.

School administrators will also need to get involved in the policymaking regarding access to information. Aside from the enormous importance of districts officials ensuring that content can be redistributed and accessed by students and parents at home and other off-campus locations, they will also need to play a leadership role in ensuring that content is readily available in the school building. One way to accomplish on site access is to have school librarians develop and maintain content collections. In many schools, librarians already circulation strategies for textbooks and, in many cases, support the devices that will be used to interact with the digital content (Oder 2009). This natural expansion of the school librarians' role and will allow administrators to empower staff they have instead of having to find funding for new staff to assist resource selection and description.

Another way in which school librarians can support the adoption of high quality content is by reviewing content using the criteria they already use to add materials to the school library's collection. Administrators can use the skills and expertise of school librarians to develop a system in which digital content is integrated with the school library collection,

linked to local curriculum and assessments, updated on an ongoing basis, and factually correct. School librarians can also facilitate a process by which content problems and errors are tracked and reported.

### **Educator Support Considerations**

Aside from considerations relating to devices and content, educators require professional development to support the transition to digital textbooks and ameliorate classroom management, instructional design, and technology implementation burdens that may result from the shift.

A key actor in this area is the school librarian. School librarians can become active in the school district's efforts to adopt digital textbooks because they have the expertise to select high quality resources. High quality resources have a better chance of being adopted by teachers if they are curated by a knowledgeable individual (JISC 2009). School librarians have been trained to look at educational content a granular perspective; that is, think of how a video, an podcast, an image, and text can work together to promote understanding of a concept. An active and involved school librarian can assemble from songs, audiobooks, podcasts, and videos that to enable your teachers and students to create "playlists" of high quality open content. Likewise, school librarians already manage an on-site repository for educational materials, i.e., the library catalog. School librarians can facilitate resource discovery by annotating catalog records for grade level, Lexile, keywords, local descriptors, and curriculum objective. They can also have teachers and pupils tag resources so that they can find the digital content they need in your collection.

### **Conclusion**

In this chapter, we explored the promise and potential pitfalls of digital textbook adoption in the context of the statewide adoption facing the state of Florida in 2015. In the U.S., textbooks provide structure and consistency to classroom experiences, although many states appear to be interested in forging ahead with their own instructional materials choices instead of following the lead of textbook adoption states. Certainly, an approach that makes use of free and low cost digital resources circumvents traditional textbook adoption cycles and constraints. However, the benefits and drawbacks of digital textbooks must be considered carefully.

Digital textbooks offer educators a way to bring 21st Century Skills to the classroom by facilitating learning environments that take advantage of multimedia and technology skills that transfer to college, career and lifelong learning. And, at a time when districts face unprecedented financial challenges and globally, environmental impacts of mass paper consumption appear to be very dire, digital textbooks may offer a solution to spending and waste concerns.

Yet, these potential benefits may be overshadowed by issues relating to the accessibility of high quality digital content by English Language Learners, students with learning disabilities, and students who lack access to after school learning environments, devices, and connectivity. As the directors of the classroom experience, teachers' professional development levels must be tailored and maintained as content and format changes occur. Digital textbooks will require ongoing investments for districts that may outpace current staggered multi-year textbook adoption cycles.

Policymakers and administrators should use this opportunity to take stock of the capabilities in place within their staff. School librarians have led and continue to lead digital implementation efforts in Florida, currently the only state in the U.S. with a digital textbooks mandate. Florida's unique initiative provides a context in which to trace the extent to which adoptions follow the guides on top-down imposed or bottom-up educator-led implementations.

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# Digital textbooks come to all Australian students and schools

*Los libros de texto digitales llegan a todos los estudiantes australianos y a las escuelas*

*Os libros de texto dixitais chegan a tódolos estudantes australianos e ás escolas*

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**Abstract:** *Much research on the introduction of educational technologies in the classroom has been fragmented, limited, concerned with evaluation and has ignored the severe difficulties faced in integrating ICT into the classroom. This research focuses on the long term introduction of digital textbooks into the Australian education system. Textbooks, teaching and learning kits and packages, websites and digital textbooks and materials produced by Australian commercial publishers and teacher authors are the most important teaching and learning resources in the Australian education system. The research analysed the entries into the Australian Awards for Excellence in Educational Publishing for a 20 year period 1993-2013. These awards represent a longitudinal snapshot of the types of educational resources used in schools. The research identified four phases in the introduction of digital resources into educational materials and classrooms a) a print phase 1993-1998 b) an ancillary and complementary phase 1998-2003 c) an online learning phase 2004-2008; and d) a digital curriculum phase 2009-2013. Digital textbooks have been introduced into the Australian education system only in the digital curriculum phase. The research is concerned with large scale educational systems and multiple educational actors within those systems. The research shows that new digital textbooks focus on out of school education as much as support for learning in the classroom.*

**Keywords:** *digital textbooks; Australian education materials; longitudinal research; Australian Awards for Educational Publishing; online learning*

**Resumen:** *Mucha investigación sobre la introducción de tecnologías educativas en el aula ha sido fragmentada, limitada, preocupada con evaluación y ha ignorado las graves dificultades en la integración de las TIC en el aula. Esta investigación se centra en la introducción a largo plazo de los libros digitales en el sistema educativo australiano. Los libros de texto, la enseñanza y el aprendizaje de kits y paquetes, sitios web y libros digitales y materiales producidos por editoriales comerciales australianas y profesor autores son los recursos de aprendizaje-enseñanza más importante en el sistema educativo australiano. La investigación analizó las concursantes en los Premios Australianos a la Excelencia Editorial Educativa durante un período de 20 años: 1993-2013. Estos premios representan una instantánea longitudinal de los tipos de recursos didácticos utilizados en las escuelas. La investigación identificó cuatro fases en la introducción de recursos digitales en las aulas y en los materiales educativos a) una fase de impresión 1993-1998, b) una fase auxiliar y complementaria 1998-2003, c) un aprendizaje en línea fase 2004-2008; y d) un currículo digital fase 2009-2013. Los libros digitales se han introducido en el sistema educativo australiano sólo en la fase de currículo digital. La investigación se refiere a los sistemas educativos de gran escala y sus múltiples actores educativos. La investigación muestra que los nuevos libros de texto digitales se centran tanto en la educación fuera de la escuela como en apoyar el aprendizaje dentro del aula.*

**Palabras clave:** *libros digitales; Materiales de educación australiana; investigación longitudinal; Premios australianos para publicaciones educativas; aprendizaje en línea*

**Resumo:** *Moita investigación sobre a introducción de tecnoloxías educativas na aula foi fragmentada, limitada, preocupada coa avaliación e ignorou as graves dificultades na integración das TIC na aula. Esta investigación centrouse na introdución a longo prazo dos libros dixitais no sistema educativo australiano. Os libros de texto, a ensinanza e a aprendizaxe de kits e paquetes, sitios web e libros dixitais e materiais producidos por editoriais comerciais australianas e profesor autores son os recursos de aprendizaxe-ensinanza máis importante no sistema educativo australiano. A investigación analizou aos concursantes nos Premios Australianos á Excelencia Editorial Educativa durante un período de 20 anos: 1993-2013. Estes premios representan unha instantánea lonxitudinal dos tipos de recursos didácticos empregados nas escolas. A investigación identificou catro fases na introdución de recursos dixitais nas aulas e nos materiais educativos a) unha fase de impresión 1993-1998, b) unha fase auxiliar e complementaria 1998-2003, c) unha aprendizaxe en liña fase 2004-2008; e d) un currículo dixital fase 2009-2013. Os libros dixitais introducíronse no sistema educativo australiano só na fase de currículo digital. A investigación refírese aos sistemas educativos de gran escala e aos seus múltiples actores educativos. A investigación mostra que os novos libros de texto dixitais céntranse tanto na educación fóra da escola como en apoiar a aprendizaxe dentro da aula.*

**Palabras chave:** *libros digitais; Materiais de educación australiana; investigación lonxitudinal; Premios australianos para*

## **Introduction**

**E**ric Bruillard has characterised research into the impact on student learning of ICT and digital technologies and devices as a 'Cuban cycle' (Bruillard 2013). The cycle is framed by Larry Cuban's portrayal of online learning as marketing hype, endlessly repeating inflated expectations triggered by technologies that are at fundamental odds with actual classroom practice.

Bruillard characterises much of the research on the impact of ICT and digital technologies as conforming with this 'Cuban cycle'. For example, he notes that much of the research literature on the impact of ICT on student learning:

- a. comprises small experiments, with limited participant samples;
- b. concerns the digital and ICT learning applications devised by the researchers;
- c. focuses on the promise of the technologies;
- d. consists primarily of evaluation approaches to research that invoke best practice ideology; and
- e. neglects a robust educational system that faces severe difficulties in strongly integrating ICT into the classroom.

Despite the development of virtual classrooms and schools and digital textbooks in many countries, and considerable research on online learning opportunities, ecologies of student learning feature traditional resources and pedagogies. Curriculum and assessment in many OECD countries have become even more centralised and accountability focused. The open networked community schools of the future described in the 2001 OECD Schools of the Future have not been realised – the focus of schools is still primarily content knowledge and skills oriented - rather than aimed at 21st century competencies. The largest survey of classroom and school use of teaching and learning resources (TIMSS 2011), shows that in many countries computers are being used even less in many primary classes than previously.

This description of the impact of ICT and digital technologies on student learning has been confirmed by meta-evaluation studies (Hattie 2009). Generally these studies have found web based delivery, digital learning resources and computer and tablet use have little impact on student learning achievement. There is little correlation between computer use in the classroom and education, investment in digital education, and their use in classrooms with student learning and development. As an example, a large scale meta-analysis of studies of the use of digital textbooks in Korean schools (Ryu 2012) found the use of the digital textbooks yielded an effect size of only .13.

One of the critical features of research on the impact of ICT and digital technologies on student learning is the episodic nature of the research and data collection. Most research considers short time frames in study design. Scalability, sustainability, long term impact, implementation strategies, and evolution by multiple actors are key features of the evolution of educational system structures. Much ICT research, however, focuses on Government ICT initiatives, with political imperatives and outcomes, and/or structured

around the marketing needs of ICT companies.

More recently, the European Commission published a report that developed a framework for considering the conditions under which ICT enabled innovations for learning in Europe and Asia had scalability, sustainability and impact at the education system level (Kampylis et al 2012). This report developed a framework for research that underpins the way research can identify the introduction of ICT that emphasises the scale of use, the long term sustainability of the use of ICT and how this use of ICT impacts the classroom and education system. Using the research framework identified in this European Commission report (Kampylis et al 2012), this chapter will provide a longitudinal investigation of the evolution of ICT enabled learning and digital technologies into Australian schools and classrooms. It will document the non-linear but incremental progress and journey of the introduction of ICT resources into Australian education. The research presented in this chapter will also investigate the use of 'digital textbooks' in Australian education.

### **Considering the evolution of ICT in the Australian school system and the emergence of digital textbooks: The research framework**

The research framework underpinning this research has been adapted from the change process model developed for the European Commission project that investigated the ability of ICT enabled learning to meet conditions of scalability, sustainability and impact (Kampylis et al 2012). This change process identifies 5 critical dimensions of a developmental scale that form the conditions under which ICT and digital technologies will have a learning impact in terms of common use and affordance of student learning. The five dimensions include:

- a. the nature of the way that the ICT and digital learning technologies have been introduced and the underlying pedagogical assumptions made during this introduction;
- b. the way that the ICT and digital learning technologies have been implemented in relation to the scope and engagement of all the actors in the education system;
- c. the access provided to the ICT and digital learning technologies in relation to the geographic and digital architectural scope and scale of the access - and the relationship between this access and the entire educational sector;
- d. the impact of the ICT and digital learning technologies in relation to the school and classroom organisation, procedures and systems that maximise the reach and change in educational behaviour and management effected by the use of the digital learning technologies; and
- e. the target of the ICT and digital learning technologies in terms of the variety of stakeholders in relation to their ways of working together (Kampylis et al 2012).

The research will examine the introduction of ICT and digital learning technologies into Australian classrooms by utilising these five dimensions of the framework. The research project will apply these dimensions to the evolution of 'digital textbooks' in Australia.

## **Data source: the Australian Awards for Excellence in Educational Publishing**

The data source for this research is the Australian Awards for Excellence in Educational Publishing.

These national educational publishing awards were established in 1994 and have been conducted

continuously for 20 years from 1994 to 2014. These awards are a major event in the Australian educational publishing calendar. The Australian Awards for Educational Publishing perform multiple

functions in the educational publishing sector. They provide a market guide to high quality educational materials in a free and competitive and open textbook market. This function is supported by a catalogue of shortlisted and winning titles that is published every year as a key component of the awards, and is circulated to all public and school libraries in Australia. The Australian awards also celebrate educational publishing as a dynamic industry sector. Finally the awards are a partnership between leading university textbook and teaching and learning research centre and the Australian Publishers Association. A key function of the educational publishing awards is to provide standards and benchmarks for high quality educational publishing – and embed research insights about high quality educational materials.

The awards entries provide a corpus of teaching and learning resources that reflect and provide a sample of the Australian Educational publishing industry over 20 years – a time that coincides with the introduction of ICT and digital textbooks into Australian education.

The rules of the Awards specify open entry. Authors can enter their own publications but primarily Australian educational publishers enter the publications they have developed into the Awards. Publishers often self-select the publications they believe are of merit from among their own publications, the publications they believe are innovative, break new ground, or represent best practice in their publishing houses – or develop a new educational publishing market.

The Australian Awards represent corpus of educational materials published in Australia. Data collected by the Australian Bureau of Statistics in 2004 showed that in 2004, 8,334 new titles were published in Australia. Of these titles, 55% were educational titles (4,610 titles). In 2004 the Australian Educational Publishing Awards included 232 entries self-selected by Australian Educational publishers. These entries represent approximately .05 percent of the total educational publishing volume. Since the number of educational published titles has fallen in recent years the entries into the Australian awards from 2001 represent a rising proportion of the entire Australian educational publishing effort. The entries are entered into three categories: primary school publishing; secondary school publishing; and tertiary (university) and technical education (Technical and Further Vocational Education –TAFE) publishing. Each of the main three categories also comprise sub categories that reflect the major target markets for educational publishing. In primary these include primary educational publishing aimed at students, at teachers, at literacy and numeracy and at professional development and teaching and learning kits. As the school publishing market has changed, so the educational publishing industry focus and energy has changed – leading to revision of the categories for entries each year to reflect

the realities of schooling and learning resources in schools. The number of entries for each year are listed in table 1.

**Table 1 Number of entries by year in the Australian Educational Publishing Awards**

<b>Australian Awards for Excellence in Educational Publishing</b>	<b>Number of Entries in the Australian Awards</b>
1994	133
1995	175
1996	214
1997	223
1998	217
1999	213
2000	195
2001	236
2002	208
2003	218
2004	232
2005	233
2006	245
2007	218
2008	200
2009	215
2010	200
2011	122
2012	130
2013	134

## **Research design**

The research design utilised the entries into the Australian awards for educational publishing as the data source – as a representative sample of the entire corpus of Australian educational publishing between 1993 and 2013.

The research design then included a content analysis of the 3,961 entries over this 20 year period.

The content analysis focused on the following aspects of the entries:

- a. Their inclusion of digital learning support and features;
- b. The increased scope and complexity of these digital learning support features;
- c. The proportion of total entries with digital learning support;
- d. The number of digital learning entries only compared to the number of mixed and

- combined print and digital publications;
- e. The appearance of digital textbooks;
- f. The emergence of learning packages with multiple print and digital learning components; and
- g. Qualitative changes in the nature and characteristics of digital learning resources; and
- h. Qualitative research with teachers and students on the efficacy of teaching and learning materials in different phases collected in research projects for research higher degree candidature.

One result of this content analysis has been the identification of different phases that describe the journey and trajectory of the emergence of digital learning resources in Australian classroom teaching and learning resources. These phases have been identified through the application of the content analysis describe above. A particular emphasis in the analysis has been to identify when and under what conditions 'digital textbooks' arrived in Australian classrooms, and the scope and extent of their use.

Then analysis identified four phases aligned to each 5 year period of the educational publishing awards; a **print phases** where digital learning materials were not a feature of Australian educational publishing; an **ancillary** phase where digital learning support was designed to support and complement primarily print based classroom teaching and learning resources; an **online learning** phase where educational and non-educational publishers developed online learning materials; and a **digital curriculum** phase as educational publishers responded to a changed digital curriculum architecture and published in new and innovative platforms in an increasingly online educational environment. These phases are set out in the following table. The digital nature of the phases are outlined later in the chapter.

**Table 2 Phases in the evolution of digital learning materials in Australian educational publishing**

Australian Awards for Excellence in Educational Publishing	Number of Entries in the Australian Awards	Phases in the evolution and introduction of digital learning support
1994	133	Print phase
1995	175	Print phase
1996	214	Print phase
1997	223	Print phase
1998	217	Print phase
1999	213	Ancillary phase
2000	195	Ancillary phase
2001	236	Ancillary phase
2002	208	Ancillary phase
2003	218	Ancillary phase
2004	232	Online learning

2005	233	Online learning
2006	245	Online learning
2007	218	Online learning
2008	200	Online learning
2009	215	Digital curriculum
2010	200	Digital curriculum
2011	122	Digital curriculum
2012	130	Digital curriculum
2013	134	Digital curriculum

### Conceptualising 'digital textbooks'

This chapter will adopt a conceptualisation of digital textbooks proposed in the European Commission report (Kampylis et al 2012). This approach argues that digital textbooks feature complicated platforms featuring LMS style characteristics. They are usually web based and provide limited access, requiring approval and proprietary access. Digital textbooks often are copyrighted and are based on specific proprietary programming. Usually they include resources found in paper based textbooks, and include additional digital learning features – especially formative assessment and a significant range of linked learning resources. Of course, a critical feature of digital textbooks includes interactivity with the learner and learner agency in navigation and learning journey.

Digital textbooks can be contrasted to e-books which are more platform independent, and more flexible, can be used offline, and provide access to all teachers, parents and students; and often connect with outside resources and social networking systems.

In an Australian context a digital textbook would include educational publishing such as Mathletics ([www.mathletics.com.au](http://www.mathletics.com.au)) and Reading Eggs ([www.readingeggs.com.au](http://www.readingeggs.com.au) - shown below).



## **Textbooks and digital textbooks in the Australian education system**

Australia has a free textbook market, with materials purchased by schools and teachers. The purchase of textbooks, or of particular textbooks and materials, is not mandated at any political level. Australian teachers are encouraged to prepare their own lesson resources. This has led to a reliance on teacher produced classroom teaching and learning materials, especially photocopying in lesson preparation (Horsley, 2012). Photocopied sheets from textbooks are common lesson and homework resources. Textbooks are less frequently used than in other nations, and low priority is given to them in curriculum and funding (Wikman and Horsley 2010). However, textbooks are a critical resource in the Australian education system. Many of the photocopied sheets used in classrooms, pdf files used in learning management systems and software are sourced from commercially published textbooks (Horsley 2012). TIMSS (Trends in Mathematics and Science Study) data shows that Australian teachers in year 4 maths report 97% use of textbooks as the basis of lessons and as supplementary materials in lessons; 90% use of workbooks and worksheets; and 19% of computers. The figures for teacher use of textbooks in Year 8 maths and science indicate even greater emphasis on use of textbooks. In Australia, textbooks and their ancillary materials provide the main knowledge and skills source for the production of teaching and learning resources by teachers (Horsley 2012). Teachers and classroom learning activities are not dominated by the use of textbooks to provide the structure and organisation of a course of study.

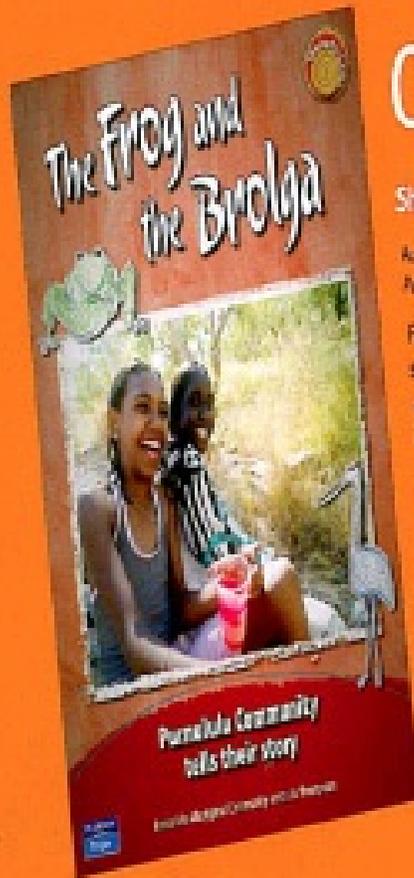


## The year

In 2009 the Awards received over 215 entries, with the largest categories by entry and in order being secondary single title, tertiary single title, primary teaching and learning, and tertiary scholarly reference categories. In 2009, there was an even distribution between primary, secondary and tertiary entries. The judges worked extremely hard to apply the judging criteria and to select the titles meeting the benchmarks reflected in the Awards criteria.

The Australian Educational Publishing Awards commenced in 1994 when the Australian Publishers Association, together with the Teaching Resources and Textbook Research Unit (TREAT), now at Central Queensland University Australia, and the Australian newspaper established the Awards in nine categories. Today the Awards seek to recognise excellence in publishing in almost thirty categories and across all facets of educational publishing.

Judging of the Awards is a rigorous process, spanning a number of weeks, culminating in the selection of the short-listed and winning titles. The contribution of experienced industry professionals and TREAT to the judging process is a testament to their dedication to the industry.



## Overall winner

### Sharing Our Stories

Author: Liz Thompson and the people of six Aboriginal communities  
Publisher: Pearson Australia

For this series, author and photographer Liz Thompson lived with six indigenous communities to record and develop the stories and art. This is an original series that will play an important role in presenting Aboriginal stories and language. It has enormous learning value as a stand-alone Indigenous Studies resource or alongside any literacy or social studies resource.



30 years producing books in Australia

1979-2009

Ligare



## **Teaching and learning strategies in Australian classrooms**

What are the core teaching and learning strategies employed by teachers in Australian schools? This question provides a particular context for the discussion of published educational materials and, specifically, commercially published textbooks in this research. Australia's teaching learning strategies have been described as teachers 'choosing their own adventure' (Fleming 2014), and reflects the autonomy of Australian teachers in constructing the teaching and learning and the classroom teaching and learning resources appropriate to the learning needs of their own students (Horsley 2011). This approach has a significant influence on the teaching and learning practices prominent in Australian classrooms and the teaching and learning resources underpinning them. Not surprisingly the OECD TALIS reports 'showed that Australian teachers are the most enthusiastic users of 21st Century skills in classrooms, using technology in classrooms, setting group work and long term projects in every lesson or in almost every lesson. By contrast, teachers in such countries as Finland, Singapore, Japan and South Korea used these strategies the least' Ferrari (2014). Australia is a leading nation with Korea and New Zealand in the OECD assessment system that examines how 15 year olds use computers and the internet to learn. Although Korea leads all the 16 nations who completed the OECD 2009 Students On Line evaluation, Australian students also performed significantly better in digital reading than print than in most other industrialised nations Horsley (2012).

## **The conditions under which ICT enabled innovations for learning display scalability, sustainability and impact at the education system level**

Horsley (2012), in a review of the funding of Australian teaching and learning resources, has demonstrated that the Australian educational publishing industry is the main provider of classroom teaching and learning materials for Australian schools, classrooms and students. The features of this industry are provided in an appendix at the conclusion of this chapter. There are almost 250 Australian publishers large and small who produce digital learning materials. There are no barriers to entering the industry and many teachers publish the materials they have written for their students and develop publishing businesses.

Multiple publishers produce multiple and varied digital learning materials for the entire education system at an entire educational industry scale. Some of these digital learning initiatives are disruptive – but many have emerged over a long period of time and have an incremental character. Australian teachers, schools and students choose and purchase the materials that meet their learning requirements so the impact of digital learning materials produced by educational publishers is large scale and system wide, and focused on student learning.

Publishers are in competition and different publishers develop different publications and digital resources for the same school subject and student market. This ensures that there has been no one size fits all learning needs and requirements developments in the educational publishing market, which naturally responds to different demands and learning needs. As a result, the digital learning materials produced by Australian educational publishers are both varied and at scale, producing gradual changes in the digital learning materials developed for the entire school system by hundreds of different

publishers and thousands of authors – most of whom are teachers in the Australian context – many of whom have written materials for their own students.

The digital learning materials produced by the Australian educational publishers utilise multiple architectures, systems and software across varied sites and levels and is not constrained by a unitary architecture or software system that dampens diversity and restricts sharing and collaboration.

These features of the digital learning materials produced by the education publishers are at system wide scale with long term impact on learning and classroom teaching and learning – and involve multiple educational actors across the entire education system.

## **The introduction of digital learning resources in Australian educational publishing**

### **a) The print phase**

Between 1993 and 1998 almost all publications submitted to the educational publishing awards were print mode titles. During the late 1990's new digital technologies began to appear in commercially published educational materials like textbooks. The initial form of connection was the listing of websites, first in geography and science textbooks for secondary students, and then in other primary and secondary subjects.

### **b) The ancillary (and complementary) phase -1993-2003**

By the latter part of the 1990s, Australian educational publishers were establishing their commitment to position the industry at the forefront converging old and new technologies. There was considerable discussion in educational publishing about the possibilities of migrating the content of books from print to cyberspace altogether. Larger professional and reference publishers, such as CCH Australia Limited and the Law Book Company, instigated such a migratory process at this time. Their early adoption of digital resources established a new online professional development and professional reference industry that continues in 2014 to provide online learning innovation; digital learning innovation that many Universities and professional association have adopted.

In school, TAFE and university education many educational publishers had also, by the late 1990's , begun to move away from the tradition of publishing purely print-based textbooks, to the new frontier of publishing textbooks that incorporated reference to accompanying CD-ROMs and/or websites that provided extension or ancillary activities for students. At the same time Australian governments and education systems were investing in hardware and software access to provide schools, classrooms and students and teachers with access to the new digital learning materials being produced by commercial publishers and state and federal departments of education.

The Australian Educational Publishing Awards themselves played a role in encouraging uptake of new digital learning technologies. The awards established standards and benchmarks for the Australian education publishing industry in relation to providing digital learning materials. The following statement from the awards confirms this role:

The 2000 Awards introduce a new Australian educational website catalogue which will recognise the excellence of educational websites. This year's Awards also see the continuation of the technology showcase category, which was introduced in 1999' .

As an example of the types of digital publishing with which publishers were engaging in 1999-2003, the following table reflects the ancillary content that accompanied four

publications entered into the awards. Each title was a winning entry in the Awards Secondary School Single Book or Secondary Series categories in the previous three years. The table lists the publications, their ancillary parts, and the school year for which the publications were intended.

**Table 3 Digital learning complements in Australian textbooks: examples and research ancillary phase**

Title/author/publisher of the printed textbook	Awards category	Print-based	CD-ROM	Web Site	Grade	Other
<b>Mirai 1 Coursebook</b> , by M. Evans, Y. Masano and S. Taniguchi, published by Addison Wesley Longman (Pearson Education), Melbourne, 1999	1999, Secondary Single Title: Joint winner	✓	✓	✓	7-9	Language Activity Book, Teacher's Book
<b>Heinemann Science Links 2</b> , by H. Cochrane and J. Devlin, published by Heinemann, Melbourne, 2001	2001: Secondary Series Title, Winner; also Joint Overall Winner	✓	✓	✓	8	Teacher's Resource Book
<b>MathsQuest 11: Mathematical Methods, VCE Mathematics Units 1&amp;2</b> , by J. Nolan, G. Phillips, R. Allen, and D. Phillips, published by Jacaranda (John Wiley & Sons), Milton, 2000	2000, Secondary Book Series: Sole winner	✓	✓	Hyper-Links on CD	11	Teacher's Edition with CD-ROM
<b>Nelson Chemistry VCE Units 1 &amp; 2</b> , by J. Sharwood, N. Taylor, R. Kronenberg, M. McLaughlin, T.Sweeney, D. Corrigan and S. Rodrigues, published by Nelson Thomson Learning, Melbourne, 2000	2000, Secondary Single Title: Joint winner	✓	✓	✓	11	Teacher's Resource Book

These four winning entries in the Secondary School Single or Series categories of the educational publishing awards from 1999-2001 were selected for a research project with schools, teachers and students. They were selected as representing the more than 50% of educational publishing, where the printed textbook was accompanied by digital learning ancillary material. They formed a representative sample from publications intended for both early and later secondary school use. They were evaluated to gauge the level of acceptance and uptake of new technologies across the range of students using the textbooks. Given the rapid continuing evolution of new publishing technologies, the study consequently analysed material at differing levels of evolution.

84 students from four classes in four different schools responded to questionnaires, as did their teachers and the publishers of the four products. The participating publishers, as creators, talking about their own publications, brought a self-reflective perspective to the research.

In preparing the accompanying CD-ROMs and/or websites, each publisher applied new technologies differently, with different styles. All four CDs incorporated core content already presented in the printed textbook. One, Mirai, added the value of audio to enhance the printed word, supporting curriculum requirements for students to acquire speaking and listening skills in learning another language, as well as writing and reading skills. This CD was the earliest produced in the study, in 1999. One title, Nelson Chemistry, re-presented principles that were explained in the printed textbook, albeit written differently, to facilitate student revision. It also offered the opportunity for textbook content to be enhanced on screen: for example, the Periodic Table appears in both, but on the CD a pop-up box displays the basic structure of an element when the mouse is placed on its symbol, adding a new dimension. The content of the CD is

replicated on the student website. Tracts of text are presented in the same way that they would appear in print, so students need to scroll up or down to read screen content. This was common to the 3 ancillaries that reproduced print pages. Maths Quest and Heinemann Science replicated the print pages of the student edition of the textbooks as PDFs, in both the student CD and the Teacher's edition, which carries additional material for teachers.

At this stage in the evolution of digital learning materials the research concluded that digital learning resources were more effective when complementing printed textbooks, and that digital learning support needed to exploit the potential of the new medium, rather than simply replicate printed pages. Students and teachers alike reported a preference for printed textbooks as primary resources. However, new technologies offered new teaching and learning opportunities, and both groups of users (teachers and students alike) found a value in the ancillary materials that use new publishing technologies. CD-ROMs and the internet, were in a relatively early stage of development. However, the new technologies evolved rapidly. The CD-ROMs in the study were much more developed than complementary websites. CD-ROMs had perceived value in certain selected instances given their state of development, but were seen as having the potential to more effectively use multi-media technologies, rather than simply replicate the text.

Associated web sites were still in the early stages of development which coupled with limited access, limited their usefulness at this time. However, given the commonality of under-pinning technology between CD-ROMs and websites, content from one can be leveraged to the other at low cost to the publisher, and could, potentially, significantly extend the use and value of electronic ancillary digital learning resources.

The evolution of digital learning resources in this ancillary phase can also be documented by reporting on the changes in entry categories (for judging) accompanying the changes in educational publishing. The move towards new technologies in textbook publishing was reflected in the TREAT Award categories. In their first six years, educational Award categories focused on printed books and textbooks and kits. By 1999, a new category termed Technology Showcase for Primary, Secondary, and Tertiary Technology was included in the Awards. This category sought to celebrate high quality linking between digital learning and print resources.

By 2000, primary, secondary and tertiary and TAFE websites (for each sector) of the publishing market had emerged as educational award categories in their own right. This new category attracted significant educational publishing entries and has remained a core award category since 2000. The rapid proliferation of website entries, their increasing sophistication and new stand-alone operation and development (without print material support) initiated a new phase in the evolution of digital learning materials. This new phase commenced in 2004. The technology showcase award category was deleted as publishers promoted digital learning websites that stood alone from print materials for the first time.

### c) The online learning phase 2004-2008

The online learning phase 2004 to 2008 represented another major shift in the characteristics of digital learning materials included in the entries of the Australian awards. Firstly, CD-ROMS became less complex and provided fewer new innovative supportive learning materials. In particular, CD-ROMS often focused on providing a pdf version of the print text: an early version of what became known as e-books. Secondly, online support for print textbooks were more focused on specially designed publisher websites that in many cases updated current knowledge in print textbooks, provided a greater range of case studies, and new case studies and generally acted to provide live connected links for 'static' print textbooks. Thirdly, the number of web only entries into the awards increased. A feature of these websites and online digital learning resources was the increase in their scope and complexity. The first features of what later came to be known as digital textbooks were developed. A particular feature of online learning resources provided through the web was the development of specific purpose built educational materials provided by government and non- government institutions interested in providing professional development to teachers and specialised curriculum and learning experiences for students.

Two examples can be seen below from the 2005 Awards catalogue. The secondary and primary websites entered into the awards and shown in illustration 2 below show how different educational and non-educational institutions provided curriculum and professional development support to link their content and operations to the content and skills of the curriculum. This development reflects the online learning phase of the entries into the educational publishing awards.

Illustration 2 Websites in the awards



Another significant feature of this phase was the introductory use of learning

management systems in a small number of entries into the awards as publishers, schools and teachers attempted to structure and organise the wealth of classroom teaching and learning materials and educational resources being made available.

As well this phase of the emergence and development of digital learning materials incorporated the use of learning objects into digital learning materials. The Australian government invested in a new institution: the Learning Federation dedicated to the development of over 10,000 digital learning objects for use in the classroom. Although, only a few of these digital learning objects were used widely in classrooms the learning objects developed shaped the development of Australia's digital education repository in the subsequent phases of the emergence of digital learning materials.

#### **d) The digital curriculum phase 2009-2013**

The digital architecture of the Australian education system was revolutionised in 2008 (Horsley 2011). Australia developed a national curriculum from state based curriculum. Furthermore, this curriculum was provided in digital form only – on the website of the new national curriculum setting authority (The Australian Curriculum and Assessment Authority – ACARA). The national curriculum was supported by the development of a national digital education repository termed Australian Curriculum Connect. The national digital educational repository contains all the teaching and learning resources developed by education system to support teaching and learning. These are linked to sections of the Australian curriculum and hyperlinked to all teaching and learning resources provided by educational publishers and professional teacher associations. At the same time each Australian school student in grades 9-12 was provided a lap top computer. The Australian Prime Minister at the time held up a lap top computer on national TV and claimed that the lap top computer was the 'textbook' of the future.

The impact of these changes created the digital curriculum phase in the evolution of Australian educational publishing. Key features of this phase included the appearance of the first 'digital textbooks' into the Australian educational publishing market; the revival of more complex and sophisticated digital ancillary materials to support print textbooks – but also the development of print materials to support digitally focused online learning resources; the linking of more sophisticated learning management system to online learning resources in schools; and the development of new relationships between private commercial publishers. For example, in 2012 Cambridge University Press, Oxford University Press, Pearson and Wiley, the five largest educational publishers in Australia, in partnership with Copyright Australia launched a new Secondary School Text Book Portal to make all the key text books available in a subscription model. This change of delivery platform was proposed to significantly alter the way that classroom teaching and learning materials could be accessed by Australian schools, teachers and students. This initiative was described as 'an exciting initiative and we hope more and more publishers work will join the project as we prove its value. It is a project that should represent all the values and qualities we are celebrating here tonight in a digital form, but at a price and in a delivery form that embraces the new era' (Grant 2013).

Analysis of the 801 entries in the awards since 2008 reveal that almost 50% of the entries came with websites accessed through proprietary codes. Most of these websites

contain formative and summative assessment resources and features, links to copyrighted resources, learning objects, collaborative social media and also foundation pre-course material to increase prior knowledge and introduce key concepts and skills critical to successful completion of the course. These developments are the pre-cursor to the development of digital textbooks and imply that digital textbooks will come to play a more prominent role in the future in providing teaching and learning resources for student learning. At this stage however, there are only a few 'digital textbooks' available and those that are available are not specifically designed for specific subjects – but are aimed at individual students and their individual development of knowledge and skills – mostly outside the classroom.

### **Some implications and conclusions**

A number of findings flow from this analysis. The first is that digital textbooks in an Australian context are primarily produced by Australian commercial education publishers, who publish and sell such materials in a competitive and consumer oriented market. An example of this is Cambridge Hotmaths – a competitor to Mathletics described earlier in the chapter .

Illustration 3 Hotmaths: digital text

# HOTmaths

**New features.  
New textbook links.  
New apps.**

**Learn more ▶**



*This digital textbook links to other print and digital materials provided by Cambridge.*

Another finding from this analysis is that Australian digital textbooks are curriculum specific and linked to the Australian curriculum. However, they are not primarily prepared for the classroom use. They are mostly aimed at individual student use and learning in both out of school and home contexts (such as homework and home schooling) and in unsupervised school experiences. Although containing multiple resources for teachers to assist in them developing classroom digital lessons – their primary focus is for individual student learning.

Donoghue (2013) argues that the publishing industry generally 'is at war with the future' but that Australia's 'small and independent publishers ... are a dynamic and vibrant sector'. The profusion of multiple digital textbooks for different markets and sectors are a testimony to this feature of the new digital textbooks being developed in Australia. The linking of these digital learning support resources across the media and communication

sectors also increase the range and scope of content available for students and learners – as the example below illustrates.



**Make maths fun for your child!**

Another finding of this analysis is the continuity of the print based nature of much classroom teaching and learning resources. Digital learning (Sawyer, 2006) based on computers is seen as the basis of a 'radical transformation of classroom cultures in the service of improved education' (Cole, 2010). However, many teachers are concerned about the digital education revolution and, like Cuban (2010), are suspicious of claims that new technology is going to transform education. Alternative descriptions to laptops being the "textbooks of the future" that have been offered by many teachers include "scrapbooks of the future," "colouring books of the future" and "moving books of the future." In some cases, teachers report that providing laptops is like providing a library on a student desk. Hattie's meta evaluation of meta evaluations (2009) has recorded very low effect sizes for the impact of ICT on student learning and development.

Print textbooks and teaching and learning materials have been designed to support learning environments; ICT provides digital resources and new communication channels for networking, that need to be mediated, developed and transformed by teachers to support teaching and learning in classrooms.

Pace (2013) has argued that online digital textbooks offer a range of benefits to students including: more widespread and easier availability; cost savings for students; synchronisation with course structures and delivery; ease of making updates; ease of correcting errors; portability and weightlessness; interactivity and integration of teaching and learning resources. These benefits of digital textbooks have yet to be realised in the Australian context. However, the continual development of what once ancillary materials to support print text, provides reason to believe that digital textbook development will create a new digital textbook phase of the emergence of digital learning development in the foreseeable future.

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# Appendix 1: A snapshot of the Australian Educational Publishing Industry – School Publishing

	Pri	Sec	Total Schools	Source
Nº of students	2.0m	1.4m	3.4m	Australian Bureau of Statistics, annual collection of enrolment data
Nº of teachers	120k	118k	238k	Australian Bureau of Statistics, annual collection of enrolment data
Nº of Schools	8,000	2,750	9,400	Some schools cover K - 12
Nº of Syllabus areas published for combining all States	≈ 20	Over 200		Education publishers' catalogues
Nº of different subjects taught at senior secondary (yrs 11 & 12) published for		Over 100		State Board of Studies / Curriculum Authorities
Nº of APA members publishing teaching & learning materials	16	12	245	Australian Publishers Association membership database. Note - some members publish for both primary & secondary
Nº of different Curriculums published for	—	—	5	Vic/NSW/SA/Qld/WA. Australian Curriculum is imminent however uncertainty remains over whether State Boards will overlay extra requirements necessitating separate published materials
Nº of people directly employed by Schools Education publishers	—	—	≈ 1,000	Estimate based on knowledge of average sales per staff member from APA benchmark surveys
Amount spent by Schools / Teachers / Students (parents) on new teaching & learning materials each year	\$120m	\$160m	\$280m	The APA receives monthly sales figures from most of its members (based on publishing size). Grossed up by estimate of non-APA member sales and for bookseller discount
Amount spent by Students (parents) on secondhand textbooks each year	Minor	\$15m	\$15m	Estimate based on APA survey of members for booklist purchasing model

# Digital textbooks: Current trends in secondary education in France

## *Libros de texto digitales: Tendencias Actuales en la Educación Secundaria en Francia*

### Libros de texto dixitais: Tendencias Actuais na Educación Secundaria en Francia

**Éric Bruillard**

DIRECTOR OF STEF LABORATORY

**Abstract:** *This chapter gives a general overview of textbooks issues in secondary education. First, some characteristics of the French textbook market are given, followed by the way publishers consider digital textbooks, in connection with economical models. Some research findings (national experiment and focused studies in several low secondary schools) are then presented, showing current difficulties in digital textbooks uses. Finally, the link with open educational resources (OER) movement is discussed.*

**Keywords:** *digital textbook, publisher, textbook market, open educational resources (OER), teacher's network*

**Resumen:** *Este capítulo proporciona una visión general de la problemática de los libros de texto en la educación secundaria. Primero se analizan algunas características del mercado de libros de texto en Francia y la forma en que los editores ven los libros de texto digitales en relación con los modelos económicos. Se presentan a continuación algunos resultados de investigación (un experimento nacional y otros estudios desarrollados en varios centros de secundaria), mostrando las dificultades actuales asociadas al uso del libro de texto digital. Finalmente, se aborda la conexión con el movimiento de recursos educativos abiertos (REA).*

**Palabras clave:** *Libro de texto digital, editores, mercado del libro de texto, recursos de formato abierto (OER), redes de profesores*

**Resumo:** *Este capítulo proporciona unha visión xeral da problemática dos libros de texto na educación secundaria. Primeiro analízanse algunhas características do mercado de libros de texto en Francia e a forma en que os editores ven os libros de texto dixitais en relación cos modelos económicos. Preséntanse a continuación algúns resultados de investigación (un experimento nacional e outros estudos desenvolvidos en varios centros de secundaria), que mostran as dificultades actuais que se asocian ao uso do libro de texto dixital. Finalmente, abórdase a conexión co movemento de recursos educativos abertos (REA).*

**Palabras chave:** *Libro de texto dixital, editores, mercado do libro de texto, recursos de formato aberto (OER), redes de profesores*

## Introduction

One can try to imagine what a digital textbook could be in an ideal world, and describe wonderful functionalities. But we do not live in an ideal world. Actually, the transition from paper textbooks to digital resources raises many issues, including the fact that different stakeholders have competing agendas. Besides, the transition is slow and technology itself evolves at a greater speed.

We shall present an overview of the current situation in France. It is not possible to provide a complete one, because it is unstable (the end of the paper kingdom is often announced but has not yet arrived) and not well documented. School publishers know a lot of things, but as they are concurrent, say very little. It could be worthwhile to include strategic elements from publishers, but there are not public.

In this paper, we begin by describing some specificities of the French context, regarding textbooks and more general issues (limitations of current paper textbooks, and the existence of two complementary markets...). Then we give some characteristics of the French textbook market and try to define what a digital textbook is according to publishers' offers, in connection with economical models. We present recent research findings (national experiment and focussed studies in several low secondary schools of the east suburbs of Paris). We conclude with general statements and by pointing to the possible link between digital textbooks and digital resources and open educational

resources (OER) movement and the possible role of teachers' network concerning digital resources.

### **Textbooks in France: some characteristics**

The textbook French context is very specific. There is a national curriculum (Ministry of education) and, as Choppin pointed in 1992, it is characterized by a triple freedom:

- of production: private publishers design, publish and distribute. No state control. No textbook designed by Ministry except in very specific cases (tiny market for example)
- of choice: teachers in each school choose what they think best
- of use: pedagogical freedom, teachers can use other resources.

The key role played by teachers' prescription (choosing textbooks, using any resource) is probably essential in the current situation. As a consequence, textbooks are written for them and have become more a tool for organizing activities in the classroom and outside the classroom, than a book to be read by the students (Bruillard 2010).

Concerning the costs textbooks in primary and secondary:

- Primary schools (up to grade 5): Municipalities (towns) pay for textbooks
- Lower secondary schools (grade 6 to 9): State: textbooks are lent to students and are supposed to be changed each four years
- Higher secondary schools (grade 10 to 12): Parents have to pay, sometimes regions do. Local policies (according to economical level of parents)

An unexpected situation is observed. As we have just remarked, textbooks are designed for teachers, for preparing their lessons and organizing classroom situations. It is an open market, but with not much diversity. For example, a study of history books (grade 9) showed important similarities (quite all the same!), a low variety of student activities (Baldner et al. 2003). Understanding why textbooks are similar can help to draw a picture of the French context. First of all, we can invoke the constraints of official programs, in line with national curricula. But also the constraints of textbook market: do not disconcert teachers, do just a little better than the others as innovation requires an audience. But also the dynamics of textbook elaboration (Ratka 2009); constraints of paper: heterogeneous constraints and arguments hold by heterogeneous actors.

Most of the time, textbooks implement a not very innovative didactical or pedagogical model: innovation can be risky for publishers. In order to get a sufficient number of sales, publishers do not design for the last appeared technology but for the previous one. As said one publisher: publishers do not design programs; do not develop school uses (ambiguous role of inspectors). We know, but with no precise example to show, that changing a cover can generate multiplies sales...

For several years, it has been announced that paper textbooks, which tend to no longer be books but an undefined object, are outdated. Their hypertextual model would have become too complex, and could not be implemented anymore on paper. Paper textbooks were adapted for an homogeneous population, not for individualization. they have to face

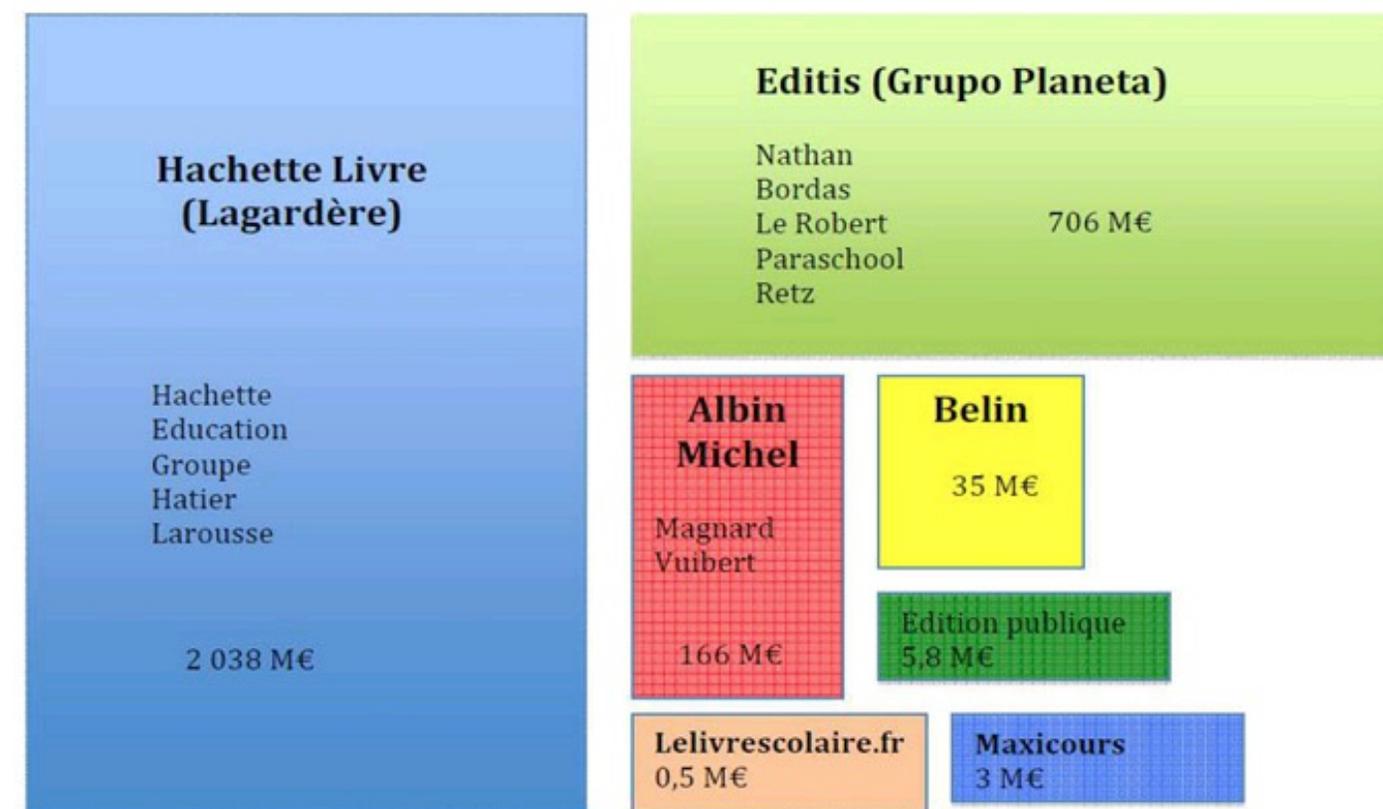
many contradictory constraints (tool for teacher, book for student...). Students face many difficulties to use them.

In line with the textbook market, publishers are concurrent (studies are not published) and no (or very few) research exists on textbook as objects (because there are not chosen according to official requirements, with norms). There are few grids for textbook choice, no study about readability... On the other side, studies about textbook uses are difficult, costly, require time, and cannot be limited to opinion questionnaires...

### Some characteristics of the textbook French market

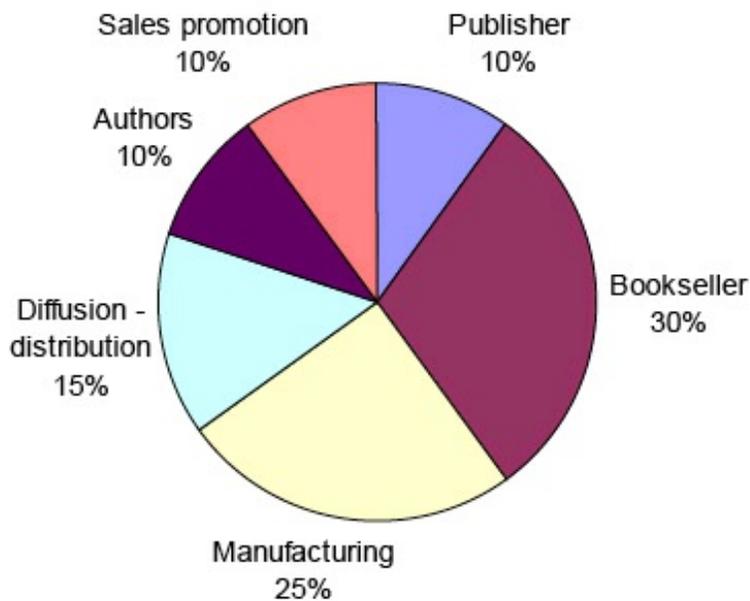
The paper textbook is still a very profitable business. According to IGEN (2013), the market structure of private educational publishers is that of an "oligopoly fringe", the sector is characterized by a high concentration. Figure 1 presents the current situation; the name of the companies and the names of know French publishers.

Figure 1. Major publishing houses in the school sector (source: IGEN 2013)



In the same report (IGEN, 2013), the different elements explaining the cost of a paper textbook are listed with their percentage in the total cost.

Figure 2. Cost structure of a textbook (IGEN 2013, annex, page 19)



The current cost structure of a paper textbook (figure 2) will change with the transition to digital media. For example, it is well-known in the industry of videogames, that investments are often big, and French school publishers often requires some public funding to help them. But, as the paper textbook market is still flourishing, we can wonder if publishers may find an interest in digital textbooks.

Another characteristics of France, is the existence of a second market, sometimes called the parents' fear market. Educational resources for "after school" with edutainment or school support, Internet use requires other characteristics: personal not collective use; game oriented for student and also similarity with classical textbooks for parents in order to reassure parents. We can wonder if this is a step towards home schooling or at home complementary education? Is it a step towards school as a market for big companies?

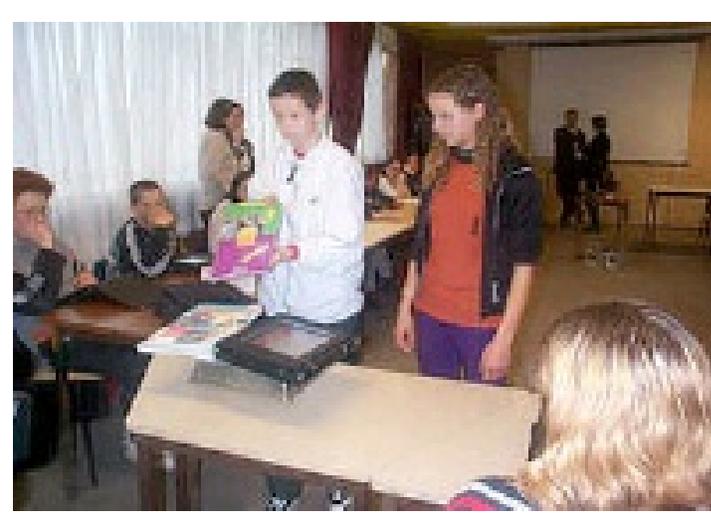
In such context, how is it possible to think about the introduction of digital textbooks?

Nevertheless, research and initiatives are not new concerning digital textbooks. Ten years ago, several experiments have been launched using the name "Digital schoolbag". These experiments were inconclusive, but often were given a lot of coverage.

For example, a Korean television was present during a presentation of the electronic schoolbag Vivendi in a low secondary school of the Somme (Moreuil) in the early 2000s (Bruillard, 2003; Romby, 2003). On the school website, several images and videos were celebrating the event. A photograph showed two students comparing the weight of the electronic schoolbag with that of several textbooks.

On one side of a scale is an electronic schoolbag. On the other side is a dictionary and a history textbook. The science textbook is not yet installed and the tray is already leaning

...



Schoolbag weight is a very classical argument in favour of digital technologies

Ten years after, according to a press release from the National Union of publishing <sup>1</sup>, in November 2011, "despite an increase compared to 2010, digital textbooks represent less than 1% of the turnover of printed manuals".

In the report previously mentioned (IGEN 2013), it was asked what proportion of the the digital business in the turnover of textbook publishers? They have gathered some figures: 1% in Germany, 2% in Austria, between 35 and 40% in the US (notably due to national tests), no available data in Denmark and Estonia and a description of the Finnish textbooks market: 10% digital, 60% hybrid, 30% paper.

### **What is a digital textbooks... for French publishers**

It is not easy to define a digital textbook. Is it a portable device or internet services, the digital Schoolbag (PDA, mobile devices...), a complementary or a substitute to paper textbooks.

Quite unusually, Wikipedia is not really helpful. The English "digital textbook" article <sup>2</sup> is a description of the digital textbook program announced by the Education Ministry of South Korea on March 8 2007. It is a kind of advertisement ("The digital textbook is currently being tested in several primary schools and will be distributed free to every school nation-wide by 2013."; links to Korean information, and advertisement for Toshiba and Fujitsu). The only other language connection is Korean, all examples are from Korea. This page was last modified on 7 November 2012, it does not seem to be a hot topic.

It is worth noticing that in the annex of the Inspectors report (IGEN 2013), a specific report on South Korea provides a contrasted view of the current situation, Korean society being now attentive to the consequences of an "all digital" educational policy. Teachers' unions have expressed concerns about the training of teachers and the actual costs of such a program. A whole generation of teachers does not feel able to meet the new requirements of the Smart Education. In terms of health, education policy of "all digital" seems inconsistent with the concerns expressed by the government about Internet addiction, which could affect Korea 8% of the population, or 2 million people, half of whom are aged 9-19 years. Finally, on the economic front, the ongoing negotiations between the Department and the editors have not yet identified a viable model.

Concerning Wikipedia and the French "manuel numérique" <sup>3</sup>, it is even worse, a small page with a broken link and information from the Ministry, last updated June 28, 2010

and no link with an article in another language.

Fifteen years ago (Bruillard & Baron 1998), considering the potential of hypertext technology and computer based learning and teaching, we had the idea that digital textbooks had to be designed in connection with teaching processes. Used independently (for example by students at home), it should both be seen as a set of resources and integrate functions of teaching, managing interactivity with the student. This tension is difficult to manage. In practice, indeed, due to the lack of alternative model sufficiently recognized, the management of interactivity with the learner in a position of autonomy is often designed, even by proponents of constructivist approaches, as a tutorial guide. This invites us to rethink the complementarities between book and IT environment and devise tools to provide teachers to link theory, objectives, knowledge gaps and misconceptions of students and activities to implement. So it seemed essential to be able to provide teachers with software integrators incorporating more or less a pedagogical theory or reusable pieces, taking into account that neither the tools nor the necessary culture were present.

But what happened? Looking at current offers, we observe a very different story and other issues. In this section, we try to report publishers' point of view, on the basis of what emerges from their web sites? It is worthwhile to notice that the specific features in France concerning textbook market have implications for what can be viewed as a textbook. As the main target is the teacher, the definition of a digital textbook is for teacher use.

According to one big publisher (Nathan)<sup>4</sup>, "The digital manual is, in its simple version, the digital video projector version of the paper manual with an intuitive and user-friendly interface". But "enriched and Premium versions" are also offered, enrichment by many and varied multimedia resources: audio, video, interactive resources (enhanced digital manual); and a "customization tool", allowing teachers to create learning sequences and student to create presentations (digital manual Premium). It is also stated that many features allow for collective use in the classroom, video projection or digital whiteboard use or individual consultation by students at home.

According to Bordas<sup>5</sup>, there are three categories of digital textbooks: simple, enriched, premium<sup>6</sup>. We find the same discourse with all publishers. For example Magnard<sup>7</sup>, Hatier<sup>8</sup>, Foucher<sup>9</sup>... Hachette<sup>10</sup> express five big ideas: (1) video project in classroom and focus the attention of your students; (2) enrich your courses; (3) personalize your approaches and your lessons; (4) share; and (5) work where you want.

According to KNE<sup>11</sup>, a group of digital textbooks publishers:

"based on structured content of eponymous paper textbooks, they propose the contents of the paper textbook in digital format, accompanied by easy-to-use features such as animation for easy video-projection by the teacher with or without an interactive board to build sequences, customizing the manual, preparing and conducting lessons, interacting with the class or simply consulting its manual illustrated with multimedia content."

Concerning costs, the offers are complex, depending of the kind of digital textbooks (simple, enriched, premium...) and if the school has bought or not the corresponding paper textbook. For example, a publisher<sup>12</sup> shows a simple matrix (simple / premium) (users of the paper textbook / non user of paper textbook<sup>13</sup>). For another publisher<sup>13</sup>,

teachers who have recommended the corresponding paper textbook are allowed to use the digital textbook through the video projector for free.

According to a newspaper article<sup>14</sup>, publishers realize each year a 250 million euro turnover through textbooks, according Savoir Livre association<sup>15</sup>. They represent a bonanza in a very depressed publishing market when 10% of sales come from textbooks. The digital manual represents 1% of their turnover. That explains why the digital version, often modelled on the paper, is sold in addition to a few extra euros.

In the same newspaper article, Sylvie Marcé, CEO of Belin, warns not to dream about a low-cost digital manual, since design and rights purchase for images explain most of the price. "Publishers are also investing to develop enhanced versions, really interactive. We must stop thinking that we are sitting on a pile of gold," argues Sylvie Marcé.

As said Marc Delaunay, also from BELIN, during a roundtable<sup>16</sup>: "For now, we must not forget that it is paper that gives life to digital. Digital is a challenge for publishers, but for now it is not profitable."

It is always difficult to have accurate figures. According to GEDEM<sup>17</sup>, a group of multimedia publishers, "The market for digital resource has struggled to find its place between spending on equipment (computers, connections IWB and projectors, tablets ...) and paper textbooks. Today, communities spend most of their budget "digital education" of equipment (over 250 million); government spending for textbooks is approximately 300 million euros, to which must be added the cost of about 110 million photocopies. The market of educational software and digital textbooks is estimated at only 20 to 30 million, an average of 2 to 3 euros per year per student, for a total public expenditure of euros 7410 per year per student.

To summarize, according to the recent report from national inspectors (2013), textbook publishers have begun to develop digital products mainly from 2008 on. Three "generations" of digital textbooks have been successfully developed:

1. simple digital textbook, reflection of the paper textbook, which was marketed from 2008 (PDF version of the paper manual), even earlier
2. digital enriched textbook, launched in 2009, which, unlike the previous one, also contains enhancements audios, videos, and animations;
3. Finally, the digital textbook "3rd generation" marketed from 2011 on, offers the teacher the opportunity to mix textbook resources and personal resources and includes interactive exercises.

All of these tools are intended to be integrated into the collective use of the class textbook, and primarily for teachers in order to be projected in the classroom instead of on the student' desktop.

According to the SNE<sup>18</sup>, there are over 1000 digital titles; since 2009, every textbook is systematically bi-media (paper & digital); all with advanced interactivity (video projection, ergonomic navigation tools for interaction with the class), digital textbooks are increasingly rich and customizable; today, a majority of digital textbooks embark different media (animations, video, sound) resources and allow each teacher (and

student) to customize content”.

It is clear that in the eyes of publishers, the preferred model is the joint use of the paper textbook and the digital textbook.

A new product, called the Lib (for Livre interactif Belin<sup>19</sup>) is a new generation digital textbooks, accessible on tablets. As explained, a teacher can change his/her textbook, adding and editing documents, text or pages, creating his/her own courses from the textbook records or documents. Toolbox highlighter, arrows, zoom tools, selective presentation... Multimedia supplements: animated maps, interactive diagrams, videos ... Media, “Share your modified pages with your fellow teachers”. More and more publishers show their interest towards this Lib technology, which can provide an answer to the requirements of teachers to adapt educational tools for their students and to the overall context of their teaching.

But economical constraints remain, and publishers want to preserve their advantages and ask help from the government (see for example publishers’ contribution for the radical reform of school system<sup>20</sup>). But the picture viewed through publishers’ websites and feedbacks from school experiments are not quite in line!

### **Some research**

As quoted in a preceding section; research on digital textbooks is not new. It helped to foresee some possible options, to understand some situations, but lessons learned from past research are very rarely used. Political interest concerning new technology fluctuates.

During the 3 past years, we observed a renewal of the interest expressed by official discourses, conducting to a lot of initiatives:

- reports from national inspectors (Séré & Bassy 2010), Leroy (2012), IGEN (2013)
- survey (educational ministry website),
- financial support for projects in association between publishers and researchers (a lot of different projects helping school publishers and software companies to develop some new offers)
- national consultation for a new foundation of the school of the Republic.

This interest sheds some lights on school publishers and on digital textbooks. But the results are not clear.

### **Digital textbooks: a national experiment**

The ministry of education has decided to launch a national experiment called “digital textbooks through digital working platforms”. So, it is not directly oriented towards digital textbooks, but associated to the context of the development of digital working platforms. These platforms can be considered as a combination of a VLE (virtual learning environment) mostly devoted to pedagogy and school-work (exchange of documents between teachers and students) and a school management system (management of student absences, administrative information, grades...). The official idea was to experiment the use of digital textbooks both in the context of the classroom and at home for students.

During the 2009-2010 school year, this operation involved all the classes of 65 low secondary schools (grade 6) located in regions that have initiated a process for generalizing digital working platforms. This area represents 8000 students and 890 teachers who were able, via an extranet, online access to their digital textbooks from anywhere at any time: in the classroom, resource centre, at home, while having the corresponding paper manuals.

Not surprisingly for readers, the experiment observes more uses in the classroom with video projector or interactive whiteboard than at home by students. The official results of the first year of experiment (published on the ministry website) are not very promising.

- Digital textbooks designed along the lines of printed manuals, enrichments provide real value but still too modest, interactive features being very limited or absent
- A sustained overall frequency of use for teachers / use significantly less frequent for students
- Different uses following the disciplines but little activity with new digital textbooks
- Significant differences between schools / Few marked differences between disciplines
- Suitable for collective use (lectures) but do not encourage individual work
- Classroom configurations not always suited to reading
- Still insufficient training for teachers
- Hurdles are identified on the form and features of digital textbooks

For the second year, if some positive facts are given: impacts are always positive and relatively stable upon the weight of schoolbag but still disappointing results are obtained in terms of innovative teaching. According to the report, digital textbooks contribute to some extent to development of digital use in low secondary schools, despite the difficulties (in particular, technical malfunctions, at the beginning and then throughout the school year).

These technical problems reveal a desire of school publishers to protect their digital textbooks from copy: they have installed a lot of protections, causing many problems to users. As observed one teacher<sup>21</sup>: "Many problems are related to facilities, the publisher gave us a CD, that could be activated only once. Now the computer on which the textbook was installed is down..."

The other results of the second year of experiment were not very optimistic: digital textbooks have changed very few things despite some highly innovative textbooks and a using frequency lower than the first year.

- A significant decline in the collective use in the classroom because of dysfunctions and the development of digital media products by teachers
- Individual use by students during and outside of class remains weak but with a significant change in and outside the classroom in some local experiments encouraging use

- Uses are primarily based on the practices of teachers, than differences between disciplines

Disappointment is the main result. Many teachers expected significant improvements to deepen their use of digital textbooks. Most of them during the second year confirm both their interest in the experimentation and their disappointment towards the digital textbooks available. Students were rather motivated in particular by easing the transportation of their schoolbag, but were a little less enthusiastic than during the first year.

In conclusion, the economic model does not facilitate the dissemination and distribution of digital textbooks

### **Digital textbooks: an exploratory study in low secondary schools**

We have conducted a study in five lower secondary schools participating in the national experiment and considered as “advanced” concerning use of ICT in education. Our investigation confirms national results. Actors are disappointed: there are technical problems and digital textbooks are considered of bad quality. The use of textbooks with interactive whiteboard leads to enhance a “frontal” pedagogy, far from interactivity and individualisation.

One exception needs to be noticed: the teacher network called Sesamath produce free textbooks but also tools which can be used by students at home. Teachers can propose exercises to be done by students and can obtain the results of students’ activities at home. So, what school publishers do not seem to be able to provide to teachers is offered by an innovative team of mathematical teachers.

A questionnaire was administered to students of grade 7, Spring 2011. It has been particularized for each low secondary school according to the digital textbooks they were supposed to have used during the preceding year. In total, nearly 500 questionnaires were analyzed. The analysis quickly showed a great confusion in the responses of students for whom it was difficult to distinguish between digital textbooks, and more general digital resources, which were displayed on an interactive whiteboard or visible via a computer. In particular, inconsistencies have emerged in several answers, which led us to set aside a large portion of questions.

Almost all students reported having at least access to a home computer (personal computer for almost half of them) and more than 90% say they have an Internet connection. Some students do not have access to internet at home, two-thirds have access outside the home: with friends, neighbors, CDI...

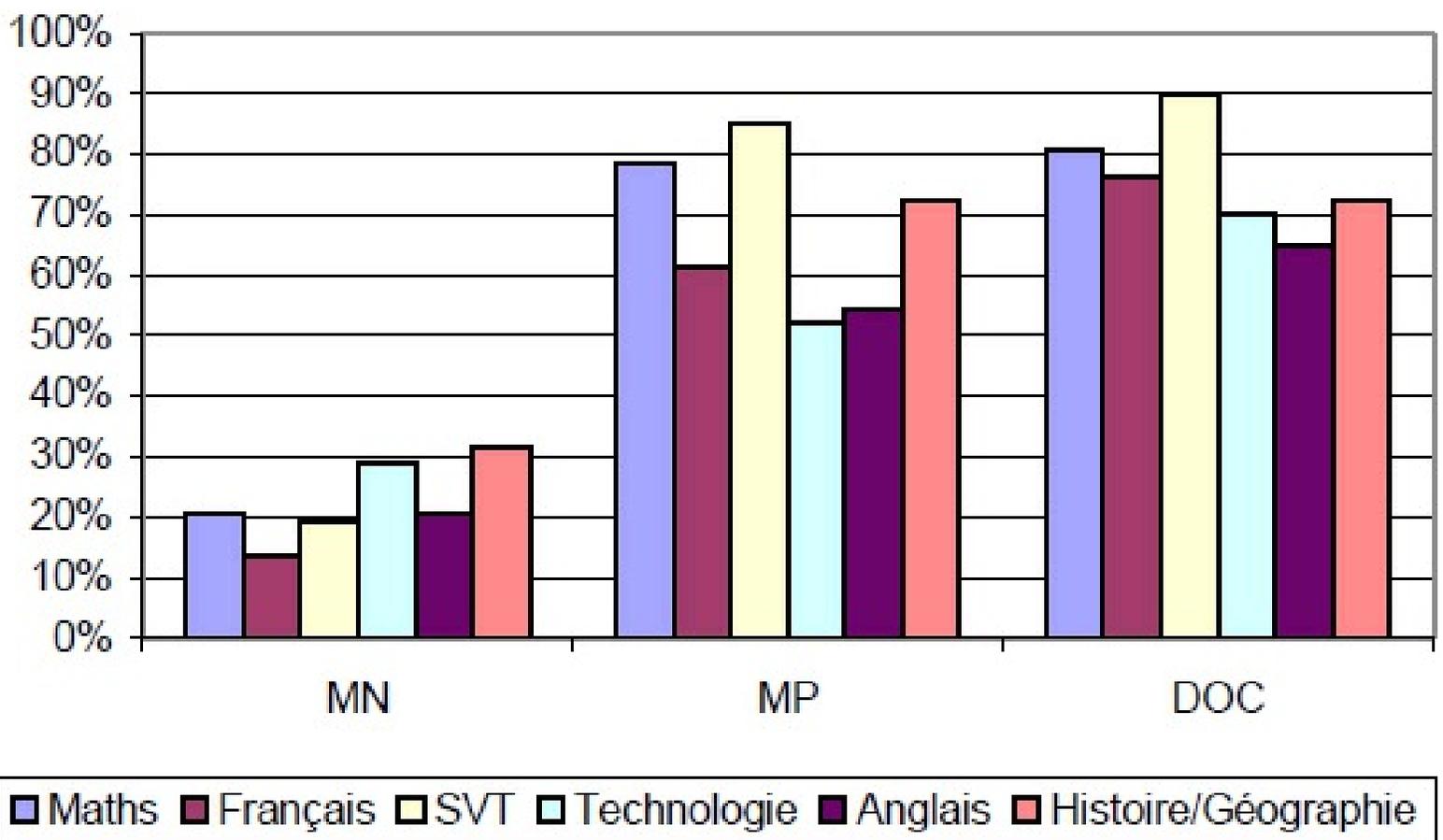
2/3 of the students reported using a computer also away from home, especially with friends (1/2) or CDI (4/10). As shown in Table 1, seven out of ten students said they most often worked alone at home, fifth with their parents, regardless of their 6th grade and whether girls or boys.

**Table 1. With whom student do their homework**

With whom did you mostly do your homework	Nb.	% (*)	Examples
Alone	346	71%	
With parents	102	21%	"my father sometimes"; "only my mother"; "my grand mother"; "my grand father"; "my aunt or a neighbour..."
With a brother, a sister	45	9%	
With others	45	9%	"friends"; "a classmate"; "sometimes with mates."

For their work at home, students still enjoy, in addition to manual digital school books ("paper manuals") documents provided by their teachers or other resources. From one discipline to another, the use of digital manual is more or less (depending on the discipline, between 10 and 30% of citations, average = 1/4) but remains a minority; documents include in paper textbooks and teacher remain the most common use (on average, 2/3 on manual and paper documents the teacher).

**Figure 1. With which do student declare learning and revising their lessons at home?**



(MN manuels numériques, digital textbooks / MP manuels papier paper textbooks / DOC documents provided by their teachers)

Other students' answers indicate uses of manuals (paper and digital) as well as uses of interactive whiteboard. It seems that three disciplines - mathematics, technology and history / geography - have, ultimately, more used digital textbooks through interactive whiteboards, with notable differences between schools, suggesting an institutional or teacher effect.

## Concluding remarks

To conclude, the digital textbooks offered in France are mainly improvements of paper textbooks, including new features, with an economic model still in line with paper products. School publishers try to keep their control on this market and offer few improvements. Digital textbooks do not include software managing a meaningful interaction with a student (the market of educational software including tutorial guidance is separate). As so many young students work alone (nearly 3/4), the possibility of digital textbooks to manage interaction is certainly a key point.

New economical models follow the global transition from products to services. A digital textbook, as the one of Belin (Lib), is a service provided on Internet. Digital textbooks provided by publishers and completed by teachers can be used by a specific community (passwords are linked to payment) as far as payments are made. As soon as such payment cannot be made, resources are no more accessible. A teacher can keep access to what he/she has designed, but publishers' resources are suppressed. So concerning textbooks, becoming digital, there also can become only rent for a period of time. Paper textbooks are products you buy and you can use it as long as you want (even for too long period of time, even if official programs have changed), digital textbooks are offered as limited services.

It may be noted, however, that the effects of infrastructure can be judged interesting. Teachers who have the habit of using a video projector or interactive whiteboard have established preparations taking into account the possibilities of projection. Their supports are done, they are demanding digital resources (including digital textbooks) and consider that any institution must provide them with the necessary collective projection technologies. They do not want to go back. Can we think that this will contribute to the proliferation of digital educational resources and if other conditions are met, this will encourage them to exchange and improve collectively. The educational activities with ICT should take consistency and more teachers should be able to grow and naturalize practices that will no longer be labelled innovative but well considered educationally relevant.

The important issue of articulation between paper-digital, school and outside school resources remains not really addressed, and companies try to be present on this market. Aware of this situation, Ministry of education has announced that a specific internet service will be freely offered for sixth grade student this year.

The traditional model of textbook publishing can be seen as being in decline. Several different models can arise. One possibility is that teachers will organize themselves in networks to produce and share their own content and discuss teaching practices they appreciate effective. Closely linked to the concept of academic freedom, textbook production by teachers' network can be facilitated by Internet. Sesamath advocates the importance of open and accessible format. As Sébastien Hache, one of the three founders of Sésamath, asserts: Sesamath "aims to (re) give all the keys to the teacher." Sésamath ensures that the resources it provides are fully convertible by teacher users. According to members in charge of Sesamath, the fields of individualization and personalization of learning must be understood and mastered by teachers themselves.

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### Annex 1: characteristics of the Lib offer

The first column gives the available functionalities for the basic offer; the second one for the Premium offer.

	Lib' Basic	Lib' Premium
<b>Your application with you</b>		
Internet access	✓	✓
Downloading on a computer	✓	✓
Exportation on an USB key	✓	✓
<b>Animation of your lesson</b>		
Video projection	✓	✓
Full screen view of a double page	✓	✓
Toolbox	✓	✓
Access to free pedagogical add-ons	✓	✓
<b>Lesson personalization</b>		
Documents comparison	✗	✓
Personalization of a page	✗	✓
Page creation	✗	✓
Access to all textbook documents	✗	✓
Import of your personal documents	✗	✓

[http://www.editions-belin.com/ewb\\_pages/l/le-lib.php](http://www.editions-belin.com/ewb_pages/l/le-lib.php)

<sup>1</sup> <http://www.sne.fr/img/pdf/SNE/Enseignement/CP-Manuelnumerique22-11-2011.pdf>

<sup>2</sup> [http://en.wikipedia.org/wiki/Digital\\_textbook](http://en.wikipedia.org/wiki/Digital_textbook)

<sup>3</sup> [http://fr.wikipedia.org/wiki/Manuel\\_num%C3%A9rique](http://fr.wikipedia.org/wiki/Manuel_num%C3%A9rique)

<sup>4</sup> <http://www.nathan.fr/manuels-videoprojetables/>

5 <http://www.editions-bordas.fr/manuels-numeriques>

6 [http://www.editions-bordas.fr/pdfs/mvp/ce\\_qu\\_il\\_faut\\_savoir.pdf](http://www.editions-bordas.fr/pdfs/mvp/ce_qu_il_faut_savoir.pdf)

7 <http://www.magnard.fr/spip.php?article5264>

8 <http://www.numerique-hatier.com/>

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# Third Part

Digital textbooks, specific studies

# How to learn from digital textbooks: evaluating the quality

*Como aprender de los libros de texto digitales: evaluando la calidad*

*Como aprender dos libros de texto dixitais: avaliando a calidade*

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**Abstract:** *Slowly but inevitably digital materials are more and more in use in schools. Most of them are just additional to the traditional textbook or they have a high fun and game character. Also publishers seek new ways by putting textbooks on i-pads. And (communities of) teachers are arranging materials themselves, using texts and videos from the internet, like you tube videos. But there also concerns about how to detect the quality of digital materials? Quality in the sense of how those materials support learning processes. In this chapter we will discuss what are important criteria for textbooks in general and digital textbooks in particular. We define digital textbooks as digital carriers of information and/or communication containing texts and/or images with the intention to facilitate learning, in a sense that the content has been selected and organized to achieve certain learning goals, and prompt the learner to conduct learning activities and activities that regulate the learning process*

**Keywords:** *Quality of digital textbooks, learnability of digital textbooks, evaluation of digital textbooks*

**Resumen:** *Lentamente, pero inevitablemente los materiales digitales se usan más y más en las escuelas. La mayoría de ellos son meros añadidos al libro de texto o presentan un fuerte carácter de diversión y juego. Además, los editores buscan nuevos caminos al introducir los libros de texto en los iPad. Las comunidades de profesores están elaborando materiales ellos mismos, con textos y videos procedentes de internet, tales como los videos de youtube. Pero también existen preocupación sobre como detectar la calidad de los materiales digitales. Nos referimos a la calidad en el sentido de como esos materiales apoyan a los procesos de aprendizaje. En este capítulo, abordaremos los principales criterios para los libros de texto en general y para los libros de texto digitales in particular. Nosotros definimos a los libros de texto digitales como portadores digitales de información y/o comunicación que contienen textos y/o imágenes con el fin de facilitar el aprendizaje, de tal modo que los contenidos hayan sido seleccionados y organizados para alcanzar determinados objetivos de aprendizaje, y estimular que el alumno lleve a cabo actividades de aprendizaje y actividades que regulen los procesos de aprendizaje.*

**Palabras clave:** *Calidad de los libros de texto digitales, aprendibilidad de los libros de texto digitales, evaluación de los libros de texto digitales.*

**Resumo:** *Lenta pero inevitablemente, os materiais dixitais vanse usando cada vez máis nas escolas. A maioría deles son simples engadidos ao libro de texto ou presentan un forte carácter lúdico. Ademais, os editores buscan novos camiños ao introducir os libros de texto nos iPad. As comunidades de profesores están elaborando materiais eles mesmos, con textos e vídeos procedentes de Internet, tales como os vídeos de Youtube. Pero tamén existe preocupación sobre como detectar a calidade dos materiais dixitais, entendida como apoio aos procesos de aprendizaxe. Neste capítulo, abordaremos os principais criterios para avaliar a calidade dos libros de texto en xeral e dos libros de texto dixitais en particular. Nós definimos os libros de texto dixitais como portadores dixitais de información e/ou comunicación que conteñen textos e/ou imaxes co fin de facilitar a aprendizaxe, de tal xeito que os contidos foran seleccionados e organizados para alcanzar determinados obxectivos de aprendizaxe, e estimular que o alumno leve a cabo actividades de aprendizaxe e actividades que regulen os procesos de aprendizaxe.*

**Palabras clave:** *Calidade dos libros de texto dixitais, aprendibilidade dos libros de texto dixitais, avaliación dos libros de texto dixitais.*

# Evaluating textbooks

## The important role of teachers

Because (digital) textbooks play an important role in education, evaluating them is an important activity. Textbook roles however differ, depending on one's perspective. For teachers textbooks are important tools in planning and executing their lessons. For publishers it is important that textbooks are adopted by teachers, while parents want a textbook to be a good preparation for exams. And of course authorities want textbooks to reflect their policies. In this chapter we approach the role of textbooks primarily as a learning tool. So if evaluation may be defined as assessing the value of an object (or a subject), we mainly look at textbooks from the perspective if and how textbooks support learning processes of learners, pupils or students. This should be the leading question anyway when designing textbooks.

Learning processes are complex processes, which also differ individually in their proceedings, and are depending on what has to be learned. It is almost impossible to create a set of quality criteria that suits all kinds of learning situations. Yet we have in this chapter tried to bring together relevant insights from research and learning theories, and to apply them to concrete educational material, i.e. digital textbooks.

There are several contexts in which this perspective is relevant, especially for teachers. Because they play a crucial role in the learning process, it is inevitably important that teachers know how learning processes take place, and how textbooks may support or hamper these processes. So teachers need to be equipped with expertise in these fields when:

- they have to select a new textbook for their pupils or students
- they want to use sources of the internet to use in their lessons
- they want to compensate the shortcomings of the textbook in their lessons
- they want to arrange new materials themselves

As we have said, teachers play a crucial role in the learning process of pupils and students. The last decades this role is changing. There are at least three developments responsible:

1. Educational innovations like competence-based education imply more autonomy of the pupil. Teachers have to support their pupils in this process by motivating, coaching and guiding.
2. Ict makes it easier for pupils to work autonomously; the digital material takes the expert role over from teachers: the computer instructs, the teacher coaches.
3. The pedagogical load of the teacher has become heavier among others because of intercultural society and the presence of more and more broken families.

So, because of their important role, as well as the changes in that role, it is important to learn (aspirant-) teachers how they can recognize quality in (digital) textbooks. Hansen (2009) formulates this as follows: "From a professional perspective such assessment work

contributes to the fact that teachers manage and reflect upon their practices on the basis of knowledge collected systematically. This is necessary due to the fact that this practice is very complex and to manage educational materials is even more complex. It is also necessary because it serves to develop the profession as such and the school institution and ensure their status and autonomy in society." According to Bundsgaard & Hansen (2009) "it is not enough to ask 'what works'. We have to add qualitative and contextual questions, namely 'how does it work?', 'under which circumstances?', and 'which competences can students expect to develop by working with this material?'" According to Kojanitz (2008) it is for that reason not useful just to look at the components of textbooks, like pictures, texts, questions and assignments, where these components are disconnected from the function they have to fulfill. The function of these components must be the starting point, as seen from the perspective of the characteristics of learning processes.

### **Different evaluation methods**

Evaluation in this case we describe as assessing the value of digital textbooks. What are different methods to assess that value?

Mikk (2002) states that textbook research methods can be divided into three groups:

- Questioning teachers, parents or students about the different aspects of textbook quality. The method is easy to implement and questions can be put to all the aspects of textbook quality. But: "different experts may differently evaluate one textbook and therefore the evaluations are sometimes of questionable value".
- Textbook analyses. The analysis consists of counting some characteristics of textbooks using strictly fixed rules. The analysis can often be computerized and carried out before using the textbook in school. On the other hand "it is difficult to define exact rules for counting all the important characteristics of textbooks". Tholey & Rijlaarsdam (2002) distinguish between qualitative and quantitative methods. Qualitative methods are especially useful when analyzing aspects of meaning, like value education, otherness, stereotyping, where the hidden curriculum has at least a similar strong impact on attitudes and consciousness as the overt texts and pictures. Tholey & Rijlaarsdam use the Delphi-procedure as a method. Quantitative methods can be used in cases where it is possible to have fixed rules, like in counting sorts of exercises, sorts of pictures, use of signal words in texts etc.
- The results of an experimental evaluation are the most reliable indicator of textbook efficiency and the results serve as a basis for validating other methods of textbook evaluation. The experimental comparison of textbooks is based on some indices of the efficiency of the textbooks but the values of the indices depend on a broad variety of factors:
  - Students: abilities, motivation, prior knowledge of the topic etc.
  - Teachers: professional competence, attitudes towards teaching etc.
  - Textbooks: content, comprehensibility, illustrations, learning methods etc.
  - Tests to measure effects: difficulty of questions, time to answer etc.

Evaluation methods are also used to assess the quality of textbooks before printing, where governments want to approve textbooks to be used in schools. In many countries different standards and criteria are developed (see Bruillard et al. 2006).

### **Learnability as indicator of the quality of digital textbooks**

In this chapter we will address the question of how to evaluate the quality of digital textbooks. What characteristics constitute the learnability of digital textbooks and foster learning success by pupils? The answers to these questions we derive from a broad scale of research, especially in the domain of learning psychology. The outcomes of this research can help teachers choosing the right material for their pupils or arrange new materials themselves.

More and more we expect from teachers to look for or develop learning materials for their pupils. In the paper era it was sufficient for teachers to simply follow the structure of the textbook, but ict invokes teachers to select or arrange additional materials, creating new methods even. This implies that teachers understand where to look at evaluating the quality of these materials. This chapter does an attempt to meet this need.

### **Paper and digital textbooks**

Textbooks, paper and digital, are designed and developed to let pupils learn effectively: be it knowledge, skills, attitudes or competencies. This is the main function of textbooks. Of course textbooks are also helpful for teachers in preparing their lessons. And textbooks often are materializations of exam programs. These functions are also determining their quality. But in this chapter we primarily address to the learning function of textbooks.

For digital textbooks the same counts: digital textbooks too have secondary functions like the accessibility of the material: place and time independent. But the main function of digital textbooks too has to do with learnability. So in many cases for paper or digital textbooks the same criteria hold as to their quality. But digital textbooks have two characteristics paper textbooks do not have: multimodality and adaptability. Multimodality refers to the possibility that different senses simultaneously can be applied in information processing, while adaptability refers to the possibility of a program to adjust to specific characteristics of individual pupils. Paper textbooks do not have these possibilities.

### **Learnability**

Therefore, when we evaluate the quality of digital textbooks we primarily look at the degree to which textbooks let pupils learn effectively. For us quality is the equivalent of learnability (see also Haynes 2006). But what is learning exactly? We follow the definition of Boekaerts & Simons (1995): someone has learned something when we see a stable change in his or her knowledge or behavior, as a consequence of learning activities and is characterized by a certain degree of transferability. This transferability is an important part of the definition. It refers to the capability someone has to apply what he or she has learned in other situations than those in which he or she has learned the specific knowledge or skill.

Transferability distinguishes information from knowledge. Information is not transferable and has only incidental meaning. Only in the case the information has been stored in long-term memory, and thus may be used when a new situation needs that, we

speak of knowledge instead of information. In schools not all information is used to create knowledge. Much information may be forgotten after consultation and cannot be seen as part of learning material.

Characteristic of the definition of Boekaerts & Simons is that they only talk about the result of learning: change in knowledge or behavior, observable learning results. But how learning takes place, is another story. Although there are many theories about how people learn, many of them rely on the information processing model of Mayer & Moreno (2003).

According to Mayer & Moreno learning implies that presented information is transformed into transferable knowledge. This process normally takes place in three phases: selection of information, organizing information, integrating information. Textbooks, also digital textbooks, have to be designed in such a way that these three processes are suitably supported. In this chapter we will show how digital textbooks can.

Although all learning processes normally go through these three phases, this will not mean that all people have the same learning style or preference. Pupils also differ in their interest, motivation and cognitive skills. In this chapter we will also discuss how to adjust to these differences, how to match textbooks to pupils.

### Three quality domains

In evaluating textbooks, usually three domains are distinguished: content, pedagogics and presentation (Elen 1993). This is a very useful distinction. First because you can't learn without content: it resembles looking without images or hearing without sound. But content in itself is raw material and has to be transformed pedagogically: pupils have to act upon the content. Without acting learning will not take place. And third: for information processing you always need senses. So the material must be designed and presented in a way that learning will be supported. Only when textbooks meet those three domains of quality criteria we talk of good textbooks.

The three quality domains contain each three so called learning functions of textbooks:  
Content

- Selecting content
- Organizing content
- Modalities of content

### Pedagogics

- Instructional strategies
- Didactical activities
- Regulating learning processes

### Design & Presentation

- Readable texts
- Functional visuals

- Lay-out

In the following paragraphs we will discuss these different learning functions.

## **Content**

In arranging or evaluating textbooks the content is an essential part. What content is necessary, how it has to be organized and what modality do we choose?

To summarize it is all about:

- **selecting** the content: does it fit with exam standards, learning goals and is it attuned to prior knowledge and interests of the pupils?
- **organizing** the content; are there strong connections between the parts?
- choosing **modalities** of the content: does the presentation of the content involve the use of different senses?

This paragraph will follow these three learning functions of textbooks.

### **Selecting the content**

In selecting the content the exam programs of course play an important role, as the learning goals do. Besides the content has to reflect prior knowledge and interests of pupils and there must be possibilities to identify with the content.

### **Prior knowledge**

It is essential that the content can be connected to the prior knowledge of the pupils. This fosters the understanding of the content. Dochy (1993) concluded that learning results are strongly related to the prior knowledge (he found correlations up to .72). Also research of Van Dam (1993) reveals the importance of prior knowledge as responsible for the variance in learning results between 30%-70%.

### **Interest**

Research from Krapp et al (1992) shows that textbooks with content that is interesting to pupils have a positive impact on the learning results. Interesting material motivates pupils to read, it influences understanding and results in better learning. According to Hidi (2006) interest attracts attention and stimulates memory. Interest facilitates learning, enlarges understanding and stimulates the mental effort as well as personal involvement. On the other hand: when texts touch pupils emotionally, there is a chance that pupils will be distracted, instead of attracted. Interest must not be confused with fun. Interest arouses the necessary mental effort, while fun mainly distracts attraction from learning.

### **Identification**

One way to raise interest is to let pupils identify with the content (Madaus & Kellaghan 1992; Heemskerk 2008). They feel more addressed and also it is important for their self-image. Besides they need not translate the content to their own situation, for instance when the material accounts for age, differences between boys and girls and the 'couleur locale'.

## Organizing the content

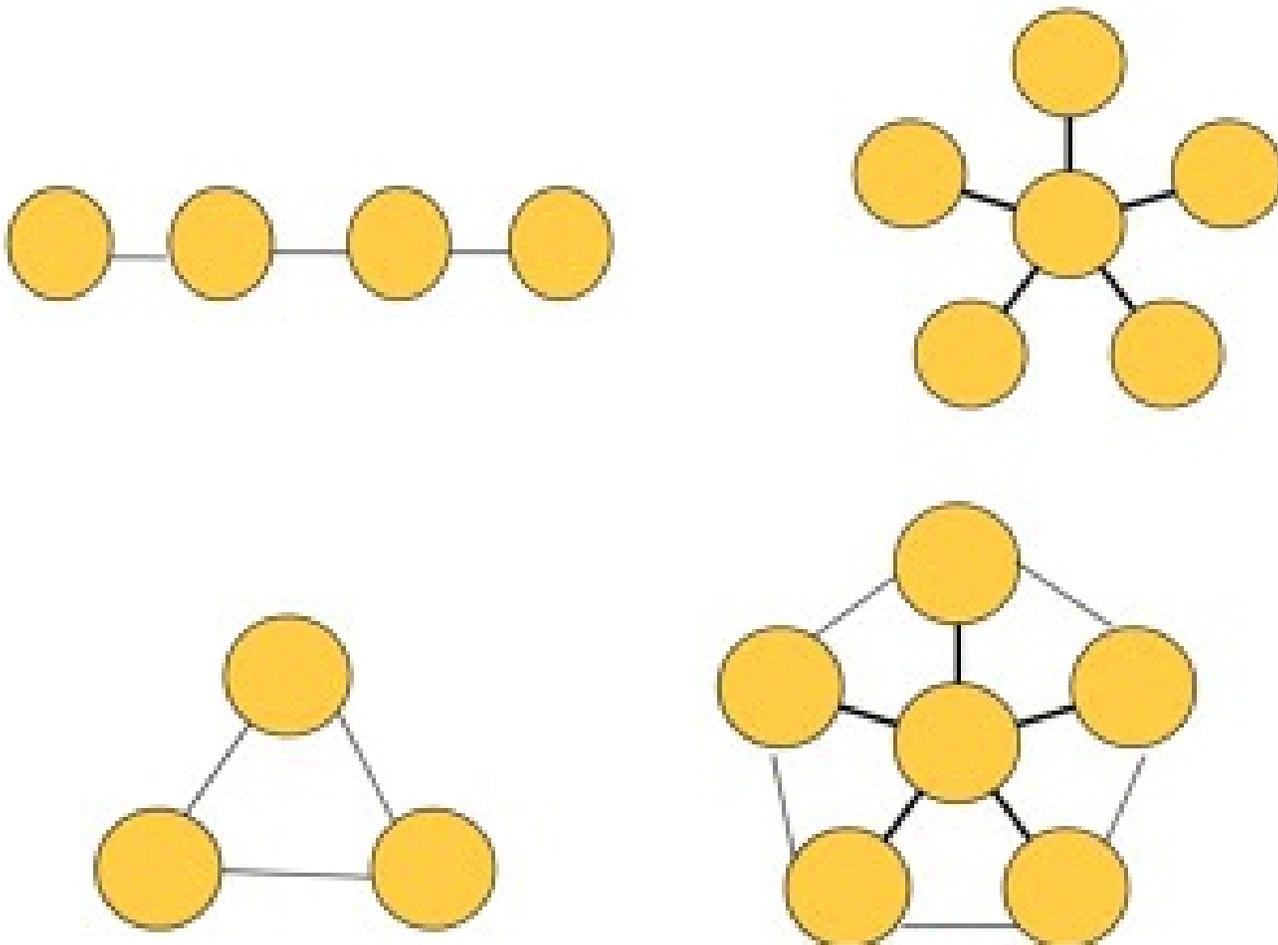
If the content has been organized in a strong structure, this can help learners to process information better and to store it in the long-term memory. Research by Vreugdenhil (2009) shows that:

- there must be coherence of the content
- relationships must be explicit and clear
- pupils need to be supported to relate concepts or phenomena
- strong connections enlarge the probability that information will become knowledge

## Different structures

When someone evaluates or arranges learning material it is important to recognize strong structures. There are four structures which are often chosen: the chain, the star, the triangle and the spider's web. The least strong structures are the chain and the star. They are easy to grasp for pupils, but are more difficult to activate in the long term memory. The triangle and the spider's web are more complex because there are more interconnections. But once mastered, they are easy to activate.

Figure 1: Different structures of content: string, star, triangle, and spider's web



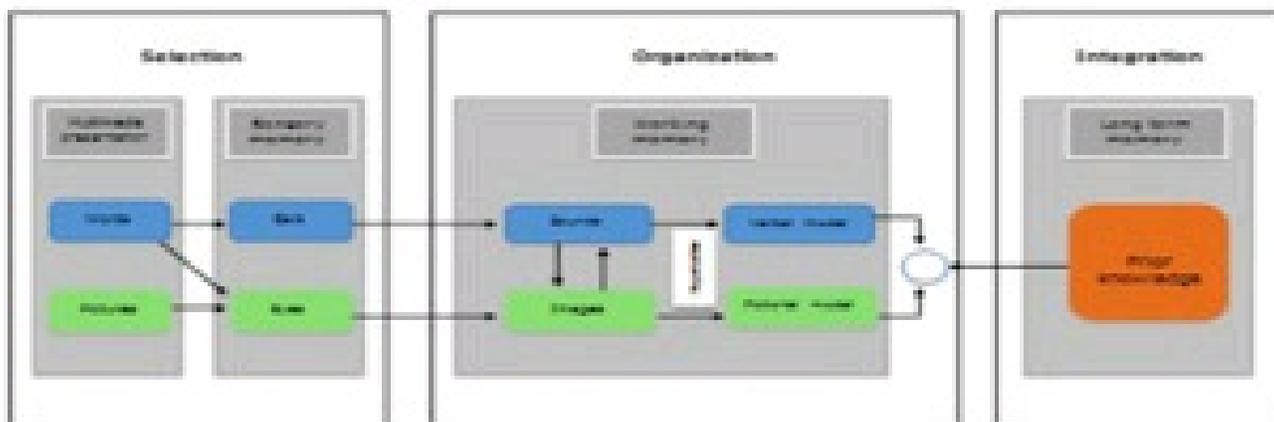
## Choosing modalities

Content can be 'packed' in different manners: video, text, pictures, sound, music etc. These different manners we call modalities. It is important that learning material varies between visual and auditory information.

The first reason for that is that pupils differ. Some pupils have a more visual learning style, others more auditory. It is even more efficient when you offer authentic material so that pupils also can learn from smelling, touching or tasting.

Secondly it is important to use the right combination of modalities, to relieve the working memory. The more relieve, the better a pupil learns. Why this is as it is shows the information processing model of Mayer & Moreno (2003):

Figure 2: The information processing model of Mayer & Moreno (2003)



According to this model information processing occurs along three phases:

- selection** of relevant information in the sensoric memory
- organization** of the selected information into mental models in the working memory
- integration** of the mental models and the prior knowledge into new knowledge in the long term memory

Information enters memory mostly by means of images and words, through the ears and the eyes. They have to be elaborated in the working memory, which has a limited capacity. Only when a learner is capable of connecting and integrating the information to and in the existing knowledge, learning takes place. The new information has been stored as new knowledge in the long term memory.

The dual channel hypothesis plays an important role. Humans possess two parallel channels to process information: visual and auditory (Paivio, 1986). If information enters memory through different modalities which make use of only one channel, for instance written text and a picture (twice visual), then the information processing task is much heavier than the case in which the information can be processed by two different channels, for instance ears and eyes. This is called the modality principle.

Other important principles are:

- presenting written text and pictures simultaneously (multimedia principle)

- presenting text and visual on the same page or screen (contiguity principle)
- avoiding redundant texts, sounds and visuals (redundancy principle)

## **Digital textbooks**

Digital material is very suitable to support these processes of selecting, organizing and integrating information. Digital material has the possibility to support the sensory memory by offering static and dynamic visuals, written and spoken texts, sound and music. The working memory may also be relieved by offering many different kinds of elaboration techniques. And the long term memory may be supported by offering many exercises.

## **Pedagogics**

Last paragraphs we discussed topics like selection and organizing the content, and choosing its modalities. Now we turn our attention to the pedagogics of a digital textbook: pupils have to do something with that content in order to learn successfully. Therefore developers of learning materials choose certain learner activities: exercises, assignments, questions etc. These activities are meant to foster specific learning goals. Not every activity is suitable for any learning goal.

When these activities are applied systematically we speak of instructional strategies. There are many different instructional strategies, like activating prior knowledge or giving feedback. Specific learner characteristics ask for specific instructional strategies. Sometimes a certain theory of learning, like socio-constructivism leads to specific strategies.

Activities and strategies are used to reach certain learning goals. But learning processes are also object of regulation. If pupils get support in orienting, planning, monitoring and evaluating their learning process, their metacognitive capabilities will grow.

In this paragraphs we will discuss how learning materials can help in presenting and choosing the right activities and strategies and how they can help pupils regulating their learning process.

## **Instructional strategies**

Van Beek (2009) found six instructional strategies which support effective learning:

- activating prior knowledge
- directing and keeping attention
- presenting possibilities to exercise
- motivating
- giving feedback
- reflecting on the learning process

## **Activating prior knowledge**

To activate prior knowledge it may be helpful to use fixed formats. Parts of such formats are for instance: asking questions and summarizing former lessons (Marzano 1998). Other means of activating prior knowledge is to reread former texts or consulting sources.

### **Directing and keeping attention**

One way to direct attention is to state the learning goals at the beginning of a new chapter or topic. Also advance organizers are effective instruments to draw attention. For instance schemes or figures which structure the content of the chapter. If pupils get information about the content to be learned in that chapter the new information will be better organized and elaborated in their memory.

An important instrument in keeping attention may be giving examples (Jonker 2008). But not for all pupils this is recommendable. Especially gifted pupils are sometimes hampered by presenting examples. They want to learn more conceptual than concrete. Digital textbooks can differentiate between pupils by putting examples in links so that learners can choose if they want to get an example or not.

### **Presenting possibilities to exercise**

It is important that pupils have the possibility to exercise what they have to learn. Exercising helps the elaboration of knowledge in the long term memory. Pupils learn also better when they can do different kinds of assignments. For instance searching for similarities, and afterwards looking for matches. Making a mindmap or a summary are examples of effective activities at the beginning or the end of a chapter.

### **Motivating**

If pupils are not motivated, learning will hardly take place. But motivation in itself does not automatically lead to successful learning. If motivation leads to a higher mental effort, learning will take place. This is the case when we arouse pupil's interest. Motivating content takes the interest of pupils into account. Also concrete experiences of pupils may help. Or adjusting to different learning styles of pupils.

### **Giving feedback**

Digital material is very suitable for giving feedback. But not all feedback helps learning. Hattie & Timperley (2007) made a distinction in three different kinds of feedback:

- Knowledge of Response (KR): pupils are told if the answer or solution is right or wrong
- Knowledge of Correct Response (KCR): pupils are also told which is the right answer or solution
- Elaborated Feedback: pupils are also told why the answer/solution is correct or not

According to Hattie & Timperley pupils learn most from elaborated feedback and least from KR. A good example is the digital textbook Lesewerkstatt from Lehrmittelverlag Zürich where pupils are piloted through a reading program by adapting to the reading capabilities of the pupil.

### **Reflecting on the learning process**

Reflecting on the learning process is a strong instrument for success. How did they master the task? Was it easy or not? Took it a long time or not? Are you satisfied about the result? In this way the acquired knowledge will be better remembered in the long term memory.

## Learner activities

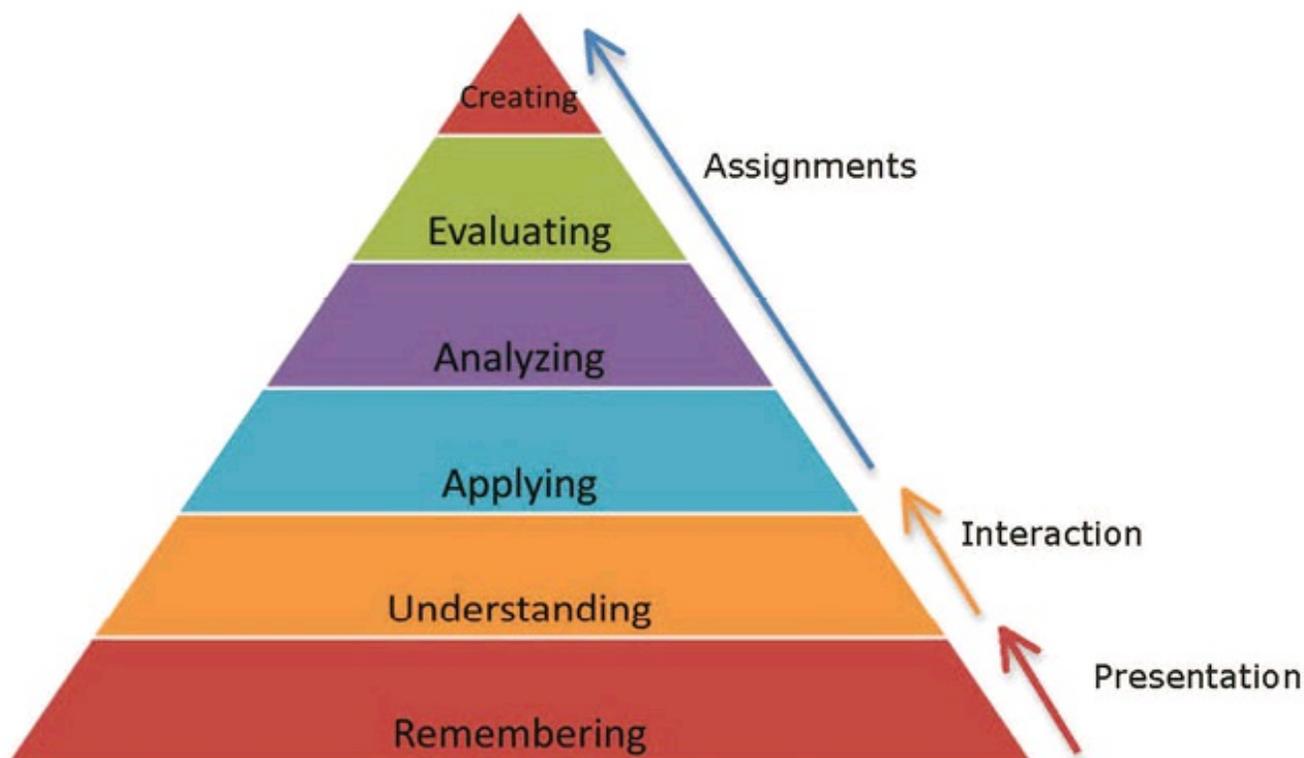
Learner activities are specifically chosen to attain certain learning goals. There are many different distinctions in learner activities. Most of them are grounded on a division in:

- Presentation forms with learner activities as listening, looking, reading
- Interaction forms with learner activities as chat, dialogues, role play
- Assignment forms with learner activities as solving problems, observation, exercising

Not all learner activities are suitable for every kind of learning goal. To illustrate this we make use of the taxonomy of Bloom (1956). According to his theory learning can take place on different cognitive levels and takes place in different steps. Anderson & Krathwohl (2001) renewed his theory and make a distinction in six levels: remembering, understanding, applying, analyzing, evaluating and creating.

If the learning goal of a chapter ends on the lowest level, remembering, presentation forms are sufficient. In the case of understanding you will need interaction forms. In attaining higher order levels assignment forms will be necessary:

Figure 3: Bloom's taxonomy and learner activities



Furthermore Bloom's taxonomy helps in structuring the learner activities. If you want to attain a learning goal on the level of analyzing, you have to be sure that pupils have already attained goals on the levels of remembering, understanding, and applying. If not, you have to design learner activities on these levels in your material.

## Differences between pupils

Pupils may differ in their learning styles, motivation and cognitive capabilities. These differences may count for individual pupils as well as groups of pupils.

Many pupils in lower educational school levels tend to learn in concrete, authentic, and practice-oriented learning environments. They like assignments that resemble all-day-life and benefit from examples (Van der Neut & Teurlings, 2011). Many pupils have a so-called application oriented learning style. In grammar schools we often see pupils with a more meaningful oriented learning style. They look for relationships between phenomena and are often more hampered than supported by examples.

There are also indications that boys prefer other learning styles than girls (Reints, 2012). Relevant differences seem to be:

- girls are more linguistic, while boys tend to be more spatial-mathematic
- girls like to work together, boys prefer to work on their own
- boys are more competitive, girls more cooperative
- girls like to work step-by-step, boys prefer to experiment
- boys are more touched by abstractions and graphics, while girls prefer more concrete, realistic pictures

In primary education all kinds of pupils are presented in the classroom. By enhancing **variation** in your learner activities you can cope with all these differences. Besides learner material can try to **adapt** the difficulty of exercises to the level of the pupils. Of course digital textbooks are very suitable in adapting not only to the cognitive level of pupils but also to their learning styles.

### Learning styles

We know of many distinctions in types of learning styles (Coffield et al. , 2004). One of the most valid and reliable learning styles theories is that of Vermunt (2011). He found four different learning styles of pupils:

Learning style	Pupils...
Undirected	...are not aware of their preference for certain learner activities and are not capable of regulating their learning process
Reproduction directed	...have a preference for memorizing, repeating and analyzing the content; they tend to follow programs strictly
Meaningful directed	...prefer to establish relationships; and to learn autonomously
Application directed	...need practice oriented assignments and have no clear preference in following programs strictly or learning autonomously

Digital programs can adapt assignments to learning preferences of pupils. Some programs diagnose the learning style of a pupil at beforehand and design a so-called user model for this pupil (program control). Other programs let pupils choose what assignments they want to do (learner control). There are many programs where learners can choose from a given set of assignments to choose from (shared control). Because it is very difficult to design reliable user models, and because especially teachers do not want their pupils to choose the assignments on their own, programs with shared control often are preferred.

## Eight intelligences

Gardner (1998) distinguishes eight different so-called intelligences. In fact they are learning preferences. When designing digital textbooks it is important to establish enough variation in these intelligences:

Gardner's multiple intelligences	Pupils...
verbal-linguistic	...are directed to language, like reading and writing stories
logical-mathematic	...like to work with figures, to solve problems and establish relationships
visual-spatial	...like to make drawings and to construct and to organize, like spatial relationships, forms and colors, have a good sense of spatial direction
musical-rythmical	...love music, think in measures, rythms and patterns, are auditory directed
bodily-kinesthetic	...prefer bodily activities, role playing and physical activities
naturalistic	...like to observe natural phenomena
interpersonal	...like to communicate and share experiences
intrapersonal	...like to reflect about emotions, moods and memories

The best way to address different intelligences is when designing rich assignments with different learner activities. When pupils are doing a project where they have to give an historical overview of a city in the Golden Age, you can design different learner activities like:

- reading historical sources and writing a report on that (verbal-linguistic)
- collecting demographic data and putting these in graphics (logical-mathematic)
- making a model of the city (visual-spatial)
- collecting sound fragments of that period (musical-rythmic)
- role-playing of all day life events of that period
- making an overview of the flora and fauna in that city during that time (naturalistic)
- simulating the way of communication in that time (interpersonal)
- collecting fragments of diaries and make a reflective report on that (intrapersonal)

## Regulating the learning process

Pupils who are able to regulate their learning process learn more deeply and more effective (Bannert & Mengelkamp 2008; Georghiadis 2004). So we have to consider the possibilities of digital textbooks how to support these processes. Flavell (1987) distinguishes the following activities: preparing, planning, monitoring, evaluating.

### *Preparing*

During the preparation pupils have to consider if they think they are able to master the learning task, which learning goals have to be attained and what they need in attaining them.

### *Planning*

Pupils have to be aware of the time they need to master the learning task and how to work on the task. They have to make a planning and have to organize the means to work on the learning task.

### *Monitoring*

During working on the task the pupils have to monitor the process and have to think about if they still understand what is expected from them.

### *Evaluating*

Pupils have to consider the question if they have reached the learning goals and if their learning process was successful. And if there was time enough to fulfill the task.

In digital textbooks all activities can be placed in a separate screen, with categories like preparing, planning, monitoring and evaluating. Pupils can be led to this screen from other screens by a link.

## **Design & Presentation**

When the content has been selected and the right pedagogics are chosen, this all has to be designed and presented. Three aspects are important: the texts must be readable (i.e. understandable), the visuals must support understanding, and the lay-out must help the learning process. These aspects will be discussed in this paragraph.

### **Presentation of the text**

Characteristics of the text play their role on different levels: word level, sentence level, and text level.

On word level it is important that a text contains many familiar words for the pupils. Beware of too many metaphors.

On sentence level the length of the sentence plays a role, but not always decisive. Text coherence is much more relevant (Schnotz 1984). Sentences must be connected to each other by signal words like 'because', 'thereafter', 'also', 'besides' etc. The use of these words is especially relevant for poor readers (Land 2009). Longer sentences with signal words are better understandable for pupils than short sentences with no connections between them.

Coherence is also of importance on the text level where signal words as 'to begin with', 'secondly', 'at the end' highlight the structure of a text. Also headings are essential.

Understandable texts contain:

- many familiar words, no abstract terms
- a clear sentence structure with active use of verbs
- sentences that are connected by signal words
- explicit coherence between text parts

## **Texts for screen**

Most publications about how to write texts for screens are not meant for learning texts. There is hardly any research done concerning these kind of texts. We're not talking about readers, but learners. What we can do is applying general suggestions for reading texts to learning texts. Readers do not seem to read a screen text, but they scan these texts (Nielsen, 2012). This is exactly the core problem of digital texts: how to design screens in such a way that learners are willing to study these texts? According to (Lutgerink, 2012) screen texts must follow these rules:

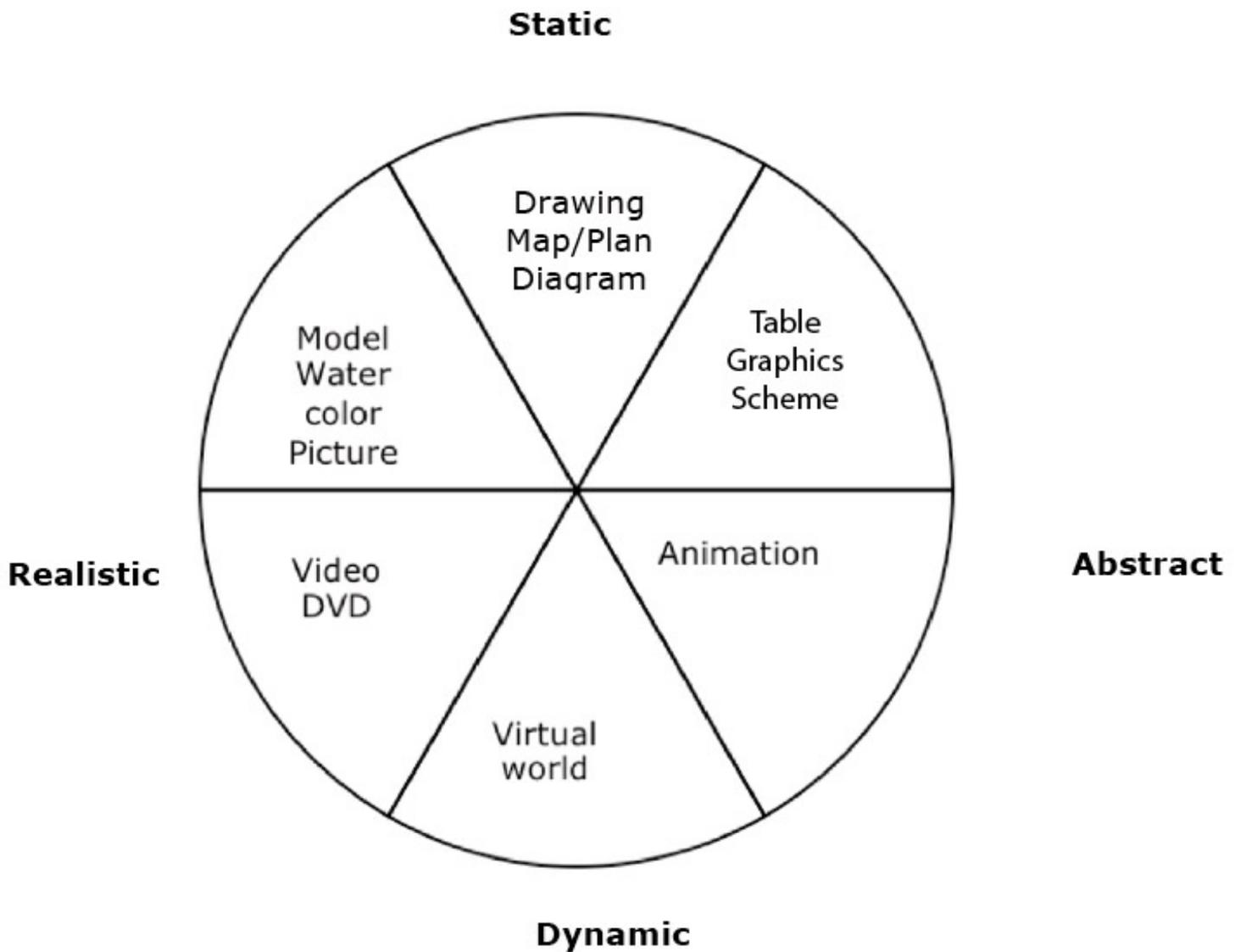
- a short text with a clear structure
- the most relevant information must be placed in the middle
- pages may not exceed one-and-a-half screen with a clear composition of paragraphs
- every screen has only one information chunk
- content that is not relevant for all learners are placed in hyperlinks
- enumerations (not more than nine items)
- hardly any bold and italics, no underlining (confusion with hyperlinks)
- use of signal words only on the same page
- short, clear sentences, active verbs, no complex sentence structures

## **Presentation of visuals**

In paragraph 2.3 we discussed that pupils will process information better when written texts are supported by visuals (multimedia principle). Text and visuals need to be placed near to each other (spatial contiguity principle). In this paragraph we discuss which visuals support learning and which do not.

Visuals in digital textbooks encompass static (illustrations, pictures, models) as well as dynamic visuals (animations, videos, virtual reality). They can be realistic or abstract:

Figure 4: Different kinds of visuals



Choices enough. But what are the functionalities of all these visuals? Carney & Levin (2002) distinguished the following kinds of visuals: decorative, representing, organizing, interpreting and mnemotechnic visuals:

Function	Wat they do	When to use
Decorative	Just decorating	Useful at the beginning of a new chapter to motivate. When used frequently they hamper learning
Representing	Make content concrete	Useful when concepts, phenomena and objects have to be clarified
Organizing	Give structure to content	Useful when concepts, phenomena or objects have to be analyzed or processes to be shown
Interpreting	Simplify content	Useful when complex processes, abstract or complex concepts and phenomena have to be explicated
Mnemotechnic	Aid to memory	Supportive in remembering difficult, mostly meaningless facts

Relevant suggestions are:

- The purpose of the visual must be clear
- Illustrations must have a functional captive
- There must be a strong connection between text and illustration
- The value of an illustration is higher when it is part of an assignment

## Lay-out

In this paragraph we will discuss in what way the lay-out can support learning processes. In this respect lay-out has two important functions: to direct attention and to structure the information (Hartley 1999; Lorch 1989). To direct attention aspects like the typography, use of color and markers are useful. To structure the information we can think of the type page, the combination of text and image, and the use of headers.

In the next table we present how these lay-out features can help the learning process.

Directing attention	
Typography	Serif (f.i. Times New Roman) or sans serif (f.i. Verdana) does not seem to matter much, as long as it is a current typography. The size may be important. Experienced readers have no problem with a smaller typography, while poor readers need larger ones. Too many different typographies may be confusing.
Use of color	Adequate use of color has a positive effect on learning (Kalyuga et al., 1999; Ozcelik et.al. 2009). Concepts are better remembered if they have the same color in the text and as caption of an illustration; pupils then need less time to find the corresponding concepts.
Markers	Markers (like frameworks, icons and numbers) direct attention. Frameworks isolate text which is no part of the main text. Pupils see in a glance that these texts are mere examples or only give extra information. Icons help pupils to navigate autonomously through the program. And numbers support learners in better remembering the information. This is because texts with numbers are read slower which leads to deeper learning (Lorch & Chen 1986; Rayner 1998).

Structuring of information	
Type page	Online reading of texts with margins leads to a better understanding of the information than the same text without margins (Chaparro et al., 2004). Texts with margins are read slower. This leads to better scores on questions answered after reading the text. For the same reason a larger line spacing is important.
Text and image	Information processing goes better when texts are combined with images (see also p. 255). The following aspects are of importance (Mayer & Moreno 2003): <ul style="list-style-type: none"><li>• text and corresponding visual must be placed near to each other</li><li>• redundant information has been deleted; links refer to more information</li><li>• the texts are optically divided in well-organized parts</li></ul>
Headers	Headers organize information. Besides they help pupils to orient and to help find information. They help pupils to remember in what context texts are used. Headers support the structure of the whole text.

## A hampering lay-out

Lay-out may hamper learning. Especially when:

- there is abundant use of CAPITALS
- there is abundant use of color
- combinations of colored characters which are difficult to read (f.i. red on white, green on red)
- a text has many enumerations
- there is abundant use of markers

## Some closing remarks

Evaluating digital textbooks is of great importance to the quality of education. Most digital textbooks we know hardly make effective use of the digital potentialities. The two most strong characteristics are multimodality and adaptability. The multimodality characteristic is sometimes used, but often in a wrong manner, presenting redundant visuals, sounds and texts. Or by ignoring the principles of spatial and temporal contiguity, and so overloading the working memory.

As to the adaptability characteristic we notice that mostly programs are not capable of adapting program elements to the input of pupils. Besides pupils are seldom stimulated to reflect on their learning process, and programs mostly give only correct response feedback, without further explication of why the answer is correct or not.

In a first survey we found out that student teachers know not much about learning processes and how digital textbooks should support these processes. Student teachers often chose the wrong illustration, given a certain learning goal the pupils had to achieve (Mossink & Overbeek 2012).

It is also evident that teacher training institutes have to play a crucial role in the acquisition of this knowledge. As long as teachers lack this important knowledge, and as long as they are not capable of recognizing the quality of digital textbooks, these textbooks will have less impact on the quality of education as they should and could have.

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# Beyond Textbooks: Educational Digitals Texts and Gamification of Learning Materials

## *Más allá de los libros de texto: Textos digitales educacionales y Gamificación de los materiales de aprendizaje*

## Máis alá dos libros de texto: Textos dixitais educacionais e ludificación dos materiais de aprendizaxe

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**Abstract:** *The first part of chapter provides a characterization of the textbook as an educational technology model representative of a school of the twentieth century (reception learning, information transmission, a concept illustrated knowledge resource mediator between the official curriculum and curriculum practical and as a product of a cultural industry). In the second part, we present two alternative models of digital materials. On the one hand, models of structured educational materials that adopt interactive ebook format, and models of learning gamification. We conclude on the need to seek the integration of both approaches (structured and gamification materials) in the production of new digital resources.*

**Key words:** *textbook, gamification of learning, educational ebook, digital educational resource*

**Resumen:** *En la primera parte se ofrece una caracterización del libro de texto como una tecnología educativa representativa de un modelo de escolaridad del siglo XX (aprendizaje por recepción, transmisión de información expositiva, una concepción ilustrada del conocimiento, recurso mediador entre el curriculum oficial y el curriculum práctico y como producto de una industria cultural). En la segunda parte, se presentan dos modelos alternativos de materiales digitales. Por una parte, los modelos de materiales educativos estructurados que adoptan el formato de ebook interactivo, y por otra parte los modelos basados en la gamificación del aprendizaje de naturaleza lúdica y con entornos abiertos. Se concluye en la necesidad de buscar la integración de ambos enfoques (materiales estructurados y gamificados) en la producción de los nuevos recursos digitales*

**Palabras clave:** *libro de texto, gamificación del aprendizaje, ebook educativo, material educativo digital*

**Resumo:** *Na primeira parte ofrécese unha caracterización do libro de texto como unha tecnoloxía educativa representativa dun modelo de escolaridade do século XX (aprendizaxe por recepción, transmisión de información expositiva, unha concepción ilustrada do coñecemento, recurso mediador entre o curriculum oficial e o curriculum práctico e como produto dunha industria cultural). Na segunda parte preséntanse dous modelos alternativos de materiais dixitais. Por unha parte, os modelos de materiais educativos estruturados que adoptan o formato de ebook interactivo, e por outra parte os modelos baseados na ludificación da aprendizaxe e con contornas abertas. Conclúese na necesidade de buscar a integración de ambos os enfoques (materiais estruturados e ludificados) na produción dos novos recursos dixitais*

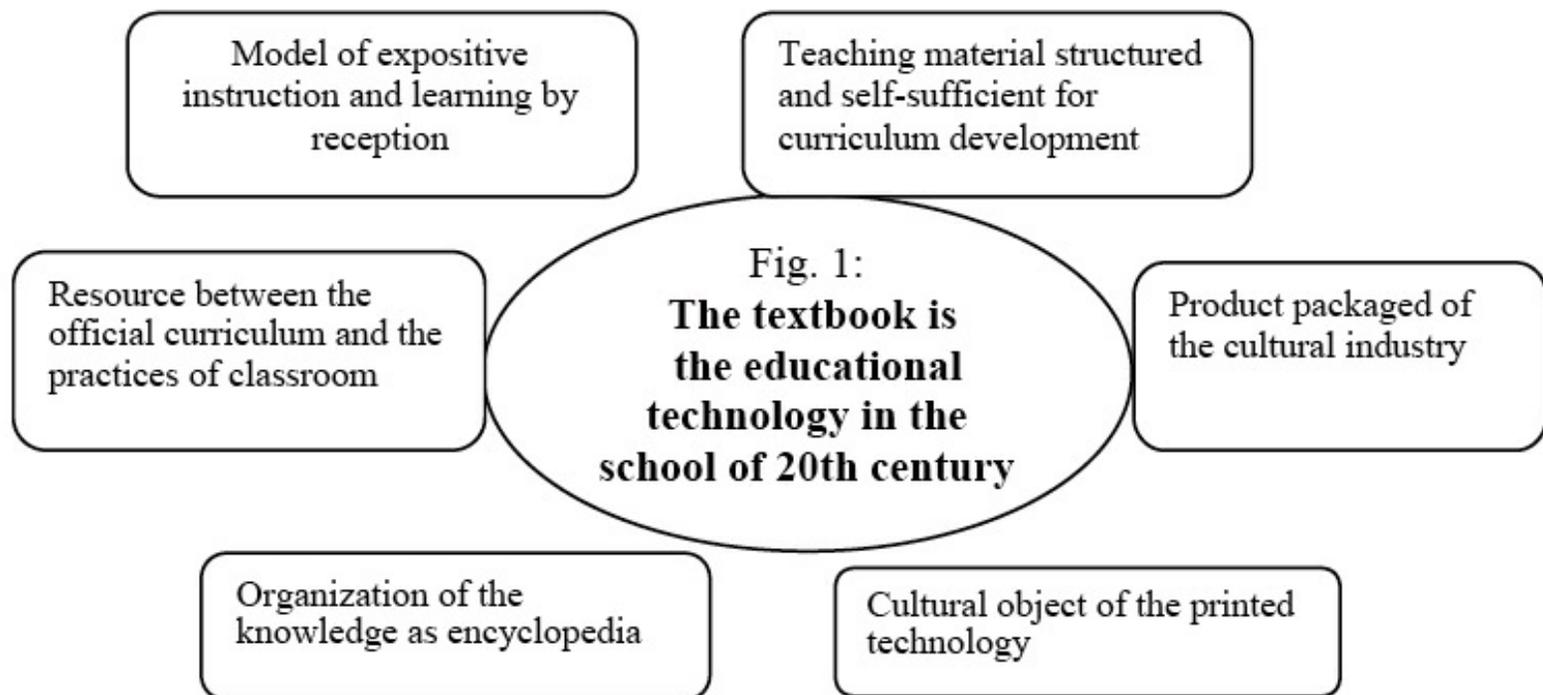
**Palabras chave:** *libro de texto, ludificación da aprendizaxe, ebook educativo, material educativo dixital*

## The textbook as the educational technology of the 20th century school

The textbook is the most genuine technological invention of the school institution. The textbook is labeled as the appropriate educational technology for a model of education based on the expositive instruction of the knowledge, in the individual learning, in a curriculum segmented by subjects and organized in function of ages and levels. The school and the textbook, along this last century, have constituted a so intense symbiosis that nowadays turns out to be very difficult to break. The natural habitat of school text is a classroom with an teacher that explains and some students that learn from books. In another model of education –as constructivism learning model- the textbook makes no sense and functionality. Of similar way, occurs with the traditional school. So that this function and be useful needs teaching materials, in format individual book for each student, that establish and offer along all the academic course the contents and the activities that should be complimented in the environment of the classroom.

Along the 20th century these rules of play were clearly defined. They were functional since they permitted to achieve, in greater or smaller measure, the educational goals established in the official curriculum and above all they were assumed, without to be questioned, for all the educational agents: teachers, students, families, governmental administrations, politicians and all people in general.

This status of privilege and monopoly of the textbook in the academic life of the schools would be able to be explained for the conjunction of different factors or phenomena that go beyond the technical characteristics of these printed works and that are pedagogical and sociocultural nature phenomena product. These factors of functionality and success of the textbook as educational technology is presented in the Figure 1.



## **The textbook is an appropriate technology for model of expositive instruction and learning by reception**

The concept of appropriate technology comes already from several decades behind (Klassen and Solid 1981) and refers to that certain technologies are adapted or they function efficiently in you determined contexts or situations. In our case, the textbook is the appropriate technology to the model of traditional education where the vision or dominant pedagogical theory is that of teaching through informative methods and of learning by reception. The textbook is the adequate technology for it since it offers a selection of the available knowledge for a determined matter or subject, the same one is organized and presented of sequential form and adapted, in greater or smaller measure, so much in its vocabulary and in its degree of difficulty to its potential users. The textbook is the central axis or cornerstone of the instruction in school education.

This pedagogical theory or conception of teaching-learning impregnated the genesis of the school institution in the middle of the 19th century and has been consolidated in the 20th century. Nevertheless, for more than one century, the experts and the so much coming research of the psychology as teaching established other theories and educational foci (the New School Movement: Decroly, Dewey, Piaget, Freinet, ...) that collided or they contradicted the theory of the school practices based on the broadcast of information well oral way –through expositions of the educational one to the assembly of the class, well material way like the textbook. In this sense, as we will see further on, the raid of the digital technologies and the environments online open new opportunities so that the pedagogical theories of the New School and of the psychology constructivist be generalized and be a habitual practice in the schools.

## **The textbook is a structured and self-sufficient teaching material for curriculum development**

The school curriculum, in most of the countries, has been conceived and elaborated as an instrument of prescription and control, on the part of the educational authorities, of the educational practices of the classrooms. The authors of curriculum critical sociology have showed that the governmental powers have utilized to the curriculum as the mechanism that to regulate and structure what is taught and learned in the schools. The grammar of the official curricula has a presentation format of the specifics objectives and contents to guide or prescribe the practice of the teachers.

In this logic, the textbook became the resource or more useful material to transfer to the classrooms the curriculum guidelines. Gimeno (1988) called to this phenomenon as the function translator between the official curriculum and the curriculum in action. The textbook puts into operation in concrete terms of daily practice of work in the classroom what are principles and supposed educational established in the official documents and formulated in generic terms. The school text is the only teaching materials that is conceived and elaborate to structure and to give form to a project of educational work for a complete school course. It's a didactic proposal closed and self-sufficient so that the role of the professor consists of applying it to his group of students.

## **The textbook is a product packaged of the cultural industry**

The birth of the school as social institution regulated by the modern state is a contemporary with the apparition and development of the industrialization. The position to teach, consequently, passed to be a craft activity and deregulated to be a task offered by the state with the purpose to form in mass to the greater quantity of youthful and childlike population of a determined country. Because of it, the standardization of the formative offering, the homogeneity criteria establishment in the selection and promotion of the students, as well as to guarantee that all the students to receive the same contents, ..., favored that there was an only material that guaranteed that all the educational, all the students and all the classrooms of the country to continue the same process and they taught the same know-how.

This material that permitted standardized these phenomena were the school text. Her logic of production, distribution and consumption was assumed by industries or private enterprises specialized in this type of cultural products created former I profess for the school activity. To date this market of the textbooks and other teaching materials has functioned without large starts, but the times are changing and this cultural industry, just like other similar linked with the leisure, the music, the literature, the movies or the press are in crisis by the explosion and omnipresence of the digital technologies. These they have broken the rules of traditional play with relation to who produce information, how is diffused and how is agreed to the consumption of the same one.

Set against the industrial model where the producers were private enterprises and where the extortionate to be able to consume any cultural product (a book, a newspaper, a movie, a disk) had to buy it, the digital technology is favoring that any subject can be converted easily in producer of information and to diffuse it in the network, as well as the possibility to reproduce the same work digitally carries to that this be easily distributed and accessible causing That, in many occasions, its consumption require not to pay for the same one. This carries us to the growing concept of licenses copyleft and of free resources and of open access, what has some enormous repercussions on the nature and potentialities of the new teaching materials distributed digitally. This sense, the textbook as object or cultural merchandise, to stops making sense to open a new type of educational materials online generated by the own educational based on the exchange, in the random access and in its recycling or recreation without commercial restrictions.

## **The textbook is cultural object of the printed technology**

The textbook is, above all, a printed book, a technological object of role. The school institution, since its creation in the middle of the 19th century, had always to the printed book as canon cultural, like referring fundamental for its educational function. The modern school is built around the book as cultural object. The education was always, and continues being, synonym of teaching literacy in the reading and writing since the same one is the indispensable competence to continue in the formative system and to acquire the condition of cultured person.

Exactly this goal, the eradication of the illiteracy, is the one that legitimized the social utility of the school since the teaching literacy is a necessary condition for the social progress and the democratization of the culture. The school text, consequently, became

that book specific and idiosyncratic that synthesized, organized and showed the knowledge that should be taught and learned in the classrooms. The school institution is a construction of the modern company because, among others reasons, adopted and was appropriated of the technology of the role on the one that the rationality was built and the thought of the western modernity. School and printed technology became a binomial inseparable to date.

The schools on the one hand, next to the libraries by another, were the public spaces of worship to the book as cultural object. The role of the school was to form the readers, the function of the library was to guard the books and to facilitate the democratic access to the same. During many decades was considered that the school curriculum should take charge of transmitting the cultural knowledge that was in the books, without another type cultural formats as the music in disks, the audiovisual, the cinematography and the photography among others. Nowadays, it is evident, that the school cannot continue giving the back to the new digital technologies since these, among others reasons, they have absorbed to all the other media to doing them practically to disappear. The culture, nowadays, is digital.

### **The model of knowledge organization in textbook is like a encyclopedia**

In parallel to the expansion in Europe of the printed technology and to the ideas that you insert in the pages of the books, to ends of the 18th century, began to be gestated a new vision of the knowledge based more in the reason that in the faith, supported more in the evidences and empirical certainties that in the truths revealed. The French movement known as Illustration established the architecture of the rational thought of West just as has arrived to ours present.

One of the objectives of the movement illustrated was to compile, to give form and to organize of systematic way what was the human knowledge. This process consisted of writing the "Encyclopedia" (1751-1772) that is to say, an assembly of books that they intended to classify and to organize the human knowledge to do it accessible to the public. The key axis of this organization of knowledge was the matters or scientific fields. This organizing model was the one that inspired and gave form to the school curriculum a century later.

This, consequently, it was divided into parts (the matters and subjects) being established the contents that should be taught. In this logic, the textbook appeared like a "small encyclopedia" adapted to the formative needs of the students in function of its level of know-how and age. The textbook is a son or consequence of a conception illustrated and encyclopedia form in the organization of the curriculum where there is primate more the knowledge to discipline that the competences or environments of learning of the subjects. This conception to discipline of the curriculum –in force to our days- requires, like we have just indicated, for its put in practice in the classrooms of "micro encyclopedia" for each matter and educational level.

## **The textbook is a resource between the official curriculum and the practices of classroom**

Finally a last phenomenon that explains the hegemony of the school text in the practices of classroom is linked with its function curriculum mediator that name previously and the role of the faculty in the same one. We refer to that the textbooks enclose a determined theory or vision of the educational professionalism (Martinez Bonafé 2010) that separates the producers of the consumers of these materials. The existence and status quo of the textbooks they consolidate a model of deskilling professional of the educational based on the social division of the work among experts or technical curriculum and master. These, through the textbooks, they become mere applicators or agents in their elaborate educational work proposals classroom in far away and alien instances of their school. Then they called curriculum materials "professors-proof" (as is the case of the school text) they are those that are elaborate by experts or businesses to offer him the professors products or material that to present a proposal or educational project "packaged" with their objectives, contents, activities and evaluation detailed. In this way, the textbooks replace the faculty in the process of takes of decisions of adaptation and implementation of the curriculum to its group of concrete students. The work of the educational one remains reduced to negotiate the use that carry out the students of the textbooks in the classroom and the home. On the other hand the lack of the formation and adequate competences, along with the characteristic constraints of the school job, causes that many educational have difficulties to plan, to develop and to evaluate educational projects that go beyond the mere broadcast of information. Trying to create alternative own materials to the textbooks require of another model of educational professionalism that implies greater competences to face situations of greater pedagogical complexity.

## **Beyond textbook: Digital texts and gamification of learning materials**

The massive raid of the ICT (information technologies and Communication) in all the environments and spheres of our company is producing a radical mutation of the forms to produce, to consume, to distribute and to agree to the information and the knowledge. The economic, cultural, and social impact of the omnipresence of the digital technology is very notorious and begins to be so generalized that is transforming what were the rules of up to now existing play in numerous institutions of the knowledge.

To date the schools and the classrooms have been, up to a point, waterproof to the utilization and pedagogical integration of the TIC. It is certain, that a lot of money has been invested and has gifted to the educational centers with classrooms or rooms of data processing and these, in their great majority, already they are connected to Internet of wide band. In many classrooms also there are laptop computers, tubes of multimedia projection and interactive digital shales. Nevertheless, many studies continue showing that the textbooks and other traditional didactic resources continue being the predominant and most habitual media in the practices of classroom. For example, in a recent study carried out in Spain (Area 2012) where him he was asked at more than 5,000 educational participants in the Project "School 2,0" (project that continues the politics of the model one 1:1, a computer by student) was found that the textbook

continued being the daily technology used of form wholesale number of professors, in spite of the existence of numerous digital technology in its classrooms.

These full situations of contradictions we should interpret them as own phenomena of a time of traffic among the "old school" and the "new school", among the school of the 20th century and that of the 21st century, among the school of the technology of the role, and the school of the digital technology. The direction or school horizon should advance toward the radical redefinition of the forms and educational goals of the education. In this sense works exist that have explored different possible settings of evolution of the school institution, and in all they, the TIC appear, with greater or smaller importance, as one of the axes or attributes of the future school OCDE (2001). In this sense, reports as the recently published by Fletcher, G.; Schaffhauser, D. and Levin, D. (2012) they fight determined by a school system –in this case for US- without textbooks in role and full of digital teaching materials.

What characteristics or characteristics should have these new alternative teaching materials to the traditional textbooks? Evidently the first characteristic is that they should be digital, not of role. It implies that the same should assume characteristics as the interactiveness human-machine, the hipertextually or connectivity among some parts and other of the content, multimedia in the sense of the utilization of different languages and expressive forms like the text, the image, the audiovisual thing, the sound, ..., and that they be distributed online.

On the matter, there are two large tendencies or foci of development of this type of digital educational materials:

- a. By a part they would be those materials of informational nature that, being digital, they continue being characterized for offering a proposal structured of presentation of the knowledge to the students. Evidently they are interactive, hypertextually, multimedia and online, but they belong to the tradition of the teaching material destined to the presentation or elaborate exposition of the knowledge. This focus has its roots or origin in the CAL (Computer Assisted Learning) and evidently today they adopt new forms as the electronic tablets.
- b. The other focus or tendency is the one that proceeds of more next approaches to the constructivism and to the experiential learning. It has their origins in the proposals of S. Papert and they are supported in the logic, interface and playful experiences of the videogames transfers to the educational environment. At present they respond to what is called "gamification of the learning".

In the following pages we will describe one and another focus that represent lines of work and experimentation of alternative digital educational materials to the traditional textbooks in role.

## **Structured educative texts: from paper textbooks to digital contents**

Textbooks have been remained unaltered for decades, but not their contents. Although their composition has evolved into more and more innovative and attractive materials for the students, the way they interact with them has not changed because of the limited possibilities of paper. Nevertheless, the advances of hardware and software during the last decades were the basis for newer and more effective methods for transmitting knowledge, moving the paper contents to the screen of even smaller portable devices. Concepts like interactive or e-books have appeared for the first time associated with textbooks and are changing the way students interact with their teachers in the classroom and how they study at home. However, this model is not only altered how the students learn, but has also changed who creates the contents and how are them distributed, giving more control to the schools of their educative textbooks if their technology gaps are filled.

## **From paper to the display: the e-book as a textbook**

Textbooks are one of the most profitable businesses today, so the appearance of technology companies like Apple, was only a question of time. The new rules within the editing industry have created a controversy between advocates and detractors of these novel technologies. When Apple's iBooks Author appeared in January 2012, teachers and educational institutions had for the first time a tool in their hands towards the creation of high quality interactive and multimedia educative contents for the iPad. Output of an iBooks Author is similar to an EPUB 3, but it uses its own proprietary tags, what it makes it incompatible with other platforms different from the iPad. iBooks Author is free, but it only runs within OS X 10.7.2 or later, and there is not a Windows version. The launch of iBooks Author was very criticized because of the restrictions of its EULA, which was clarified in February 2012 when Apple specified that only the .iba output file was subject to distribution restrictions if it is provided for a fee, but not the contents. Despite these restrictions, iBooks Author has been well accepted by educational institutions, teachers, editors and independent authors who pretended to create iPad oriented contents. However, this tool was specifically created for easy authoring of interactive digital textbooks, and this is what it makes it the best tool in the market for this purpose at the moment. Students can interact with an iBook in several manners, depending on the way on how the contents are designed: they are able to visualize videos and listening audio, interacting with figures and images, answering a quiz, visualizing 3D objects, etc. The possibility to embed HTML5 code adds the possibility of creating more personalized and interactive contents like puzzles, embedding YouTube clips, maps or even live polls widgets and so on. Students have also easier access to their textbooks, with rich interactive resources and multimedia contents, without having to carry a set of books to their school every day. Teachers can use a set of tools for authoring their own specific contents, and changing any part of the text does no result in a painful task. By contrast, Apple's technology is out of the limits of many families and schools, it is restricted to a closed environment and it is still not clear what is the influence in the acquisition of competences of the students. The tremendous success of Apple's iOS was closed followed

by Google when their first version of Android –version 1.5, Cupcake– was released. Android is an open source project, so many manufacturers started to compete against the iPad with their own hardware running customized versions of this OS. In September 2010 Samsung announced their first Galaxy Tab, which was immediately compared to the iPad during the IFA conference in Berlin. In only two years, other important companies like Sony, ASUS, Acer, Toshiba or even Amazon, developed their own tablets using their own customized versions of Android. In addition, other smaller companies –mainly Chinese– wanted a piece of the pie, but with less success. Owing to the huge variety of devices of different vendors, Android OS has not been able to get into the classrooms as iPad did. This system simply has become too heterogeneous when trying to design digital educative textbooks and related applications: The different sizes of the screens and resolutions from different manufacturers become a nightmare to developers when designing educative contents. As a result, textbooks and educative apps remain dominated by iOS owing to the high fragmentation of Android. On the other hand, the apparition of the HTML5 standard was the reason why some companies have adopted it to make tools to create easily distributable contents, compatible with any platform. Most of these tools are relatively high priced, but contents created are not subject to any distribution restriction like Apple’s iBooks Author. Examples of these tools are stand-alone applications like Adobe Captivate 6 and Articulate, which are specifically oriented to the creation of educative contents. The trespassing of the rules imposed by editors carried by independent authors has gone one step further, since they can freely distribute their digital educative textbooks on the Internet, where hundreds of free educational textbooks –some of them are interactive and others not– can be downloaded for free. One example of this type of distribution is the non-profit CK-12 Foundation, which provides more than 15,000 resources, many of them under one of the Creative Commons licenses available.

### **Not just digital textbooks on tablets**

Following a strict definition, digital textbooks can be presented on tablets like paper textbooks with the addition of multimedia resources and advanced widgets, but many teachers have gone further, and use these technologies adopting different points of view and methods to interact with their students. This focus implies changing how the knowledge is presented and how the teacher interacts with his or her students. In many cases, textbooks adopt the form of educative apps with several targets. Some of them are thought to get the students more concentrated on the concepts being taught and are able to balance the class from the teacher to the students, aiming them to participate and bringing back an instantaneous feedback to the teacher. Others are oriented to present the contents more attractively and dynamically, getting the students more engaged, giving them the possibility of online accessing after their classes or even adding or modifying contents. These educative apps usually consist in the framework for building, authoring and sharing educative contents to students and other educators. Social networks become an important aspect to take into account, and many of these apps have their own social networking platform and/or are able to share contents with others. This implies that the success of an educative app depends on the size of the

community using it. Other apps just present the contents in a nonlinear way, like an encyclopaedia, but including activities, extended resources and tools, making the contents easily searchable, attractive and interactive. These are not pretended for building contents, but to present them. Lastly, a third group of educative apps mix gaming with the corresponding curriculum, most of them oriented to younger students, becoming more an instrument for the development of their capacities than a way to expose complex concepts.

The number of educative gaming apps has increased exponentially since Apple presented the first iPad in 2010. Now there are thousands of educative apps and educative games available for different platforms, so it is getting easier to build a set of apps for any educative requirements on a portable device. This sharp increase in the number of educative apps initiated by Apple has popularized the iPad between students and professors. Some educative institutions have recently started one-to-one programs, so their students have now the opportunity of using their iPads at home, but in fact, this implies an increasing technology gap, as many educative institutions cannot afford these initiatives. However, technology is evolving faster: cloud computing is now a reality, so educative digital textbooks and educative apps will embed the future innovations of the following years. The future evolution of digital educative materials has established its basis the actual ICT technologies, and HTML5 has demonstrated its potential for the creation of high quality educative materials and contents. As HTML5 matures, its combination with the possible short-term appearance of a competitive authoring tool, able to output digital textbooks in compliance with the EPUB 3 standard, a prizing drop of mobile devices and further improvements in their power and OS's, will help to the democratization and the easy access to educative digital textbooks of students all over the world, independently of the platform being used.

### **Breaking the rules: Gamification of learning and educational materials**

In this section we explore the design features to gamify educational materials. To do this, first of all, we explore the mechanics of video games, wondering why games produces "engagement" in his players?; And can we learn the engagement features of videogames to apply it in the teaching-learning process?. Finally, we present a set of properties that can be taken into account as design guidelines for educational gamified materials. This set of properties secure the engagement of educational materials.

### **What can we learn from video games?**

Scientific research into video games has been rather scarce, only coming into its own in the 80s, when video games first started to proliferate. This research has focused mainly on the negative effects of video games, namely aggressiveness, addiction and withdrawal, and was based on previous research into the effects of TV (Irwin & Gros 1995; Welch 1995; Flood, Heath & Lapp 1997; Cesarone 1998; Wellish 2000). The result has been a social discourse that has uniformly discredited video games and, by extension, games, platforms and players, producing a negative effect on its perceived educational potential. There still continues to be a mistaken cultural perception regarding the educational potential of video games and also a persistent and deep-rooted dominance of lecture classes in our educational systems.

But in fact, research has demonstrated the practical non-existence of negative effects, along with the presence of some positive ones, including those of an instructional nature (McFarlane, Sparrowhawk & Heald 2002). So, we can affirm that videogames can be really powerful learning tools to help people to learn to solve problems and allow them to adopt new reasoning forms and transform the learning process in interesting, easy and fun.

According to Prensky (2005), there are two main reasons for the use of video games as tools for the support of the study: (1) the new students have changed radically, and (2) this students need to be motivated through new forms to learn. Our new learners grow up with the current digital technology, and computer games are part of it. They are digital natives, because they were born and grew up in a technological word. On the other hand, most of us were not born into the digital era. However, we need to use digital technology in our day-by-day activities. We are digital immigrants because we need to adapt our lifestyles to the new digital technologies, and well designed educational digital games can be an excellent support instrument. A current research area called DGBL (Digital Game-Based Learning) addressed this problem.

Of note is Jane McGonigal's assertion that "video games can make us better persons and help change the world" (McGonigal 2010). She states that there is a lack of research regarding the skill set that is acquired in immersive environments and why players, who often feel frustrated and are marginally integrated in real life, feel successful in these types of settings where they spend a great deal of time cooperating with others to achieve common goals. One example of this is provided by the online game World of Warcraft (WOW), which has a Wiki with over 80,000 pages and 11.5 million players who devote 22.7 hours a week to engage in epic quests and work as a team (Corneliussen & Walker 2008). Although not designed for educational purposes but ludic, the use of commercial games like World of Warcraft open up a world of possibilities in education today (Chang 2008; Corneliussen & Rettberg 2008; Hui-Yin & Shiang-Kwei 2010; Golub 2010; Ducheneau 2010; Pirius & Creel 2010; Bainbridge 2010), such as: students collaborating and discussing ideas, possible solutions, connecting with other students around the world, on topics of study, immersing students in a learning experience that allows them to grapple with a problem, gaining higher-order thinking skills from pursuing the solution, among others.

While not targeted at education, nor seeking to cover any type of educational content, Green and Hannon (2007) cite multiple skills associated with being a "guild master" (one of the roles in WOW), such as: attracting, evaluating, and recruiting new members; creating apprenticeship programs; teaching children to work together for a common goal; communication skills; understanding multiple perspectives, respecting and even embracing diversity of views, understanding a variety of social norms, and negotiating among conflicting opinions; orchestrating group strategy and organized thinking; managing disputes, etc.

We see that the objectives intended through the use of these game types in the education where mainly the improvement of instrumental, interpersonal, informational and digital competences, which includes cognitive skills, methodological skills, technical

and language skills, teamwork skills, self-critical capacity, ethical commitment, skills about searching information, selecting it, analyzing it and extracting it and social communication and interaction (collaborative work, chats, forums). In this sense, through the activities around the videogame it is possible to contribute to the use of information technology and communication and to develop 21st Century skills (Gonzalez et al. 2012).

Thus, commercial videogames can help in the developing of different skills of students. These potential formative benefits have been studied under the project "Educational Games in the Classroom" (Felicia 2009).

On the other hand, in the most cases of "educational games" -games designed for specific learning purposes-, the learning principles tend to be more focused at practice and exercise than at understanding. This means that the student can memorize the answer to a question that shows many times, but without understanding the underlying rules. Moreover, the knowledge is obtained through the included contents in the game, and the cognitive skills are developed as results of the player actions. On the other hand, most games have a very basic gameplay, often derived from classic games or a simple adventure.

But, ¿what are the differences between a videogame from an educational video game?, ¿which characteristics that make video games so "addictives" ? ¿how can incorporate these characteristics into the activities and resources?. In the next, section we propose some main game characteristics and methods for the creation of educational activities.

### **How can we mix gaming in education?**

In "What Videogames have to teach us about learning and literacy", James Paul Gee (2003) maintains that good video games are "machines for learning" since they incorporate some of the most important learning principles postulated by today's cognitive science. Specifically, he states that:

- a. Good video games provide the users' information on demand and as needed, not out of context as is often the case in the classroom. It is much more difficult for people to remember or understand information that is given out of context or well before it is needed.
- b. Good games are capable of presenting users with tasks that are challenging, but at the same time doable. This is essential to maintaining motivation throughout the learning process.
- c. Good games convert their users into creators, and not mere receptors. Their actions influence or build the game's universe.
- d. Good games feature initial levels that are specifically designed to provide users with the basic knowledge required to allow them to build generalizations that will enable them to face more complex problems.
- e. Good games create a "cycle of mastery", in which players acquire routines through which they increase their level so as to accomplish a specific task. When said task is mastered, the cycle is started again with more difficult tasks.

As a result, many of these characteristics can be used for learning the material and skills

relevant to school and professional work.

Moreover, in the design of an educational video game can be considered a set of properties that securing the “learn to play and play to learn”, that is named “educational playability”. In general terms, “playability” (González Sánchez 2010) can be defined as: “a set of properties that describe the player experience using a specific game system whose main objective is to provide enjoyment and entertainment when the player plays alone or in company”. In extension, the educational playability is not limited to playful objectives but must take into account educational objectives, such as learning while having fun, improving the abilities of students to solve complex problems, reinforcing players’ skills and improving player experience (Ibrahim et al. 2012) (Table 1).

**Table 1. Playability Design Patterns to Facilitate the Design of Educational Video Games (Ibrahim et al., 2012)**

<b>Educational Playability Proprieties</b>	<b>Description</b>
<i>Satisfaction</i>	The gratification or pleasure derived from playing a complete video game or from some aspect of it
<i>Learnability</i>	The player’s capacity to understand and master the game system and mechanics (objectives, rules, how to interact with the video game, etc).
<i>Effectiveness</i>	The resources needed to offer players a new experience -fun and learning- while they achieve the game’s various objectives and reach the final goal.
<i>Immersion</i>	The capacity of the contents to be believable, such that the player becomes directly involved in the virtual game world.
<i>Motivation</i>	The set of game characteristics that prompt a player to realize specific actions and continue undertaking them until they are completed.
<i>Emotion</i>	This refers to the player’s involuntary impulse in response to the stimulus of the video game that induces feelings or a chain reaction of automatic behaviors.
<i>Socialization</i>	The set of game attributes, elements and resources that promote the social dimension of the game experience in a group scenario.
<i>Supportive</i>	The ability of the game to keep the player motivated, to teach players/students effectively and encourage them to continue learning and achieve the learning objectives.
<i>Educative</i>	The educational characteristics of the game and the ability of the player to be aware of, understand, master and achieve the learning goals

Relating to the “addictive” or “engagement” component of games, we can found the “gamification” concept (Zichermann & Cunningham 2011). Essentially, gamification tries to applying the mechanics of the games in other settings, such as the educational environment. This concept is not directly related to game design, but seeks to engage the user through small doses of challenges and rewards in order to get that the user perform certain actions in different environments.

Gamification works to satisfy some of the most fundamental human desires: recognition and reward, status, achievement, competition & collaboration, self-expression, and altruism. People are hungry for these things both in their everyday world and online. Gamification taps directly into this.

The game mechanics can be of different types, such as: a) behavioral (focused on human behavior and the human psyche), b) feedback (related with the feedback loop in the game mechanic) and c) progression (used to structure and stretches the accumulation of meaningful skills). In Table 2, we present a proposal of different suggested game mechanics to gamify environments, in our case, educational gamified

## materials.

**Table 2. Proposal of recommended game mechanics to be used in educational materials**

<b>Game mechanic</b>	<b>Description</b>
<i>Collection</i>	It exploits the human characteristic of “collector”, all are or have been collectors of something: books, records, pictures, movies, etc.
<i>Points</i>	It is the most used mechanical, in real life we handle sports scores, grades in school, etc.. We reward or punish through the points given or removed, respectively. Points are a running numerical value for a single action given or a combination of actions.
<i>Comparisons and classifications (leaderboards)</i>	It exploits the social component, the effort is compared with other users and / or other types of classifications (global, local, etc..). Leaderboards give users the feeling of “fame” and “status.” They also give users the chance to compete and compare with other members or players.
<i>Levels</i>	The levels are related to the user experience or level of expertise (expert users, beginners, etc..). Karate belts, job titles, and frequent flyer programs are just some of the examples. They are to shorthand indicator of status in a community and show that you should be afforded respect for your accomplishments.
<i>Status</i>	Status is the ranking or level of a player, related to the scores obtained by users, users are motivated to achieve a high status.
<i>Feedback</i>	People are used to receiving feedback on their actions, it is important to reward positively and provide information to the user about his condition, the environment, and their achievements. For example, showing the progression in which the success is granularity displayed and measured through the process of completing tasks. Or giving rewards to motivate users: points, badges, trophies, virtual items, unlockable content, digital goods, etc.
<i>Achievements</i>	Achievements are a virtual or physical representation of having accomplished something, usually considered “locked” until the user have met the series of tasks that are required to “unlock” the achievement, for example virtual coins, medals or badges.
<i>Epic meaning</i>	Players will be highly motivated if they believe they are working to achieve something great, something awe-inspiring, something bigger than themselves. Examples of this mechanic applied to education could be, the fight to save the planet while they are learning about the environmental care.

There are other game mechanics that can be used for gamification materials and educational activities, such as: time (the players have some limited time to perform a task), exploration (players have to explore and discover things that will surprise them), challenges between/among users (players can challenge each other and compete for the achievement of objectives, objects, medals, etc..).

It is also important to have other people with whom to compete, collaborate and compare accomplishments. As a general rule, humans want to interact and compete with others. In the social game, the objectives can be competitive or collaborative. When you get users to compete and collaborate as part of something bigger, it increases the stakes, adds another level of accountability and is a dynamic motivator. So, in team games must be considered separately the mechanics that influencing the team (win projects, group scores, etc.) as well as the mechanic is that influencing the individual (motivation, positive reinforcement, etc..). In a best-practice implementation, a user’s individual achievement should be rolled up under the group or team’s success and highlighted in inter and intra group leaderboards and news feeds.

The best way to approach this is with a standard ranking system. Once you have identified the actions for environment, system or activity, you will want to rank them in order of value. Start with the least valuable action and give it a factor of ‘1.’ Working from there, assign relative values to everything else.

So, you can use different kinds of point for different purposes and activities, for example: basic points (usually earned by participation and spendable on virtual or

physical goods), experience points (earned by participation, constantly increasing and the point total is never deducted, not spendable), premium points (only for some special action, spendable on "premium" virtual or physical goods). Once they reach a set number of points, they progress on to the next designated level. Alternatively, another option is a hybrid approach, mixing points and tasks to allow the users to progress. Badges should tie directly into the goals and to what users care about and are proud of. They also encourage exploration of your site, even mastery. Badges can also be used to encourage users to take a specific action. Some badges can be "aspirational," requiring certain prerequisites such as achieving a certain level or owning another badge or virtual good.

Another option is to use the time to reward students based on the made activities, such as:

- Every time - Every time that participating in the forum, the student earn 10 points.
- After X times - After 10 participations, the student get a trophy.
- Score higher than X - Score 90 or more on the quiz, and receive 100 points.
- Time limited - The clock is ticking! Now or never...

Moreover, the gamification of educational resources can be enriched through the use of mobile devices and tablets (smartphones), using geolocation and social networking. These wide possibilities are still uncharted; there is a long way to explore....why we do not start now?

## **Conclusion**

The printed textbooks and the traditional instruction are in crisis. Some countries already have announced the establishment of educational politics destined to substitute the textbooks by digital educational materials. For example, the South Korea Department of Education has planned that the tables and other electronic devices will replace the textbooks of role in the year 2014. In U.S.A.. various federal states as Florida or California already have begun this process. The State Educational Technology Directors Association (SETDA) demand that this process finish in the course 2017-2018 (Fletcher; Schaffhauser, and Levin 2012).

Already there are many voices that admit the need and urgency that the school be appropriated of the digital technology and transform of radical way its pedagogical practice. It is time to break the rules in education in schools. Students should learn together, should research and develop projects, must be independent and must use much digital technology. We must go beyond textbooks and traditional teaching that transmits information

In this chapter, we have intended to synthesize two of the most noticeable foci of the digital alternatives to the textbooks: on the one hand, educational digital books that respond to a vision structured of the knowledge, and by another to the gamification of educational material that offer flexible and open experiences of learning supported in the contributions of the videogames. Our position is not to defend in exclusive a focus or another, but to present the need that in the school of the 21st century both types of

materials live together. The presence and use of these different technologies (structured digital contents and gamification material) will provide the students so much varied learning to formal teaching processes bias as of playful and more informal experiences.

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# Future teachers' perceptions of the pedagogical use of digital textbook in the learning process

*La percepción de los futuros profesores del uso pedagógico de los libros de texto digitales en los procesos de aprendizaje*

A percepção dos futuros professores do uso pedagógico dos livros de texto digitais nos processos de aprendizagem

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**Abstract:** *Using digital textbook (from now on, DTB) in the learning context has been gradually gaining importance in the 21<sup>st</sup> century educational scenarios. Nevertheless, there is ambiguity in the literature and in the educational field as far as the advantages and efficiency of the widespread use of digital textbook. In order to understand, in the Portuguese context, the implications foreseen, as far as the learning process is concerned, on the use of digital textbook, the present study focuses on students' perceptions of some pedagogical and functional issues related to the use of digital textbook and was carried on at a higher School of Education in Oporto. A total of sixty-six students from postgraduate classes (future teachers/educators of children from five up to eleven years old) participated in the study by completing a survey questionnaire regarding their representations on their familiarity, perceived pedagogical advantages, textbook format preferences (print vs. digital) and learning potentiality of the digital textbook. The results illustrate the importance given to digital textbook, and despite the fact that the students were, to a large extent, unaware of the concept of digital textbook, their perceptions on the usability and pedagogical aspects indicate, on the one hand, the need for continued growth in the number and variety of digital textbook made available and, on the other hand, that more research on this subject is needed.*

**Keywords:** *Digital textbook, teachers training, perceptions*

**Resumen:** *El uso de libros de texto digital (de ahora en adelante, LTD) no contexto educativo foi gañando pouco a pouco importancia nos escenarios educativos do século 21. Sin embargo, hay una ambigüedad en la literatura y en el ámbito educativo cuanto a las ventajas y la eficacia de la utilización generalizada del libro de texto digital. Con el fin de entender, en el contexto portugués, las consecuencias, para el proceso de aprendizaje, del uso de libro de texto digital, el presente estudio se centra en las percepciones de los estudiantes sobre algunas cuestiones pedagógicas y funcionales relacionados con el uso de libros de texto digitales y se llevó a cabo en una Escuela Superior de Educación situada en el Porto. El total de sesenta y seis estudiantes de clases de posgrado (futuros profesores / educadores de niños de cinco hasta once años) participaron en el estudio, completando el cuestionario con respecto a sus representaciones cuanto a su familiaridad, ventajas pedagógicas percibidas, formato preferencial de lectura (impresión vs digitalmente) y la potencialidad para el aprendizaje del libro de texto digital. Los resultados ilustran la importancia que se da a los libros de texto digitales, y aunque los estudiantes expresan, en gran medida, un desconocimiento del concepto de libro de texto digital, sus percepciones cuanto a su uso y a los aspectos pedagógicos indican, en primer lugar, la necesidad de un crecimiento continuo tanto cuanto a su importe cuanto a la variedad de libros disponibles en texto digital y, además, que se necesita más investigación sobre este tema.*

**Palabras clave:** *libro de texto digital, formación de profesorado, percepciones*

**Resumo:** *O uso de libros de texto dixital (de agora en diante, LTD) no contexto educativo foi gañando pouco e pouco importancia nos escenarios educativos do século XXI. Porén, existe unha ambigüidade na literatura e no ámbito educativo en canto ás vantaxes e a eficacia da utilización xeneralizada do libro de texto dixital. Co fin de entender, no contexto portugués, as consecuencias para o proceso de aprendizaxe do uso de libro de texto dixital, o presente estudo céntrase nas percepcións do alumnado dunha escola superior de educación situada no Porto sobre algunhas cuestións pedagóxicas e funcionais relacionados co uso de libros de texto dixitais. Participaron no estudo o total dos sesenta e seis estudantes de clases de posgraio (futuro profesorado e educadores/as de nenos e nenas de cinco ata once anos), que cubriron o cuestionario con respecto ás representacións en canto á súa familiaridade, vantaxes pedagóxicas percibidas, formato preferente de lectura (impresión vs dixitalmente) e a potencialidade para a aprendizaxe do*

*libro de texto dixital. Os resultados ilustran a importancia que se concede aos libros de texto dixitais, e aínda que os estudantes expresan, en gran medida, un descoñecemento do concepto de libro de texto dixital, as súas percepcións en cuanto ao seu uso e aos aspectos pedagóxicos indican, en primeiro lugar, a necesidade dun crecemento continuo tanto en relación á súa importancia como en canto á variedade de libros dispoñibles en texto dixital e, en segundo, a necesidade de seguir investigando sobre este tema.*

**Palabras chave:** libro de texto dixital, formación de profesorado, percepcións

## Introduction

In contemporary societies, children and teenagers are growing up in a world where digital technology is all over. The widespread use of information technology and communication (ICT) and online services by the teenagers in their lives, whether for leisure, fun or in their social relationships has an impact on their learning needs, on their requirements and expectations. There is therefore a need to equip them with the ability to learn skills for their personal development, to participate in society and in future working life, because they are increasingly using ICT to learn everything. That is how this "learning new generation" (also called the New Millennium Learners by OECD) was born and how new learning forms are arising, such as informal learning, largely boosted, though not determined, by the opportunities offered by ICT.

Considering the fast pace of ICT evolution, we think that educational institutions (particularly those engaged in teacher training) should consider a strategic update of the different possibilities that technology offers, by bring examples, practices and/or theories typical of this arising scenario of the new learning.

Despite the existence of numerous ICT application possibilities, new ICT tools, public social network applications - Web 2.0 and Learning 2.0-, as well as recent opportunities to learn via mobile or playing games, among others, the DTB really fits both this educational paradigm and the way this new generation learns. In fact, according to Morgado and Morgado (2012: 148), «educational institutions are led by actors who strive to deliberately assume themselves as "digital immigrants", having in mind a generation of "digital natives" that requires active and evolvable methods, so knowledge and knowledge processing must occur in new formats, more challenging, so that "digital natives" could identify with them, by taking advantage of ICT in general», and of DTB in particular.

Considering that the current and future learning in a knowledge-based digital society is more horizontal and open, comprising learners as active contributors, new challenges arise. Some are already with us, namely, the importance of soft/transversal skills (e.g.: learning to learn, creativity, innovation, collaboration), the teachers' crucial (but changing) role, the increasing value of informal learning, and the alternative methods to assess, and certify the skills, the tacit knowledge and the experience skills, among others. Therefore, it's urgent for schools and teacher training schools to find ways to support this new learning generation, opening paths for modern learning in order to acquire skills to a professional context, not forgetting the learners' perceptions regarding the current context. In this work, the concern is to understand and discuss the prospective teachers' perceptions as far as DTB is concerned, using as a reference the teacher education at an education school in Portugal.

## **The training context of study participants**

Since its origin, the Escola Superior de Educação de Paula Frassinetti (ESEPF) has been developing its activity through the systematic and unsystematic education with a special concern: the promotion of a global education and the harmonious development of the human being in its different dimensions (individual, communitarian and transcendent). ESEPF establishes Education as a scientific and professional domain that, in a transdisciplinarity process, aims to generate, spread out and apply knowledge on multiple contexts, speeches, citizens and processes that configure education as a field of practice and research, benefiting from a closeness relation among collaborative college members, students and institutions. In this direction, undergraduate courses constitute a first stage in the professional training and development of kindergarten, primary and middle school education teachers, intending to develop knowledge that constitute basic foundations of the personal, professional and citizenship development in a democratic society.

This curriculum is organized to allow the skill development in different knowledge areas, which forms the basis to the second study cycle and entitles to teaching. The objectives definition represents the purpose of a consistent training in the areas of General Educational Training, Teaching Training, Specific Teaching and Initiation to the Professional Practice, as defined by the Decree-Law 42/2005 of 22nd February, the Decree-Law 74/2006 of 24th March and the Decree-Law n.º 43/2007 of 22nd February, articulated with the general and specific profile of the professional performance of the Infancy Educator and the Teacher of Primary and Secondary Education. The learning of the human being, the knowledge and the know-how constitute the pillars of this dynamic process of training, based on the participation, negotiation, reflection and the knowledge questioning.

ESEPF main goal is the reflection, scientific production, the training of students/teachers and the knowledge disclosure in the education field. Within its principles, there is the purpose of developing these aspects in a humanitarian, participative way, supported by the continuous scientific knowledge development. All the study cycles intend to construct a global perspective in political, organizational, curricula, educational psychology and social aspects. Thus, the purpose is the assimilation of scientific, artistic and technological knowledge by students, which allows the construction of a global overview of children and the contexts where they grow and develop. The development of this knowledge and of personal/professional skills is enabled by reflection attitudes, critical spirit, the intellectual curiosity, openness to diversity and collaborative work, in a throughout life training perspective.

## **Goals of the study**

Some of the problems related to the use of DTB - the difficulty of reading from digital display, the need of mastering digital and the cognitive skills for making effective use of this tool, and the lack of a larger and more diverse range of DTB available (when compared to the heavy weight of printed versions of textbooks), among others - have been emerging as some of the most important reasons that justify the relatively low use of DTB in the context of Portuguese educational system.

Accordingly, and in order to verify if these problems were perceived by our postgraduate

students, the main goals of this study were to determine students' perceptions of the following aspects:

1. Knowledge on the digital textbook format;
2. Expectations on the use of the digital versus printed textbook;
3. Pedagogical potentialities and limitations of the DTB in learning environments.

## **Tools**

A structured survey questionnaire consisting of twelve questions was designed in order to retrieve data concerning:

- i. the sample's characterization in terms of the students' age and the frequency of computer's use;
- ii. students' perceptions about the following aspects:
  1. Knowledge on the DTB format in terms of their familiarity with the concept, level/degree of experience and identification of the relevant features;
  2. Expectations on the use of the digital versus printed textbook as far as its usefulness, specific purposes and format preferences;
  3. Pedagogical potentialities and limitations of the DTB in terms of the perceived learning potentiality, the impact on study methods and possible advantages and disadvantages.

The questions were presented in a deliberate random sequence, in order to reveal possible inconsistencies in the answers, given the fact that we are dealing with student representations.

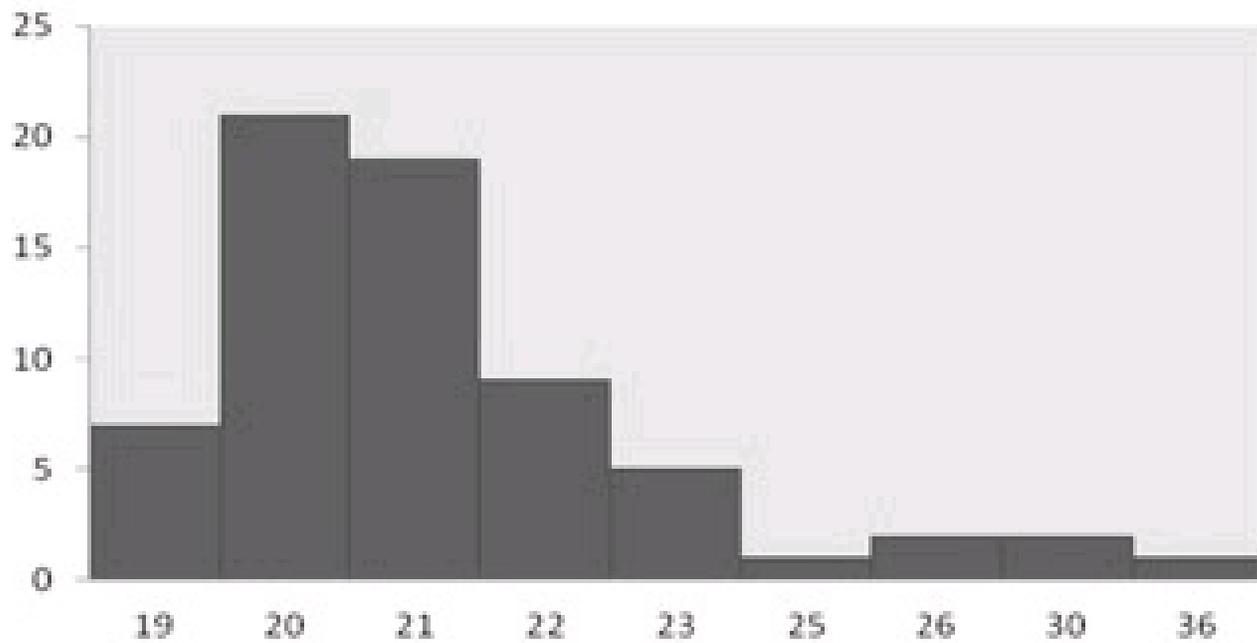
Ratings were made on a 1-2, 1-4 or 1-5 Likert scale for some questions, depending on the subject. In some other questions, ratings point to the number of students that agree with a given statement. The survey questionnaire was distributed during the fall semester in 2012 and can be found in Appendix A.

## **Participants**

Data were collected anonymously, during the 1<sup>st</sup> semester of the school year 2012-2013 from three postgraduate classes that constituted the convenience sample for this study. The participants, 65 students (all female), were carrying their postgraduate studies in order to become educators/teachers of five to eleven year old children. The selection of the participants to integrate the study was restricted to postgraduate students, on the account of their experience both in the educational context and in the domain of ITC; only one responded that doesn't use the computer in her daily practice.

The sample student's average age is 21 and a half years old and its distribution according to age is shown in figure 1 (age – horizontal axis; frequency or number of participants – vertical axis).

Figure 1: Distribution of the study participants according to their age



## Procedure

Students were asked via electronic mail to complete the questionnaire, which was administered on a [google.doc](#) format<sup>1</sup>. It was not compulsory to complete the questionnaire, since it was not part of the any class requirements and students participating in the study were given no incentive to do so.

Due to scheduling issues and time considerations, it was not possible to conduct a pilot study (pre-test) of the survey questionnaire.

## Results: presentation and discussion

The results will be presented in order to attend to the three major study goals as far as student's perception of:

- i. their knowledge on the digital textbook format;
- ii. their expectations on the use of the digital versus printed textbook and
- iii. the perceived pedagogical potentialities and limitations of the DTB in learning environments.

### Students' knowledge on the digital textbook format

In order to determine the students' knowledge on DTB, they were asked to evaluate their familiarity with the concept, their level of experience and to identify the relevant features of DTB.

As far as the first question is concerned, we found that 60% of the respondents were not familiar with the concept.

As for the minority of the participants that answered affirmatively, they were asked to identify the contexts they associated with the use of the concept. Only 7 did that identification: each one identified only one context and, as we can see below, there is a somewhat generalized confusion between the concept of DTB and that of a digital text:

- In primary school manuals;
- Actual daily news, schools and students reading support;
- Didactic (Educational) books in the classroom or ludic books during the free time;
- Text books that can be digital in teaching context and playful too;
- It is the book that can be read / looked up on the computer;
- I often see, more and more people using PDA's, mobile devices, laptops to read books. Instead of carrying books often heavy, people choose digital books;
- Actual daily news, schools and students reading support.

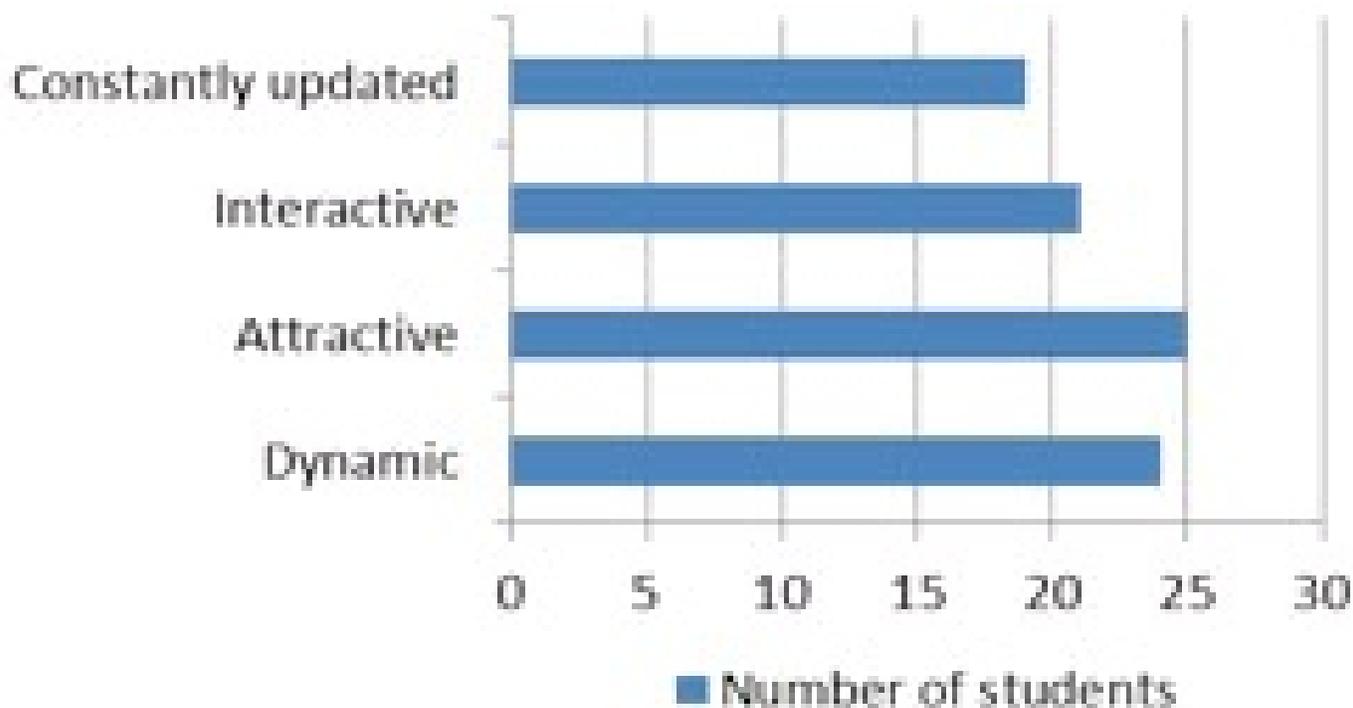
This mismatch in the conceptualization of DTB is not new and it can be explained attending to the low rate of use and implementation of DTB in the academic Portuguese context, which makes them still very poorly understood devices.

In the next question, the participants were asked to evaluate their level/degree of experience with DTB. The majority of them stated they have never experienced (54%) and about one third had a limited experience with this tool. Only five students evaluated their experience as good and no one considered their level of experience to be exceptional/ high.

According to this scenario, we consider that teacher training should emphasize the dissemination of new multimedia learning resources like the DTB, truly taking into account the challenges of a digital culture.

In one of the final questions, the participants were asked to identify, from a set of given features, the ones they considered to be relevant to describe the DTB.

Figure 2 "How do you classify the Digital Text Book?"



Although our participants' knowledge on DTB was poor, they were able to identify, in an equal manner, some of the most relevant features of this tool as being its dynamism and interactivity (given the benefits from learning with hypermedia and multimedia), its

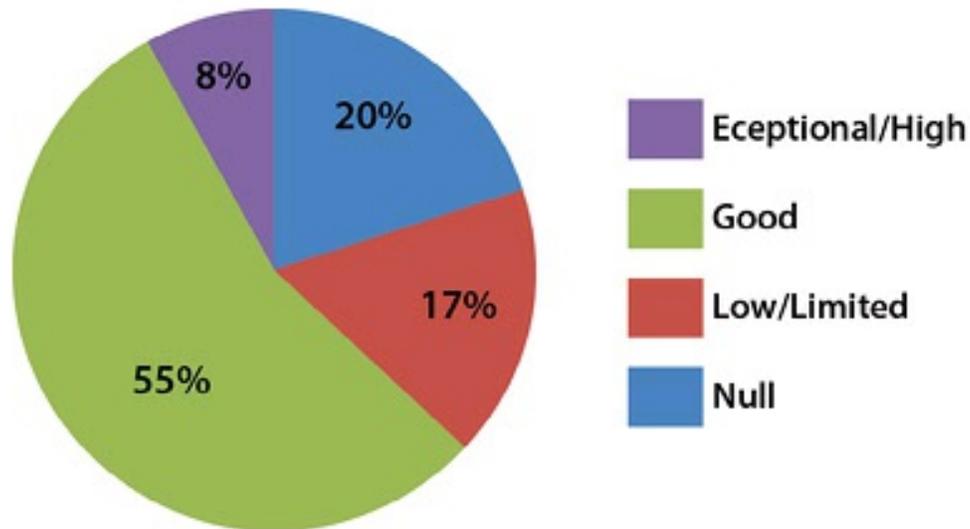
attractiveness and constant updating.

Anticipating the students' unfamiliarity with the subject, we thought it would be interesting to explore their expectations both on the general use and on the perceived pedagogical potentialities and limitations of the DTB.

### Students' expectations on the use of the digital *versus* printed textbook

In one of the next questions, we asked the students to rate their expectations for the usefulness of the digital textbook.

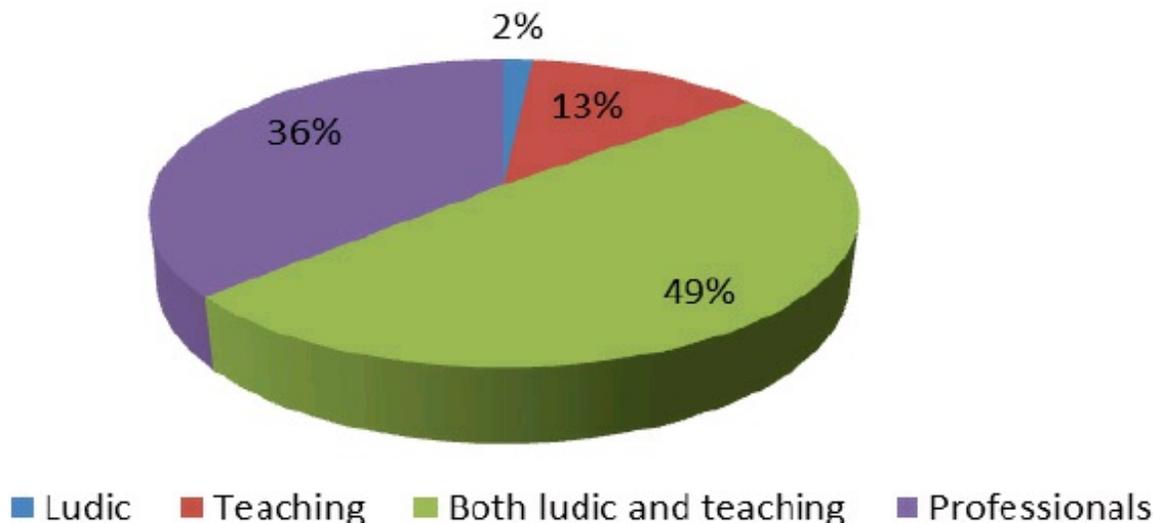
Figure 3: "Evaluate your expectations regarding the Digital Books usefulness"



The majority of the students rated their expectations as being good and only 5 students (8%) as being exceptional/high. A considerable minority of 37%, however, reported to have null or limited expectations as far as the DTB usefulness. We can interpret these answers as indicators that there may be a lack of interest on part of schools or simply a lack of knowledge about this available technology.

Students were then asked to rate their expectations on the use of the DTB as far as specific purposes (ludic, teaching, both ludic and teaching or professional in general). The results can be seen in figure 7:

Figure 4: "Evaluate how you will expect to use the Digital book in the near future"



Almost half of these students reported expecting to use DTB for combined ludic and teaching purposes, thirty-six percent for professional purposes and thirteen percent only

for teaching purposes. We would like to enhance here a certain depreciation of the ludic functionality, per se, of the DTB, unless when combined with a teaching purpose, which seems to be a most relevant feature for these students who will soon be teachers.

With the next question, we intended to perceive how much they expected to use the digital textbook in comparison to the paper book. Once again, the participants revealed a wise sense of proportion: none of them reported expecting to use only paper book and only one stated the intention of using exclusively the digital textbook. The majority of the participants, fifty one percent, reported they intended to use the paper and digital text about evenly.

In fact, other studies [like Weisberg (2011)] have shown that, as far as students are concerned, DTB are becoming more and more popular but are not yet ready to completely replace textbooks:

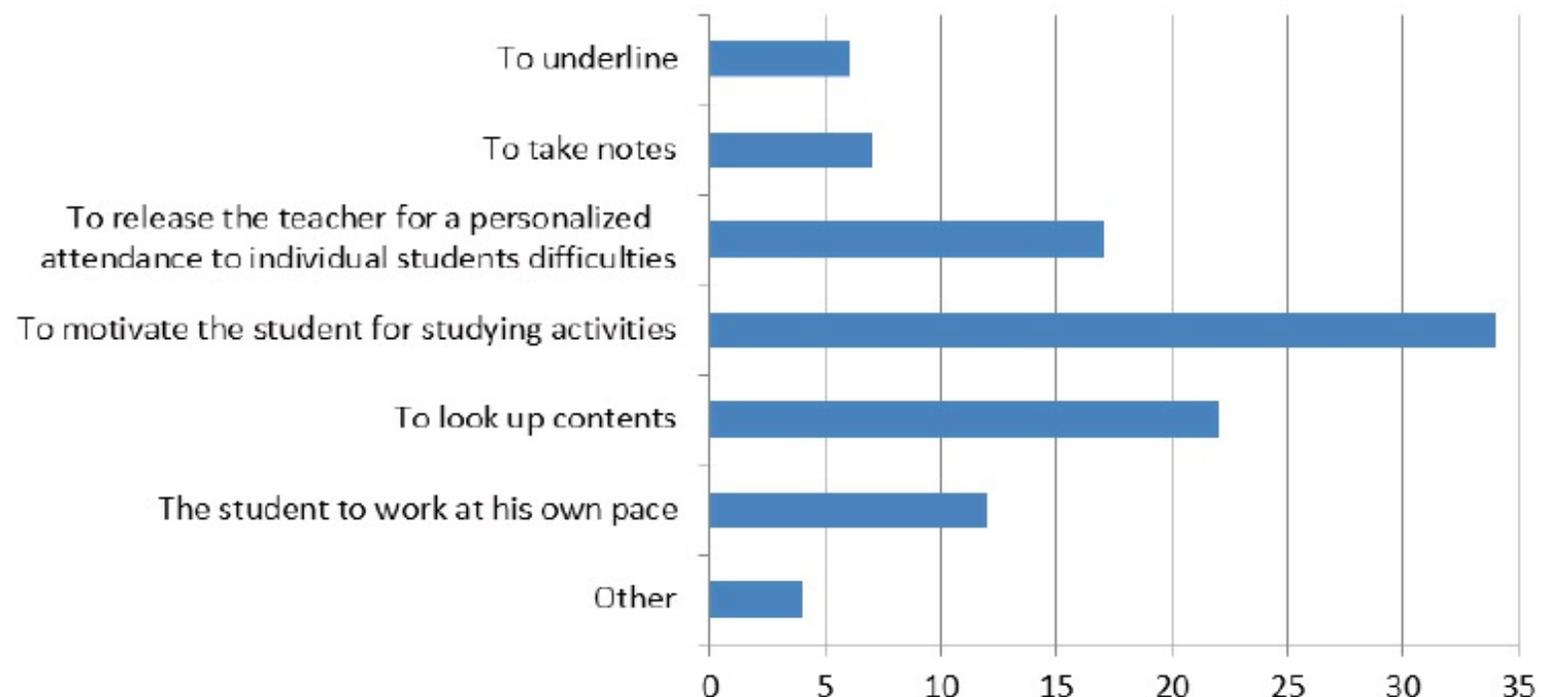
They do see value in having their textbook available digitally on the computer for research. In the study, 71% of the students reported that they would use their computer as a secondary textbook if the textbook was available in digital format. (Weisberg 2011 193)

### Students' perceived pedagogical potentialities and limitations of the DTB in learning environments.

As far as the potentiality of the DTB, almost two thirds of the participants (63%) stated that this technology would, indeed, lead to changes in study methods, statement that can be interpreted to portray the importance given to this tool.

When asked to identify the pedagogical advantages of using the DTB, we found out that the participants enhance the fact that it motivates the student for study activities and, at the same time, releases the teacher for a personalized service of the individual student difficulties. By doing so, it further facilitates the search for contents and allows the student to work at his own pace.

Figure 5: "The Digital Book is an *asset* as it permits":

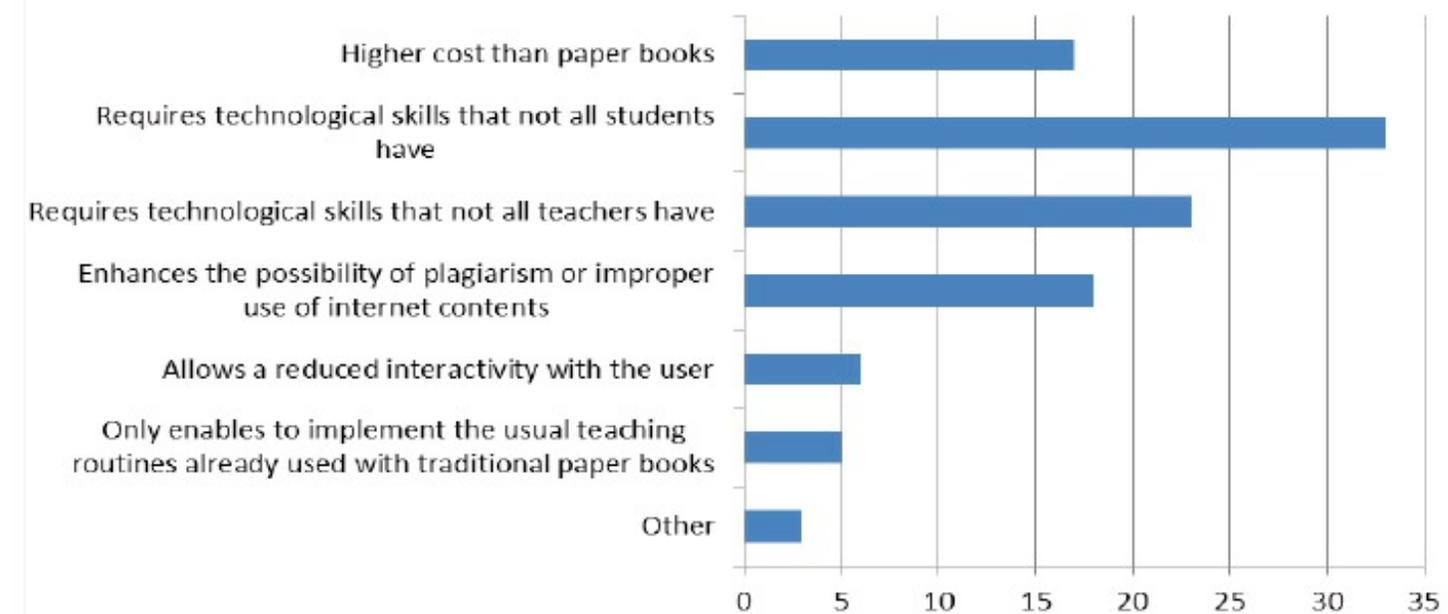


Indeed, when we take into consideration the need to attend individual educational needs,

we quickly get to the conclusion that the printed textbook is just an instructional device that makes it easier for the teacher to teach and the student to learn in a scaffolding logic. On the contrary, the DTB evolved from being the pdf version of the textbook to a more dynamical resource that nowadays incorporates other tools (such as videos, hyperlinks, and virtual reality) in a collaborative logic that involves both teachers and students in the creation and construction of knowledge.

Finally, we also wanted to identify the limits and constraints of the DTB, which can be seen in this final figure.

Figure 6: "The Digital book is a difficult resource because:"



One of the main concerns the students reveal as far as the DTB constraints are the often-alleged need for technological skills that may not be familiar to all students or teachers. This is, however, a false claim, especially if we consider younger learners. According to Kim & Jung (2010), there has been a change in the role and cognition of the Net-Generation Learner:

The educational system of the 21<sup>st</sup> century must prepare life-long learners who are capable of processing vast amounts of knowledge on a daily basis. In traditional South Korean educational system, the student is a vessel receiving the knowledge the teacher transmits. Therefore, good students are characterized by skills such as listening attentively, summarizing content, taking notes and taking tests. In contrast, 21<sup>st</sup> century learners need to be self-directed, active problem solvers, and knowledge generators who design their own learning goals. [...] In particular, this characteristic of self-regulated learners is key to the definition of the Net-generation as it has come of age on the Internet. Net generation is another name for Generation Y who has grown-up with information technology. Reared in cyberspace, the Net-generation thinks differently from the old generation. Theorists argue that personal computers, personal digital assistants, Game Boys and the Internet may displace formal schooling as the primary means of developing thinking skills. [...] The new computational media demands students with new habits of mind and the ability to master new skills such as programming and algorithmic thinking. (Kim & Jung 2010, 249-250).

This change in the role and cognition of younger learners has not, however, affected most educators, who will be willing to admit that their students know more about technology than they do. This necessarily means that, if we want to keep up with their rhythm, we will have to learn to meet their needs.

As far as the cost of textbooks, we all know how expensive textbooks can be. Reynolds (2011) conducted a recent study in the United States that concluded the following:

“While digital textbook sales currently represent a small portion of the overall textbook market – approximately 1.5% - year over year increases show strong and steady growth” [...]

With digital textbooks from many publishers continuing to sell for 50% of print textbook prices, students are turning to digital solutions as a lower-priced alternative”. (Reynolds 2011, 179-180)

Again, DTB can be considered a means to reduce educational costs, attending to the fact that printing textbooks, because of the time and money required by the publishing process are, actually, more expensive. Furthermore, printed textbooks are expected to be used for a period from several years to a decade, but we know that the content of the book can be quickly outdated before that.

### **Brief considerations on DTB in the Portuguese context**

In the Portuguese context, as in other countries, education has traditionally (and still is, to a large extent) based on printed material. According to the survey carried out within the Associação Portuguesa de Editores e Livreiros (the Portuguese Association of Publishers and Booksellers), the number of digital textbook published in Portugal until the end of 2012 is irrelevant when compared to the printed textbook editions.

Because of the costs (both of time and money) required by this publishing process, printed textbooks are, nowadays, expected to be used for a period of several years and the loan is presently being considered a valid option both by the parents and the government. In recent legislation on textbook evaluation and certification (Decree-Law n.º 258-A/2012), the government continues to ignore the digital textbook specificity and no reference is made to it: among other criteria, all textbooks are subject to the evaluation of physical features as weight, dimensions, and other criteria only applicable to printed books.

This general trend has, to a certain extent, restrained the publishers intention to invest in the digital edition. In parallel to this, we must remember that what Rodríguez Rodríguez e Montero Mesa (2012) identify in the Spanish context, also happens in Portugal, namely. In most cases, teachers end up following almost verbatim the schedule contemplated in the printed textbooks not only to facilitate their action, but also due to the difficulty in using efficiently and effectively the ICT. What started out as a potential advantage to deal with the fact that students are coming to school with different skill sets has been facing the educators anxiety towards the impact of integrating digital content into the existing curriculum.

However, as the pace of change evolves, it is not infrequent to find educators that are willing to recognize that a printed book is already outdated when it gets to be finally published. Indeed, printed textbooks cannot often cope with the increasingly short life cycle of knowledge. Furthermore, the volume and variety of information required by the learners of the 21<sup>st</sup> century, used to processing vast amounts of knowledge, is hardly compatible with the physical limitations of printed textbooks. Digital textbooks can effectively overcome these limitations, due to their storage capacity, being able to further incorporate resources such as animations and video. Indeed, although the DTB already exists since the 90s, with technological advances since then, the use of it has become

increasingly attractive as, in addition to the characteristics of the conventional book, the DTB also offers often audio and video resources to help the reader assimilate the information contained in the text.

Another important difference between DTB and printed text book that quickly emerged was the ability to search text without having to rely on an index, as in DTB it is possible to do keyword or expression search.

As the digital textbooks became more appellative, many textbooks started to adopt online interfaces to help with students' homework, helping the consolidation of learned subjects, since students can complete their homework even being offline. In this case, it is necessary to load a full version of the software attached to the textbook and then, when the student comes back online, it can send his work via email or via network.

Nowadays, in the Portuguese context, there are textbooks' publishers that already offer digital textbooks with their printed versions; in some cases, when purchasing a printed manual, the publisher offers for free the same but in digital format. However, the characteristics of each digital version vary from publisher to publisher, with no well-defined criteria to evaluate this teaching resource.

The question that comes to mind is, then, what are the characteristics that identify a DTB.

According to Kim & Yung (2010) these can be reduced to four specific features: hypertext, multimedia, interactivity and self-regulated learning.

As far as the hypermedia feature is concerned, this is considered to be one of the most beneficial features. Contrary to the traditional printed textbooks, digital textbooks allow for much more flexibility both in the delivering of instruction and in the construction of an individualized knowledge. Different theoretical perspectives have been arguing that "hypermedia environments allow for active, constructive, flexible, adaptive, and self-regulated learning", at the same time it "allows the learner to actively control the learning process rather than being directed by a teacher or the argumentative structure of a textbook" (Kim & Yung 2010, 254).

Learning from multimedia is another specific feature that has been suggested in the literature to foster cognitive change, facilitating information processing in learning. By promoting the contact with several multimedia products like games, videos, audios, animations and so on, digital textbooks explore multiple sensory channels, in which verbal and non-verbal (visual and spatial clues) combine to offer the most effective learning environments.

Combining multimedia with carefully designed interactive resources that provide feedback in learning offers the learner the possibility to gain conscience about the learning process. In fact, educational researchers have pointed out that, "despite the ability to interact with the instructional materials (behavioral activity), learning may not occur if opportunities to obtain feedback and to reflect (cognitive activity) are absent. Therefore, the interactivity principle needs to be considered in combination with the principles of guidance and reflection." (Kim & Yung 2010, 255) In order to clarify what kind of activities are we dealing with, we can consider the five common types of interactivity in multimedia environments presented by Moreno & Mayer, in Kim & Yung

2010):

“There are five common types of interactivity in multimedia environments: dialoguing, controlling, manipulating, searching, and navigation. By dialoguing, the learner can ask a question and receive an answer, or can give an answer and receive feedback. For example, in the course of learning, the learner can seek help from an on-screen agent or can click on a highlighted word in a hypertext environment to get additional information. Interactivity enables the learner to determine the pace and/or order of learning episode. For example, with a narrated animation, the learner may be able to control the pace by using a pause/play key, or by using a continue (or forward) button when the material is presented in segments; and the learner is able to control the order by using a forward and back key, rewind key, slide bar, or a menu for direct access to a particular segment. Interactivity that is manipulative allows the learner to control aspects of the presentation, such as setting parameters before a simulation runs, zooming in or out, or moving objects around the screen. Where interactivity is accomplished by searching, the learner is able to engage in information seeking by entering a query, receiving options, selecting an option, and so on, as in an Internet search. Interactivity that is based on navigation enables the learner to determine the content of a learning episode by selecting from various available sources, such as by clicking on a menu (Moreno & Mayer 2007)”. (Kim & Jung 2010, 255-256).

Finally, learning in a self-regulated learning process is another one of the specific features that, in common, define the DTB. In fact, learning with a hypermedia environment in digital textbooks demands from the student the ability to regulate his or her learning, namely when compelled to make choices about what to learn, how to learn and when to learn.

The shift from the traditional educational paradigm to an emergent one is partly driven by a net generation who has grown up with information technology. Nowadays, we observe that this generation, always connected and engaged in the computational media, thinks and relates differently from the previous generations. In fact, several authors (for instance, Gee 2003) have been arguing that the traditional focus on language skills based on the ability to read and write (essential in the printed world) is being challenged by the need to interact in multimodal literacy scenarios, which, as we have seen, can easily be explored in a digital support.

We believe that this fact has to be taken into consideration when evaluating the pedagogical implications of the use of the DTB and, for that reason, we focused on students' perceptions (future teachers/educators of children from five up to eleven years old) of some pedagogical and functional issues related to the use of DTB, namely regarding their representations on their familiarity, perceived pedagogical advantages, textbook format preferences (print vs. digital) and learning potentiality of the DTB.

### **Final remarks**

Results of the current study provided a meaningful contribution to our understanding of the perceived knowledge, expectations and pedagogical potentialities of the DTB by our students.

Although the students participating in this study were, to a large extent, unaware of the concept of DTB, their perceptions on the usability and pedagogical aspects indicate, on the one hand, the need for continued growth in the number and variety of DTB made available and, on the other hand, that more research on this subject is needed.

The findings that students tend to have a positive though moderate preference for the DTB, in comparison to the printed version, is in agreement with reports from most studies on the subject. (see Weisberg (2011) for instance).

As far as the usability aspects are concerned, we would like to enhance the students'

perception as for the flexibility in reaching easily to the content and for motivating students, at the same time it frees both the teacher and the student to more significant tasks.

The current study has some limitations concerning mainly the reduced sample size and the fact that participants are students in an educational graduate program which provides them higher computer/digital skills than the average student.

Furthermore, the questionnaire used in the study did not undergo a large - scale validation process.

In future studies, and after validating the questionnaire, special care should be given to the testing of a larger group, comparing students' attitudes from different proficiency levels, for instance.

We must emphasize, in teacher training, the need to disseminate these multimedia learning resources if we don't want to be left behind. It is possible to infer, from these results, the need to develop digital skills in teachers so that these can use a variety of teaching resources with their students, including digital, facilitating the learning process and relying on higher student motivation.

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## Appendix A – Survey questionnaire

1. Age:

2. Do you often use the computer in your daily practice?

- Yes
- No

3. Know the concept of "Digital Textbook"?

- Yes
- No

3.1 If you answered yes, please describe in which context you identify it



4. Evaluate your experience to date with Digital Books.

- Null
- Reduced
- Good
- Exceptional/High

5. Evaluate your expectations regarding the Digital Books usefulness.

- Null
- Reduced
- Good
- Exceptional/High

6. Evaluate how you will expect to use the Digital book in the near future.

- Ludic
- Teaching

- Both ludic and teaching
- Professionals

7. Evaluate the Digital Book potential benefits for learning.

- Null
- Reduced
- Good
- Exceptional/High

8. Evaluate how you expect to use the paper books versus Digital Book in the near future.

- Only paper book
- Mainly paper book
- Both in the same way
- Mainly Digital Book
- Only digital Book

9. This technology will change the way you study.

- Yes
- No

10. How do you classify the Digital Book?

- Dynamic
- Attractive
- Interactive
- Constantly updated

11. The Digital Book is an advantage (is an asset) as it permits:

- To take notes
- To underline
- To look up contents
- To motivate the student for studying activities
- The student to work at his own pace
- To release the teacher for a personalized service of the individual students difficulties
- Other:

12. The Digital book is a difficult resource because:

- Higher cost than paper book

- Needs a technological ability that not all students are prepared
- Needs a technological ability that not all teachers are prepared
- Enhances the possibility of plagiarism or improper use of the internet contents
- Allows a reduced interactivity with the user
- Only enables to implement the traditional teaching routines already used in traditional paper books
- Other:

Submit

1

available

on [https://docs.google.com/spreadsheet/viewform?](https://docs.google.com/spreadsheet/viewform?fromEmail=true&formkey=dDIczJfR3BkamxPdU5YOGp5d3lclE6MQ)

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# Old age and digital textbooks: the image of aging in digital curricular materials

## *Vejez y libros de texto digitales: la imagen del envejecimiento en los materiales curriculares digitales*

## Vellez e libros de texto dixitais: a imaxe do avellentamento nos materiais curriculares dixitais

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**Abstract:** *This chapter will present some of the findings of a study done in the context of our dissertation. The main aim was to determine the conceptualization, treatment and presence of old age in the school curriculum of Galicia (Autonomous Community in Northwest Spain). Specifically, we analyzed a sample of curricular materials published in digital format and used in the sixth grade of primary school. We will reflect on the empirical design of the study and findings regarding the image and role of old age presented by a set of digital class programs for teachers. We will also discuss a digital tool designed along open software lines and used to analyze the selected sample of didactic materials consisting of both publisher class programs and textbooks. This tool was designed for use by teachers to independently assess commonly used classroom resources. Overall, the study falls within the parameters of intergenerational pedagogy, in defense of solidarity between generations which begins to be formed in earliest childhood.*

**Key words:** *old age, school curriculum, didactic resources, digital format, intergenerational pedagogy*

**Resumen:** *En este capítulo se presenta una parte de los resultados de un estudio, nuestra tesis doctoral, cuyo propósito fundamental fue descubrir cuál es el tipo de conceptualización, tratamiento y presencia de la vejez en el curriculum escolar de Galicia y, en concreto, en una muestra de materiales curriculares editoriales en formato digital empleados en las aulas de sexto curso de Educación Primaria. Se ofrece una reflexión respecto del diseño empírico de la investigación y de algunos de los hallazgos obtenidos en relación a la imagen y papel de la vejez en un conjunto de programaciones digitales de aula dirigidas al profesorado. Igualmente, se presenta la herramienta digital de análisis de materiales didácticos diseñada en coherencia con los principios del software libre y empleada para analizar las unidades muestrales seleccionadas, tanto libros de texto como programaciones editoriales, siendo concebida también para ser ofrecida a los docentes como instrumento de evaluación autónoma de los recursos educativos que emplean asiduamente en el aula. El conjunto del trabajo se enmarca íntegramente dentro de los parámetros de la llamada pedagogía intergeneracional, en defensa de una sensibilidad etaria y una solidaridad entre generaciones que comienza a construirse desde las edades más tempranas.*

**Palabras clave:** *vejez, curriculum escolar, recursos didácticos, formato digital, pedagogía intergeneracional*

**Resumo:** *Neste capítulo preséntase unha parte dos resultados dun estudo, a nosa tese de doutoramento, cuxo propósito fundamental foi o de descubrir cal é o tipo de conceptualización, tratamento e presenza da vellez no currículo escolar de Galicia e, en concreto, nunha mostra de materiais curriculares editoriais en formato dixital empregados nas aulas de sexto curso de educación primaria. Ofrécese unha reflexión respecto do deseño empírico da investigación e dalgúns dos achados acadados en relación á imaxe e rol da vellez nun conxunto de programacións dixitais de aula dirixidas ao profesorado. Igualmente, preséntase a ferramenta dixital de análise de materiais didácticos deseñada en coherencia cos principios do software libre e empregada para analizar as unidades de mostraxe escolmadas, tanto libros de texto coma programacións editoriais, sendo concibida tamén para ser ofrecida aos docentes como instrumento de avaliación autónoma dos recursos educativos que empregan acotío na aula. O conxunto do traballo enmárcase íntegramente dentro dos parámetros da chamada pedagogía interxeracional, en defensa dunha sensibilidade etaria e unha solidariedade entre xeracións que comeza a construírse dende as idades máis temperás.*

**Palabras chave:** *vellez, currículo escolar, recursos didácticos, formato dixital, pedagogía interxeracional*

## Introduction

The reality of old age should be made apparent in the school curriculum and the integration of intergenerational education that does not discriminate in terms of age should be advocated. Therefore, it is necessary to decisively address the subject of aging in the school curriculum and classroom teaching resources, textbooks and class programs in digital format.

The ultimate aims of this approach are none other than to promote social cohesion, learn to live in community with democratic solidarity, develop student understanding and empathy for the elderly, enhance their capacity to critically reflect on the biological, psychological and social reality of the latter stages of the life cycle, break with potential prejudices regarding this stage, and fighting in favor of a society for all ages (Bernard and Ellis 2004; Johnson 2000; Kuehne 2005; Pinguart, Wenzel and Soerensen 2000; Sánchez Martínez 2007). In order to preserve the principles of equality, non-discrimination and respect for differences, we believe that textbooks should reflect a realistic and comprehensive view of aging, so students can fully understand the variety of problems faced by the elderly in accordance with main proposals by the Second World Assembly on Aging (United Nations 2002). These are the principles upon which the present study is sustained.

Insofar as they are "mirrors of society", textbooks and digital class programs reflect the dominant mentality, the "collective imagination that makes up some of the key aspects of what today is known as the hidden or explicit curriculum" (Escolano 2001, 38). It is true, therefore, that curricular materials transmit social and cultural values and conventions, reflecting what is legitimate for society (Prendes 2007), containing "ideological, moral, religious, political, ethical, anthropological, psychological, and cultural concepts that are sometimes explicit and sometimes implicit". Therefore, the analysis of these materials should focus not only on what is said and how it is said, but also on what is not said or left without saying. This "silence, can be as important as explicit messages, as both give clues to the process of selection, hierarchy, and excluding of knowledge and values" (Ossenbach and Somoza 2001, 24). Without doubt, one of the main aims of this study was to discover implicit cultural attitudes regarding the reality of aging that are hidden inside the school textbooks in our sample as well as determine the treatment of intergenerational issues in the curriculum. An environment that promotes liberating learning in democratic teaching/learning contexts requires enquiry into the ultimate goals of the selection and approach to certain curricular contents, behind which may lie the interests of hegemonic groups who pursue favorable power relations (Torres 2011).

We should point out that our research takes a critical approach to the curriculum and didactic materials. Re-conceiving schools and imagining new directions for educational change is a challenge forced upon us by the turbulent knowledge society. In light of the new demands (as well as exciting possibilities) generated in times of uncertainty, schools must make a decisive leap to take on the challenges inherent in joining the digital universe (Rodríguez Romero 2003). For this, we must put our efforts into reformulating and transforming what Tyack and Cuban (1995) called the "school grammar", which remains unchanged, stable and immune to school reforms from above (Puelles 2006). We are referring to the internal operating rules and deep socio-historical structures of meaning which constitute the identity of educational organizations. Rules and structures that resist change are often anchored in isolation, fragmentation, bureaucratic logic, repetition, or decontextualization. It is therefore necessary for schools to become a project; i.e. a democratic community of learning allowing for the metamorphosis of the school grammar.

As we all know, curricular materials can be one of the paths leading closer to that coveted change. It can also lead to professional improvement and innovation among teachers (Area 2004; Martínez Bonafé 1991; Montero Mesa 2007; Rodríguez Rodríguez 2003). All this is defined by the spirit of critical reflection on resources and teaching practice as a whole. This conception of the teaching profession is radically opposed to routine practice that guards custom and tradition, and ties in closely with a curricular development approach focused on educational innovation and teacher research (Carr and Kemmis 1988; Cochran and Lytle 2003; Elliot 1989; Fullan 1999; Hargreaves 1996; Rodríguez Romero 2003; Walker 1989).

Materials evaluation and adaptation is therefore a great opportunity to address student diversity and adapt to context (Rodríguez Rodríguez 2009). It is also an opportunity to investigate and reflect on practice itself from a critical and professionalizing standpoint. Only with a commitment to critical analysis and the adaptation of didactic aids used in the classroom—in this case, digital resources—can materials become facilitators to teacher autonomy and professional development as well as a stimulus to curricular innovation (Area 1999; Bautista 1989; Cabero 2003; Martínez Bonafé 1991; Rodríguez Rodríguez 2000; among others).

As highlighted by Rodríguez Rodríguez (2009), teachers should become real agents for change, reflection, observation, exploration, experimentation and reconstruction of the educational resources they use. By playing an active, critical and analytical role in relation to resources, teachers can carry out a truly professionalizing activity (Atienza 1994; Reyes Santana 1998; Stenhouse 1987). This model of teacher responds to the demands of the so-called theoretical or critical view of the curriculum, the development of which requires an awareness of the teacher's role (as theorist and teacher) as a product and producer of ideology. It is also necessary for the teacher to coordinate with others to make their own historically and politically sensitive reviews of their values and educational ideas regarding the curriculum, their practice, and their work environment (Kemmis 1998).

### **Empirical research formulation**

The empirical part of our study, as well as our dissertation, consisted of two main parts: the first aimed to analyze the image of aging in a sample of educational resources, and the second aimed to analyze the perceptions of a group of teachers regarding integration of aging into the curriculum. Thus, a discussion team was formed that also allowed us to adapt the initial materials assessment guide.

In this chapter we will focus only on the first phase of the empirical research and, more specifically, on the analysis of the digital materials in the sample. After the evaluation tool (to which we refer in detail below) was designed, we proceeded to implement it with a sample of fifty didactic resources. We hoped to gather relevant information about the following: the presence of elderly people in the text and illustrations of the evaluated materials, the terminology used to refer to aging, the general conceptualization of old age in the selected materials, myths and stereotypes regarding longevity, the main theoretical approaches to aging perceptible in the texts, and the presence of intergenerational principals. In short, we aimed to get the most complete and detailed overview possible of how old age was treated in selected didactic materials interpreted in

light of the study's theoretical framework.

This first phase of research involved the following steps:

- Design and validation of a materials assessment guide, the digital version was design with the aid of a group of primary school teachers. Based on the principals of didactics and gerontology, the assessment guide was meant to be extremely thorough and rigorous. It offered a comprehensive view of the conceptualization of aging in the materials analyzed. It was usable both by teachers and as part of other studies aimed at delving deeper into the image of aging in curricular resources.
- Implementation of the instrument with a sample of fifty publisher curriculum materials for sixth grade of primary school (25 textbooks and 25 class programs employed in Galician schools).
- Gathering of findings regarding the presence, conceptualization and treatment of old age presented in the Galician primary education didactic resources. These finding were added to those deriving from an analysis of the issue of aging in the curriculum obtained through the study of the current legislative framework upon which the design of curriculum materials is based in the autonomous community of Galicia. This analysis was also included in the dissertation.

The strategy chosen was content analysis methodology, a research technique that seeks to unravel the discourse in a given social reality through its documents. In this part of the study, the content analysis focused on the selected digital materials, following in the footsteps of previous research that provides a solid methodological background (Cantarero 2000; Castiello 2002; Delgado de Paiva 2008, or Parcerisa 1995, among others).

We should also point out that our intention was to focus the overall study as well as its methodological strategy from a critically oriented research perspective, to the extent that critical formulations stress the need to uncover the possible discourse distortions—in our case, with respect to the image of old age—openly addressing the ideological basis of knowledge (Angulo 1992 cited by Cantarero 2000). We also considered it necessary to orientate the research toward change and the possibility of transforming reality in a liberating direction, in such a way as to integrate the demands of scientific rigor and the need for human relevance (Angulo 1992); in other words, a study that actually links theory to practice and recognizes that ideas guide action, but are also the product of it.

It is also worth specifically mentioning the peculiarities of the process of assessing the digital class programs in the sample. The stages of analysis for these resources basically corresponded to those for textbooks, and the assessment methodology coincided fully. So, to proceed with the class programs assessment, we used a guide to analyze the image of old age in curricular materials, paying particular attention to detecting the models for representing old age, as well as the ways particular conceptualizations of aging are introduced into the curriculum (in the sections for describing contents, learning objectives and evaluation criteria in each unit), and the presence or absence of specific

suggestions for teachers regarding the treatment of the elderly and intergenerational relations. In any case, the analysis of class programs and application of the guide had to also take into consideration the particular characteristics of these publisher resources: the lack of illustrations, specific activities, exemplifications, direct references to people or actions; these materials basically provide generic descriptions of didactic proposals as a practical guide for teachers in their daily experience, complementing the selected textbooks in each subject.

### **Sample of analyzed resources: didactic resources in digital format**

The materials selected for the sample in the empirical research consisted of fifty curricular materials in print and digital format; however, this chapter we will focus only on the twenty-five resources in digital format, that is, the selected class programs.

The sample of class programs assessed (which allows us to go beyond the textbook, although still within in the framework of publisher products) were composed of twenty-five resources in digital format from all curricular areas in the 6th grade of primary school and pertaining to three different publisher groups (Grupo Rodeira-Edebé, Grupo Anaya and Edicións Obradoiro-Santillana), available online during the 2004-2005, 2005-2006, 2006-2007 and 2007-2008 academic years (during which the textbooks corresponding to these class programs were also in active use). These proposals were specifically designed for teachers in the Autonomous Community of Galicia, and were written in the Galician or Spanish languages depending on the publisher. The materials were in digital format, although they were also available to teachers in printed format as part of the “materials package” with each year’s textbook. We chose to analyze all resources available online for 6<sup>th</sup> grade from the selected publishers, because they were considered to be widely available nationwide for free by any teacher choosing to use of them for their daily work. We will now take a closer look at the selected class programs, which are listed in the following table:

**Table 1. Sample of the Class Programs analyzed: sampling unit.**

Publisher	Class program curricular areas
Grupo Anaya	Environmental Studies Foreign Language: English (in Galician) Spanish Language and Literature (in Galician) Galician Language and Literature Mathematics Arts Education: Music Catholic Religion Education for Values Physical Education (in Galician) Foreign Language: French Arts Education: Plastics and visual
Grupo Rodeira-Edebé	Environmental Studies Nature and Society Spanish Language and Literature (in Galician) Galician Language and Literature (Vía Láctea Project) Galician Language and Literature (Imos Indo Project) Mathematics Arts Education: Music Catholic Religion
Edicións Obradoiro-Santillana	Environmental Studies Spanish Language and Literature Mathematics Arts Education: Music Catholic Religion Arts Education: Plastics and visual
<b>Total: 25 class programs in digital format for the 6th grade of Primary school.</b>	

It would be worth considering the reasons for choosing publisher class programs in digital format as curricular supplement to the textbooks in the selected sample. We chose these resources as a way to cover different representative elements of the school curriculum, used regularly in classrooms and potentially influencing the concept of aging transmitted in schools. Hence, we thought it would be best to analyze other publisher didactic resources (publisher class programs available in digital format on the publishers' website and often used by teachers to organize, plan, and structure their lessons, constituting authentic materials packages together with textbooks) that would help broaden and enrich our sampling universe, and gain access to the image of aging provided by other educational resources used in Galician schools.

Referring to the abovementioned class programs, we should point out that they are a "set of organized didactic units for each stage of education" (Bernal 1994) which are designed, produced and published by national publishing groups, and, therefore, have a commercial nature. Regarding their structure, there is no widely accepted consensus as to what elements they should include, but the Organic Law on Schools (RD 334/2004, BOE 28/02 / 2004) provides institutional guidelines for the following: course objectives, content selection and timing, organization of activities, variety of content types, methodology criteria, students grouping and space options, and evaluation criteria/strategies (Bernal 1994).

These materials are aimed at teachers, and according to Area (2004, 83) they fulfill two basic functions: "to provide teachers with an interpretation-comprehension framework about programs and features of a program or curricular design and suggest operational

strategies to facilitate planning, development and assessment of the practical teaching activities in the classroom.” In this set of materials, the author includes official documents that provide the design and provisions of the curriculum and rules for its implementation, teacher support material, pedagogical literature, and didactic guides. The purpose of these materials is to help teachers understand the philosophy and objectives of new curricular innovation projects and orientate their implementation in the classroom.

These didactic units tend to include the following basic structure (which are common to the three selected publishers): identification and unit title; learning objectives, assessment criteria; and content classified as conceptual, procedural, and attitudinal. We would also like to point out some of the thematic sections or basic structural elements included by only some of the publishers, but which also became object of our analysis:

- Learning activities and teaching suggestions.
- Specific activities for the development of habits and values.
- Cross-sectional topics.
- Resources and suggested timing.
- Methodology: teaching and learning process.
- Activities and assessment criteria.

And what about non-publisher digital materials? Why limit ourselves to published digital materials? In this regard, we are aware that, according to Spanish standards, primary school teachers are supposed to elaborate their own class programs based on the curricular project for each stage and specifying the elements that compose the students' educational process including curricular adaptations for students with special educational needs. However, we chose to select publishers' class programs in digital format, essentially, because their dissemination is so broad as to reach the majority of teachers. This was precisely the point that worried and interested us. We wished to analyze the reality as a whole and make proposals to potentially improve the quality of education by enhancing the most frequently used materials. At one point in the investigation we considered analyzing digital materials produced by teachers themselves; nevertheless, this is not a case study, but a focused inquiry into publisher didactic resources in Galicia and the image of old age in the school curriculum. We are fully aware of the interest that such a study might have, however, as in all scientific inquiry, it was necessary to define the scope of the study and our aspirations. For this reason, we decided to analyze the general curriculum framework (the foundations upon which production of resources, units and school didactic materials are based; that is, the legislative framework); as well as study other resources that currently play a more relevant role in teaching-learning processes. This was expected to help us get a fairly comprehensive and accurate feel for the presence, conceptualization and treatment of old age in the school curriculum in Galicia. Although we did not intend to obtain statistically representative results, we did wish to shed some light on a subject so overlooked in our classrooms or, at least, in the world of educational and gerontology research.

We should also keep in mind that research of this nature often analyzes text excerpts

and not entire materials (as we were able to see while doing the background for the study). This served to increase our efforts and perhaps even the value of the findings (to the extent that we did not need to use predictive statistics or random selections of pages to allow us to draw inferences and make them extendible to the rest of the material, but instead we assessed each of the units in their entirety). Nor did we resort to outside observers, or interviewers to apply questionnaires. Everything, therefore, for better or worse, was primarily unravelled by the researcher, who bears the ultimate responsibility.

### **The digital teaching guide to analyze the image of the elderly in curricular materials: opensource software in education.**

The digital tool for teachers designed and proposed for the study constitutes a curricular materials analysis guide aimed at Galician teachers to determine the prevailing image of older people and aging in commonly used classroom didactic resources.

It is an assessment tool developed in collaboration with a group of primary school teachers in Galicia, which aimed to be a useful, practical, relatively quick, versatile, easy-to-use and flexible resource. It is a materials assessment tool for the analysis and adaptation of didactic resources by teachers as part of their daily educational work.

Therefore, with this digital guide we aim to offer the educational community and Galician teachers a tool to facilitate the process of independently assessing the curricular resources they use in the teaching-learning process, and spur reflection on the role and conceptualization of aging in the school curriculum (Zapico 2012).

It is a multi-platform open source software tool developed in the Java programming language. The digital format is hoped to promote dissemination, making it freely available to all those teachers wishing to independently assess the resources they use in terms of intergenerational and gerontology issues in the school curriculum.

The fact that this is open software<sup>1</sup> that can be redistributed and modified under the terms of the GNU General Public License (GNU project, proposed by the Free Software Foundation) demonstrates our interest in emphasizing that the educational community is free to run, copy, study, improve and redistribute the software. This freedom is built upon four basic principles (Stallman 1996): the freedom to use the software for any purpose, the freedom to study how it works and adapt it to one's own teaching and research needs—for which access to the source code is required—the freedom to redistribute copies, and the freedom to publicize the improvements so that the whole community can benefit from them. The only limitation is the obligation to extend these same rights to the users of future program versions. Therefore, our tool could be subject to any change, modification or adaptation to other specific contexts, to be translated into other languages and to be used in other territories.

In this regard, we agree with Adell (2007) who claimed that opensource software embodies values very similar to those that should be promoted by public education (freedom, transparency, collaboration, innovation, flexibility, independence), and its use in education is justified by a variety of reasons. On the one hand, there are pragmatic or technical advantages, such as superior quality, lower cost, greater security, stability, efficiency and integration compared to proprietary software—this was understood by authors like Raymond (2004) who pointed out that open source makes it possible to

optimize program quality, being the most effective way to improve reliability—. On the other hand, there are reasons of a public, ethical and social nature that come through because values are promoted such as freedom of thought and expression, equality of opportunity, effort and collective rather than individual benefit (Amatriain 2004).

Regarding the structure and composition of the guide, we should clarify that this digital curricular materials assessment guide (which is also available in a print version) consists of six areas or theme blocks, basically aimed at determining: how the elderly are described or perceived in writing and illustrations, the manner in which the conceptualization of aging is addressed, the potential myths or stereotypes regarding old age which might be detected in the resource; and how the material treats the undeniable link between schools and the elderly in all its diversity.

Most areas of analysis, especially the most complex, were subdivided into more specific units of inquiry in order to combine the most closely related issues and better organize, clarify and systematize the assessment process.

Likewise, each of the blocks is made up of a series of items or indicators which take the form of questions or statements and are intended to reveal the image that is offered of old age in the selected didactic materials. Each of these items offers a variety of response options that the guide's user can choose from in a reasoned and thoughtful manner. The basic structure of the guide is the following:

**Table 2. Basic structure of the didactic materials assessment guide for teachers.**

A) DATE AND IDENTIFICATION OF MATERIAL
B) ANALYSIS OF THE WRITTEN TEXT
B.1. Presence and entity of the elderly in the written text
B.2. Characterization of the elderly in the written text
C) ANALYSIS OF THE ILLUSTRATION
C.1. Presence and entity of the elderly in illustrations
C.2. Characterization of the elderly in illustrations
D) POSSIBLE MYTHS OR STEREOTYPES REGARDING OLD AGE
E) THE ELDERLY AND SCHOOLS: POSITIONING OF MATERIAL
F) OVERALL ASSESSMENT OF THE ANALYZED MATERIAL

The first block contains the fundamental aspects which characterize the material, providing concise and basic information about their author, title, grade, area, year of publication, publisher and other relevant information. The other blocks are designed to discover how older people are portrayed and perceived in the written and illustrated content of the material, which reference terminology about old age is used, what kind of potential myths or stereotypes about aging can be detected, how is facing the conceptualization of aging and what is the position of the material about intergenerational relationships and experiences at school. The analysis tool consists basically of a series of questions or statements, for which the option best fitting the essence of the image of a specific aspect of the elderly in the material should be chosen. Moreover, space for "observations" is provided so that respondents can give the reasons for their choice. The criteria are open and present a range of answer types (in order to facilitate and systematize the application of the guide), including the following variants:

- options with a polar answer: Yes/No, and the choice must be justified.
- options with multiple choice answers: open to various possibilities. There are

several specific statements to choose from.

- options with a scaled answer: these aim to value the degree of truth or falsehood of a specific assertion regarding the material being analyzing according to the following scale: 0 = Not at all; 1 = Quite a lot, in large measure; 2 = Yes, absolutely.

It is therefore an eminently qualitative analysis guide that combines some quantitative aspects (in line with the methodological model that we proposed), including elements to quantify the number of references to multiple assessed situations, as well as a grading system (0 to 2) for some items.

Finally, regarding the technical description of the tool, it was created using the Java platform in order for it to be compatible with a wide variety of operating systems.

### **Some of the findings: the image of old age in digital materials**

With respect to the digital resources analyzed, firstly, we can say that most of them do not include any reference to the elderly. We found a total of fifteen allusions in twenty-five materials, appearing exclusively in six resources (Catholic Religion 6 by Edebé; Education on Values 6 by Anaya; and Environmental Studies 6, Catholic Religion 6, Spanish Language 6 and Arts Education: Plastic Arts 6 all by Santillana). Therefore, in 76% of the digital materials studied, the reality of aging is completely avoided throughout their many pages and units, there being not a single reference to the elderly. Given such data and seeing that the reality of aging has seemingly been forgotten, only a negative assessment can be made of the class programs analyzed. These results are in line with those obtained by other researchers such as Melero Marcos (2007), Romans, Petrus and Trilla (2000), Terrón and Cobano-Delgado (2009) and Torres (1993, 2011) who include the elderly among a wide range of cultures that are forgotten and silenced in textbooks.

Moreover, the allusions made to old age in the only six digital materials, are so limited and anecdotal that they can not be assessed positively in terms of reflecting this stage of life. Only indirect mention is made of aging. In all cases, the reference is extremely small, insufficient and only plays a secondary role in the contextual framework (whether it be activities, storytelling, exemplifications, text, content suggestions, or other).

However, though meager, five cases offer certain clues regarding the conceptualization of aging available in the digital texts studied. These cases could be described as providing a chronological perspective, presenting aging simply as "state of being an older person" and always lacking richer, more profuse and detailed defining elements that would help us understand the concept of aging more deeply. In the class program for Catholic Religion 6 by Edebé, a brief mention is made to old age with a proposal involving a single activity for reflecting minimally on the "mystery" of the last stage of life and its connection to "illness and death". This activity is extremely shallow in promoting that students focus on that one aspect and apparently overlooks the great potential that also characterizes aging. Therefore, this allusion falls into a biological perspective (which understanding old age as "a period of biological, functional and structural decay of the body") which lacks richer defining elements, and reveals the conceptualization of aging

transmitted by the material.

Insofar as the improvable aspects in the written content of the resources analyzed, we would like to point out that the references to older female characters are quite scarce and strikingly limited compared to male characters. This is one of the most obvious elements in need of optimization in the textbooks and class programs assessed, as it may be fostering gender discrimination. In fact, of the allusions to aging in our set of digital materials, we found a total of three involving female references versus twelve involving male references. Thus, we found a relatively constant gender discrimination which was in line with the findings in studies such as Blanco Garcia (2000), Cerezal (1999) and Kaeser (1987). These and many others, found a low overall presence of women versus man in the content of school textbooks.

Similarly, only one of the digital materials assessed, Environmental Studies 6 by Santillana, includes two short isolated references to the demographic situation in our society, but no proposal is included to spur students to reflect on this specific issue. In this sense, we found no exemplification or reference to the variety of contributions made by the elderly to the history of mankind that could have a positive impact on the view of their role in society. In the absence of truly profound features of aging, we found it impossible to identify aging stereotypes in the aforementioned materials, or to infer the presence of aging theories or approaches without running the risk of over-generalizing or making overreaching interpretations. Therefore, it was not possible to detect any differences between the image of aging in these materials, those transmitted by media, or those held by the different age cohorts in the preschool-adolescent group. Likewise, it was not possible to find connections between these texts and socially accepted features regarding old age and the aging process.

It is also noteworthy that most of the texts studied (with the exception of one digital resource) do not propose any activities or exercises involving the direct relationship between children and their elders to promote intergenerational contact or the sharing of experiences. Nor are there any proposals aimed at enhancing students' reflection regarding the reality of aging in any of its dimensions, or exercises (of significance and applicable to the entire set of materials) that emphasize the value of the elderly as transmitters and preservers of cultural, or take advantage of their experience and culture background in a given field, as would be in accordance with suggestions by a variety of studies (Gárate, González and Mora 2005; García Mínguez and Sánchez García 1998; García Mínguez and Bedmar Moreno 2002; Johnson 2000; Sánchez, Díaz, López, Pinazo and Sáez 2008; or Valdivieso et al. 1999, among others) in defense of intergenerational education principles and favoring a society for all ages.

Regretfully, we have to point out and negatively evaluate the fact that the vast majority of the digital texts studied do not include any proposal to somehow foster the direct contact of students with their elders through activities involving mutually-beneficial intergenerational enrichment. We found only one material—the classroom program for Spanish Language 6 by Santillana—which included any initiative in this respect. Although brief and meager (almost anecdotal), the proposal is worth mentioning and positively assessing as it is the only digital material to open at least a tenuous line of work in the

field of aging and enhancing intergenerational relationships. This proposal aims to address, together with older people themselves, issues such as ethnography, heritage preservation, language, culture and folk history by focusing on the role of the elderly as a potential source of knowledge and traditional culture, and by proposing activities involving the gathering of legends, stories, sayings or an approximation to folk history through contact with the elderly. We think it is a shame that materials do not take fuller advantage of oral tradition and its close ties with the heritage that the elderly help to preserve. Going further along the lines of this tenuous activity proposal would surely provide rich and ambitious optimization potential, though it would also be necessary to go beyond heritage preservation into other dimensions of intergenerational contact.

Finally, we should not forget to mention that some of the digital resources analyzed include a variety of fundamental cross-sectional concepts, but not the principles of intergenerational pedagogy. Thus, in their sections for objectives and evaluation criteria, but above all in their attitudinal and conceptual content, the aforementioned materials present a number of cross-sectional elements directly, expressly and openly associated with values such as moral and civic education, intercultural education, environmental education, traffic education or health education. These contents have an attitudinal nature that are thoroughly developed in sections specifically aimed at addressing a diversity of cross-sectional curriculum issues, however, they never make even the slightest reference to intergenerational education. As noted in some resources, these cross-sectional content are aimed at better understanding our world and learning to live responsibly. Surely a laudable goal, unfortunately, however, it does not include a single direct reference or proposal to address the theme of old age and the need to expose children to a more positive and realistic concept of the elderly as a way to optimize intergenerational relations and make the most of what they can offer at a personal, educational and emotional level.

In summary, in light of the results regarding the various points of analysis, we can assure that the situation concerning the presence and image of aging in the digital resources assessed is far from ideal, to the extent that only six materials included any reference at all to the last stage of life.

Even those were meager, minor and anecdotal (with a maximum of four allusions in two materials and a minimum of one in two others). Therefore, we must denounce that the presence of aging in these teaching resources is virtually nonexistent (limited to generic, extremely isolated and insufficient references). The almost total neglect in these texts of the elderly and the principles of intergenerational education favoring a society for all ages, compelled us to determine that the image and presence of the elderly in all the digital resources was profoundly in need of improvement. There is, therefore, still a long way to go in the direction of authentic integration of intergenerational philosophy in the school curriculum.

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<sup>1</sup> Software available in: <http://www.nova-escola-galega.org/WebDefault.aspx?MenuInd=1&MenuId=309&Lng=gl-ES&tl=0>

# The Digital Textbook: Methodological and Didactic Challenges for Primary School

*El libro de texto digital: Desafíos para la metodología y didáctica en la escuela primaria*

O libro de texto dixital: Desafíos para a metodoloxía e didáctica na escola primaria

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**Abstract:** *The potentialities of ICT in education bring about changes in the teaching and learning methodologies, in the places where you learn and in the way you learn. This reality demands a reflection not only on the ways of learning, but also on the support resources, so that learning can take place and, of course, it is indispensable to understand the teachers' answer to the digital challenges. Thus, the purpose of this analysis is to reflect about technological trends in an educational context and their underlying models by analyzing the role played by digital textbooks in Portugal in an innovating context. This way, we intend to contribute to an educational policy as we plan to relate the teachers' training to the increasing development of the digital textbooks and we also intend to contribute to the understanding of a didactic resource which is closely related to the learning processes which resort to advanced technology.*

**Key-Words:** *digital textbooks, ICT (Information and Communication Technologies), methodological change.*

**Resumen:** *El potencial de las TIC en la educación requiere cambios en las metodologías de enseñanza y aprendizaje, en los lugares dónde se aprende y cómo se aprende. Esta realidad exige una reflexión no sólo sobre las formas de aprendizaje, sino también sobre los recursos para apoyar a los alumnos, siendo imprescindible para entender la respuesta de los docentes a los retos digitales. Por lo tanto, nuestro análisis tiene como objetivo reflexionar sobre las tendencias de la tecnología en el contexto educativo y los modelos subyacentes, analizando el papel de los manuales digitales en Portugal en un contexto innovador. De hecho, tenemos la intención de contribuir a la política educativa, con el fin de mejorar la coordinación de la formación del profesorado con el creciente desarrollo de manuales digitales, y la comprensión de un recurso didáctico que responda a los procesos de aprendizaje que integran tecnología avanzada.*

**Palabras-clave:** *manual digital, tecnologías de la información y comunicación, cambios tecnológicos*

**Resumo:** *O potencial das TIC na educación require mudanzas nas metodoloxías de ensinanza e aprendizaxe, nos lugares onde se aprende e na maneira como se aprende. Esta nova realidade esixe unha reflexión non só sobre as formas de aprendizaxe, senón tamén sobre os recursos para apoiar o alumnado, e resulta imprescindible para entender a resposta dos docentes aos retos dixitais. Polo tanto, a nosa análise ten como obxectivo reflexionar sobre as tendencias da tecnoloxía no contexto educativo e os modelos subxacentes, analizando o papel dos manuais dixitais en Portugal nun contexto innovador. De feito, temos a intención de contribuír á política educativa, co fin de mellorar a coordinación da formación do profesorado co crecente desenvolvemento de manuais dixitais, e de mellorar a comprensión dun recurso didáctico que responda aos procesos de aprendizaxe que integran tecnoloxía avanzada.*

**Palabras-chave:** *manual dixital, tecnoloxías da información e comunicación, cambios tecnolóxicos*

## **Introduction**

If the world rules are changing quickly, the way you learn, where you learn and what you learn is also changing. In a context of change, tomorrow's school is redrawn and the future generations are prepared for a society which is more and more global and demanding. In this context, and for this reason, teachers have an increased responsibility in the teaching-learning process and the supply of books in this digital era generation can be an important contribution to the improvement of the quality in education. At a certain stage there emerges a reflection which focuses on the type of resources available as far as digital textbooks are concerned and, consequently, on the quality of the teachers' training in the field of ICT, in the role of promoters of the e-book, and on the way the students' learning process is carried out so that school success as well as the conjuncture of change may be understood. On the whole, we hope to contribute to a modern and up-to-date education which will answer to change and to social interests.

Thus, we shall analyze some challenges that change presents in the educational context and the way school and teachers respond to this conjuncture which is in transformation, having as main characteristic the technological evolution which affects each and everyone of us in a different way, not forgetting that the generation school is the one that most demands a new educational paradigm. However, in a scenario of big changes we can verify that some teaching resources, even though suffering deep transformation, were able to survive: this is the case of the school textbook in paper support. We shall analyze the way students learn and today's formative offers of the textbook.

### **A changing context**

Today's technology is creating a world which is immaterial, timeless, flat and global, surrounding us every day, and changing our ways of communicating, our relationships, our interests, the place we ascribe to things and the way we experience them. Thus the magic of the digital is bringing about a technological, political, social, economic and, we hope, educational revolution. Friedman (2006) tells us he was aware of this evolution when he had to buy a mere plane ticket: there were those who still belonged to the 1.0 generation (someone was responsible for the emission of the ticket, the customers made their way towards the company ticket counter to get a number, wait in a queue and negotiate the acquisition of a ticket); others belonged to the 2.0 generation (an electronic ticket machine replaced the clerk responsible for the selling of the ticket and all the customers had to do was to make their way to the machine); others, however, were already living in the 3.0 generation (those are the ones who do not need the clerk or the machine and who emit their tickets themselves and, as such, they may be considered collaborators of the airline company). In the educational context, we are also supposed to find, in the teachers, different stages of competence in ICT, in the schools, different types of resources available and the use of different kinds of school books. The study carried out by Quadros-Flores (2010) shows that, in fact, there are distinct stages in the integration of ICT, but that those stages are not tight because there are teachers who stand at the point of transition and who, therefore, use mixed methodologies. In this sense, the author has defined three stages according to the resources and the methodologies that are used:

- Discovery Stage – Teachers have at their disposal several basic ICT tools, such as the computer, the printer, software and the Internet. However, the author verified that the availability of these tools is not enough to increase the degree of frequency in which the computer is used. Also the teachers within this stage use a traditional methodology adapted to technology since they are mainly concerned with the successful management of the new tools.
- Experimentation Stage – the majority of teachers can be placed in this phase and they have at their disposal the computer, the printer, the CD player/ recorder, the scanner, varied software and the Internet. Nevertheless, the author verified that these teachers work less than three hours per week with the computer and that the above mentioned tools do not stimulate the degree of frequency in which the ICT are used. Nonetheless, teachers assume differentiated attitudes: for some the resource to the new technology represents the use of only one more working tool; they relive the same mise en scène with new accessories, keeping the old methodology and the old profile of both the teacher and the student; and that is why, in this case, the technology became a means of exposition and consolidation and the traditional methodology was adapted to the new technology. For others, the resource to the new technology may well represent a way to change since they already use a renewed methodology, that is to say, they are already able to recreate scenarios, new learning environments, new ways of teaching and learning, new temporal spaces and the student is now the creator of his/her own knowledge. We could say that this stage represents the beginning of the transition from a teaching model to a learning based model. There is a change in both the student and the teachers' profile.
- Transformation Stage – The author verified that the availability of the interactive board, the wireless net, the digital camera, the video recorder is more meaningful for the teachers who use the computer more than three hours per week; in this case, these resources stimulate the number of hours of the ICT use. At this stage, teachers develop innovating or renewed methodologies and they carry out practices which are democratic, transferable, up-to-date, useful and that they can effectively solve teaching/learning problems. This shows an undeniable change in both the students and teachers' profile; teachers stop being information consumers to become information creators/producers and they guide their students towards the information and knowledge paradigm. These are practices which are not centered on "copy and past", but on research and construction of knowledge, on teaching individualization and on the development of autonomy; creativity, critical reflection, collaboration and interaction with others are valued.

Based upon the information obtained in from teachers who carried out good practices, the author asserts that those teachers backed themselves on technology, so that they could obtain better school results. The good practices they used were effective solutions to problems in a given context, drew a renewed scenario of a dynamic school, a school which was more attentive and more open to the world, and made children happier. These

are practices which involve the students in meaningful contexts, leading them towards the world of discovery, of the pleasure of sharing, of collaboration, of production, of know-how; these are practices which feed knowledge and which motivate efforts towards final results; practices which draw an outline of a new profile of the teacher: much more attentive to the student, an investigator, a coach, worried about the teaching-learning process and effective in the preparation of his/her students for the future; practices which give school and the educational paradigm a new face. It is important to underline that, according to Hernandez (2007) and Gilleran (2006) good practices depend on the context, on the teacher's starting-point and on the project goals. However, they allow all students a place in the learning process, they favor the know-how, comprehension and debate. Silva (2001) adds that they make a new definition of time and space possible and that they adapt themselves to the students' needs. Are not these the main aspects that should be taken into account when elaborating a digital textbook?

However, the existence of the stages mentioned above by Quadros-Flores (2010) presupposes distinct school books, so that teachers can feel satisfied and, of course, school books will tend to offer teachers and students the possibility to implement different practices in an easy, quick and safe way. True change will happen when most teachers show a meaningful methodological change by introducing new digital resources and new ways of teaching how to learn; in this case, they will demand a digital textbook which must be elaborated according to a renewed methodology and a more global vision of education; thus, new processes, new ways of acting and doing are necessary and, as a consequence, new skills, so that you can effectively accompany the evolution and know how to be in a global world which is permanently changing. Pink (2006) speaks of a new era, a conceptual era, full of opportunities, but cruel for those who are slow and not flexible. However, it is not enough to equip schools with technology or offer teachers and students the digital textbook; you need to include methodologies which can bring about new ways of learning in a global society and in network; in this situation there is a strategy which is very important: the use and application of the digital textbook by the teacher is fundamental for success in the students' results. Even because, according to Carvalho (2007) technology can also reinforce approaches centered on the teacher; that is why we underline the fact that the correct use of these more advanced technological resources is fundamental to success. Furthermore, it is also important to underline the need to make adjustments and plans elaborated according to the educational goals and to the school mission. It is necessary to give importance to what is relevant, so that school will not lose itself in the global world and in the great variety of relationships of information and of "things" that are attractive but that are futile and that deviate from its purpose. Here lies the importance of the digital textbook which can open school to the world, but must guide learning, making it meaningful, up-to-date, interactive and individualized. The "good" book will be the one that allows school to fulfill its mission with good results and that contributes to the proper education of a generation who will serve the society in the near future.

Technologies also evolve by stages, so they affect the methodologies used by teachers. Carrillo (s/d) mentions the transition from a model centered on the teacher and based on

technologies which were transmissible to a model centered on the student, based on interactive technologies, and still to a model centered on collaboration in group based on collaborative methodologies. It is at this third stage that the methodological change is supposed to take place and, as a consequence, a change in the mental pattern.

The course of these stages outlines a course of education; in this context digital textbooks must be prepared to include working methods which are up-to-date, useful and motivating of a meaningful, communicative interactive, global learning, taking social habits into account. In fact, technology created a network society which promotes a dynamic, global, self-expansive culture and that changes the ways of life. The online culture architecture allows fluxes of information and relationships which exceed the time and space of learning as well as the learning contents. Downes (2011) speaks of a network that learns, that adapts itself and that takes new forms based on reflections and interactions, networks that invite you to learn, to teach students how to learn and to motivate them to manage their own learning; thus, to be online in the networks, also shows what each one, or each school knows or does not know, their expectations and needs. This presupposes the growth of virtual learning communities since, according to Dias (2007), communicating and learning online, besides the social interaction or the individual learning, also involves the collaborative meditation on the creation of distributed knowledge. In this context, we can say that the digital textbook will be able to take a flexible form that will allow the identification of a school, or a class, or of an educational community, momentarily built or in a programmed based way. Its quality may, thus, reflect the capacity of the group and its dynamics. This way, the digital textbook may defy organizations to share, to co-operate, to construct knowledge as a tool that stimulates collective intelligence (Levy). The school textbook, which today's teachers follow closely, rigidly and blindly as representing all the knowledge the students should acquire, will stop being a book that promotes passivity, repetition and memorization, limited in information, to become an interactive, dynamic book that will allow access to large quantities of information in multimedia format and the use of the hypertext that will create a collaborative culture and both a synchronous and an asynchronous communication. This idea underlines the need for trusting the others, determining the teacher's new characteristics: attentive, critical, observant, inquisitive, productive and enterprising as well as his/her students. The e-book will, this way, help to turn solid learning into a more fluid one (Bauman, cited by Area, 2012). According to this author, the electronic book represents the change of a solid culture, representative of an era of certainties and of close, stable knowledge which passes from generation to generation through physical objects, into a 21<sup>st</sup> century's fluid culture, stimulated by advanced technologies which contribute to the student's training in a more flexible way and which develop skills for the autonomous construction of knowledge and its dissemination, so that students can deal with today's uncertainty and complexity.

Cabero & GIBert (2005) and Cabeo & Román (2006) underline the importance of activities that may lead the student to understand contents, to transfer them to other situations and to examine them more deeply in an autonomous way, which will integrate differentiated scenarios, which will promote the acquisition of specific vocabularies and

which will allow the application of contents; activities which may promote the learning how to learn, which may be useful, meaningful and interactive, which may arise curiosity and create the motivation to deepen concepts and which may help students to create their own strategies of an autonomous construction of knowledge. However, they call their readers' attention to the fact that the websites that possess didactic materials are still designed for a passive model of learning. Do modern digital textbooks also lie upon this type of model?

The 2.0 Web tools promote writing, production and multidirectional interaction, revolutionizing the traditional applications by rebuilding environments in social networks "from many, to many" (Selwyn, 2011, 35), but, in spite of that fact, when used in education, we verify that there are not many yet who refer the use of good practices with their students. We can still observe on the Internet that they resort to several practices which are still connected with traditional patterns of reference and many others are still against using them frequently. The reason why this happens dwells perhaps in the fact that most teachers' training in ICT, particularly in that area, is still very elementary, as mentioned by Sanpedro (2012), Quadros-Flores (2010), Costa (2008), Blamire (2009), and consequently, it lies in the problem of adapting to an efficient methodology which leads to innovations and recreations which are not so operative in what concerns the results people hope for. The reason still lies in the low availability of the resources that promote the use of ICT (Quadros Flores 2010). Educational policies can also be fundamental as far as change is concerned, so a clear definition of goals, of the curriculum and of the way one evaluates competences help to build the designer of the methodological strategy.

Changes are not generalized and have occurred particularly in some contexts, namely in the classrooms of teachers who are more dynamic and innovating and, according to Simão (2007), in the normative field and in the curriculum plan; he even wonders whether the way teachers teach and evaluate, the way their students learn and show the knowledge they have acquired do not stay the same. This shows that the digital textbook will respond to the teachers' needs. In fact, the most demanding teachers will look for new e-book formats and will expect the market to offer them more and more effective answers. As far as the market's answers are concerned, quoting Visel, Adell (2007) mentions two types of electronic books: based on PDF, which imitates the characteristics of the physical book; based on the reader, which uses a certain language type – HTML or XML – to label different parts of the text structure. However, he adds that both deal with the book as a text and a text is just a part of the book which involves reading while the e-book involves writing as well. The book should be alive, stimulating dialogue and social life. He adds that electronic books should solve problems: the one of preservation relating to the use of electronic formats, the reason why active, deliberate policies are necessary as well as the use of open, standardized formats; the one of note-taking – as far as physical books are concerned you can take notes on them and you can lend them, but to one person at a time, while electronic books should allow several readers to take notes and add commentaries to the text, stimulating, this way, the exchanging of ideas and debate on the present and past text. In our opinion, the digital textbook should also solve

several problems: to teachers, it should facilitate a living, dynamic learning model that should answer to the challenges of education in the future; to students, it should solve the problem of the weight of the backpacks they have to carry to school every day and that harm their health and the problem of the lack of motivation which represents an increased effort in the teaching-learning process; to parents, it should be a cheaper solution. Adell (2007) passes on the idea that technology can make the book alive because the book can be more easily updated, and technology may include tools that may facilitate the appearance of e-book designers in what concerns formal, multimedia and interactive aspects and that may facilitate freer surfing through the hypermedia. The e-book is, thus, a living book, online, a book which brings the communication between authors and readers alive, a book with social life, in Vershbow's words, an unfinished product because it is dynamic. He adds that, as far as school digital text books are concerned, teachers should be able to elaborate and hand out didactic activities to their students, parents should have access to their children's school progress, assiduity and homework, and the platform tools should allow the communication among intervenients and the development of learning networks. Nothing better than to visualize the e-book of the future! Matas (2011) suggests "a next-generation digital book". A book in which interactivity plays a determining role. Flexibility of images, graphics and interactive videos are highly valued, taking the student to real scenarios, and the interactive simulation is valuable since it will most certainly attract students to digital books. The possibility of accessing the digital textbook via mobile-phone will solve a lot of problems, but it will also present a challenge to school, as far as the students' guidance is concerned.

As change takes place, a new school is created, a school which is different from school in the past, a school in which unidirectionality gives rise to multi-directionality; schools connected in network establish connections that may (re)create information patterns that encourage innovation and new ways of thinking. Quadros-Flores (2010) presents three adaptation stages of schools to the most advanced technologies, showing that in a last phase, schools may become more intelligent, more humane, able to translate feelings, knowledge and ideas and to expose themselves to the world; schools may be able to relate and interact; schools which will be reflective, critical and enterprising in a large, real, virtual space; schools which will be able to respond to the knowledge society: school (re)organization; competence acquisition, experimentation; renovation, acquisition.

For Area (2007) today's challenge is the future citizens' educational system and our society's democratic system. In this context, Barbosa (2006) thinks that the school is expected to be the place where democratic practices are experimented and a way of learning the virtues and attitudes which are necessary for the promotion of the new forms of citizenship. Carneiro (2007) designed different scenarios of the school course. In one of those scenarios he mentions the rupture with the factory model and the change to a model which stimulates constructivist pedagogical models in connection with multi and interdisciplinary teamwork. That is why teachers will integrate networks which will provide update and professional development. In this context, the key-note is a citizenship of participation and learning of duties and solidarity which will ensure the

fundamental rights. That is the kind of citizenship it is expected in this context.

### 1- The teaching-learning process: the human brain's behavior

The restrict use of traditional resources inhibits evolution, but the use of new technological resources and of new technologies recreates the educational environment and allows the development of a different school. In a situation of change, people must mainly focus on how to learn, because what we learn is easily reached. The way we teach, educate and teach how to learn in a global world, in which technology promotes interconnection, self-learning and massive intelligence development and uncertainty conditions the future, school books and the traditional models are no longer an effective answer to the interests of the generation of the XXI century.

To make the teaching-learning process easier and prepare today's young people for an uncertain future, we consider that the way the human brain works is extremely important, despite the fact that we are conscious that the systematic use of these new technologies affects brain development itself.

After reading Wolfe's book (2004) we realized that:

- The brain has the ability of mentally transferring situations, so when an action is frequently repeated it is memorized, becoming automatic and we need less awareness to do the task, as it happens when we are learning how to drive.
- As the brain gets used to new things, it ignores them. Thus, the brain is always looking for stimulations and trying to find out if what is received is different every time, if it is something new, being this fact an important part of the filtering process. Novelty, the intensity of the stimuli (loud sound, intense light) and movement make people pay attention in an innate way because, as the author adds, the human brain is programmed to focus on unusual situations.
- Memory allows us to learn by means of experiences, it is crucial for survival.
- There are two types of memory: the declarative one, which stores and remembers the information we can speak or write about, is reflected and reflex, can be incidental (remembers places and times) or semantic (includes symbols, rules and precise words, like the multiplication table); the procedural one, which consists of how to know and how to do, makes us focus on the task, making sure that the movements are performed correctly.
- The information we get through visual stimuli is interpreted and grouped in the visual cortex which means that two people can look at the same thing and focus on different things or even see different things.
- Meaning and Emotion are two factors that influence the brain capacity for paying attention to information and keeping it; that is to say, the brain pays attention to a new piece of information, but if this piece of information is considered to be senseless it will not be processed. That is what happens when we are using a book written in an unknown language or a text about something we do not understand: we do not get motivated. Our brain cannot rebuild a circuit which has not been activated before, so it does not receive the information. If the information in the classroom does not relate to something the student has

previously stored, it will be excluded as senseless.

This way we consider that digital books must take into account the following requirements:

- Allow the consolidation by means of memorization, understanding, experience and know-how;
- Develop declarative and procedural memory;
- Promote something new to attract brain attention – this means the application of several resources with diversification of movement, light, sound, colour, rhythm and interactivity. Sensorial memory filtrates information;
- Avoid repetitive sequences or resources;
- Encourage new working methodologies, as the use of the e-book will not have the desired effects without methodological changes;
- Include an introductory note of preparation and orientation of the subject because that will raise the probability of better attention and, as a consequence, will lead to more lasting knowledge;
- Be careful with the type of language one uses, the contents one exposes, the possible links, the type of resources and the sequence of contents, because learning has different stages and the benefit one gets in a specific stage depends on one's knowledge of the previous stages;
- Enable knowledge sharing and collaborative spaces in Network;
- Make the teacher's individualization of the digital book possible so that he can adapt himself to the different sociocultural contexts and needs, making the process of learning more meaningful and emotional. This way people will have stronger remembrances of the topic which aroused attention. Solving life/daily problems is another way of raising emotional and motivational concern;
- Be safe, appealing, interactive and open. The syllabus taught out of context causes misunderstanding and demands a lot of memorization effort and effective learning does not take place sine what you learn does not last.
- Allow the creation of contents and their storage and the extension of the book throughout the class and its collaborators.

If a digital textbook offers all these features, it will allow the student a wider field of action, thus allowing him to learn more about each topic, it will challenge the ways of evaluation as it strengthens informal learning and it will challenge pedagogical methodologies as it needs a pattern which helps the student to organize the information he gets and to transform it into effective knowledge that he can critically use in his daily life. Furthermore, it will lead to a more flexible curriculum and completely change the student's teaching-learning process; it will also encourage social constructivism as it values the interaction among individuals as far as tasks and production of concepts are concerned. This way we believe that the digital textbook can make schools more intelligent and sensitive, getting closer to what the human cortex allows: thinking,

dreaming, imagining, innovating, feeling, criticizing, learning and producing. This way it is possible to understand Landim's table, which shows that the learning process happens mainly in situations that involve the different sensors of sense (Table 1), and this is the reason why we underline once again the power and potentialities of today's advanced technologies: sound, image and interactivity play an important converging role in the teaching-learning process.

**Table 1 – How learning is achieved**

Knowledge	
How people learn	How it is preserved
1,0% related to taste	10% of what we read
1,5% related to tact	20% of what we hear
3,5% related to smell	30% of what we see
11,0% related to hearing	50% of what we see and hear
83% related to sight	70% of what we say and discuss
	90% of what we say and immediately do

*[Source: Mehlecke & Tarouco, 2003]*

As a matter of fact, our eyes contain almost 70% of the body sensory receptors and every second they send to the brain million pieces of information to be processed there, causing people to say that a picture is worth a thousand words (Wolf 2004). Sight helps to keep information and broadens understanding. The same happens with the learning of a musical subject which is better achieved if students are involved in its making. The author adds that our eyes can get an image like a camera does, but what we actually see is influenced by the information we store in our brain. This shows the importance of the knowledge we possess and also that an ordinary image or video in the textbook require the student's previous contact with that particular subject otherwise they may not produce meaningful effects on the learning process. We underline the importance of the teacher's role as a guide, a mediator and a "coach educator" in the teaching-learning process, so that each and everyone can give their best and grow in a know-how environment, and so that information overload does not become cognitive noise or garbage and from it one may accomplish meaningful learning that will produce knowledge.

This way, a digital textbook may make students forget the physical space of the classroom, setting them in new environments, where they can experience and live new relationships and build an experienced knowledge, enlarged by their own or peer group motivations: the kind of knowledge which will be better consolidated and memorized for a longer period of time. According to Epper (2004), an active learning makes students learn better, by directly involving themselves in the application of contents in addition to listening to the teacher. Students need to talk and write about what they are learning and associate it with previous experiences to internalize new concepts. These are the advantages of a digital book when compared to a physical book which is more static and limited. In the past the prevailing model expressed a deep concern with information

transmission based on memory and with information processing: repetition and attention were fundamental; however, the lack of understanding and emotion shortened the period of time memorization lasted. Nevertheless, learning takes place at a concrete, symbolic, abstract level and repetition as a routine, although important to acquire an automatic habit such as reading, writing, solving equations, etc. is less effective as far as the understanding of a historical event or the explanation of words are concerned. Elaborative repetition is more suitable in these situations. According to Wolfe (2004) these strategies encourage the student to organize information in such a way that it will increase comprehension and the retaining of information because they increase memory, making the information more meaningful and relevant to the student. He adds that if you are conscious of how information adjusts itself to meaningful units, you will find a way of working with higher and higher quantities of information, that is to say, teachers should be able to see connections that others do not see, but they should not teach them, because students need make their own connections.

Involving students in a project or experience is more productive and effective when compared to a situation in which they only listen to the teacher and use the traditional book made of paper. Piano players play their music by themselves and students are not different. Goleman (2002) notes that researches show that people learn better when they use methods which are adequate to their own styles. Learning theories underline the position that effective knowledge is reached through reason or experience and that behaviorism, cognitivism and constructivism show how people learn.

This way, according to Siemens (2007), the first one – behaviorism – values the observable behaviour which is centered on stimuli responses and learning changes behavior. The second one – cognitivism – recognizes the individual in the collective knowledge and that is the reason why the author emphasizes connectivism as a new paradigm of teaching and learning as both individuals and organizations develop specialized networks and the network is a cognitive agent that overcomes individual limitations. In this sense the challenge is centered on the students' capacity for creating their own learning networks to evaluate and filter information overload, to connect with others, to indicate lack of knowledge and to offer new and creative combinations of information in order to increase their knowledge, advancing and expanding it. The third one – constructivism – suggests that students should construct their own knowledge supported on problem solving in collaboration with others. It presupposes the transition from a teacher-centered learning to a student-centered one, a type of learning that is also more centered on the relationship with others, thus, being more collaborative.

In this context, both the teacher and the digital textbook should, in addition to transmitting knowledge, guide and facilitate learning, sharing and collaboration. Students should construct their own knowledge, in connection with others and with the world.

The communication process is complex because, besides involving the sender and receiver, the encoder and decoder, the channel and the message, it also involves a context which enhances communication. In what learning is concerned, Escudeiro (2012) refers the construction and the visualization of knowledge. The first one presupposes knowledge acquisition, its deconstruction and application and the second one, the use of

visual representations and interactive features which enable the creation, transfer and perception of knowledge through meaningful communication. Sound, image, movement, light, color, voice, interactivity are among the many key factors of communication to which current technology effectively responds. The traditional physical book possesses a lot of limitations. For example, images are static and inflexible while in the digital textbook they are dynamic and

### **The digital textbook (e-textbook) in Portugal**

Discussing the digital textbook involves much more a prospective approach, trying to establish the lines in which to insert the future of education. An e-textbook implies a view supported in electronic equipment; it is, thus, performed in a specific format for that purpose and it can be easily available for its users, regardless of time and space. It does not merely mean availability in electronic form, for the e-textbook allows hyperlinks and adding videos, films and animations. Therefore, it demands available technological resources and, in order to be included in the daily school tasks, it determines teachers with enough ICT training toward the technological domain and methodological change, which means it is possible to find resistance from lots of teachers who are used to more traditional pedagogical resources and models. It must be, nonetheless, pointed out that the integration of the digital must not eliminate the possibility to use other physical resources; both can cohabit, meeting diverse needs. Rodríguez (2003) mentions limitations within the physical resources and the fact that they develop a type of teacher with a sense of consumerism, dependent upon elaborating materials and decisions of publishing companies. In this sense, he mentions (2007) the existence of a crisis in the teaching practice, since teachers are more concerned about selecting books and knowing how and where they are going to use them than about researching other kinds of materials, and a crisis in the educational policies which are more concerned about recommending the use of certain materials than providing means to a reflection on them or having teacher elaborating them themselves. He adds that, in reality, despite the existence of some technological resources used in isolated moments, the textbook determines the work done at schools. Effectively, it is a powerful instrument which gathers a set of information, according to the official program, for it serves as a rigorous guidance for many and only a few teachers point out any critic, reflection of demanding parameters on a scientific and editorial level to which they are subjected. They usually have a clear structure, intending to stimulate the students' participation and learning.

According to nr.1 of the article 15 of the Portuguese Decree-law nr. 261/2010 "Textbooks to be used are chosen from the ones that, as a result of the evaluation process, have been object of Certificate assessment mention." The assessment criteria of textbooks which have not yet been submitted to evaluated and certified are based on organization and method: it presents a coherent and functional organization, structured within the student's perspective; it develops a facilitating and enriching methodology of learning; it stimulates autonomy and creativity (DGE 2012). The choice of textbooks taken by schools is within the competence of the coordinating body and educative guidance, which means that groups of teachers are created to analyze and select the textbooks properly reasoned also according to a set of criteria. The Ministry of Education

created a Database of Textbooks, allowing the online collecting of the selections and choices made by the schools in order to manage the print run estimate.

Note that in Portugal policies of incentive to use ICT have been promoted and, in this sense, an updating of the classrooms and schools in general has been occurring; as a result, a response of change from the publishing companies regarding textbooks supply is expectable. In these past few years, the textbooks used by most teachers are of physical media and come with an additional CD-ROM, structured for linear usage without bringing in possibilities for methodological innovations. However, the latest analysis of textbooks, in different school grades within primary school and published by different Portuguese publishing companies, led us to conclude that there are two significant models that dominate the market and which are offered, for free, to schools that have chosen their textbooks: Escola Virtual [Virtual School] (Porto Editora group) and "20 Aula Digital" (Digital Lesson) (e-LeYa group). Note, nevertheless, that the textbooks include a teacher audio CD with the narration of texts supporting the oral comprehension of the textbook or audiobook, in the case of music lessons to provide the enriching of children's musical-sound personal experiences.

- The "Escola Virtual" (Virtual School) is integrated in the BRIP (Banco de Recursos Interativos para Professores [Bank of Interactive Resources for Teachers]) is considered to be an educative project that aims to provide attractive and effective resources, for different subjects and to the school grades, according to the textbook chosen by the publishing companies (Lisboa and Porto Editora, Areal Editores), in leading students to school success. It is, thus, a learning platform directed to students' self-training and which allows the personalization of a textbook in digital format. It is destined for the entire educative community (students, teachers, parents and institutions). In what comes to teachers, it involves four strong aspects: Classes, Resources, e-Textbooks, Topics. Regarding classes, it provides diverse digital and interactive resources which involve audio, image, video and animation, it sets record of the tasks delivered by class or by student and of the reports done, allowing the viewing of time, evaluation, state, tips, attempts, details and, also, to print and export. This way, it makes it easier to control situations related to the delivery of the student's material. It also makes it easier to organize the teacher's work, in what comes to the students' biographic data, class schedule, week plan, record of group work, tests grading and evaluations. As for resources, there is a list of general resources (Textbook, worksheets, games) which allows researching by subject, publishing company, projection and others, and favorite resources. The e-Textbook gives access to the textbook in digital format, allowing you to access a toolbar that enables the underlining, scratching, adjusting while supporting the teacher's communication. The student's e-Textbook has got additional resources that stimulate the content scanning in a more attractive and dynamic way. In relation to topics, it allows a selection by topics and subjects. It is also possible to research tests by type of question and difficulty level. There is a pre-drawn fact sheets bank for students

and the teacher can organize a folder with tests or consolidation worksheets that he has made, according to the student's needs, goals, and type of class, selecting resources placed in the platform or adding other external resources. It allows the teacher to print or send the paper to the students and access dictionaries. For subject consolidation, students have access to pre-set conceptual maps and interactive activities with animation. This platform also allows the development of online communities (activity, profile, friends, photos, Blog, Forum, Chat) enabling the user to view the total and last visitants. The presence of an organizer stimulates work organization all year through; the mailbox facilitates the quick message sending among pairs, promoting the sharing of information. Each user has access to "My Account", a home page which designs the tasks and activities done by each user on the platform. Although it suggests a general planning, it allows a personalized planning and the creation of a lesson plan, which are easily saved in "my planning". We believe that the possibility of programming lessons and the easiness of implementation increase the teacher's performance in context, it increases the student's concentration time and reduces the off-peaks or passive times within the lesson.

- The LeYa group meets the challenges of school projects with the "20 Aula Digital" (20 Digital Lesson) for teachers and students (digital resources supporting the textbook). "20 Digital Lesson" is a platform avowed by several publishing companies, namely, Texto Editores e GaiLivro, ASA, NovaGaia and Sebenta. It is composed of four major dimensions, aiming to boost the lessons and to motivate students: multimedia textbook; digital resources bank; digital worksheets bank; planning. There are other tools that support the teachers' communication, allowing them to set meetings, write notes, research and zoom. In what comes to the multimedia textbook, it allows the teacher to project and explore the textbook pages and, by being articulated with contents in digital format, it allows a more dynamic, interactive and attractive exploring of the issue being studied. The availability of a resource bank associated to its easy use, whether in the way of using in the classroom or in the organization of the lesson plan, by dragging, promotes the use frequency in the classroom and the organization of its sequence, avoiding wasting time and breaking the rate of work. We must point out the possibility for the teacher to add external resources, once the platform directly interconnects to the file and to the Internet, allowing the access to resources prepared by teachers and to a range of other resources found online with diverse categories. The platform thus presents a list of general resources that involves the multimedia textbook, the digital test bank and games, a list of the teacher's resources "my resources", allowing the teacher to add external resources to the CD-ROM and, also, resources selected in "favorite resources". The editable test bank, besides the worksheets organized by the textbook topics, integrates "my tests", allowing the teacher to easily elaborate personalized worksheets to the student's context, which enables the print or projection in the classroom. Although there is a general plan of the subjects content, with pre-

elaborated planning, the platform allows teachers to create their own personal planning so that they do not feel restricted to its proposals, as it occurs with the physical textbook. The lesson plan involves "all plans", "base plans" and "my plans". Lesson planning with diverse resources and under a sequence created by the teacher according to the rhythm he or she wants to implement, the possibility to save and access a posteriori a lesson list set by the teacher and to send them to the students, and the possibility to add text (topic and issue) to the resource, supports communication and orientation of the speech, it can stimulate motivation, depending on the type of resources added, it increases the rate of work, adjusting it to a personalized context, it allows the interaction while learning, the attraction and participation within the lesson, since it extends the concentration time and contemplates the information provided by the school textbook. Furthermore, it makes the teacher's job easier. Adding to this panoply, there are also animations, activities and interactive games, types of cartoon modes, which convey contents and facilitate its consolidation in a recreational way. Also, the easy creation of concept maps allows the clear organization of ideas and their consolidation. Therefore, generally speaking, 20 Digital Lesson suggests that the teachers explore the multimedia contents articulated with the school textbook, that they prepare lessons quickly with resources of the project or with their own resources, evaluate their students in an easy way, accessing the editable worksheets bank, communicate and cooperate taking advantage of the communication and interaction features and sharing resources with the students.

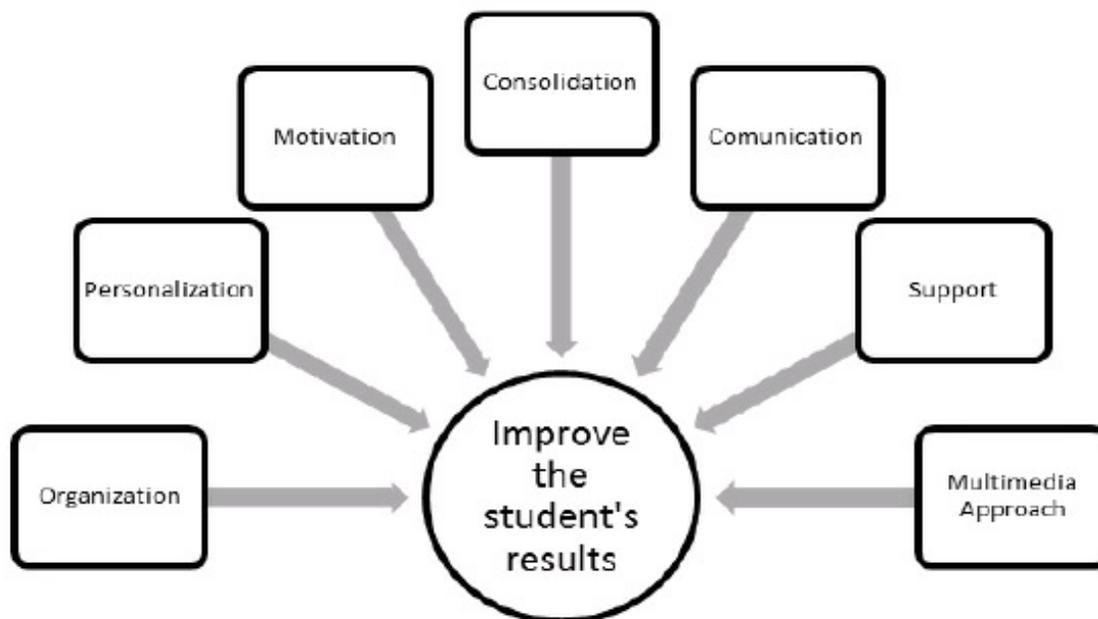
- Another concept and product currently in the Portuguese market is the called "Manual Digital II" (Digital Textbook II) developed by the Lusoinfo Multimédia Company in collaboration with the Instituto de Educação da Universidade do Minho (Education Institute of the University of Minho). It is about a multimedia resource, designed from scratch in a digital format, which is innovating as far as e-textbooks are concerned, to support teaching and learning in Primary School. The software can be installed in any personal computer with Windows, being under way to convert it into other operative systems, even in mobile devices. It is structured by school grades and it comprises the fields: Portuguese Language, Math, Study of Social Environment, English and Information and Communication Technologies. This software organization facilitates its curricular integration in the classroom, as well as the use in extracurricular fields. Since the structure and navigation of the Digital Textbook are intuitive, it is possible for the child to autonomously use it and, thus, evolve at his/her own rhythm, managing the learning and developing personal strategies of situation and problem resolution. The software is not restricted to exposing content, but it rather promotes integrating activities that favor interdisciplinarity and allows the student to have a significant learning (Ausubel, 1968), that is, the child is involved in a "process through which a new information relates to a relevant aspect of the knowledge structure" (Moreira & Masin, 2006, 17), in a close relation to his/her interests, with absorbed concepts and with the surrounding environment. As a multimedia

product, the Digital Textbook includes text, image, video, animation and context simulation, which can respond and correspond to the different types of students' "intelligence", in the line of the "multiple intelligences" concept (Gardner, 1983). The proposed activities (experimental activities, suggestions of small projects, diverse games, worksheets and others) are oriented to help the child to acquire and surpass skills of elementary thinking in the sense of developing the skills of greater cognitive demand.

As an effect, the activities, particularly if accompanied by the teacher, stimulate the development of a critical and reflective attitude in the students, toward the development of critical thinking, more and more necessary in the society of knowledge. The Digital Textbook can, therefore, be put into perspective as being a strategy so that the student "learns with technologies", asserting his/her role as "partner in the educative process" (Jonassen 2007, 20). Recently, The Digital Textbook has been enriched with the Classroom Website, a platform somewhat close to the "social network" concept which allows the online cooperation and sharing among students, teachers and parents properly identified by the system, which guarantees safety, an important factor in the online working with children. The work spreading is, for children, a great asset since the fact of having an audience, knowing that the educative community has access to their school productions, stimulates them to perfect their assignments. This online interaction is also an important strategy in connecting the school with the family. For the set of interactive multidisciplinary and interdisciplinary activities and for the online cooperation dimension that the Digital Textbook provides, it is, surely, a good resource at the service of the teachers as well as families to get the child involved in educative activities with ICT.

We verify that, until now and in a global way despite the differences, there are significant similarities in the concerns that sustain the edification of digital platforms (Pict. 2).

Pict. 2 – Fundamental pillars that sustain the e-textbook



The organization of the teacher's work, whether on a level of classroom and assignments done, or on a level of classroom plan, taking tests and evaluating, makes the teacher's job easier by having a global view of the class, of the student and the agenda and it contributes to the adjustments to the learning rhythm and possibly better school results. The support to the teacher and student through multimedia resources that stimulate sight, hearing and interaction, such as animations, recreational activities, videos, interactive games and concept maps, facilitate the transmission and consolidation of learning and contents, develop memory, promote content comprehension, draw attention of the brain, thereby increasing the attention skills and make knowledge more persistent. In this context, they motivate for and in learning. The possibility of communication among peers and the fact that the teacher can send documents designed by him/her, and even organized lessons, eases communication and stimulates the sharing of useful information. Also, the individualization of the textbook pages according to the needs and the easy integration of other external resources to the platform allow the adaptation to the context and to the students, turning it into a more significant and emotional learning, and animate a guiding school of its own transformation. The virtual school even allows a network communication in a safe platform. The chat and the forum stimulate the sharing of knowledge and the collective building of knowledge, but the good results depend on the good use of these resources and the implemented dynamic by the teacher and by the class; hence, the teacher possesses an essential role in using these resources and an added responsibility regarding the digital fracture. It can promote social building and problem solving, collaboration, socialization, know-how, life skills and it promotes the involvement in the task of learning by developing several skills. Quoting Vox, Cobo & Moravec (2011), they mention that the digital skills are learnt when people perform tasks that go beyond the simple use of technology, through informal socializing and through a non-induced way, and that the invisibility of ICT is related to the ability to generalize, connect and disseminate the knowledge that has been created. Note, nonetheless, that these abilities are not acknowledged in a formal evaluation, thereby requiring a reflection on the ways of evaluating a digital culture.

Generically, the current digital manual is directed towards a policy based on students' results, but it reveals a curious change in what comes to the physical textbook which instills a different image of the teacher, the student and the learning context. In this sense, it can be an important link to build a new methodological model in the digital era. Different publishing houses meet the new challenges and make the teachers' tasks easier in the teaching-learning process, improving their own performance. The easy use of these platforms, while not demanding a lot of ICT knowledge, tends to meet the elementary level of training of most ICT teachers and even of the school computer equipment; we must point out the fact that these platforms are likely to be used even in schools with no Internet access because they also exist on CD-ROM support; hence, they reveal their use feasibility and possibly their success, furthermore, they diminish two significant obstacles in the integration of ICT: lack of time and teachers' training.

## **Final reflection**

Teaching actors in the era of information and for the society of knowledge, in which technologies of information shore up the teaching-learning process, led us to reflect upon current e-textbooks, an important instrument in redefining the teaching practice in a context of change. It was verified that current technologies are effectively promoters of a new designer within education, carrying in it, meaning and emotion in the teaching-learning process. They demonstrate a more effective response to social demands, to the interests of this new generation and even to the challenges that the human brain implements. Moreover, the potential they offer come and amplify the ones in the physical textbook, thus meaning progress and a new revolution in the book history and technology. Knowing that the physical textbook stimulates the memorizing and repetition given its physical, time and space limitation, it seems to us that this e-textbook design is the first step in the downfall of the traditional model and towards the creation of a dynamic learning model that is bold in the creation and production, in the collaboration and network learning. Despite striking political ambiguity in the speeches regarding the requiring skills and curricular evaluation, since they significantly reflect a policy based on results that ignores the process, the path of ICT inclusion seems to show a type of learning that seeks meaning and emotion in the educative experience, action over the acquired knowledge, solving life problems and in context, it invites us to reflect upon an education that meets the demands of a global world. Publishers, through physical books, have been guiding the educative agenda. However, by allowing the teacher to recreate the textbook, they open the possibility for the school to be the one to recreate the direction of the change that is capable of taking on the social challenges and building autonomous citizens and with a creative and critical thinking. Besides, e-textbooks enable network interaction, participation and communication and also make it easy to integrate other free tools online, inviting us to be co-educators in the collective building of knowledge, magnifying the genesis of meanings, and creating new concepts in line with the social and cultural democratization. Memorization, comprehension, creativity, innovation, collaboration, production, dissemination, keys to the change of old practices into training youngsters who are able to think systematically given the challenges of an uncertain society, yet demanding in the world of globalization in the digital culture era. The e-textbook will stimulate all of these dimensions, being in consonance with the educative project and the global citizenship, in the sense of comprehensive training of the student and in the development of a critical attitude held in the values of democracy and social justice. Therefore, the challenge of school increases in the flexibility of the curriculum, in the organization of information, interpretation, comprehension and smart use of knowledge in context, in the global evaluation, including the "invisible learning" (Cobo & Moravec, 2011) and in life skill within a society of information and networking. The e-textbook is the reflex and impulsion of the passage from a solid education to a liquid one, redefining the ways of learning and organizing knowledge.

In a scenario undergoing transformation, despite the technology proposed by e-textbooks being easy to understand and use, a monitoring of the teachers' training emerges it should set the rhythm of the change with results that make known the so hoped and longed for quality of education in Portugal; although the technological

equipping has improved in the Portuguese schools, an investment in technologies that stimulate the use of ICT emerges.

So, the effective use of the studied platforms will indicate the direction of change and the sense of the practices and, by transforming the teaching-learning process, we hope they will improve the satisfaction of the educative community, the school results in general and the preparation of youngsters in the era of uncertainties.

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