Digital Textbook

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INTRODUCTION

Digital textbook theory and practice is an important area in the field of technology today, as it relates to all educators as well as those seeking to further their knowledge as a student or for personal interests and advancement. However, the idea to replace printed textbooks with digital versions comes from the late 1960th. In time many textbooks, including school textbooks, were digitalized during the Gutenberg project (1971-2008) "with the goal of making literary works belonging to the public domain available for free, and electronically" (Lebert, 2008, p. 2).

The history of digital textbooks goes hand in hand with educational, writing, reading, reordering, storage and disseminating technologies. During the first thirty-five years, digital textbooks were developed mainly as "a static electronic copy of a regular textbook: chapter by chapter, page by page, and picture by picture" (Brusilovsky, Schwarz, & Weber, 1997). In addition, different models of programed textbooks, hypermedia textbooks, multimedia textbooks, interactive textbooks etc. were exercised. Now learning is taking away from a fixed point and can be self-regulated through Information and Communication Technologies (ICT). A complex array of possibilities was opened up by the convergence of wireless infrastructure, new mobile technologies and post-modernism philosophy of learning.

A digital textbook is a textbook that can be read, heard or explored with digital devices. Most the digital textbooks are placed on learning platforms or on cloud systems and are accessed through computer(s) and digital devices. The personal library with digital textbooks may be taken anytime and anywhere. All textbooks can be digitized, but not all are programed. Compared with printed textbooks, digital textbooks have features, which allow to take notes, highlight words, search topics etc. In addition, the content is multimodal or programmed. This allows an increasing usability and affordability as well as the achievement of educational objectives. Didactic activities are based on information/communication, cognitive or assessment processes.

This article provides a framework for clarifying digital textbook initiatives using metasystem methodology and is related to all users of online technologies, because digital textbooks have the potential to engage all students in learning. The general aim of this paper is to describe the results of the meta-analysis of digital textbook confusing terminology, as well as structures and features. The central question concerns the optimal interdependencies between domains that study learning outcomes triggered by digital textbooks. The objectives of the article are:

- To describe the terminology and diversity of digital textbooks;
- To identify the main elements of digital textbook structure;
- To evaluate digital textbook features from the learner-centered perspective.

BACKGROUND

Digital textbooks are widely used in P-12, universities and in lifelong education around the world. However, the concept of digital textbook is defined in various ways, which interact with each other. According to the most recent definitions, a digital textbook is:

1. A textbook, specially created for a reader like Amazon's Kindle or Apple's iPad; read-on-demand computer based textbooks like those from Google Books and Net Library; print-on-demand e-textbooks; modular assembler of audio, visual, interactive, and text resources presented via iTunes, wikis, and digital applications (Mardis & Everhart, 2013, p. 93);

DOI: 10.4018/978-1-4666-5888-2.ch220

2. Digitized forms of textbooks that will potentially replace existing paper-based textbooks in the school curriculum (Lee, Measom, & Yau, 2013, p. 32);
3. Teaching/learning tools that "incorporate a plethora of features supporting student learning, such as note-taking tools, memo pads, writing and highlighting tools, messenger services, discussion boards, navigation tools (e.g., bookmarking, page search/scroll, and course selection), screen-capture capabilities, textbook display options, and search tools" (Lim, Song, & Lee, 2012, p.160);
4. Textbooks for future inclusion of diverse materials and learning support functions such as multimedia materials (video clips, audio aids, photos, and animation), evaluation items, supplementary and deepening materials, and glossary as well as all contents in print-textbooks (Korea Institute for Curriculum and Evaluation, 2013);
5. Textbooks, which are delivered in a digital format using a proprietary program for reading and annotating the text or a digital version of an instructor textbook, "which allow to reorganize chapters, delete or add chapters, delete or add paragraphs to individual chapters, and add their own notes, videos and images" (Harvey, 2011, p. 149);
6. A digital textbook is a learning tool that allows students to "watch videos within their books, answer questions with immediate feedback, and explore 3D models all at the touch of their fingers on their iPads" (Encheff, 2013, p. 62);
7. The digital version of a printed textbook improved with educational media features (Falc, 2013; Chuilkov & VanAlstine, 2013 etc.).

The meta-analysis of the proposed definitions allows to identify the following trends:

- Digitizing the existing textbooks;
- Programming the content or instructional and assessment frameworks;
- Personalisation of the open source content;
- Development of own digital textbooks using authoring tools etc.

The term "digital textbook" implicitly reflects the role of philosophy in learning: learning with digital textbooks must engage all learners into cognitive and metacognitive activities. The digital textbook, which is an artefact of globalisation and ICT, provides new opportunities for teaching, learning and assessment. These and other forces cause a diversity of digital textbook initiatives. The diversity of such initiatives is analysed through psychopedagogical, methodological, or technological criteria. On the base of technological criteria current digital textbooks initiatives are related to:

1. **eTextbooks:** "A subset of e-books" (Samuel, Grochowski, & Nicholls, 2013) or "a technological innovation which needs to use ICT as the medium through which textbook content is delivered" (Feldstein & Lewis, 2013, p. 179).
2. **Open Source Textbooks:** A textbook that can be read "either online or in hard copy, and there are no restrictions on copying or printing" (Brunner, 2013, p. 6) or, "the open accessible content, which allows anyone to edit individually or collaboratively, and give it away for free reading on the Internet" (Acker, 2011, p. 47).

eTextbooks are written by author(s) and cover educational standards. There are three models:

1. eTextbooks elaborated under the terms of the GNU Free Documentation License and available for free in .pdf, .html, .gtp or other formats (Hefferon, 2013; Beezer, 2013 etc.);
2. eTextbooks that can be purchased or rented at a cost or/and compared for free or/and accessed online (CourseSmart, 2013; Raymond & Kenneth, 2013; McMurry & Fay, 2012 etc.);
3. Tutors- intelligent solutions that adapt to all students: innovative research-based pedagogy, multiple representations, interactive examples, flexible sequencing; automated assessment, just-in-time feedback, skillometer and 24/7 help (Carnegie Learning, 2013).

There is also a diversity of principles, norms, objectives, structures and features associated to digital textbook use and development. Some of these are conceptualised according to linear thinking, but others, according to system (or systematic) model thinking. The proposed MetaSystems Learning Design in digital