

An overview of textbooks as open educational resources

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Abstract

The shift from machine-centered automation to user-centered services and tools is enabling users to be more creative and achieve more. Electronic textbooks become more and more open, free, accessible and affordable. Recent years have seen an unpredicted growth of electronic, digital and eBooks as well as authoring tools for its design, development and implementation. This article analyses the diversity of textbooks as open educational resources elaborated in recent years for K-20 education. It has identified four major trends in order to prove the metasystems transition theory from programed textbooks to open textbooks for individual and collaborative learning. This presents unique insights into perceived relative significance of impact of different pedagogical resources and authoring tools for learning in global learning environment.

Keywords: electronic textbook, teaching machine, programmed learning, systems thinking, metasystems thinking.

1. Introduction

Open Educational Resources (OER) are digital materials that can be re-used for teaching, learning, research and more, made available free through open licenses, which allow uses of the materials that would not be easily permitted under copyright alone [1]. These resources can be used in any learning environment that reside in the public domain or have been released under an open license that permits their free use and re-purposing by others. With Creative Commons (CC) copyright licenses, learners can find and incorporate free materials for reports and presentations; educators can customize textbooks and lesson plans; universities can distribute video lectures to a global audience; and publishers can adapt materials and develop services for an enhanced learning experience [2]. There are many projects which use CC licence for education: Open Courseware [3], Khan Academy [4], CK-12 foundation [5], OER Africa [6], Curriki [7], Connexions [8], Flat World Knowledge [9] etc.

Flexible learning is a flexible form of education, which creates options for learners in terms of where and when they can learn. Khan (2007, p.3) notes to stay viable in global competitive market, providers of education and training must develop well-designed, learner-centered, affordable, easily accessible, efficient, and effective flexible learning systems to meet learners' needs. A flexible learning system includes: traditional instruction and flexible learning open and distributed learning environment blended learning approaches and a framework for flexible learning. Flexible learning needs open and distributed learning environment. Open learning occurs in time, pace and place common for learner. According to Saltzberg and Polyson (1995, p.10) distributed learning is an instructional model that allows instructor, students, and content to be located in different, non-centralized locations so that instruction and learning occur independent of time and place. The distributed learning model can be used in combination with traditional classroom-based courses, with traditional distance learning courses, or it can be used to create wholly virtual classrooms. Flexibility in learning depends on the openness of the system and the availability of resources.

Morgan & Bird (2007, p. 248) observed that flexible learning is about:

1. *Pedagogy*: Flexible learning includes open learning, student-centred learning, and lifelong learning pedagogies, as well as more recent pedagogies associated with technology and online learning.
2. *Delivery*: Flexible delivery allows teachers and students to choose the media through which units of study are offered: face-to-face teaching, print materials, online materials and/or communications, audio and video, CD-ROM, etc.
3. *Institutional policies, systems, and structures*: Institutions necessarily support flexible learning and flexible delivery with policy related to issues such as advanced standing, flexible entry, enrolment categories, flexible course structures; and with systems and structures that support multi-modal delivery.

2. Electronic textbooks for open and distributed learning environments

Open, free and affordable textbooks are an easy way to drive down costs and reach under-served students. The first and largest publishing company for K-12 education can be considered Flat World Knowledge. Every Flat World textbook is free to read online. The company works with successful authors and well-known scholars to create electronic textbooks as well as printed textbooks. All textbooks are published under a Creative Commons license, which gives faculty unprecedented control over content, meaning faculty have permission to create a derivative version of any published textbook. With a simple click can be added links, rearranged chapters, edited down to the word level, and more.

There are 2 ways to read electronic textbooks: as educators and as learners. Educators can find and review the right textbook for their own courses, browse or search online textbook catalogue by course or topic, read the description and contents. Electronic textbook can be reviewed online or printed, customized before adoption or access to view and download supplements like an Instructor Manual, Lecture PowerPoint Slides, and Test Item Files. Users communicate with the author and other professors using the same book through phone, chat, email, Twitter, Facebook etc. Unlike educators, learners can read free textbooks using provided URL or access flatworldstudents.com and find course or book by professor, school or book title. From custom course URL students can access Study Pass option. After registration, students can navigate back to their own book and find downloads. Once student is the online reader and purchases the Study Pass or the All Access Pass, the notes and highlights are visible in the Study Mode, can be found in Downloads tab or disseminated through Facebook.

Its online resources are divided into 5 main categories: Business & Economics Textbooks, Science Textbooks, Math Textbooks, Humanities & Social Sciences Textbooks and Professional & Applied Sciences. For example: "The Basics of General, Organic, and Biological Chemistry, v. 1.0" is written by David W. Ball, John W. Hill, and Rhonda J. Scott, but can be customised (<http://catalog.flatworldknowledge.com/catalog/editions/170>). The e-textbook includes table of context (left side), divided into chapters and paragraphs. Each paragraph can be accessed online. The text may provide hyperlinks, examples, skill-building exercises, and concept review exercises with answers, key takeaway, and exercises with answers. The user can choose a preferred item, for example iron and receive full information about the presence of this item in each chapter. Supplements include instructor manual, Powerpoint lecture notes, test item file, Powerpoint image library, testbank for import to Learning Management System, test generator and solutions manual. Study Aids include e-textbook for instant download to iPad, Kindle, NOOK or other eReader devices or PDF Book for download to print or read offline. Also, the students can get support talking, writing or send a message.

CK-12 FlexBook is another example. It is free, easy to use standards-aligned and customizable tools and educational resources for teachers and students. FlexBook offers customizable books (teacher can rearrange the chapters, add, remove and edit content), concepts (bite-sized lessons for independent learning), interactive items (videos and multimedia simulations), exercises (instant feedback, track progress) and teaching materials (assessments, answer keys and ideas for differentiated instruction). Users can choose one of the following subjects: arithmetic, algebra, geometry, trigonometry, probability, statistics, calculus, biology, physics, chemistry, English etc. Content can be used anytime and anywhere, which means that, it can be read online or in printed form. Flexbook content can be used with the Kindle, iPad, NOOK, and more. The main concept can be found using a search tool. Moreover, there are three options: FlexMath (a web-based interactive Algebra 1 curriculum that provides daily lessons and real-time feedback to help raise student achievement), I Need a Pencil (free online SAT preparation with practice questions and an adaptive SAT score predictor) and new experimental tool "Homework Help". All images are created by the CK-12 Foundation and are under the Creative Commons license CC-BY-NC-SA.

The main page of each CK-12 electronic textbook includes cover title, options for personalisation, Pdf, Kindle and iPad (ePub) download, sharing on Facebook, Twitter, email and table of context. Table of content is structured into paragraphs. Firstly is presented Lesson Objectives, then vocabulary or main equations and learning content. At the end of paragraph is provided a summary, further reading or supplemental links and review questions. Supplementary links provide video, audio or pdf documents. In addition are provided details about authors, tags, categories, grades and data. All learning units include real examples and practice. Some textbook provides interactive exercises with multiple items and feedback. Quiz can be pursued after free registration.

Instead of K-12 electronic textbooks, the content of courses can be available freely and openly online for anyone, anywhere to adapt, translate, and redistribute. So, MitOpenCourseWare from Massachusetts Institute of Technology provide 2100 open content of courses in Architecture and Planning (Architecture, Media Arts and Sciences, Urban Studies and Planning), Engineering (Aeronautics and Astronautics, Biological Engineering, Chemical Engineering, Civil and Environmental Engineering, Electrical Engineering and Computer Science, etc.), Humanities, Art and Social Science (Anthropology, Comparative Media Studies, Foreign Languages and Literatures, Science, Technology, and Society etc), Science (Biology, Brain and Cognitive Sciences, Chemistry, Mathematics, Physics) etc. All courses are designed for undergraduate and graduate. For example, course “The Brain and Cognitive Sciences II” [10] is the second half of the intensive survey of brain and behavioral studies for first-year graduate students in the Brain and Cognitive Sciences curriculum. Each module involves a series of overview lectures by leading researchers in the field. By offering a thorough introduction to the current state of the discipline while emphasizing critical thinking, the course aims to prepare students as cognitive scientists.

One of the most interesting innovations is high school features that are most useful for high school students and teachers. The example of these resources is “Highlights of Calculus”. There are a series of videos with real-life examples illustrating the main concepts of basics for calculus. “Highlights of Calculus” is a series of short videos that introduces the basics of calculus — how it works and why it is important. The intended audience is high school students, college students, or anyone who might need help understanding the subject. Calculus Online Textbook, written by Professor Gilbert Strang, presented in a single pdf format, can be accessed here <http://ocw.mit.edu/ans7870/resources/Strang/Edited/Calculus/Calculus.pdf>.

Khan Academy is one more useful discovery for online learning. Electronic textbooks library is divided into 5 main categories: math, science, finance & economy, humanities and test preparation. Each category includes electronic textbooks. For example, math category includes Arithmetic and Pre-Algebra, Algebra, Geometry, Trigonometry, Probability, Statistics, Precalculus, Calculus, Differential Equations, and Linear Algebra. Each of learning contents is presented in video format and can be practiced. The student answer is checking immediately. If the answer is correct, he/she will receive next question, but, if the answer is incorrect, the student can opt for hint. The hint is presented in steps. Moreover, there are 2 interesting categories of videos, which include Brain Teasers and recreational mathematics and inspirational videos.

3. Wikibooks: an opportunity for collaborative learning and group assessment

Wikibooks is open content textbooks collection that anyone can edit. This collection includes free textbooks, which is listed according to the first letter of title and an editor. Wikibooks is for textbooks, annotated texts, instructional guides, and manuals. These materials can be used in a traditional classroom, an accredited or respected institution, a home-school environment. Wikibooks include annotated texts. These are a special kind of text which serves as a guide to reading or studying. An annotated text contains 1) a copy of a published original primary source text or other established narrative, academic or literary media, available under a Wikibooks-compatible license and 2) various kinds of study aids for reading, understanding, and teaching the text, like explanatory notes, introductions, summaries, questions and answers, charts, lists, indices, references, wikilinks, media, etc.

Wikibooks include 9 main categories: computing, engineering, humanities, languages, mathematics, miscellaneous, science, social sciences and all subjects. Each of categories includes subjects. For example, the category “Social science” deals with the social sciences subjects, which include academic disciplines concerned with the study of the social life of human groups and individuals: Anthropology, Education, Cognitive Psychology and Cognitive Neuroscience, Learning Theories etc. Some books can be read or printed in pdf format, example “Learning Theories” (http://upload.wikimedia.org/wikipedia/commons/5/5a/Learning_Theories.pdf).

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4. IBook textbooks: new challenges for global learning

IBook is an e-book application by Apple Inc. for their iOS operating system and devices. Such textbooks can be bought anytime from iBookstore. Users can change the modality of reading by adjusting the text size, selecting a different font, adjusting the brightness or choosing a white, sepia, or nighttime-friendly theme. Also, the users can highlight or underline text, make notes, look up a word in the dictionary or on the web, search inside the book or even use VoiceOver. The selected iBooks can be browse or updated in a beautiful bookshelf. Users can tap a book to open it, flip through pages with a swipe or a tap, and bookmark or add notes to favourite passages.

IBook diversity provides resources and tools for use in all levels, types, and styles of education from pre-school to university, including professional training and informal learning. A new kind of textbook, created by publishers using a new authoring tool from Apple is fully dynamic, current, engrossing, and interactive. The iBook textbooks are brought to life by iPad. A Multi-Touch textbook on iPad is a gorgeous, full-screen experience full of interactive diagrams, photos, and videos. No longer limited to static pictures to illustrate the text, now students can dive into an image with interactive captions, rotate a 3D object, or have the answer spring to life in a chapter review. They can flip through a book by simply sliding a finger along the bottom of the screen. Highlighting text, taking notes, searching for content, and finding definitions in the glossary are just as easy. And with all their books on a single iPad, students will have no problem carrying them wherever they go. New textbooks have been created by McGraw-Hill, Pearson Education and E.O. Wilson. The following textbooks are available for download on iPad in order to learn algebra, biology, chemistry, physics, environmental science and geometry. Students have the chance to experience and interact in new and unique ways to support learning and understanding. Moreover, students can learn strategies to develop important and meaningful mathematical reasoning habits. For example, "Environmental Science" provides the tools students need to get energized and apply what they are learning in their classroom to situations in their own neighbourhood. Students read, see, and ultimately understand environmental science. A new focus on the Big Ideas of biology sets the stage for active inquiry and participation through "Biology" from PEARSON. In addition, there is built-in reading support, visual and interactive overviews of complex processes, which aid understanding, realism and interest, and provide students with a visual link to the narrative.

For authors, who wish to create and publish Multi-Touch textbooks for iPod, iPhone and iPad and share them for students, is important to have an idea and a Mac. There are three main steps: 1) start with one of the Apple-designed templates that feature a wide variety of page layouts; 2) add text and images with drag-and-drop ease and 3) use Multi-Touch widgets to include interactive. Each template has a variety of page layouts to choose from — or create one of your own. Text, shapes, charts, tables, and Multi-Touch widgets can be added anywhere on the page with a single click. Moreover, people with disabilities can read and experience. The table of contents, glossary, widgets, main text, and more are built to automatically take advantage of VoiceOver technology. The elaborated authoring content can reach millions of potential customers on iTunes, the App Store, the iBookstore, and the Mac App Store.

On January 2012 was realised iBook Author, and Updated iTunes U [19]. Some of the new titles are already available via the new iBooks 2 app. There are 2 challenges: iBook Author and iTunes.

1. iBook Author is a free application from Apple that allows anyone to create interactive textbooks, upload the textbooks for sale in the iBooks 2 store, or upload them for free distribution through iTunes U. iBook Author comes with a handful of templates and widgets for controlling interactive content.
2. iTunes U, which has had lecture series available for a long time, has been updated to support taking complete courses on the iPad. Yale, Duke, MIT, and Stanford already have coursework available via iTunes U. iTunes U now includes course overviews and outlines of course plans, and offers users the ability to track assignments, collect and manage course notes, read textbooks, view videos, listen to audio, and much more.

Digital textbooks are a special kind of iBook. The project aiming to elaborate digital textbook is currently being tested in several primary schools of South Korea. Theoretically, digital textbooks contents tailored to students' abilities and interests. Practically, such textbooks offer various interactive functions, and provide the learner with a combination of textbooks, reference books, workbooks, dictionaries and multimedia contents such as video clips, animations, and virtual reality. It is expected that digital textbooks construct and create the knowledge not only of individual learners, but also the community, and support and manage the teaching of students and learning activities of teachers and learners. The Digital Textbook will use Windows XP and Linux Tablet PC Edition as its operating system. Learners can create their own textbooks while using digital textbook, underline important parts, take notes, and combine the contents with high-quality, reliable knowledge that is their own.

5. Lectora Inspire: a new way for individual learning designed by teacher

Lectora Inspire makes online course development fast and simple [18]. Bundled with the leading flash content creation, screen capture and recording software, Lectora's powerful authoring tools allow to quickly create dynamic video and Flash content as well as transform e-Learning scenarios to HTML5 for mobile delivery.

Lectora Inspire includes:

- Flypaper™ for Lectora – develops professional, custom interactive exercises; adds Flash animations, special effects and transitions to Lectora courses.
- Camtasia® for Lectora – creates professional tutorials by easily capturing real world video, Flash animations or 3D design software for zooming and panning, audio handling, transitions and more.
- Snagit® for Lectora – captures anything on your screen to create custom images, insert special effects, combining images or magnifying content.

This authoring tool has wizards and hundreds templates, which allow teacher to integrate multimedia, assessments and variables into coursework. Lectora enables automatically push e-Learning content to HTML5, Web (HTML), mobile and tablet devices, SCORM and AICC-compliant learning management systems (LMS), CD and DVD. Multimedia tools include audio recording and editing, image editing, video editing and synchronization. Reviewers can easily post comments, attach files and provide valuable feedback on individual pages within courses and training. Authors and reviewers can repeat this process to quickly complete the review cycle.

6. Conclusion

Open Educational Resources (OER) can be used and re-used for teaching, learning, research and became available as result for free through open licenses. Modern open, free and affordable electronic textbooks have the affordance to create a powerful learning environment, in which learners create, customise or share the content. From pedagogical point of view, the diversity of electronic textbooks can be analysed as didactic, dogmatic, monographic and declarative. Such textbooks have been developed by Open Courseware, Khan Academy, CK-12, Curriki, Flat World Knowledge etc.

Wikibooks is a real opportunity for group learning and assessment. This means that teacher can guide students step by step in order to construct their own content in virtual collaborative learning environments, using metacognitive methods and techniques. Authoring tools allow teachers to create content or personalised courses. There is a vitality of authoring tools diversity for smartphones, Ipod, Ipad etc. Each authoring tool includes templates and wizards that enable to create multimedia scenarios and plan activities in order to engage students in active learning processes.

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A Brief Author Biography

Elena Railean – researcher at Academy of Sciences of Moldova, Information Society Development Institute. She wrote more than 50 articles in theory and methodology of learning. Research interests include philosophy of learning, knowledge management, quantum psychology and mathematical modeling. Elena Railean is author of monograph “Methodology of educational software”, 2 IGI book chapters “Knowledge Management Model for Electronic Textbook Design” (in Enterprise Resource Planning Models for the Education Sector: Applications and Methodologies, K. K. Patel (Ed.)) and “Issues and challenges associated with the design of electronic textbook” (in B. H. Khan (Ed.), User Interface Design for Virtual Environments: Challenges and Advances). Her visions about e-pedagogy were published in the book chapter “Trends, issues and solutions in e-books pedagogy” at Victoria University.