# The Transformation of School Textbooks into Digital Educational Media[1]

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## Abstract

For a long time, educational institutions such as schools defined books as the preferred medium for learning. The article argues that schools, embedded as they are in a societies undergoing a digital change and experiencing concomitant change in the skills and competencies required of their members, bear a responsibility for teaching digital media practices in the classroom. The article focuses on the 'digital revolution of textbooks' and how it demands the transformation of former school textbooks into digital educational media. Furthermore, the text pinpoints what is inhibiting this 'revolution' by taking a look at the current debate concerning challenges and opportunities of Open Educational Resources (OER). By describing the contemporary trends concerning digital textbooks and OER as well as looking at contemporary pilot projects, which already break new ground for OER production, the article will discuss future challenges for producers, distributors, and users of digital educational media.

## Keywords

Digital educational media,
Open educational media (OER),
School textbook,
Media practices

[1] The paper summarizes the main aspects of a contribution for the Open Educational Resources Conference 2014 in Berlin and especially reflects the national OER discourse at that time.

**The Transformation of School Textbooks into Digital Educational Media**

For a long time, educational institutions such as schools defined books, or more precisely school textbooks, as the preferred medium for learning. Textbooks are labelled as the typical or lead medium of instruction in schools, certainly in European classrooms, and provide a 'map for orientation or navigation' (Wiater 2003: 219ff). What need is there for a *digital turn* in the classroom? What is the fundamental benefit promised by a change in educational systems whose roots go back centuries? And how would such a change be conducted?

One view might be that this change is already underway. Researchers concerned with the topic of textbooks in their social context refer to a competitive situation (Wiater 2003: 219ff) in which textbooks compete with new communication technology, computer software, the internet, and, especially, with social media applications for the attention of students in and outside the classroom. The fact that students surround themselves with digital devices and are perfectly able to handle them can no longer be ignored. And it is not only students who engage with digital media in the context of their schooling, using them, for instance, to do their homework or prepare for tests. Teachers are also assisted by digital media during their lesson preparations and in class. One might therefore argue that the long-term dominance of textbooks in the classroom is already on the wane. The use of educational media in the classroom and the practices related to this use are changing not least because of the ongoing digitalization of our society. Digital media used in teaching and learning contexts in schools are playing an important role in this process of development, since along with their *digital constitution* come several advantages, which shall be discussed later on. But first, in order to precisely identify the subject, I will now outline what I mean by *educational media* and specifically *digital educational media*.

From a communications studies perspective, Thomas Mock understands a *medium* as a communication tool of (1) perception, (2) interaction and (3) distribution and more precisely as (4) a communication technology and its associated practices. A medium in this fourth meaning is understood as a social phenomenon which includes technologies as well as the agents, institutional and organizational issues which interact with it (Mock 2006). In this regard, *educational media* can be defined as media which are produced for and used in educational contexts such as schools or universities and which have a pedagogical impetus. These media encompass textual, audio, visual or audio-visual media content and the related media practices (GEI 2014: 4). *Digital educational media* can be divided into (1) digitalized textbooks, which in general are PDF copies of an already existing (historical) textbook; (2) a digital version of a (present) textbook with additional content that is available online or delivered via DVD and (3) *born-digital* educational media that do not have a printed equivalent, but are specially produced to be used via digital hardware (computer, notebook, tablet computer or mobile phone).

The last-cited group, born-digital educational media, will be of particular interest for the following considerations. What is special about these born-digital educational media is not simply their digital character *per se*, but their potential for interactivity, individualizing of content, hypermediality, multimodality, and media convergence or media connectedness (GEI 2014: 5, Bock and Isermann 2009, Kuhlen 1997, Nielsen 1995). *Interactivity* of digital educational media allows students to interact and collaboratively learn with one another. The *individualization* of content for different levels of knowledge and competencies responds to contemporary challenges of the inclusion in school settings of students with varying needs. The term *hypermediality* refers to the non-linear, non-sequential and decontextualized reading and reception of content, which might support individualized reading or alternative learning practices. *Multimodality* as the embedding of different textual or audio/visual content, internet applications or Java applets in digital media might speak to the high levels of affinity with visual or audiovisual content found among young adults (Hoffmann and Münch 2005, p. 252). The *convergence* or *connectedness* of digital content gives rise to the opportunity of linking, remixing and distributing diverse media content (GEI 2014: 5, Bock and Isermann 2009). The need for school textbooks to *metamorphose* into digital educational media derives to an essential degree from the skills for a connected world addressed by these characteristics of digital media:

> It is widely accepted that certain core competences are essential for individuals to participate successfully within a knowledge-based society. These core competences, which learners' should strive to acquire, are: self-direction and creativity, critical thinking and problem-solving skills, collaborative team-work and communication skills. (Geser 2007: 16)

Those competencies could be fostered and promoted when teachers actively encourage students to work with digital educational media. The traditional role of the teacher as simply 'dispenser of knowledge' (Geser 2007: 16) is no longer appropriate to these new challenges. Concerns emerge in this context, certainly from a European perspective, in light of the fact that media socialization and the acquisition of media practices today still mostly take place outside the classroom (Ludewig et al. 2013: 2), although there is an evident need for students to actively learn not only how to use digital media, but also to understand and critique the way these media are produced and distributed. Against this backdrop, schools find themselves called to take greater responsibility for actively teaching digital media practices, and will no doubt rise to this responsibility. Some researchers hope that digital media use in the classroom will improve students' media competencies and prepare them for interacting and connecting with 'a world shaped by media', as well as reforming 'didactics and subject teaching' (Ludewig et al. 2013: 3): 'A world where learners can act directly and interact with others could help provide the ideal cross-over from the restricted models of teacher-based education to the more independent and

holistic approaches envisioned' (McAndrew and Farrow 2013: 74). Until this vision can become a reality, there are still a lot of fundamental challenges to be tackled and resolved.

## The Debate on Open Educational Media and Resources and its Implications for Digital Educational Media

We can pinpoint what exactly has been inhibiting the *digital revolution* and digital textbook practices in schools thus far by taking a look at the current debate concerning the use of open educational resources (OER) in class. OER are,

> in [their] simplest form [...] any educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are openly available for use by educators and students, without an accompanying need to pay royalties or licence fees. (Butcher et al. 2011: 5)

Referring to the UNESCO Paris Declaration of 2012 (UNESCO 2012), the term *open* in relation to educational resources is specified by Muuß-Mehrhols and Schaumburg as "teaching and learning material with (1.) open access, (2.) open licenses, (3.) open standards' (Muuß-Mehrholz and Schaumburg 20xy: 9f). Another definition adds: 'OER can be full courses, course materials, modules, textbooks, streaming videos, tests, software, and other materials or techniques used to support access to knowledge' (McGreal 2013: xvii). OER in the school context may be classified by their structure (worksheet, tutorial, module), output format (digital/analog, online/offline), medium (book, film, audio file, video file, multimedia application), or content (teaching subject or media content as textual, audible, visual) (Bock 2014: 11). The following reflections will concentrate on OER that are digital, used in school contexts, with an educational purpose and a didactic concept behind them (Muuß-Mehrholz and Schaumburg 20xy: 9f, Bock 2014: 10).

The contemporary OER movement 'emerged from the recognition that the Internet has great potential to change the way we live and learn, provided it can be harnessed for common good' (McAndrew and Farrow 2013: 74). Although OER are still a relatively recent phenomenon, these open educational resources are already a subject of growing interest (OECD 2007: 118) and even concern. There are essentially two opposing *camps* in the debate around OER and their influence on textbook markets: the activists welcoming free and open access to education and the publishing houses and commercial textbook producers which insist that there is no such thing as a *free* resource, because educational content must be produced and this gives rise to expenses which someone has to pay. At the moment five aspects of OER are particularly at the center of discussion among publishers, researchers, OER activists, OER producers and OER users: (1) expenses and costs, (2) technical challenges, (3) copyright and licensing, (4) quality and evaluation of content and (5) changes in knowledge transfer and the related practices: In many European countries we still see a gap between these digital opportunities and an

underfinanced school system (Bonitz, 2013: 134, Ludwig 2013: 82), that does not dispose of enough money to pay for the necessary technical equipment; meaning 'hardware' like broadband internet, WLAN, whiteboards, computers or mobile devices as well as 'software' like learning tools, licenses for digital textbooks or courseware. A lack of technology and technical knowhow in schools is one problematic aspect. Additionally, many teachers profess a degree of uncertainty about issues around licenses and copyright (Muuß-Merholz and Schaumburg 2014: 40f). It had once been unproblematic, if not strictly legal, for teachers to make a copy of a textbook and hand it over to a teaching colleague. Today, in the *digital age*, a simple copy can *be handed over* to hundreds and thousands of teachers via the internet, which opens up the possibility of exponential increases in violations of publishers' copyright. Intertwined with the near-unlimited amount of content available online are issues of locating and selecting educational resources with genuine educational value. A frequently aired question is whether there is an additional value to these online resources in comparison to existing, approved printed textbooks. Ehlers and Conole (2010: 5) argue that the actual quality of an educational product is highly related to the capability of teachers and the level of competency in evidence in their teaching practices. Another concern is the question as to the extent to which knowledge transfer and acquisition in the teaching and learning context might change through the use of digital educational media as opposed to textbook use (Bock 2014: 12).

**Overview of OER projects**

As there is yet no general overview of all international, European and nation-specific activities in OER development (Geser 2007: 31), this article must restrict itself to giving an insight into some national and international projects, and into how interventions differ from country to country. This overview, which it does not claim to be all-encompassing, demonstrates that OER production, distribution and use takes place across national boundaries and that OER use is not yet fully established internationally nor even within the boundaries of specific nations.

There is an international awareness in evidence around the topic of OER, though the intensity of engagement with the issue, in the form of actual projects, differs significantly among world regions and individual countries (Hoosen 2012: 3). Hoosen argues that the regions 'Asia and Pacific' as well as 'Europe and North America' are comparatively active in engaging with OER (Hoosen 2012). Geser says that, there is a predominance of material in English, due to the considerable and sustained efforts of countries such as the USA (e.g. MERLOT – Multimedia Educational Resources for Learning and On-Line Teaching), Canada (EduSource – Canadian Network of Learning Object Repositories), Australia (EdNA Online) and, on the European side, the United Kingdom. (Geser 2007: 31). Hoosen further points out that '[c]ountries appear active in the OER movement mainly through initiatives by institutions and engaged individuals and

through specific projects or programs with public funding' (Hoosen 2012: 3). Some exceptions are the Arab states, South Korea, Poland, and Norway, where government initiatives appear to be the driving forces. The Polish government, for example, has provided 26 million Euro as funding for technical support and infrastructure in schools, teacher training in this area, and the production of open e-textbooks. The Norwegian 'National Digital Learning Arena' is a government-funded open-source platform where digital textbooks and newly produced OER are archived (Ebner, Schön, Schön and Vlaj 2013; Vlaj 2014: 36-45).

Besides these projects supported or promoted by governments, there are a number of national projects and initiatives which receive public funding. In its 'Gateway to European innovative Learning', the European Commission lists 248 European projects related to OER in schools. Some are limited to single regions (such as 'NordicOER – Creating a Network for Sharing Educational Resources in the Nordic Countries'[2]), while others bring together several countries from all over Europe (such as 'Innovative OER in European HE'[3]) or are international projects (an example is 'ROLE – Responsive Open Learning Environments'[4]). One noteworthy US project is CK-12 and its FlexBooks. CK-12, which came into being in 2007, is a publicly funded 'non-profit organization, which aims to provide K-12 [i.e. primary and secondary - from kindergarten year to year 12] learning materials that is customizable, aligned to requirements, and free for all, in the US and worldwide'[5]. CK-12 also delivered free content for the German OER project Schulbuch-O-Mat, which I will now outline.

**The Schulbuch-O-Mat Project**

Schulbuch-O-Mat is a German crowd-funded project that launched in 2012 and was initiated by biology teacher Heiko Przydhodnik and social scientist Hans Wedenig. The aim of Schulbuch-O-Mat is to publish a curriculum-compliant, open-source textbook under Creative Commons license (CC-BY), which would be freely usable, editable, copiable and re-publishable to anyone who wished to (Schön, Schön, and Ebner 2013: 19). One of the major challenges of this project lay in motivating teachers to collaboratively work together via an online-wiki. The initial interest of potential authors declined quickly when they became aware that they were to openly share and discuss their thoughts with other educators (Schön and Schön 2013: 50). Even after several personal requests made to university professors, teacher trainees, and subject teachers, the Schulbuch-O-Mat initiators were unable to gain any support in writing the OER biology book. The team eventually turned to CK-12 for help and spent a large part of the money raised by crowdfunding in translating the English content of a biology FlexBook (Schön and Schön 2014:

[2] http://www.openeducationeuropa.eu/en/project/nordicoer
[3] http://www.openeducationeuropa.eu/en/project/oer-he
[4] http://www.openeducationeuropa.eu/en/project/role-0
[5] http://www.ck12.org/

54). In August 2013, version 1.0 of the Schulbuch-O-Mat biology textbook book went online, with 6,000 downloads in the ten weeks that followed. By the end of October 2013, the book had been revised and version 1.1 was live.

**Challenges and Opportunities Raised by OER and Digital Educational Media Practices**

The example of Schulbuch-O-Mat points to some of the current challenges around the introduction of OER into school contexts as well as some of those facing digital educational media in general. The following considerations will reflect those challenges, but also address the opportunities presented by OER. OER has the potential to play an important role in the fundamental, evolving process of textbook production that had for a long time been shaped by political and economic agents. I can only make brief indications in this article as to how influential OER or born-digital educational resources could become. Future developments in this field will be strongly associated with upcoming decisions by governments regarding the extensive implementation of digital hard- and software in schools and of continuing education programs for teachers using digital media.

**Challenges**

Currently, in most European schools, OER act as a supplement and not a substitute for existing printed textbooks. This is due to a variety of reasons related to the production and distribution of OER: 'Collaborative production of OER requires well-designed and robust online spaces and infrastructure (Wikiwijs) and repositories' (McGreal et al. 2013: v). Yet OER are not yet systematically, frequently and reliably produced. Therefore, even if a teacher were interested in teaching without printed textbooks, fully supported only by OER, it would barely be possible in the current state of affairs. Further, web searches cannot yet easily locate OER and there are no adequate tools for searching for specific OER content (McGreal et al. 2013: v). This is one of the thus far unsolved challenges for the field: Depending on what is defined as OER, there may be hundreds of thousands of resources *out there* (VBM 2013: 3), distributed online and therefore needing to be searchable. We will need online repositories for cataloguing, categorizing and tagging this content in all its diversity. If production and distribution (traceability in online repositories) were to be better organized than they are today, OER could compete with digital educational media produced by publishing houses and therefore potentially revolutionize education systems.

Textbook publishers, such as the German publishing executive David Klett, are highly skeptical with regard to OER: "We do not see a single country in which OER have to any extent improved education. So far, above all where there are government-financed calls for OER production, such as in Poland, we see a breakdown of long-term existing publishing structures […]." (Klett 2014).

Yet - as Klett stresses – OER are 'part of the variety' of educational products that are already offered by textbook publishers. The German *Verband Bildungsmedien* (VBM), which represents the interests of companies involved in the production of educational media, agrees with this viewpoint and adds that a strength of OER is the diversity of current topics they deal with, which cannot to the same degree be offered by textbook publishers (VBM 2013: 2). The association, however, cautions against the potential risks of launching OER, warning that the rise of OER products could ruin contemporary textbook publishing houses, putting an end to reliable coverage with all educational media needed in schools. The VBM further asserts that OER producers might not be able or willing to fill the gap thus left by the downfall of textbook publishers (VBM 2013: 2).

This scenario of publishing houses disappearing must not inevitably come true. The implementation of OER in school contexts does not necessarily exclude publishing houses from the production process (Ebner, Schön, Schön and Vlaj 2013: 3). Indeed, there are several arguments that support their inclusion. Textbook publishers hold long track records of expertise in collecting, designing and printing content with the assistance of teachers and academics. This treasury of knowledge could be usefully applied if publishing houses prove willing to make rearrangements in their production, distribution and payment models.

One of the problematic features of the current school textbook production process is the fact that publishers are required to invest in innovation, production and marketing operations in advance. Before their products provide them with any financial benefit they spend an approximate average of approximately 160,000 Euros for the development of textbook content and layout (Schön, Schön 2013: 87), with the ever-present risk that the investment may not be recouped in full. To minimize this risk, textbook publishers often employ the approach of producing repeated print runs of textbooks with a minimum of revision effort. Maximizing the income of a textbook also means selling the same product to as many schools, teachers and students as possible. One book for a large number of readers is the logical outcome of this model of textbook funding, which does not sufficiently reward innovation; recycling old content is cheaper than creating new. Reducing costs by producing fewer additional digital educational resources and by not trying new, unconventional formats leads to a market which supplies only little in the way of non-standard, individualized content.
In countries like Germany, where only three publishing houses share the school textbook production and distribution market (Dobusch 2012: 2) and where a lack of availability of funds for or willingness to invest in educational resources leads to textbooks being reprinted essentially unchanged from one school year to the next (Schön, Vlay, and Ebner 2013: 32), OER

have the potential to compete with commercially produced textbooks and may indeed enhance competition and therefore lead to diversification.

**Opportunities**

Since the UNESCO Declaration on OER was issued in Paris in 2012, there have been several changes in the way experts talk about OER. The question is no longer what OER means and how it can be developed; now, the primary issue revolves around identifying the specific value of *open* part of OER (McGreal et al. 2013: v). Why, then, are license-free, noncommercial and free-format educational resources that important? And why can other forms of born-digital educational media not have the same *effect* as OER? In other words, is the *open* aspect of OER really necessary, or would born-digital educational resources produced and commercially distributed by publishing houses be an equally useful substitute for printed textbooks?

One might respond here by pointing out that new, innovative practices of knowledge transition and acquisition call for learners to interact, exchange ideas and work together, which in turn requires them to have open access to information and no restrictions on usage and distribution of resources. Thinking this through to its logical conclusion inevitably leads us to OER, especially if publishing houses continue to adhere to their contemporary business and copyright models. A further issue is raised by the currently transitioning role of the teacher from that of a *keeper of knowledge* to that of a *facilitator of learning practices*. The new type of teacher encourages learners to find, select, edit and process information and perhaps to share the resulting educational products with other connected learners. Teaching practices of this nature call for the development of a technical and legal basis for the type of learning they promote. Cooperative learning requires the active engagement of students, the sharing of data, and prompt communication among participants, and therefore access to digital networks, computer facilities and school servers. One final aspect, which is rarely discussed in contemporary research on OER, also merits a mention in this context:

> [The development of OER] raises basic philosophical issues to do with the nature of ownership, with the validation of knowledge and with concepts such as altruism and collective goods. It reaches into issues of property and its distribution across the globe. It offers the prospect of a radically new approach to the sharing of knowledge, at a time when effective use of knowledge is seen more and more as the key to economic success, for both individuals and nations. (OECD 2007: 9)

If we consequently open up access to educational resources, we may fundamentally change the way our society thinks of (intellectual) property. From the very beginning of their school careers, children would learn to share their own knowledge and respect the value of others' ideas. The educational success and personal level of education of students would not be as strongly related to the income of parents as they are nowadays. Responsible access to

information and practices of knowledge acquisition in our global knowledge society should not be a priceless asset, limited to those who can afford it. In the contrary, it should be *open* for anyone. This said, this and other advantages of born-digital educational media or OER can only be realized if substantial changes take place in the level of technical support and equipment available in schools, the cost of which remains an unresolved issue. Current models for the funding of school classes which work exclusively or primarily with notebook or tablet computers ask, for instance, parents to pay for their child to have sole use of a device. Practices such as these have the potential to exacerbate existing inequalities in education (VBM 2013: 2).

**Conclusion**

The text argued that schools, embedded as they are in societies undergoing a digital revolution and experiencing concomitant change in the skills and competencies required of their members, bear a responsibility for teaching digital media practices in the classroom and need to rise to that responsibility by actively embracing digital educational media and addressing the challenges to which they give rise.

All things considered, however, we are not yet in a position to make a general judgement on whether school textbooks must or even should transform wholesale into open educational media. We will need to address the concerns held by various stakeholders about digitalization before we can begin to progress from a fundamental idea of open educational media as truly *open*. What the digital learning environment of the approaching future will need are motivated, qualified and influential agents working across different disciplines and institutions; they will include policymakers, producers of educational media (publishing houses, freelancers or practicing teachers), practitioners (teachers and perhaps students), and academic researchers. These people will, in many instances, literally and figuratively not speak the same language, as their cooperation will cross national and disciplinary boundaries. The challenge here will be to bring together these stakeholders from their various fields of work to engage their collective energies toward a shared aim: To prepare today's schools for tomorrow's digital educational media revolution.

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