E-TEXTBOOK OF THE FUTURE

Matija Lokar

University of Ljubljana, Faculty of mathematics and physics
Matija.Lokar@fmf.uni-lj.si

ABSTRACT

Electronic versions of textbooks (eTextbooks) have recently become a hot topic in the educational community. The advent of tablet form PCs has further secured eTextbooks as one of the most frequently discussed issues among educators. How can they be compared to printed textbooks? On their web pages one of the leading publishers states: "An eTextbook is the complete contents of a printed textbook, delivered in electronic form over the Internet. ... An eTextbook has the same content as a printed textbook, the same chapter divisions, and the same page numbering. ..."
We claim this is not the right way to go. A good eTextbook should be quite different from a printed textbook. What are the main characteristics of a good eTextbook, then? It should provide much more besides the obvious additions and improvements such as interactivity, multimedia, and ease of navigation.
As the need for individual approach towards each student is becoming more and more emphasized, one of the crucial changes we should expect and require is that an eTextbook should allow for customization and personalization. The customization should be achieved on different levels: be it technical (adaptation to different output devices where the eTextbook is to be used, tools used in examples and so on) or (more importantly) be it the adaptation of its content.
But where should this customization occur? Should the publishers provide all the possible variations? Should the learners decide for themselves what is the most appropriate for them? We think that customization will be one of the most important parts of a teacher's duties in the future. It is the teacher who is capable of making the proper combination of the teaching resources available, making it suitable for the particular pedagogical situation. Who if not the teacher is the most capable of assessing what is the preferred learning style of a specific learner, or which approach works best for each of his students. The teacher knows what tools are available, which technological skills his students possess ... The personal characteristics of each teacher should not be neglected either; namely the way of teaching, personal beliefs, opinions regarding motivational approaches, etc. Therefore eTextbooks should be designed to be adaptable to the pedagogical situation and to the user, be it a learner or a teacher.
Consequently, eTextbooks should be quite different from the printed editions. It should be a given that an eTextbook allows and enables uncomplicated customization and personalization.

1 INTRODUCTION

In the last few years even the daily press devotes quite a lot of attention to e-textbooks. We can see cartoons, titles such as "E-textbooks arriving into schools", "Lighter backpacks – more knowledge" … Even the authorities have succeeded and changed the regulations regarding the use of textbooks within the school system so that the digital form of textbooks are an option …

What are this momentum and the attention to the topic bringing to our schools? Before we look at some characteristics that modern e-textbooks have or should have, let us recall briefly what a textbook is. There are quite a lot of definitions of the term **textbook**. For example (Nose, 2003) writes "A textbook is a book that has been designed specifically for the needs of school education. It is a guide toward other sources of knowledge, toward discovering new knowledge". For our purposes the following two definitions are important, especially the text indicated in bold. In (Jurman, 1999) "A textbook in a contemporary school is part of methodologically-didactical materials, and it cooperates

with the teacher in the education process" and in (Turk Škraba, 2005) "The definition of a textbook depends on the **nature of the school system**. The basic contents of the textbook are determined by the state through the means of the curriculum which defines the objective and operational goals of the subject or the field. A textbook is one of the means that help the teacher and the student to achieve those goals*".*

2   USING TEXTBOOKS

An integral characteristic of a good teacher is that s/he always uses teaching materials in the way that is best suited to the class being taught. Therefore s/he uses the best suited textbook! So what a good teacher does? S/he chooses a textbook, starts lecturing on page one and follow through to the last page (or to the page we are on when the school year ends)? Of course not! Good teachers use several textbooks, multiple sources …and provide the students a "navigation" through the materials in the form of instructions:

- Start with the example in textbook Y on page 15.
- Read the explanation given and then do the exercises on page 21.
- In the handouts I have just given you, some examples of practical use are provided.
- Then we shall continue with the same topic on page 12 in textbook X …

Either that, or technology is applied – namely the most common and useful one in the teachers' everyday practice –scissors, adhesive tape and a photocopier, with the goal to produce a resource that is the most suitable for the pedagogical situation the teacher encountered.

With the advent of e-textbooks it is to be expected that the teachers' work is becoming easier, quicker, with more options. But is it really?

The advantages of an e-textbook over its paper counterpart most commonly mentioned are weight, price, storage place and access. As mentioned in (Ray, 2011) "A 4GB tablet filled with 3,500 e-books weighs a billionth of a billionth of a gram more than if it were empty of data - a difference that is approximately the same weight as a molecule of DNA. The same number of physical books would weigh about two tons. " and if we are confronted with the fact stated in (Dallas, 2012) that "During the 2011-12 school year more than 13,700 US children, aged 5 to 18, were treated in hospitals and doctors' offices for backpack-related injuries such as contusions, sprains, fractures, and strains to the back and shoulders." lighter backpacks are of course important for our students. Quite often e-textbooks from the same authors, covering the same content, are significantly cheaper compared to their paper "siblings" (for example Boundless is offering the electronic edition of the Algebra textbook for one tenth of the price of the paper version (Boundless, 2014)).

All advantages mentioned before are important, but the digital format brings much more important aspects such as simplicity of search, quick access, easy updating, use of multimedia, interactivity …

Of course, every advantage can be abused. Thus we too often see multimedia being used where it does not really clarify anything. It is nonsensical to demand that an e-textbook have a multimedia or an interactive element on each and every single page. Multimedia and interactivity should be used when they are appropriate for the learning situation and not »because they can be used«.

3 E-TEXTBOOKS

If we follow (Pesek, Zmazek, & Milekšič, 2014) we can divide existing e-textbooks into three categories:

Digitalized textbooks: The content is the same as in the print version. Their only elements are text and pictures. The only added value is the option to add comments and notes more easily.

Rich textbooks incorporate some form of interactivity. They add video and sound elements, some forms of interactive questions are present.

Interactive textbooks have all the elements of digitalized and rich textbooks but also the content adapted to human to computer interaction, interactive elements (dynamic interactive constructions), interactive progress check (instant feedback), the possibility to save answers, success rate analysis …

But is this enough? I think an important aspect is missing. Namely, if we recall the definitions of a textbook mentioned before – what is the role of the teacher?
The school today is still a reflection of the model created in the age of the industrial revolution:
- – equal standardized education for many students
- – „assembly line" – all students in a class spend an equal amount of time dealing with a particular topic (e.g. trigonometric functions)
- – "One size fits all"

Of course, the textbooks reflect the same model, too, whether they are a digitalized, rich or an interactive one. So the order of topics and materials is prescribed and fixed, examples (number and order) are set, exercises are at prescribed places... So we have the same textbook for Jane, Mike, and Susanne ... just because they happen to go to the same school and to the same class...

But if we cannot object to this when "classical" textbooks are used, as this is simply the reflection of technological limitations of a paper textbook (even though good teachers "fight back" and avoid those limitations with the technology of scissors, adhesive tape and photocopies), must this still be the case with e-textbooks?
We live in a society where everything is individualized and personalized. But all the students are still expected to use the same textbooks. If we take into account that not all students are able to learn at the same pace, in the same environment, following the same learning path, and using the same methods, it soon becomes apparent that an individualized approach is absolutely essential. Just as everything else, e-textbooks need to be customized.

Why
- – do textbooks provide the same examples, the same exercises whenever a certain page is accessed?
- – does a textbook use illustrations and descriptions of procedures and thus „forces" the teacher and the student to use Excel, if they could have used Calc just as successfully?
- – is Joe's textbook exactly the same as Jane's when their bikes can be different?

4 THE DISADVANTAGES OF E-TEXTBOOKS

There are several technological drawbacks, the majority of e-textbooks nowadays have:
- They are often merely digitalized versions of paper textbooks
  - The addition of e.g. video content does not mean these are true e-materials; e-materials are an essentially different media than paper.
- Poor interactivity and limited multimedia
  - Truly interactive tasks are a much neglected feature. They would enable the learner to participate in an active manner (e.g. answer in the form of a drawing, a plan, use a video camera and a microphone, participate actively when experiments are being conducted, solve problems with the help of games).
  - For example: using a star chart interactively achieves better interactivity than passive watching of a video clip presenting its use.
- Lack of contextual dependency
  - there are hardly any e-materials, that would enable the user to see the content based on their previous activities while using this same material (this function is very useful when we want to show the learner a mistake, that has been made a few steps ago, and the consequences of that mistake).

They quite often have several conceptual drawbacks, such as:

- Monolithic (constitutes of a single large block)
- Difficult to combine with other materials
- Non-editable content in presentations (e.g. the material constitutes of a single large Flash file)
- No suitable editing and building tools for e-materials
- Form and content are inseparable

5 DESIRED CHARACTERISTICS

What are the desired characteristics of a good e-textbook? They should be:

- **Accessible**: an e-textbook should be available online and there should be the possibility of transferring it to other locations.
- **Adaptable**: an e-textbook should be adaptable to the needs of individual teachers, learners and groups of learners.
- **Cost effective**: an e-textbook should increase the efficiency and productivity by cutting the time and money spent on the whole lifecycle of a textbook, including future revisions, adaptations….
- **Durable**: an e-textbook should be adaptable to the changes in technology without costly redesign and re-encoding.
- **Interoperable**: an e-textbook should have the option of being used in different learning environments and with different tools.
- **Reusable**: an e-textbook should have the option of its parts being used in different contexts.

And how can this be achieved? Some recommendations can be made to the authors and publishers:

- Content and form must be separate.
- Materials, that are part of an e-textbook, must be modular in construction.
- Everything must be open code based.
- Search options must be included in all parts of an e-textbook and all parts of the e-textbook must be metadata equipped.
- E-textbooks and all parts of them must be transferrable into different environments.
- E-textbooks must have a simple uniform user interface.

The most important aspect of a future e-textbook is its adaptability. An e-textbook should be adaptable to the needs of individual teachers, learners and groups of learners. As we said – there is no reason why the textbook for class 7a should be the same as the one for class 7b, or even within the same class, why Joe's textbook should be the same as Jane's. The role of the teacher is to adapt the textbook to the pedagogical situation.

We have already seen some steps taken in this direction. Several publishers offer the possibility of changing the order of the chapters; skipping and adding topics … or even changing the contents (see for example (FlexBooks, 2014), (CK12, 2014), (McGraw-Hill, 2014)… to name just a few).

6   E-TEXTBOOK ADAPTABILITY

In my opinion, **adaptability** is the core idea and the key feature separating future e-textbooks from their paper (as well as slightly digitally enhanced) versions.

We can talk of several different possibilities an e-textbook should offer:

- Adapting it to the user.
- Adapting it to the time component of the use
- Adapting it to the contextual dependency of the use of the textbook.
- …

And it is the role of the teacher to exploit this adaptability. The teacher is the one who must adapt the e-textbook to an actual teaching situation and to a particular student. The author creates an e-textbook having a particular, "ideal", situation in mind, however, the teacher teaches in the "real world". Therefore, an e-textbook should be flexible. It should enable the teacher to change and recombine various parts from various sources. Nowadays, there are technical means that enable such combining. The teacher should have the control. The author should merely be an initiator of the various models of a particular e-textbook in various forms. S/he, or other authors, should also provide "replacement" parts to be used instead (or beside) the ones already included in the proposed model of an e-textbook. When we talk about adapting an e-textbook to the user, the following two basic questions should be considered:

- What kind of a person and educator is the **teacher** who is using the textbook?
- What are the individual characteristics of the **student** using the textbook?

Every teacher, every student have their own characteristics, their own preferred way of dealing with problems, their own styles of teaching or learning … And the textbook should enable changes in order to reflect these individual characteristics of a person.

Is the user looking at or using part of the contents (example, animation, exercise …) of the textbook for the first, second, third … time? Adapting it to the time component of the use of the textbook means the e-textbook should change accordingly, being so by intervention of a teacher or automatically if appropriate rules supporting these changes are possible to be established.

Adapting to the contextual dependency of the use of the textbook means we need slightly different models (variants) of the e-textbooks considering whether is the textbook being used in online courses, in mixed-model courses, in standard education systems …? Also we have to take into account what are the implications of the social environment where the textbook is being used (does it make more sense to count squirrels or cars in an exercise)?

To achieve these adaptations an e-textbook should enable and support content adaptability. The teacher prepares a suitable **selection** and **combination** of the materials available, **regarding the given learning situation**.

E-textbooks must therefore be designed in the way that enables:

- selecting,
- combining,
- deleting,
- replacing,
- and adding

any part of its content. The content should be adapted (in a controlled manner) to the individual user.

So **the teacher's task** is to implement his/her pedagogical skills and knowledge in order to use such presentation of the information as is appropriate for the student and/or the group. **The technology's task is to support** the actualization of this adaptability.

7   CONCLUSION

We can conclude with a simple formula which, I hope, represents the future development of good textbooks

<div align="center">

e-TEXTBOOK

=

quality content +

multimedia elements +

new approaches +

ADAPTABILITY

</div>

.

References

Boundless. (2014). *Boundless Algebra*. Retrieved from
https://www.boundless.com/algebra/textbooks/boundless-algebra-textbook/

CK12. (2014). *CK12*. Retrieved from http://www.ck12.org/my/content/

Dallas, M. E. (2012). *Overloaded Backpacks Can Injure Kids: Experts.* nlm.nih.gov.

FlexBooks. (2014). *FlexBooks*. Retrieved from http://www.flatworldknowledge.com

Jurman, B. (1999). *Kako narediti dober učbenik na podlagi antopološke vzgoje.* Ljubljana: Jutro.

McGraw-Hill. (2014). *McGraw-Hill*. Retrieved from http://create.mcgraw-hill.com

Nose, Z. (2003). What is a textbook anyway? *EDUCA, 12*(3), 29-34.

Pesek, I., Zmazek, B., & Milekšič, V. (2014). *Slovenski i-učbeniki.*
http://www.zrss.si/digitalnaknjiznica/slovenski-i-ucbeniki/: ZAvod RS za šolstvo.

Ray, C. (2011, October 24). The Weight of Memory. *New York Times*.

Turk Škraba, M. (2005). *Učbenik kot sredstvo za kakovostno učenje in poučevanje družboslovja.*
Ljubljana: diplomsko delo.