Possible Aspects of E-Materials Application in the Teaching Process

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Abstract: *The effectiveness of the teaching process and learning is partly determined by the quality of the teaching material. Digital teaching material means all material that can be used and distributed in electronic form. This paper presents aspects of the application of e-materials in the teaching process, which are based on technological progress and the development of new possibilities. The paper discusses the types of e-materials as well as their role in the teaching process.*

Keywords: *e-materials; teaching process; types of e-materials; electronic books; multimedia learning*

1. INTRODUCTION

The latest publishing phenomenon could be said to be electronic books (also known as e-books). The basic formats of digital teaching materials are given in terms of:

• text,

• visual content (images, charts, etc.),

• animation, i

• audio and video recordings.

The term "electronic book" dates back to the late 1960s [1], and a recent definition by Feather and Sturges (1997) [2, p.130] is "book-analog text that is in digital form for display on a computer screen" (p. 130).

Multimedia teaching material is a combination of at least two or more digital formats, such as text and video, or visual elements (photos) with accompanying audio content (explanation of the visual element).

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The e-book is a significant new medium that can offer additional value to the printed book through its potential to include other media pages in addition to the text on it. It is a document designed for viewing on a computer screen, which integrates the classic structure of books with features that can be provided within an electronic environment [3].

Creating teaching materials is an integral part of the professional activities of teachers. Based on experience, it can be concluded that certain forms of multimedia teaching material are very common in primary and secondary schools, such as slide presentations (PowerPoint).

However, even a cursory analysis of those presentations used in schools indicates that most are not designed in accordance with the basic principles of creating effective multimedia teaching content. Such presentations and other multimedia forms of teaching material are not only not in the function of stimulating and supporting the learning process, but they can reduce the student's efforts to master the specific content of the teaching units.

More precisely, an e-textbook is an e-book that contains educational material for teaching and learning methods [4].

In addition to the slide presentations that are standardly used in primary and secondary schools, audio and video recordings can also be extremely valuable teaching material. There has been a rapid expansion of educational multimedia since the early 1990s [5] and the conversion of printed publications such as textbooks into electronic interactive form is likely to prove useful [6]. It is argued that the e-book is particularly suitable for enhancing learning outside the classroom, and recent technological developments have produced a strong incentive to provide such electronic material for educational purposes [4].

2. TECHNOLOGICAL PROGRESS AND DEVELOPMENT OF NEW POSSIBILITIES

It is a well-established opinion that for the creation of effective digital teaching material it is necessary to have professional equipment and programs. Professional equipment can certainly contribute to the technical aspects of quality, but often this is not crucial to their effectiveness in learning activities.

Printed textbooks are also often outdated compared to e-textbooks, with the printed version usually being updated and replaced every eight years on average [7]. Current teaching activities attempt to combine the best teacher- and curriculum-based online resources. E-learning enables faster and greater access to information for education [8].

However, the accessibility of technologies and programs in recent years provides the opportunity for teachers to independently create audio and video teaching materials. Simple digital cameras, mobile phones or web cameras and microphones can be used for this purpose. Numerous web services can be used for editing and dissemination of audio and video recordings, e.g. media sharing services, podcast, videocast.

Many authors suggest that e-learning is effective because it offers great opportunities for collaboration and interaction. However, the implications of taking on this e-learning initiative should be considered, including financial support, staffing burden and changing roles [9].

Teaching materials are one of the most important components of the educational process. In a similar way to their printed equivalents, e-textbooks allow students to underline important sentences, write notes and look up unknown words. The content of the teaching material is in accordance with the educational program, so the learning material first of all plays an important role because it serves as a useful aid for the teacher to prepare for his lectures. In addition, learning materials are specifically designed to provide information to students. In this part of the educational process, learning materials serve as a source of information, where the student can refresh already acquired knowledge or acquire new ones. Furthermore, learning materials can also be used as a motivational tool for the teacher to get more attention from his students.

Learning materials not only serve as a repository of learning content, but, according to [10], materials have a hidden curriculum that includes attitude toward knowledge, attitude toward learning, attitude toward role, and teacher-student relationship, and as such enhance the teaching and learning experience. .

Despite the many advantages associated with e-textbooks, there are also some obvious disadvantages. First, problems related to screen reading should be noted, which may cause users to read more slowly or choose to print the document and review it in hard copy [11].

There are different forms of learning materials; however, it is the teacher's decision which one to use. The most common learning material that teachers rely on is the textbook. The structure of the textbook is based on the curriculum and thus determines the components of the teaching

content, which makes it easier for the teacher to prepare for the lecture. Using textbooks makes it easier for teachers to control the content of lessons, teaching methods and procedures [10].

There are other learning materials that are included in educational processes such as: multimedia such as audio, video, interactive content and others. The use of additional materials depends on the limitations of the subject and mainly on the equipment in the classroom.

With the development of information technologies (IT), mostly access to the World Wide Web, education has gained new dimensions and possibilities, as well as teaching tools. Technological advances have enabled educators to provide opportunities for interactive dialogue at a distance. In addition, the impact of IT development has changed the educational environment and learning processes with the rise of e-learning.

There are also opinions that e-textbooks show complexity, which leads to various difficulties related to usability [3], [12] and some e-textbooks may promise complex addition of functionality, but actually provide limited multimedia functions. It is also necessary to ensure that there is enough memory space on computer hard drives both for storing electronic text and for running software [13], which could create problems in schools where existing computer equipment is not particularly up-to-date. Recently, some research has been done on children's understanding of e-books, mostly concerned with those concentrating on fiction. For example, Greenlee-Moore and Smith (1996) [14] investigated the effects on nine- and ten-year-old children's reading comprehension of printed narrative texts of varying length and complexity compared to the same narrative texts presented on interactive CD-ROM software on a computer. A study by Trushell et al. (2001) [15] took as his basic research to indicate that e-book reading can have beneficial outcomes for students' reading. The study investigated small groups of nine- and ten-year-old children reading an electronic storybook without teacher intervention and noted that the students' recall was influenced by a number of factors.

Many simpler electronic teaching materials such as tests, lesson preparation, worksheets, etc. They can be made by teachers, professors and professors who have average knowledge of computing and computing skills. Teachers could exchange all electronic teaching materials through specialized educational web portals.

3. TYPES OF E-MATERIALS

There is a big difference in teaching students at the elementary level or teaching at a university because of the diverse complexity of the audience. E-materials should enable different levels of

student involvement in accordance with the educational program. Therefore, it is the teacher who must be able to decide which material is appropriate for a particular type of student.

In the last century, three views of learning have developed and based on them we can find three architectures of e-learning, Table 1. We can see that the receptive architecture is based on the display of information gathering, and the directive is based on reinforcing the response. while guided discovery is based on knowledge construction review [16].

Table 1. Three e-learning architectures

Source:R. C. Clark & R. E. Mayer, e-Learning and the Science of Instruction, 2011, [16, p. 22]

Architecture	The view	Inter-activity	Used for
receptive	acquisition of information	low	training goals
directive	strengthening the response	medium	training objectives in the procedure
guided discovery	knowledge building	high	strategic goals of training

According to the e-learning architectures described above, the interactivity of lectures in e-materials ranges from low to high. For receptive classes, e-materials contain a low level of interactivity and do not offer opportunities for student responses and feedback. At this level we can classify traditional learning materials converted into digital media.

The middle level of interactivity is represented by e-materials designed for e-learning about directive architecture. The directive lecture e-materials follow the order of "explanation-example-question-feedback". The e-materials in this segment contain highly structured practice opportunities compiled for attending classes in a step-by-step manner. An example of e-material for teaching from the directive is an e-textbook, with integrated multimedia blocks and connecting concepts through lessons.

Electronic publishing is a relatively new form of content distribution for teaching purposes, therefore many definitions and categorizations of elements in this area go through a process of constant redefinition, addition and improvement. For now, there is a tentative agreement regarding the types of digital publications, while, for example, there are still discussions among authors on how best to define basic concepts such as e-Book, e-Textbook, etc.

The Networked European Deposit Library (NEDLIB) has published an overview of the standards for electronic publication in which it more precisely defines the categories of electronic publications. NEDLIB is a project initiated by CoBRA+, the Standing Committee of the Conference of European National Libraries (CENL). This document recognizes the following categories of electronic publications:

• Offline electronic publications. This category includes digital editions that can be used independently of having access to the global network. In other words, these releases are distributed on media such as CD, DVD, magnetic tape, etc.

• Online electronic publications. This type of digital publication provides educational content that is only available online or through the use of local borders. Online electronic publications can be further divided into a) static resources, b) cumulative resources, and c) dynamic resources.

• Hybrid electronic publications. Hybrid publications refer to educational content that is primarily distributed via CD or DVD, but which also features hyperlinks that provide access to content stored on a global network.

4. THE ROLE OF E-MATERIALS IN TEACHING

Contemporary trends indicate that the function of school libraries and librarians is changing significantly in accordance with the progress and development of media and information transfer technologies. In the past, printed material (books and magazines) was primarily used for the purpose of learning and teaching, while in the last two decades digital teaching material has become more and more dominant. Examples of good practice suggest that trained and specially trained librarians take over the creation of multimedia teaching materials. For example, as part of the LUMENS project at the University of Michigan, numerous librarian training sessions were held with the aim of preparing them for more successful use and creation of multimedia teaching aids. In European educational frameworks, the concept of the role of the library and librarians is also changing. So far, a lot of research has been done in this area with encouraging results. Initiatives that advocate the necessity of expanding the role of librarians are not new in the world. Some authors emphasize that the librarian's function must evolve since the ways in which information is transmitted in the 21st century have also changed significantly. In this sense, the professional training of librarians for the use of ICT is seen as one of the ways to improve the process of integrating ICT into the educational system and creating quality digital teaching materials.

Many teachers choose to use e-materials in their classrooms, because all the interactive and multimedia elements help them to attract the attention of all students and their senses. Namely, when information detects multiple channels

simultaneously, the quality of understanding and memory increases significantly due to increased activity in all parts of the brain [17, pp. 118-121].

Teaching with e-materials helps the student to transform the words and images in the lecture through working memory so that they are integrated into already acquired knowledge in long-term memory [17, pp. 31-33]. From this perspective, the structure of e-materials is in accordance with the theory of cognitive learning.

foundation is shown with two streams; one for converting words and the other for handling visual content. The basis of limited capacity is shown by the square working memory box in the middle of the same figure. In the image below, we can also see the active basis of processing interpreted by five pointers.
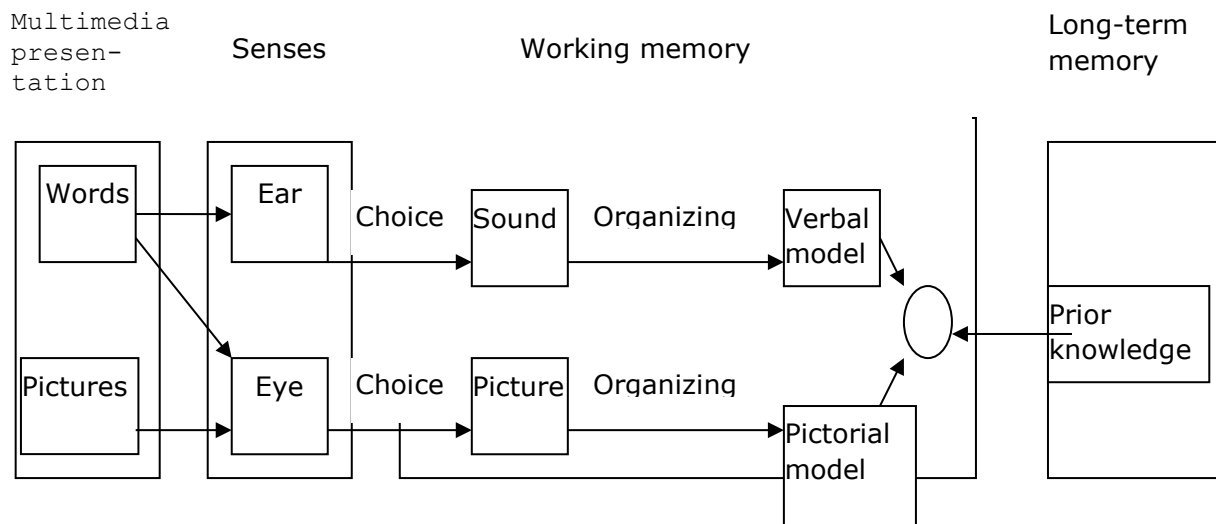
Figure 1. Cognitive theory of multimedia learning

Source: R. C. Clark & R. E. Mayer, e-Learning and the Science of Instruction, 2011 [16, p. 36]

The view of knowledge construction is presented on Mayer's theory of cognitive multimedia learning [17, pp. 31-38] based on three central foundations:

• Dual channels; this foundation declares that two independent approaches are used for data processing. The first channel processes sounds in working memory, and the second channel is used to process images. The first model results in verbal models and the second in pictorial models. The construction of both can be influenced by background knowledge stored in long-term memory [16, pp. 35-36].

• Limited capacity, as the next foundation, suggests that students are limited in the amount of information they can actively detect and integrate simultaneously [16, p. 35].

• Active processing; as the last foundation of multimedia learning, which takes place when students engage in appropriate cognitive processing during learning. The result of active cognitive processing is the development of a comprehensible subjective illustration, so active learning can be considered a process of building a model [16, p. 35].

Figure 1 shows a model of how a student learns in lectures that contain multimedia content, which is an integral element of every e-material. As we can see in the picture below, the two-channel

In Fig. 1, we can also see three important cognitive processes marked by arrows [16, pp. 36-37]:

• Choosing words and images; first, students pay attention to the important words and graphics that the ears and eyes perceive in this material - the lecture.

• Organizing words and pictures; at this step, students organize the selected words and images in their minds in an argumentative verbal and pictorial form.

• Integration; as the last step that combines oral verbal and pictorial perceptions with each other and with already acquired - background knowledge. Active learning occurs when the student is appropriately involved in all these processes [17, p. 36].

5. CONCLUSION

It should be emphasized that electronic books and textbooks (eng. eBook and eTextbook) represent only one of the ways in which authors can publish works in electronic form. Current practice indicates that electronic publishing of books and textbooks generally follows and goes through most of the stages that characterize traditional book publishing. Namely, this primarily refers to the process of writing, accepting and approving the

content of a book or textbook by the publishing house or the relevant educational authority (if it is a school textbook). However, unlike the traditional printing of books or textbooks, when publishing electronic editions there are additional, specific requirements that must be taken into account.

For the successful publication and distribution of electronic books and textbooks, it is necessary to respect certain standards and criteria for the production of such publications. Accordingly, it is necessary to adopt standards at the national level to help future authors and publishers of electronic publications. These standards must be harmonized with valid world criteria, especially with those related to the technical requirements of electronic editions.

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