



**TECHNIUM**  
**SOCIAL SCIENCES JOURNAL**

**Vol. 13, 2020**

# **A new decade for social changes**

**[www.techniumscience.com](http://www.techniumscience.com)**

ISSN 2668-7798



## Multimedia and interactivity in educational materials

**Petri Mališů<sup>1</sup>, Petr Šaloun<sup>2</sup>**

Department of Technical Education and Information Technology, Palacký University  
Olomouc, Czech Republic

[petri.malisu@upol.cz](mailto:petri.malisu@upol.cz)<sup>1</sup>, [petr.saloun@upol.cz](mailto:petr.saloun@upol.cz)<sup>2</sup>

**Abstract.** Teachers can choose from a group of different kinds of educational materials. These educational materials vary with their features, properties, and possibilities of use. Nowadays, teachers are using more digital educational materials, which are simple to use and offers advantages that come from their digital form. But not all digital materials provide significant benefits for effective education. The main features that improve the learning of students are multimedia and interactive elements. This paper contains a summary of multimedia and interactivity and different points of view on these terms.

**Keywords.** Educational materials, multimedia, interactivity.

### 1. Introduction

With the development of information and communication technologies (ICT), new forms and possibilities of how to process and display information are emerging. The individual options are gradually being improved and become more accessible to ordinary users. The mentioned development and the fact that these technologies are readily available have changed all spheres, including education. One of the examples of how education has changed, depending on the development of ICT, can be teaching materials. Today, teachers no longer have to work only with a "traditional" paper textbook. Digital textbooks are often available too. They can also use other digital educational materials such as multimedia presentations, tutorials, or try out virtual or augmented reality.

Researches show that the quality of education, pupil outcomes and the effectiveness of the educational process depends on the quality of used educational materials (Kalhous, 2009; Mikk, 2007). Therefore, we assume that educational materials should follow current trends and offer teachers and students the most effective way to achieve teaching goals. In this direction, it means to expand the use of electronic materials that are multimedia and interactive.

Under digital educational materials, we can include an ordinary, electronically distributed document with images. This kind of educational material, apart from its electronic form, offers no higher added value from the printed medium. But also, the term digital educational materials can consist of materials with interactive and multimedia elements that make greater use of digital technology, and they bring more value to effective learning.

## **2. Multimedia and learning**

Multimedia and interactivity are considered key elements for more effective education. Stoffová (2017) states that combinations of various forms of presentation of new information, or the opportunity to work with this information, are necessary for the effective building of a human knowledge system. The importance of multimedia and interactivity is shown by other research that has focused on human perception. More than 80% of information is perceived by sight, followed by hearing with about 10% of the information, and the remaining perceptions fall on other sensory organs (Petty, 2008; Stoffová, 2017; Geschwinder, 1987). Fredman (according to Pejsar, 2007) further states that we remember only 10% of what we read. We remember 20% of the information we hear, 30% of the visual information in the form of an image. We store half of the information when we hear and see it at the same time, 70% of what we hear, see and actively perform at the same time, and 90% of the information when we reach them ourselves through our own experience or activity. Although experts discuss the accuracy of this data, it is clear, that the combination of various forms of presentation of information or the ability to actively work with information helps to remember information more effectively than just reading a text. Comenius (1958) has already noted the importance of acting on different senses in teaching: "Therefore, be a golden rule for teachers so that everything is shown to all the senses as much as possible. ... And if something can be perceived by more than one senses at once, let it be shown to more senses."

## **3. Multimedia**

In the past, we may have encountered the concept of audio-visual technology in connection with education. This term has been replaced by multimedia, which better describes the current capabilities of these objects. The view of what multimedia is, however, differs between authors. This article presents the two most common perspectives on the definition of multimedia. The first view, the so-called "classical", looks at multimedia as a summary of individual media (e.g. video, image, text), used to present the information and to communicate between students and teachers (Klement, 2017; Vrba, 2003). The second view is based on computer terminology. It is a combination of different forms of presentation of information into one whole. Sokolowsky (1994) further emphasizes the possibility of interactive user intervention, which can influence the course of multimedia. Pavlokin (2007) also attaches importance to interactivity. He considers interactivity to be the fundamental difference between multimedia and an audio-visual work or document that combines, for example, only text, graphs and images.

Today we can also meet the term hypermedia. It is a connection of multimedia and hypertext, where individual multimedia objects are interconnected using hypertext links (Dostál, 2009). An example could be a website based on a hypertext structure - linking individual parts using links.

## **4. Interactivity**

The term interactivity is used in education to describe various communication interactions, e.g. between teachers, between teacher and lecturer, but also with the educational material itself. In connection with digital educational materials, we distinguish between two types of communication - evoked by the learner or evoked by the system (Evans, 2007). How this communication looks like reflects this three-step model: 1) display of the control element to the learner (computer-initiated), 2) use of a control (teacher's response), 3) display of new information (computer feedback) (Evans, 2002).

The contemporary concept of interactivity in digital educational materials distinguishes two dimensions. The first is understood as two-way communication between the learner and

multimedia, in which the learner can actively intervene in the object using the user interface (Dostál, 2009). The second dimension of interactivity enables the communication between individual participants in education (Klement, 2017).

To illustrate how interactivity can be implemented in educational materials, we can use the division of digital teaching materials into three categories according to the degree of interactivity (Klement, 2017). At the lowest level of interactivity implementation, objects allow users to choose a "custom" path. A higher level of interactivity offers us the possibility to control the simulation parameters. Dynamic simulations offer the highest level of interactivity, which has a feedback apparatus. Repolusk (according to Zmazek, 2012) distinguish a similar definition of interactivity levels. He considers the lowest level to be audio and video materials that can be controlled. The second level includes objects that give users feedback based on their responses. The highest level allows multiple interactions between the users and the system.

## 5. Conclusion

We live in an information society today; this fact should also be reflected in education. The use of educational materials with multimedia and interactive elements seems to be a suitable and effective way to master the curriculum. This kind of educational materials can interest students more. They can offer them feedback functions, and they support their pace of study. With the spread and availability of ICT, these materials can be accessed by students almost anywhere and anytime. On the other hand, the creation of such materials is extremely hard in terms of time and money. Their usability depends on the quality of processing. For the future, the right step is not to abruptly abandon paper educational materials, but to find the correct connection and balance between printed and digital educational materials. This could be made e.g. by linking the textbook with QR codes to a multimedia website or by incorporating augmented reality. This connection is offered, for example, by the interactive physics textbook FyzikAr 7 by Vít Škop.

## References

- [1] Dostál, J. (2009). Multimediální, hypertextové a hypermediální učební pomůcky - trend soudobého vzdělávání. *Journal for technology and information education*. **1** (2), 18 – 23, (2009).
- [2] Evans, C., & Gibbons, N. J. The interactivity effect in multimedia learning. *Computers & Education*, **49** (4), 1147–1160, (2007).
- [3] Evans, C., & Sabry, K. Evaluation of the interactivity of web-based learning systems: principles and process. In: *Innovations in Education and Teaching International*, **40** (1), 89–99, (2002).
- [4] Geschwinder, J. Metodika využití materiálních didaktických prostředků. *Praha: SPN*, (1987).
- [5] Kalhous, Z & Obst, O. Školní didaktika. *Praha: Portál*, (2009).
- [6] Klement, M., Dostál, J., Kubrický, J., & Bártek, K. ICT nástroje a učitelé: adorace, či rezistence?. *Olomouc: Univerzita Palackého v Olomouci*, (2017).
- [7] Komenský, J. A. Velká didaktika. In: *Vybrané spisy Jana Ámose Komenského*. *Praha: SPN*, (1958).
- [8] Mikk, J. Učebnice: Budoucnost národa. In: *Hodnocení učebnic*. *Brno: Paido*, (2007).
- [9] Pavlovkin, J. Multimédiá – významná podpora didaktických procesov pedagoga a edukantov. In: *Technika - informatyka - edukacja*. *Rzeszow : Uniwersytet Rzeszowski*, 146 – 151.E, (2007).
- [10] Pejsar, Z. Elektronické vzdělávání. *Ústí nad Labem: Univerzita J. E. Purkyně*, (2007).

- [11] Petty, G. Moderní vyučování. *Praha: Portál*, (2008).
- [12] Sokolowsky, P. Multimédia současnost budoucnost. *Praha: Grada*, (1994).
- [13] Stoffová, V. Conceptual cybernetic models of teaching and learning. In: *Firsov, A., Mathematical Modeling*, **1**(2), 80-83, (2017).
- [14] Vrba, J. Multimediální technologie ve vzdělávání. *Olomouc: Univerzita Palackého*, (2003).
- [15] Zmazek, B., et al. What is an e-textbook? In: *Metodički obzori* **15, 7** (2), (2012).