EdBi Educatio Biologiae
Extended summary

Received 14.2.2023.
Accepted 23.2.2023.
Published 28.2.2023.

Efficacy of learning about gymnosperms by individual work using textual and audiovisual teaching tools

Tihana Miloloža, Nikolina Sabo, Zorana Katanić, Tanja Žuna Pfeiffer, Matej Šag, Ljiljana Krstin
Department of biology, Josip Juraj Strossmayer University of Osijek, Ulica cara Hadrijana 8/A, 31000 Osijek, Croatia
tmiloloza@biologija.unios.hr , nsabo@biologija.unios.hr, zkatanic@biologija.unios.hr, tzuna@biologija.unios.hr, msag@biologija.unios.hr, lkrstin@biologija.unios.hr

ABSTRACT

The modern approach to learning and teaching as well as the use of active learning methods put students at the center of the teaching process. The choice of teaching methods depends on the learning outcomes, but also on the student's ability to learn using certain methods. The aim of this research was to examine whether students achieve better learning results when learning individually using textual teaching aids or when they learn in the same form of work, but using audiovisual teaching aids (videos). The research was conducted among students enrolled in the 2nd year of the Undergraduate Study Program in Biology. The research consisted of 3 stages. In the first stage, the students wrote an initial assessment test and in the second stage they were randomly divided into two experimental groups to study the part of the topic of the Gymnosperm, one of which studied using text materials, and the other by watching a video. In the third stage, they wrote a final knowledge test to evaluate their success in learning. Both teaching aids resulted in an increased average number of achieved points, i.e. grades, and no statistically significant differences were found between the achieved results. The above indicates that both methods are equally effective in the adoption of teaching material and that it is necessary to implement more of them in higher education teaching.

Keywords: *individual form of work**;** teaching aids; reading text; video; active learning*

INTRODUCTION

Examining the efficacy of different learning and teaching methods is an important research topic considering their major role in achieving learning outcomes defined by the curricula. In practice, teachers should apply as wide a range of methods as possible to help students acquire knowledge, skills and shape their attitudes. Today's students are an online generation that spends a lot of time on different social networks for the purpose of social interaction (Bulić, 2018), and due to the recent global pandemic, also for the purpose of education. It was inevitable to implement the use of information and communication technologies (ICT) in teaching practice and use it to motivate students to actively participate in the teaching process. Chen et al. (2017) also emphasize the importance of combining technology with teaching and integrating ICT into teaching subjects. Videos are considered useful for stimulating learning among students due to their flexibility, so they can transmit information and evoke certain emotions in students in several ways (Cruse, 2006). Also, working on the text is an inevitable method of work, given that written materials (textbooks, manuals, scripts) are still the main sources of information in schools and universities. The aim of this research was to examine whether students achieve better learning results when learning individually using text teaching aids or using audiovisual teaching aids (videos).

METHODS

Research included 31 students of the 2nd year of the Undergraduate Study Program in Biology. Firstly, they wrote the initial assessment test, and then they were divided into two experimental groups. The first group (N = 15) had the task of reading and processing the text in 20 minutes, and the second group

URL DOI: https://doi.org/10.32633/eb.9.3

(N = 16) watched the prepared video while taking notes. The video was made by students who did not participate in the research. After learning, they wrote a final knowledge test in order to establish the effectiveness of the applied teaching aids in the acquisition of teaching content.

RESULTS

The results were obtained by analyzing and scoring the students' answers before and after learning with selected teaching aids. Students from the first experimental group that learned using text materials obtained 16.53 ± 3.09 points on the initial assessment test and the average grade was 2.13, while the students from the second experimental group that learned using prepared video obtained 15 ± 2.80 points on the initial assessment test and the average grade was 1.69. After learning, the first group obtained 21.53 ± 3.25 points on the final knowledge test and the average grade was 3.27., while the second group obtained 20.69 ± 2.47 and an average grade was 3. Statistical analysis of the results showed that both experimental groups had similar initial knowledge and that students' knowledge significantly increased after learning using both teaching aids. However, no statistically significant difference was found in the number of points or in the associated grades after learning between the students that learned from video compared to the students that learned from text material.

DISCUSSION AND CONCLUSION

The use of text as a teaching tool in this research proved to be useful because the analysis of the results revealed an increased number of points, that is, grades compared to the initial assessment test. In recent times, less and less importance has been given to this method of work, even though it has been shown that students have difficulties working on the text and are not able to separate the main concepts and ideas (Marin, 2014). Pletenac (1991) considers using text to be an important way of learning because it is how students master reading techniques, the correct use of textbooks, and train themselves for independent work on textual sources of knowledge. Due to the high prevalence and use of the Internet in everyday life, the implementation of ICT in the teaching process was inevitable, but it is important not to diminish the importance of reading and working on text materials.

Already initial research into the effectiveness of using technology in teaching indicated a high probability that videos will positively affect the level of education and learning (Tamim et al., 2011; Timmermann et al., 2006). In this research, the use of videos as a teaching tool also proved to be successful, as an increased number of points, i.e. grades compared to the initial assessment test, was determined. The results of this research are consistent with research that has shown that teaching based on the use of videos is at least as effective or even more effective than teaching that does not use videos (Schmid et al. 2009; Torgerson et al., 2002). In addition to more successful learning, videos as well as the general use of multimedia, according to Vaganova et al. (2020) can significantly improve students' information-communication and technological competencies. Berk (2009) points out the advantages of using videos in teaching and states the potential outcomes of the same: directing students' attention and stimulating interest in teaching, creating a pleasant atmosphere for students to learn, improving attitudes towards teaching content and learning, encouraging creativity and brainstorming, providing opportunities for freedom of expression and cooperation, motivating students and creating visual images to remember. By comparing the selected teaching aids (text and video) in this research, no statistically significant difference was obtained. The results of this research coincide with the research of Scheurwater (2017) that he conducted with employees of a company who were divided into two experimental groups, one group learned through videos and the other from text materials. The written knowledge test also determined that there is no statistically significant

URL DOI: https://doi.org/10.32633/eb.9.3

difference between the used teaching aids. On the other hand, the results of this research do not coincide with the cognitive theory of multimedia learning (Mayer, 2005), according to which those who learn from videos achieve better learning outcomes. Likewise, the research by Vo et al. (2019) with medical students showed that the group that learned from videos performed significantly better on a written knowledge test and also expressed greater satisfaction with learning. Several other studies have shown better learning outcomes using video viewing (Mayer, 2019; Merkt et al., 2011; Stelzer, 2009). The research by Crnković (2021) in which students studied material from biology is in favor of learning from text materials because these participants achieved a significantly higher overall result than participants who learned from video materials. Furhan et al. (2002) generally believe that the advantage of a text is that it has headings and subheadings that give structure to the text and thus enable a person to organize information more easily.

In the conducted research, both teaching aids, working on the text and watching the video, proved to be successful in the acquisition of the teaching content compared to the initial assessment test. By comparing the results between these two teaching aids, no statistically significant difference was obtained, although a large number of recent studies indicate that today's generations are more successful in adopting teaching content through videos. Considering that the frontal form of lectures is still mostly conducted at universities, it is necessary, according to numerous researches, to integrate active learning methods in order to contribute to a better understanding of the teaching content.

LITERATURE

Bulić, M. (2018). Ostvarenost ishoda učenja biologije u sustavu e-učenja. Educatio biologiae, (4.), 56-66.

Chen, Y., Kong, D. (2017). An investigation on factors in the integration of reciprocal teaching into multimedia teaching.EURASIA Journal of Mathematics Science and Technology Education, 13(1), 133-142.

Crnković, M. (2021). Usporedba video i tekstualnih materijala u učenju (Diplomski rad), Sveučilište u Zagrebu, Filozofski fakultet.

Cruse, E. (2006). Using educational video in the classroom: Theory, research and practice. Library Video Company, 12(4), 56-80

Mayer, R.E. (2001). Multimedia learning. Cambridge: Cambridge University Press.

Mayer, R. E. (2019). How Multimedia Can Improve Learning and Instruction. The Cambridge Handbook of Cognition and Education, 460–479.

Marin, G. (2014). Utjecaj rada na tekstu na kognitivne sposobnosti učenja u nastavi prirode i biologije. Educatio biologiae, (1.), 1-17.

Merkt, M., Weigand, S., Heier, A., Schwan, S. (2011). Learning with videos vs. learning with print: The role of interactive features. Learning and Instruction, 21(6), 687-704.

Pletenac, V. (1991.) Osnove metodike nastave prirode i društva. Zagreb: Školska knjiga

Scheurwater, N. (2017). Video vs. text: Assessing the effectiveness of a video tutorial on the procedural-and factual knowledge of production workers and its potential benefits over a tutorial with text and still graphics. Diplomski rad. University of Twente.

Schmid, R. F. Bernard, M. R., Borokhovski, E., Tamim, R., Abrami, Ph.C., Anne Wade, C., Surkes, M., Lowerison., G. (2009). Technology's effect on achievement in higher education: A stage I meta-analysis of classroom applications. Journal of Computing in Higher Education, 21(2), 95–109.

Stelzer, T., Gladding, G., Mestre, J. P., Brookes, D. T. (2009). Comparing the efficacy of multimedia modules with traditional textbooks for learning introductory physics content. American Journal of Physics, 77(2), 184-190.

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. Review of Educational research, 81(1), 4-28.

Timmerman,C. E.,Kruepke, K. A. (2006). Computer-assisted instruction, media richness, and college student performance. Communication Education, 55, 73–104.

Torgerson, C. L., Elbourne, D. (2002). A systematic review and meta-analysis of the effectiveness of information and communication technology (ICT) on the teaching of spelling. Journal of Research in Reading, 25(2), 129–143.

Vo, T., Ledbetter, C., Zuckerman, M. (2019). Video delivery of toxicology educational content versus textbook for asynchronous learning, using acetaminophen overdose as a topic. Clinical Toxicology, 57(10), 842-846.