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The importance of visualization in e-learning courses

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Abstract

Good E-courses always should contain visuals. All types of visuals are important and help researchers and learners to achieve their goals. Applying visualizations to tough topics benefits both teachers and students, helping them to cope with difficult new matter, as well as leading to profounder understanding. If we support students by implementing visual learning materials their performance are risen. The results of our practices on different subjects demonstrated that students achieved better performance on exams, when visuals methods are used during learning process.

Keywords: E-courses; E-Learning; Visualization.

1 Introduction

The use of visualization techniques in learning process is not new approach; it has been used in maps and drawings for thousands of years (Klerk *et al*, 2013). The visualization gives opportunity difficult topics to be simplifying, and easily to be comprehended and adopt by learners (Kamy, 2018). Currently, educators can use enormous different types of visualizations such as images, slideshows, gifs, graphics, photos, illustrations, charts, maps, diagrams, videos and etc. Graphic interfaces and videos are gradually replacing text-based courses (Gutierrez, 2014). On the web, there are many on-line interactive sources and visualization software's that can generate animation or graphics. All types of visualizations can be applied in e-learning courses with a proper and available learning management system (LMS). Nevertheless, videos are being used as major learning tools and trend in the IT best practice training industry (Samuel, 2018).

According to Veřmiřovský (2010) visualization today is an integral part of education at all types of schools that associated with cognitive activities. Of course visuals cannot replace the spoken words, but carry advantages into the learning process by attracting listeners; reducing the burden of teachers; attending the concentration on the essence of content; and facilitating the acceptance of given information (Veřmiřovský, 2010; Gutierrez, 2014; Kamy, 2018). The combination of audio and visuals add life to perceptions and make e-Learning engaging and effective (Samuel, 2018).

Visualization on the Internet became inevitable, where information is presented in various forms exclusively visual experience (Veřmiřovský, 2010). The significance of visualization in learning can be definite through the often used expression "seeing is believes" or "a picture is worth a thousand words" (Hariharan, 2014). The visuals can be given in different ways: pictograms, diagrams, scientific images illustrations, drawings, photographs, graphics or media. All noticed approaches gave benefits when are used in e-courses, blend or distant education. The reason of their positive effect on learning process can be described as stick in long term memory, transmitted faster messages, improve comprehension, and motivate learners (Gutierrez, 2014).

The majority of teachers and students had positive perceptions of using visuals (Ghulam *et al*, 2015). Images, pictures and videos have a better and more lasting impression on the brain than only words, and that is precisely the reason of using those tools in e-Learning (Hariharan, 2014).

2 The power of visualization

During visualization, learners store information in their long-term memory (Kamy, 2018). Visuals create a quicker and stronger impact on brain than words, the images are stored in iconic memory that acts as a visual sensory memory register, and after that are deposited in long-term memory (Mylavarapu, 2016). According to Hariharan (2014), visualization means clarity, recall by association and the impact lasts for a longer time. The internal visual association is an interdisciplinary effort to understand and learn, as an effort to define the relevant knowledge, skills and competencies that are required for the acquisition of trivial and other skills for successful learning process. The key to understand different perceptions of reality (Veřmiřovský, 2010). The researchers found that the recall of information from spoken lecture after three days is only 10-20%; of written information 10%; but of visual performance is about 65% (Active Learning, 2012). Visualization helps learners to make sense out of the content and draws the direct attention (Veřmiřovský, 2010; Gutierrez, 2014; Kamy, 2018).

Visualization does not replace spoken words but can reinforce the information by (Veřmiřovský, 2010):

- ✓ *increase the concentration and attention of listeners on the essence of the content;*
- ✓ *attract listeners;*
- ✓ *reduce the burden of teachers;*
- ✓ *help in the orientation of the audience;*
- ✓ *facilitate the understanding of presented information;*
- ✓ *access to the substance of presented content;*
- ✓ *deepening and extension of the spoken word;*
- ✓ *supported remembering of the presented contents; encourage the growth opinion on the presented content.*

There is no doubt that technical devices applying during study process have a great impact on human informative system. It has been revealed that 1% of what is learned is from the sense of taste. Just only 1,5% of what is learned is from the sense of touch. Approximately 3,5% of what is learned is from the logic of smell. About 11% of what is learned is from the logic of hearing; and 83% of what is learned is from the sense of sight (Cuban, 2001).

3 Learning styles and success in education

There are four types of learners and interconnections between them (see Fig. 1), but around 65% of people are visual learners (Jukes *et al*, 2010; Mylavarapu, 2016; Kamy, 2018).

The most widely accepted model of learning styles is called the VARK model (fig. 1), which stands for visual, aural/auditory, reading/writing, and kinesthetic. In brief:

- Visual** (spacial) - learners learn best by seeing;
- Auditory** (aural) - learners learn best by hearing;
- Reading/writing** learners - learn best by reading and writing;
- Kinesthetic** (physical) learners - learn best by moving and doing.

According to another theory that takes the basics of the VARK model, called memletics, there are also some additional learning styles. This theory adds in a few different categories:

- Verbal** learners - learn best by speaking;
- Logical** (mathematical) learners - learn best by using logic and reasoning;
- Social** (interpersonal) learners - learn best in groups;

Solitary (intrapersonal) learners - learn best alone.

Ordinary, people have one dominant learning style, but most people are a combination of many. No matter what face of education you're coming from, a learning style just explain a student's preferred way of learning that may changes over time (Becton, 2019).

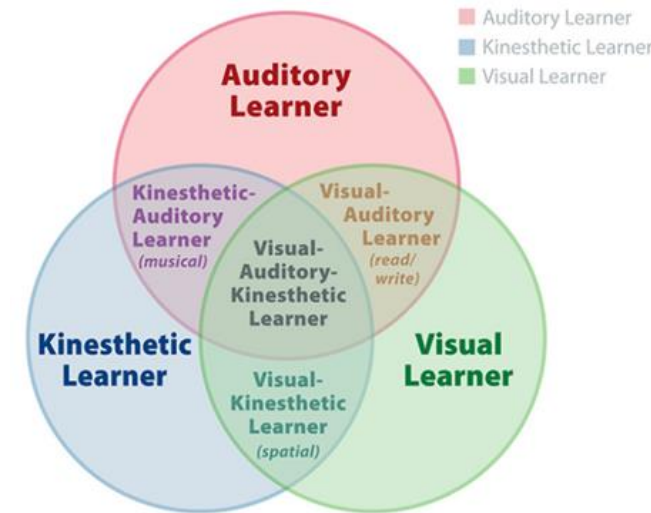


Figure 1. Types of learning styles (image credit: J.Dragonfly, Flickr; Becton, 2019)

People generally remember: about 10% of what they read; 20% of what they hear; 30% of what they see; 50% of what they hear and see; 70% of what they say; and 90% of what they say as they do a thing (Cuban, 2001). Approximately the same magnitudes has been found in other research that people remember 10% of what they hear; 20% of what they read; and 80% of what they see or do (Mylavarapu, 2016).

The reason why the visualization has so big power on learning is shown on Fig. 2.

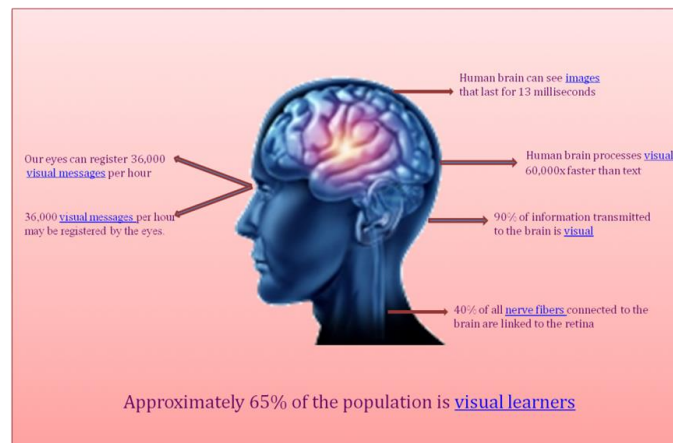


Figure 2. The Power of Visualization (Mylavarapu, 2016)

Visualization has a great impact on a learner's understanding in comparison just content with text. Visualization improves the comprehension and learning is enhancing up to 400% (Gutierrez, 2014; Hariharan, 2014). Visuals help complex patterns easier to be perceived and understand (Vallano, 2012). The human brain processes visual information much faster than plain text (Becton, 2019). The 90% of information transmitted to the brain is visual and visuals are

processed 60,000X faster in the brain than text (Gutierrez, 2014; Mylavarapu, 2016). Visual stimuli and emotional response are related, for they are situated on the same place in the brain, visual memory is encoded in medial temporal lobe of the brain where emotions are processed, and, as it is well known emotional reactions influence on retention of information. That is why text combined with visuals recalls better and for longer periods (Mylavarapu, 2016).

Around 40% of learners respond better to visual information than only to text (Gutierrez, 2014), so visuals stimulate thinking and improves learning environment in the classroom (Ghulam *et al*, 2015), attract and motivate student's learning. Nevertheless, a fine equilibrium need to be maintained between visuals and no visual information (Mylavarapu, 2016).

4 Visualizations in e-courses in FTT-Yambol

On the fig.3 is presented manual instruction for the laboratory task of students, training in the microbiology course. All parts of the methodic are demonstrated in parallels with the instructions, which are given on the website in a regular text format.

The vast majority of learners in any given classroom are no longer auditory or text-based learners, they think graphically and are, therefore, either visual or visual kinesthetic learners (fig.1), reinforced by multimedia. During visualization, the brain is being trained for actual performance (Adams, 2009). Therefore, we notice that after using video manuals as instruction, helps students to be more confident of well prepared and that they acquired adequate knowledge about the task, even they fill themselves as already trained and ready to exercise.

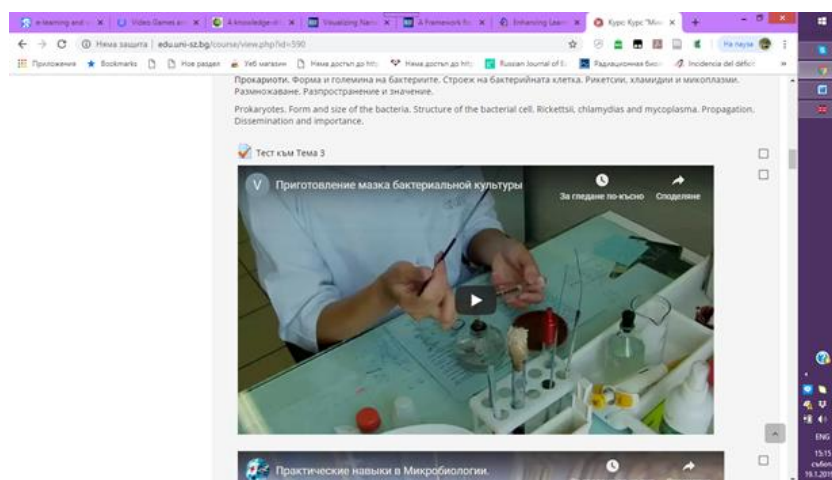


Figure 3. Visual instruction in microbiology e-course in FTT – Yambol

In the field of biochemistry and microbiology, photos and videos help a lot to express the biological structures and their functions. There no doubt learners connect quickly to the image of the microscope or videos than to the text definition (Mylavarapu, 2016).

Another way to stimulate learning of students is to give them task to create their own presentation on given topic. The basis for creation of PowerPoint e-learning presentations is to analyze the content and structure of study topic, search for an external text and visual information and form of visualization. That kind of study is mentioned as an active way of learning during lessons and outside (Veřmiřovský, 2010). Visuals arouse the interest of learners and help the teachers the complex concepts easily to be explained (Ghulam *et al*, 2015). Commonly difficult topics cannot be explain and learn without graphics, schemes, photos or diagrams.

Today most educational organizations used blend learning and the teaching resources are placed on web. The interactive visualization tools implemented in LMS definitely improve the learning and teaching process (Ghulam *et al*, 2015; Kuosa *et al*, 2016). The information about students' communication, collaboration, and participation in online courses is very useful to the teacher and that is his feedback helping to understand the weak and strong points of lessons. Most LMS that offer online courses draw simple graphs about each student's elementary actions, nevertheless many plug-ins for LMS are developed in order to grip and emit more detailed and selected information, because that is worth it (Kuosu *et al*, 2016).

5 Conclusion

By implementing video manuals, students came to the classroom with better confident that they have enough knowledge about and with impression that had been already trained, ready for exercises. The experience of applying visual data in created e-courses confirm that this approach is effective, draw attention of students and improve their learning, as well as enhance the motivation to study.

Applying videos or any types of visualizations to difficult topics always helps both teachers and students to cope with the new information.

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