Digital Generation and Visualization in E-Learning

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Digital Generation and Visualization in E-Learning

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Abstract

In the new ages we are faced with the internet or digital generation that are a digital native grown up and acquires innovative and adequate methods to be put in practice for working and training them. The paper is based on the training in the subjects "Programming and Use of Computers", "Food Contaminants", "Microbiology", "Biochemistry" and "Ecology", for students of Bachelor's and Master's degree in the period from 2016 to 2018 school years. The age analyses reveal that students undergoing FTT training are mainly from Y and Z generation. The report analyzes the effectiveness and the opportunity of unlimited on-line visual resources to educate well our generation and the putting into practice of those approaches in Faculty of Technics and Technology – Yambol. There is no doubt that the e-courses give opening a study subject to be presented in depth, logically and thought-provoking way. Many studies showed that new generation students prefer blend learning instead of traditional one, and that they don't like reading of books, instead of that they favor a learning in active manner combining all types of possible information resources applying in their activity. Most of all of course they like chat, video games or movies, as well as any kind of visualization. Therefor applying visualizations to tough topics ever benefits both teachers and students to attain deep understanding and to manage with the novel information. If we support students by implementing video manuals and they watch it before lessons or exercises, they came to the schoolroom with better confident that already have some training. The results of our practice and investigation displayed that students achieved better performance on exams when visuals methods drawing their attention are used during learning process, and that they are more motivated to attend lectures, like discussions, as well as actively to cooperate with the lecturers

Keywords: Digital Generation; E-Learning; Visualization; Python Tutor; Programming

1 Introduction

The revolutions in ICTs technologies have transformed deeply people relationship, their social behavior, collaboration and communication, market of knowledge and the knowledge itself. The knowledge and access to and acquisition of knowledge are changing, as well as the ways in which we work with others. In this digital society, a new generation has emerged: the digital natives (Cornu, 2011).

The student's generation nowadays is a digital native that grown up with enormous internet information and communication technologies. Hence, the ways of receiving and acquiring information have been completely transformed, so the teaching approach needs also to be attuned. The children of digital generations prerequisite for situations in which many simultaneous multimedia inputs are joint and they thrive in them (Roberts, 2010). They experience a world through computers, internet, and social online sites like a Facebook, Twitter, Google, iPhone's, iPad's (Jukes *et al*, 2010). Usually, by interacting with other individuals humans learn (Rago,

2014), but today young pupils prefer to interact through social networking sites and around 30% of them have a blog in the web, and 62% have a profile on internet (Curtis, 2009).

Young people favor to expose them, to be active and collaborate using newest technology and visualization. Therefore, the way of teaching should be completely altered in order to meet those challenges and to response to the new requests.

Based on well-developed VLE of Trakia University – Stara Zagora (http://edu.uni-sz.bg/?lang=en) and successful practice of blend learning in FTT – Yambol, we analyzed how visualization influences on student's motivation and performance. In the scope of interest were subjects "Programming and Use of Computers", "Food Contaminants", "Microbiology", "Biochemistry" and "Ecology", Bachelor's and Master's degree in the period from 2016 to 2018 school years.

2   Analysis of recent studies and publications

The quick development and implementation of new digital technology in everyday life, brings specific characteristic to the new generation that are continuously changing following execution of novel technics, economic and social transformations that comes in cycle of four instead of 16 year and gives birth to micro-generations, with new concerns, new motivations and new challenges in all aspects of their live (Morin, 2016).

According to Morin (2016), the first micro-generation, also called Echo-Boomers (1989-1994), or first digital natives GenY, were born with the establishment of Web, and grew up with the new technology from the cradle. They belong to the passage zone from one generation to another, and those young people now 22 - 27 years old, exhibit completely different personal motivations, with demonstration of high pragmatism and commercial spirit. Echo-Boomers have great social consciousness, appreciate businesses and organizations, like to demonstrate a commitment at this level, but anyway they are much more closely to the next Gen Z digital generation (Morin, 2015).

For the next digital generation - Net Generation, or often called Gen Z, born between 1998-1994, the web tools are as essential as air and water, and they request to use it at work. They are known as hyper-connected 'selfie' generation, attached to smart phones as if they had become extensions of their personalities (Morin, 2016). Now with ages between 17-21 years became the first sub-group of generation Z that enters the labor market. They know nothing else, but these tools to interconnect and learn, and this young cyber – generation is driven by tremendous curiosity, and favor companies that will exploit this and enable them to achieve it through their work (Morin, 2015).

The sub-group of generation Z (1998/2002), is named Rainbow Generation, for them is crucial to be treated as individuals. They like learning process and see everyone as equals, regardless of nationality or gender orientation (Morin, 2015).

The Post-Millennial Generation Z – 2002/2006, or young mobile generation, have grown up with social networks and mobile technologies, developing an instinct for collaboration and cooperation with the community. Their learning was done through social networks and mobile and they already show more awareness of the environmental and social problems in the world. Hence, when become on the labor market in 2018 probably they will seek more of a coach or mentor position than to be a traditional leader (Morin, 2015).

The last Gen Z - Silent Generation is born 2006/2010, and now is coming digital "Gen C"– "Confluence Marketing at the Era of Connected Consumers" (Morin, 2016; 2015).

All that micro-generations are different from each other, but commonly digital learners are comfortable when are doing several things at once, prefer multitask and parallel processing, receive information quickly by processing pictures, sounds, and color from multiple multimedia sources and other. The digital natives are more experience-minded, than ownership-minded, hence

they need to use data in an extremely novel way or an extremely useful way, and if that is no happen for them it is waste of time (Carey, 2018).

Digital generation undoubtedly prefers video instead or before text, they randomly accessed to hyperlinked multimedia information, and usually net at the same time with many others, learning "just in time" (Morin, 2016; 2015).

4 The Results and Discussion

In the age analysis of students undergoing FTT training, it was found that the majority of students were from Y and Z generation (Fig.1).
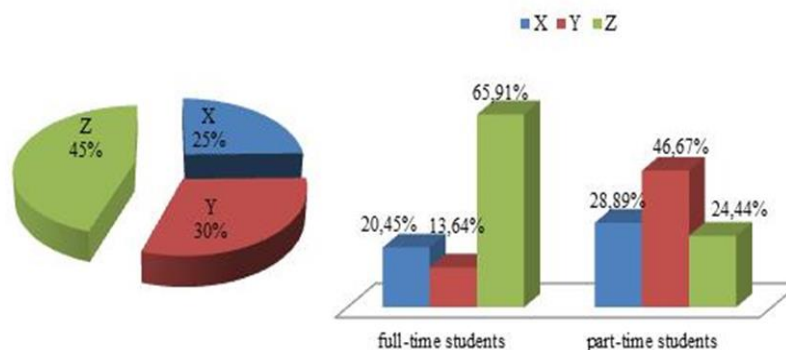

Figure 1. Distribution of the students according to their belonging to a certain digital generation in FTT-Yambol

This imposes the style of teaching and the way in which the information is presented to be conforming and adapted to the peculiarities of perception of these two generations. Digital natives have a different way of concentrating and being attentive, they are "multitasking" - performing several tasks in parallel mood at the same time, or moving from one task to another (Cornu, 2011).

The peculiarity of those two generations that we can use in learning is non-linear visual thinking, in which case we focus on the visualization in the e-learning. Another peculiarity is the speed and multi-channel in the perception of information, which unfortunately reduces the possibilities for continuous concentration and attention. For this reason the using in an addition - video, images, infographics, visual simulations and other types of visualizations in order to keep student's engagement and to give them timely access to a variety of information sources is an essential for the learning process, and for student success. "E-learning environment providing rich opportunities for using multimedia, which allows for a greater degree of acquiring knowledge. Visibility and interactivity of the multimedia attract and hold the interest of students" (Pehlivanova, T. I., 2015).

Various studies have established that the millennial generation prefers watching videos over reading manuals and documents (Samuel, 2018). Hence, to be in response to the new ages we added in our online courses video in some topics of study (fig.2).

Students of FTT-Yambol learning "Food contaminants" and "Ecology" often have a task to demonstrate novel scientific information on the different topics of that field. Usually, they choose a theme on the beginning of semester and created their own PowerPoint presentation or present video-clip. After their presentations the auditory actively discuss the subject and they receive additional mark to the final exam assessment.
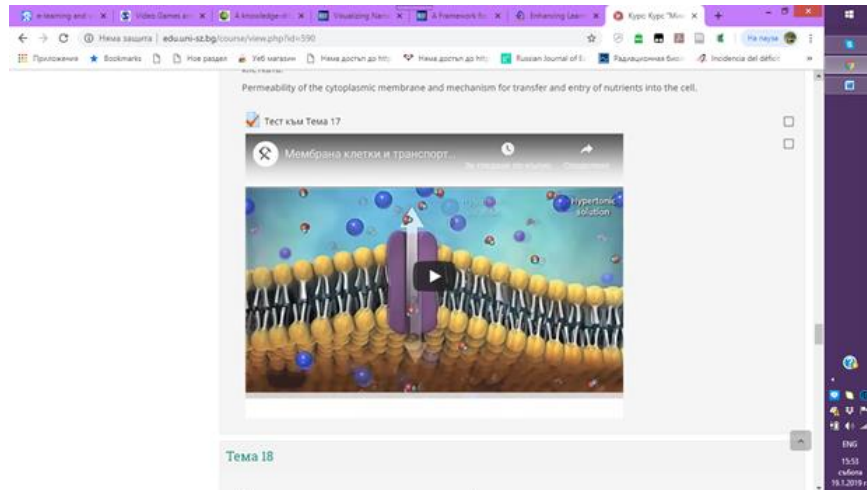
Figure 2. Membrane structure and its permeability,
Biochemistry e-course, FTT – Yambol

The active method of subject learning can take variety forms carried out by suitably awarded learning tasks. The starting point for each representation is to search on the web, obtaining textual information, selection of images and video clips or creating visuals. By using video clips together with visualization with own images and simulations, the process of learning is stimulated (Veřmiřovský, 2010).

Each subject in the e-learning allows the use of different types of visualizations (Fig.3, Visualization of Symmetric Arrays in Java).

In Programming and Using the Computers and Object Oriented Programming subjects, we use visualization in C ++ and Java program languages. The visualization is part of e-books in the e-learning system of Trakia University - Stara Zagora, which is common to all faculties, based on Moodle.
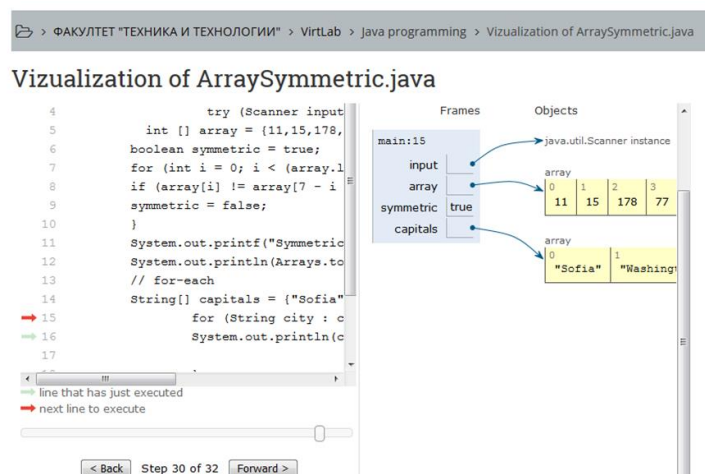

Figure 3. Visualization of symmetric arrays in Java, FTT - Yambol

Similarly, the programming tasks that are offered to students to use during their preparation seem similar. They are fundamentals for learning algorithms and the basics of programming. The creation of these visualizations was used Python tutor also http://pythontutor.com/ (Guo, 2015). In the eDuTrU for the Programming and Using the computers and Object Oriented Programming have been selected programs to visualize algorithms of programs written in C ++ and Java. But Python Tutor can also be used to program Python, JavaScript and Ruby. The visualization of the code represents the data in four panels: Left panel - for the program code; a two-part right panel - Print output - for the result that is printed on the screen during execution; Stack and Heap - Shows the visualization of the changes that occur with the memory stack variables and the dynamic memory of the computer.

Visualization allows students to track the execution of the program code step-by-step, with the possibility of multiple executions; returning to the previous step, tracking the changes occurring in Steak and Heap of memory during the implementation. This is better seen in Fig.4, when working with arrays and can see the variables in the memory and the arrays are visualized during execution.
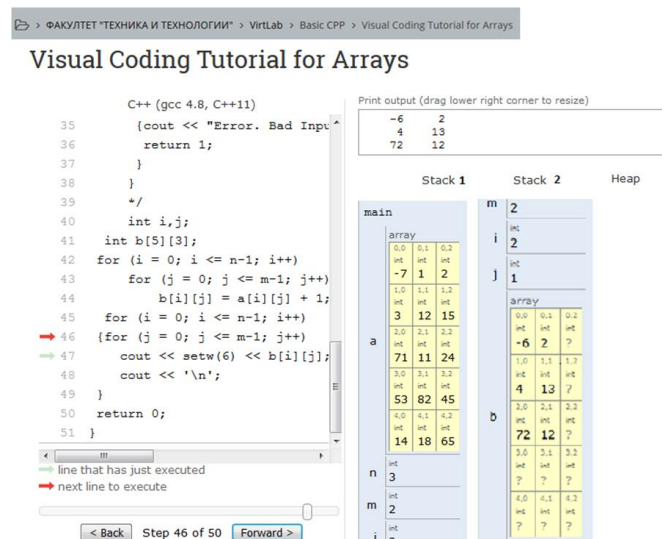

Figure 4. Stack Memory's Visualization in the code implementation for the Arrays,
FTT - Yambol.

Visualization for teaching Program languages is very important and "helps people overcome a fundamental barrier to learning programming: understanding what happens as the computer runs each line of code" (Guo, 2015). Another important opportunity to use programming visualization is the ability to use the http://pythontutor.com/ website to independently create the program code and its subsequent visualization. During these processes, students can work with other colleagues, search for online help from other users, comment on executed code, edit multiple times, and more.

The visualization is a part of all scientific fields, for instance, engineering, biology and microbiology, statistics and etc., as a recognized thinking view of facts and associated with the application of rules clarity. Visualizations are related with virtual reality and simulations, which are technically possible, but in education unfortunately are still with restricted use. Nevertheless, the visualization is an essential part of education at all types of schools in different forms from full-time education after distance learning (Veřmiřovský, 2010).

Visualization has become a strong asset in academia and some universities created Visual Understanding Environment (VUE) for managing and integrating digital resources in support of teaching, learning and research. VUE provides a flexible visual environment for structuring, presenting, and sharing digital information. Through on-line available technology and web tools, which are easy to understand and operate, anyone can enter data and create a personal visualization of it, so everyone can benefit from making intricate patterns (Vallano, 2012). Perhaps, that is a good idea for the new projects, which will support distant learning.

According to Morin (2015), following Massive Open Online Courses and distance education, vocational training and digital learning will attest great tasks for organizations.

5 Conclusions and prospects for further research

In the pending years, digital generations will become more involved in the social transformation of educational institutions, and will start practical amendments that best meet their necessities, learning styles and curiosity. The results showed that students are performed better when the innovative visuals methods drawing their attention are used, they are more motivated for the learning process, ready for discussion, and actively collaborate with the lecturers.

Acknowledgement

References

Books:

Bernard Cornu (2011): *Digital Natives: How Do They Learn? How to Teach Them?* Published by the UNESCO Institute for Information Technologies in Education. ISSN 2221-8378.

Jukes I, et al., (2010): Understanding the digital generation: Teaching and learning in the new digital landscape. Book by Ian Jukes, Ted McCain, & Lee Crockett. Review by Douglas Smith. Thousand Oaks, CA: Corwin Press (SAGE), 152 pp.

Roberts R., (2010): The Digital Generation and Web 2.0: E-Learning Concern or Media Myth? Source Title: Handbook of Research on Practices and Outcomes in E-Learning: Issues and Trends. p. 23. 2010. DOI: 10.4018/978-1-60566-788-1.ch006.

Journal Articles:

Ghulam *et al*, (2015): Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan. Journal of Education and Practice. www.iiste.org ISSN 2222-1735 (Paper) ISSN 2222-288X (Online).Vol.6, No.19, 226-233. 2015.

Pehlivanova, T. I. (2015) Methods for intensification of the training in technical subjects. Applied Researches in Technics, Technologies and Education 3, 4, 344-349

Internet Sources:

Carey G., 2018. Inside The Mind Of A Digital Native. https://www.cmo.com/ interviews /articles/2018/7/10/ cmocom-interview-gemma-milne-cofounder-sciencedisrupt.html#gs.5whl0z

Curtis P., 2009. Internet generation leave parents behind. *The Guardian*. https://www. theguardian.com/media /2009/jan/19/internet-generation-parents. Mon 19 Jan 2009.

Guo, Philip, http://pythontutor.com/ Python Tutor 2015.

Morin R., 2015. 10 Ways That Generation C Impact Us. https://curatti.com/generation-c-center-social-transformations/. 2015.

Morin R., 2015. Generation C – The Emergence of Micro-Generations. https://curatti. com/generation-c-evolution-micro-generation/

Morin R., 2016. The many faces of digital generation. https://curatti.com/digital-generation/

Rago R., 2014. Emotion on the Brain. http://sites.tufts.edu/emotiononthebrain /2014/ 10/ 24/vision-and-emotion/.

Samuel J., 2018. All About Developing Video-based Learning https://blog.commlabindia. com/elearning-design/video-based-learning-infographics April 01 2018.

Vallano E., 2012. How data visualization promotes eLearning through effective story telling https://www.mindjet.com/blog/2012/02/how-data-visualization-promotes-elearning-through-effective-story-telling/.

Veřmiřovský J., 2010. The importance of visualization in education, http://weinoe.us. edu.pl/sites/weinoe.us.edu.pl/files/36 the importance_of_visualisation.pdf p.453-463.