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Possibilities and Perspectives of Applying the E-learning Model in Educational Institutions in Bosnia and Herzegovina

Abstract

E-learning is a type of learning by using electronic technologies to access an educational program outside of a traditional classroom. As conventional classrooms continue to be transformed into digital ones, teachers must deliver lectures through multiple learning modes. Digitally enriched content and personal learning should be the primary way of teaching, as well as collaborative and interactive learning. The paper presents issues relating to education in a virtual environment, the role of virtual reality, and artificial intelligence that is increasingly entering classrooms in developed countries. The paper explores what application of artificial intelligence means for the development and broader implementation of electronic learning in virtual classrooms around the world, as well as in developing countries such as Bosnia and Herzegovina. The paper presents the advantages and opportunities that contribute to the improvement of e-learning in educational institutions and the benefits for students and other parties involved in the educational process, such as teachers and parents.

Keywords: artificial intelligence; digital content; digital literacy; online platforms; virtual reality

1. Introduction

Although the idea of e-learning was still in its infancy in the sixties (that was the decade when PLATO, probably the first experiment in the world of e-learning, was developed and first launched), Marshall McLuhan had a clear vision of the future of education. He believed that for better education we need fewer teachers, more technology, and, most importantly, a more positive view of technology. As a historian by training, McLuhan noticed that education had not changed much in many aspects since the Gutenberg printing machine was invented at the end of the 15th century. He considered that we should stop relying primarily on visual delivery methods and start creating a multi-sensory, interactive learning environment based on students' needs and interests (Taylor and Francis e / library, 2001).

E-learning primarily transmits education through computer and network of digital technology that includes the Internet, intranet, computers, satellite TV, CDROM, audio, and video resources. Therefore, e-learning can be broadly defined as the use of Information and Communication Technology or abriged ICTs to enhance and support learning that can range from teachers and learners using email for communication up to online courses.

2. Methodology

Unlike some European countries or the United States of America, there are still no clearly defined e-learning strategies in Bosnia and Herzegovina, and instances of using online learning are only sporadic and more experimental. They can only be assessed as attempts by individual schools

to use Google Education, free online learning platforms, in a short period (more precisely during one week in November). The e-learning model currently present in the country is in its infancy stage. Research, which measured the application of this model in our educational system, is based on determining the existing conditions in educational institutions concerning the usage of IT in today's classrooms as well as potentials and perspectives for the implementation of the e-learning model. Indeed, in this light, the application of some of the modern forms of learning would be a significant step. Attitudes of primary stakeholder groups for this venture were examined with the overall goal to form an e-learning model that would have a realistic prospect of success.

The survey was conducted in December 2018 in eight public schools across the country. According to the data collected by the Agency for Statistics of Bosnia and Herzegovina in 2018, 61.0% of the citizens of the country used a computer, and 31.6% of respondents have never used a computer. The share of computer users by gender is 64.4% male and 58.4% female. The results of the survey on the usage of information and communication technologies in households and by individuals in Bosnia and Herzegovina have shown that 69.2% of households had access to the Internet, and 29.6% of households did not have access to the Internet (Agency for Statistics of Bosnia-Herzegovina, 2019).

To examine how the e-learning service is used, a base of 20 statements (claims) was formed in this case for high school students. For the first part of the e-learning attitude questionnaire, four statements were selected, which answer questions relating to teacher-student interaction. In the second part of the e-learning attitudes questionnaire, four statements were also selected that relate to students' prior experience.

The third part includes 12 statements concerning the cost of learning in a virtual learning environment as well as students' skills with respect to such environment. Responses to the statements in this group are shown on a Likert scale of estimates from one to five, where rating 1 corresponds to the "disagree" category; 2 - "I disagree"; 3 - "neither agree nor disagree"; 4 - "I agree" and the assessment of 5 categories "I completely agree."

The first part of the questionnaire covers information about respondents' computer usage habits, such as questions about the frequency of computer use. In contrast, the other two questions relate to knowing the meaning of e-learning and attending e-courses. After modifications and improvements were made to obtain a more efficient instrument, questionnaires were administered to the target population through personal contacts. Respondents were informed of the purpose, and anonymity and confidentiality of responses were ensured. Finally, respondents were given a questionnaire to complete during December 2018. Respondents familiarized themselves with the purpose of the survey and the process of completing the questionnaire. All respondents filled in the questionnaire voluntarily, independently and anonymously, and the estimated time to complete the questionnaire was ten minutes. Exploratory factor analysis, a principal component analysis method, was used to determine the validity of the survey. The data obtained were analysed using the SPSS statistical software.

3. Results and discussion

The survey provides an analysis of potentials for e-learning model implementation in secondary schools in Bosnia

and Herzegovina and other educational institutions, as well as the ability to define and create a national e-learning strategy. The survey was focused on collecting information necessary for creating and adopting an e-learning model in secondary schools in Bosnia and Herzegovina. Survey respondents were students aged 16–19, both male and female.

Table 1 shows the factor structure of the statements, with the values of the characteristic root and the percentage of the explained variance of each component. Given the content of the statements and their projections on the elements, the first element corresponds to the interaction of teachers and students, the other part corresponds to the benefits that students have from the virtual learning environment, and the third corresponds to the economic aspect (costs for individual students and the scope of work).

Table 1: The factor structure of the statements

	Components		
	1	2	3
20. VLE helps teachers to respond to individual learning needs.	.722	.271	-.142
19. VLE supports a close relationship between students and teachers.	.718	.240	-.004
18. VLE enables teachers to provide students with different sources of learning.	.657	.296	.235
17. VLE increases the level of interaction between individual students and teachers.	.579	.295	.037
16. VLE helps teachers to be available to students outside of the classroom.	.515	.253	.153
15. VLE increases student workload.	.228	.768	.084

	Components		
	1	2	3
14. VLE increases the costs for individual students (printing).	.220	.709	.059
13. VLE helps students prepare well for lectures in an online classroom.	.203	.613	.126
12. VLE provides greater transparency for individual learning.	.410	.606	-.037
11. VLE provides students with flexibility in terms of their educational needs (offering access to materials at any time - allowing them to study when they have time).	.409	.566	-.133
10. VLE increases opportunities for discussion and debate among students outside of the classroom.	.128	-.238	-.816
9. VLE supports the exchange of ideas and experiences among students.	.449	-.217	.630
Characteristic root	4.414	1.184	1.003
% of the explained variance	23.017	21.919	10.067

Source: Author's work

Multidimensionality of the instrument was tested, an analysis of the main components was carried out. To check that correlation matrices are suitable for carrying out a factor analysis, we have conducted the Kaiser-Meyer-Olkin test and the Bartlett test. The Kaiser-Meyer-Olkin test shows the proportion of variance that is common or can be explained by latent factors. When the value of this test is more significant than 0.60, we consider that our data is suitable for carrying out factor analysis. In our case, the value is 0.870. The Bartlett test checks whether our matrix is identical to the identity matrix. If our model were identical to the identity matrix,

this would mean that the matrix variables were unconnected and it would not make sense to carry out a factor analysis.

This test must be significant with at least 95% security in order for our data to be comparable to factorization. In our case, the approximate $\chi 2$ is 442.256 and is significant at 99.9%. The results of these tests on our data indicate that it is justifiable to carry out a factor analysis. The analysis of the main components resulted in a three-factor solution. The characteristic roots of the three components are more significant than one, and together they explain 55% of the variance.

The analysis of results proves the assumption that VLE increases the opportunities for discussion and debate among students outside of the classroom. The results show that 71% of students agree with the claim that VLE provides students with flexibility in terms of their educational needs, offering access to materials always and anywhere – allowing them to study when they have time. It enables them to access a variety of content that they do not have access to in traditional classrooms. They learn how to use information responsibly and transparently. Furthermore, it enables them to access the same online content as other students who are not restricted by the national curriculum, which are not adapted to constant changes in the external environment. Changes in the environment might force the school management to entail policies that would bring necessary changes in terms of adaptability, possession of skills and knowledge in the use of communication tools and software that have become standards in the digital age. Students can spend more time working on materials in order to improve their results, which is considered useful because they have more time to think and connect previous knowledge with newly learned topics. Survey results' showed that online tools used

in asynchronous e-learning allow two-way communication between learners and teachers, or multi-modal, collaborative communication among students themselves. However, 55.8% of respondents agree that VLE increases the scope of students' work.

Dimensionality was added to the correlation matrix, meaning that underlying components could be identified in the subjects' answers. The logical and content analysis of the statements indicates that the first component corresponds to the quality of the student-teacher interaction. The second component corresponds to the assessment of the potential the virtual environment has for learning and students. In contrast, the third one corresponds to the economic aspect of the virtual learning environment (VLE).

The economic aspect, in this case, relates not only to money but also to invested labor. One statement indicates an increase in student workload since the student initiates discussions and communication with both teachers and other students, which is not the case in a traditional classroom where a lesson is pre-planned and organized by the teacher and the Ministry of Education. Since three factors or three constructs or three variables were obtained, it was interesting to examine the correlation between these three constructs and other claims in the matrix table. A statistically significant correlation was found between statements relating to previous experience that the students had in the virtual learning environment. A statistically significant correlation was found between the first and second group questions on the level 0.05 or $p < 0.05$.

There is a high correlation of 0.069 between the teacher-student components and the benefits of the virtual learning environment at the level of 0.01. It was expected that

the correlation is high; that is, the teacher is an essential factor in the teaching process and that it contributes to better interaction in the educational process. It is vital for the individual student that ongoing daily communication with teachers is maintained. The student perceives that the virtual learning environment gives them more opportunities to access a myriad of information, more frequent contact with the instructor or teacher, which allows them to ask questions in constant communication, which is not a common practice in the traditional classroom environment.

Thanks to online learning, students in the most impoverished cities or smaller towns can use the same educational resources as students in world capitals and large western cities, all thanks to online lectures at affordable rates. The e-Learning Initiative implies ensuring the right to education and reducing costs to such an extent that it becomes accessible to the developing countries and countries in transition, such as Bosnia and Herzegovina.

Some of the disagreements concerning implementation of online learning is how to adapt e-learning education given inability of regular access to high-speed Internet and educated IT educators. Another obstacle that the country could face in the process of improving the education system is the initial cost of e-learning. Within an extended group of claims, all statements are significant. There was also a statistically significant correlation between statements relating to the previous experience the students had in the virtual learning environment, meaning that positive learning experiences and communication in the virtual learning environment influenced students' preferences and their choice of modalities of learning. Knowledge is acquired in space, time, and opportunities for personal growth and development.

When asked about issues concerning the virtual learning environment and the application of e-learning tools, students confirmed that e-learning offers opportunities to acquire knowledge and skills that are not available in the schools they attend.

Possibilities offered by e-learning go beyond the traditional curriculum framework and the law-imposed curriculum that does not accompany changes in the environment, and accordingly adapts the curricula, and interests of students towards education in the digital age, in which some other skills and knowledge are desirable.

3. Artificial intelligence in the classroom

Enhancing e-learning with a more comprehensive social experience enables learners to interact with each other as they would in the actual classroom. Students can complete group projects together, and hang out outside of the school, enriching their learning experience. Virtual reality already enhances certain aspects of e-learning. Companies, schools, and universities are experimenting with this new technology and are trying to understand how best to integrate virtual reality into curricula. Artificial intelligence is part of our everyday life and becomes more present in world classrooms.

By using tools such as Siri, Amazon, and Alexa, the possibilities of artificial intelligence in education are just beginning to be realized. While artificial intelligence will not wholly replace teachers, it is possible to transform the way teachers teach and learners learn (The Tech Edvocate, 2017).

As artificial intelligence becomes significantly more sophisticated than in the past, it would be possible for machines to read the expression on the face of the student,

indicating that the engines are developing to the extent when it becomes possible to recognize the feelings of the person or the emotional state of the pupils. Thus they will be able to modify the lesson to adapt it to the student's condition (Editors, 2018).

Machine learning algorithms have already begun to help teachers fill in knowledge gaps, pointing to subjects with which students have most difficulties. Thanks to recent innovations in the field of artificial intelligence, the school and the entire education system go through the same digital changes that transform the world industry and business. Several studies predict that in the next ten years, artificial intelligence will replace teachers. Although such predictions are somewhat exaggerated, it is worth noting that the first tool that works under the principles of artificial intelligence and learning, IBM's Watson 1.0, has already found a way to world classrooms, where it has been proven as a teaching assistant and providing targeted support to teachers (Expert-system.com, 2018).

3.1 Virtual school visits

At the beginning of last year, US teachers received 55 million new students able to use new tools with the capability of capturing the attention of students and inspiring their imagination with the help of virtual reality. Hundreds of new intriguing experiences, many of which are free, can transfer students back through history or our solar system without a magical school bus (Babich, 2019).

From the War of Independence that took place in the United States to the marshes of the Jura geological period, students can find themselves at the center of the action where

they can experience their own real experience. The full range of school virtual and extended skills have been developed for subjects ranging from mathematics, through history, to foreign languages (Samit, 2017).

These virtual adventures can be embedded in the emotional center of the human brain by misleading the mind to believe that users are really "teleported" out of the classroom into an environment that fully occupies their senses. Research has already shown that we remember only 10% of what we read, 20% of what we hear, and 30% of what we hear and see together. However, a virtual reality can deceive the brain's cortex so that it can feel being haunted by a dinosaur or emotionally depressed by life in a refugee camp. The joy of walking on the moon's surface or passing through the deadly trenches of the First World War can trigger an emotional reaction deeper than any movie. According to a scientific study of biometric monitoring of the eye movement and direction of view, electrodermal reaction and heart rate, 27% of users of the virtual reality were more emotionally involved in these contents than in those available through a two-dimensional, conventional video (Horton W. & Horton K., 2003).

4. Conclusion

The e-learning model currently used in educational institutions in Bosnia and Herzegovina is a hybrid model, that is a combination of traditional learning and online learning in its infancy. The essential strategy that could support adoption of the e-learning model is the strategy that ensures implementation of e-learning programs in phases, so the first phase of strategy implementation includes the approval of a blended

learning model first given the current state of the country's economy. Additionally, funding and support of technical staff is another critical aspect of the application of the e-learning model in the country. Specific criteria should be developed for successful implementation of the e-learning model, such as the acquisition of appropriate technological infrastructure and adequate educational content produced by teachers who have computer skills followed by a traditional culture that fosters learning and knowledge sharing in a virtual environment.

Students enrolled in this study have a highly positive attitude towards e-learning, which leads to the conclusion that students are willing to learn using IT solutions in the classroom. Organization of the online program and online classes enable students to access content and fulfill tasks according to their time organization. Most students use the Internet every day and communicate with social networks, which undoubtedly contribute to their readiness to accept new IT solutions in the learning process. Therefore, the differences in attitudes towards e-learning are also related to the purpose and frequency of using the Internet.

Possible obstacles that may affect the implementation of e-learning in educational institutions in Bosnia and Herzegovina are the high cost of internet equipment (infrastructure), the high price of software or an appropriate computer program, lack of knowledge in computer science and Internet usage, along with fear of failure to offer e-learning services. Educational institutions, as well as other relevant government institutions, should undoubtedly pay attention to the growing needs of young people who have expressed the need for an e-learning model that is not currently being actively and regularly implemented in schools. According to the results of this research, it has been determined that several

factors hinder the widespread use of new learning technologies, including access to information and communication technologies in schools that are inadequate and uneven, with a somewhat better situation in urban areas. There is also a lack of capacity to utilize available technology since most of the teachers lack the necessary skills for the smooth implementation of the e-learning model. One of the main disadvantages of using the e-learning model is that it still heavily relies on social support in the sense that e-learning depends on the teacher's ability and readiness to create and prepare course materials and use online educational tools.

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