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# The e-Learning in Bosnia and Herzegovina Classrooms

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## Abstract

Electronic (E)-learning is a type of learning by using electronic technologies to access an educational program outside traditional classrooms increasingly demanded by many education systems. As conventional classrooms continue to be transformed into digital, teachers are expected to adopt multiple learning modes. Digitally enriched content and personalized learning should be the primary way of teaching and collaborative and interactive learning. Contrary to the continuous development of technology and students who regularly encounter computers from an early age, teachers do not have the privilege to introduce technology into the classroom successfully. The paper presents how the lack of funds influences a teacher's readiness to embrace technology into their teaching practice. The paper explores E-learning issues related to virtual environment reality and artificial intelligence that is increasingly entering the classrooms of developed countries and 'what application of artificial intelligence means for the development and broader implementation of E-learning in virtual classrooms in Bosnia and Herzegovina. The primary method of collecting data was through an open question survey distributed to students in different parts of Bosnia and Herzegovina. For research purposes, schools were chosen based on how often their students have access to computers or the Internet. Four schools from urban and four schools from rural areas were chosen, and questionnaires' were delivered directly to students by the researcher. The research aims to examine students' views on the benefits online education has in the educational process in Sarajevo and Bosnia and Herzegovina. The survey provides an analysis of the potentials for implementation of the e-learning model in secondary schools in Sarajevo Canton and the rest of the country. 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 involved parties in the educational process, such as teachers and parents. Students enrolled in this research have a highly positive attitude towards e-learning, which leads to the conclusion that students are willing to learn using I.T. solutions in the classroom.

**Keywords:** artificial intelligence, digital literacy; e-learning, virtual learning environment, virtual reality

## 1. Introduction

Today's modern society is characterized by the rapid development of information and communication technology (ICT). One particular field that presents special interest both for society and individuals are education. The advent of

computers and the development of the Internet had a significant role in the development of distance learning.

Distance Learning is a relatively new field, only a hundred years old. Stated that distance learning had followed extraordinary growth worldwide since the early 1980s. Due to the effect of technological advances, its form has changed rapidly from initial correspondence education, in which printed materials were primarily sent to high school students, to a form of learning that can be accessed from anywhere at any time. Distance learning is a field that needs to be continuously revised and renewed mainly because of its related dynamics such as technology [1]. Even though students and professors are located in remote locations, they can regularly communicate with each other. Changes in online education that allowed some of its processes to be carried out in a different place and at different times than the traditional classroom practice began to occur long before the advent of computers. First, as a form of correspondence education, students were provided with an opportunity to be educated without having to attend regular classes.

The first significant steps in programmed teaching were developed by Sidney Pressey in the 1920s and further taken over by Burrhus Skinner in the mid-1950s. Skinner's ideas for improving the teaching and learning process were mainly focused on two facts: first, that students learn at different paces, and second, that, by the dominant theories of learning stimulus-response, feedback must carefully monitor behavior. This, however, is not the case in a school setting, where students are forced to follow the imposed pace of feedback from lecturers and usually receive a delayed response because teachers need at least one day to correct assignments.

Skinner believed that hiring one teacher per student would solve the problem. However, as this was practically impossible to implement in practice, Skinner proposed and worked on introducing learning machines. Each student could work at his own pace and receive direct support after the correctly solved task [2].

In essence, the development of programmed learning aims to computerize teaching, structure information, test student knowledge, and provide instant feedback to students, without human intervention other than in designing hardware and software and selecting and loading content, and evaluating questions. B.F. Skinner began experimenting with teaching machines that used programmed learning in 1954. Skinner's teaching devices were one of the first forms of computer-based learning [3].

Although the idea of e-Learning was still in its infancy in the sixties (this was a 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. McLuhan believed that for better education, we need fewer teachers, more technology, and, most importantly, a more positive view of technology. As a historian by education, McLuhan noticed that education had not changed much in many aspects since finding the Gutenberg printing machine at the end of the 15th century. McLuhan considered that we should stop relying primarily on visual delivery methods and create a multi-sensory, interactive learning environment based on students' needs and interests [4].

E-learning primarily transmits education through computer and digital technology, including the Internet, intranet, computer, satellite TV, CDROM, audio, and video resources. Therefore, e-learning can be broadly defined as the use of Information and Communication Technology or shortened ICTs to enhance and support learning that can range from teachers and learners using email for communication up to online courses [5].

Developing distance learning is entirely conditioned by modern information technologies such as computers, educational software, computer networks, and the

Internet. However, distance learning has limitations on the technical level of ICT application by instructors who offer this education model and specialized equipment for students who want to use it. The success of distance learning is further related to educational institutions' willingness to embrace ICT in the learning process.

The educational system in Bosnia and Herzegovina is relatively rigid, and traditional teaching is still the most common form of instruction. Looking at the elementary and secondary levels of education in Bosnia and Herzegovina, it is evident that the teachers are even resorting to the traditional methods and techniques of teaching. Chalk and talk is the standard way of transferring knowledge. The war has made the teachers' continuous professional development impossible and caused the lack of a qualified teaching workforce [6].

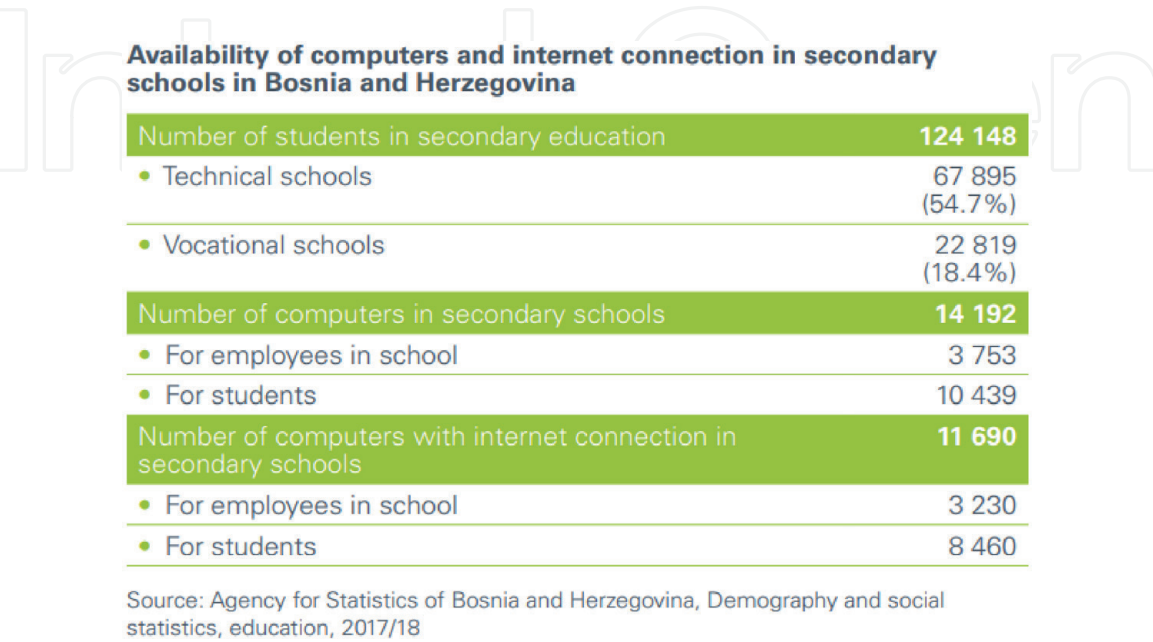
The e-learning model currently presents in Bosnia and Herzegovina is in its infancy stage. Despite the development of technology and e-learning tools, we are witnessing that in Bosnian schools, students still sit in rows of benches and read from textbooks or fill out worksheets. The teacher gives a lecture standing in front of the class in ex-cathedra style, and each student receives information in the same manner as all other students. Their different learning needs and learning styles are neglected and do not bring positive results.

The number of computers in the secondary education system overall covers 8.4% of the student population. However, there is a lack of statistics on the exact number of computers in secondary schools. Overall, the number of computers with an internet connection in the secondary education system covers 6.8% of the student population. In comparison, 42.8% of I.T. companies in Bosnia and Herzegovina are dissatisfied with the content of the I.T. curricula and learning processes [7].

According to the data, 61.0% of citizens have used a computer, and 31.6% of respondents have never used a computer. The share of computer users by gender is 64,4% of male users and 58,4%of female users.

The survey results on the usage of ICT in households and by individuals in Bosnia and Herzegovina have shown that 69.2% of households have access to the Internet, and 29.6% of households do not have access to the Internet [8].

The survey results on the usage of ICT in households and by individuals in Bosnia and Herzegovina have shown that 69.2% of households have access to the Internet, and 29.6% of households do not have access to the Internet (**Figure 1**).



**Figure 1.**  
The number of computers in the secondary education system [8].



Older teachers need to learn how to adapt to new technological changes, both inside and outside the classroom. Inside the classroom, teachers need to learn how to integrate technology into everyday teachings, such as using computer programs, iPads, and smartboards. Outside the classroom, many teachers learn how to use the Internet by having to access an electronic diary or exchange emails with parents as a part of their regular teachers' duties. Often teachers receive emails and messages on social networks or Viber groups from their student's parents. As the world adapts to this digital age, teachers must follow this trend.

Research, which measured the application of this model in the educational system, is based on determining existing conditions in educational institutions concerning usage of ICT in today's classrooms as well as potentials for the implementation of the e-learning model. 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.

## **2. Theoretical framework**

According to Anderson and Dron, historically, distance learning has undergone three pedagogical approaches: Cognitive-Behaviorism, Social-Constructivism, and Connectivism. The authors state that cognitive-behavioral models have defined the first generation of individualized distance education. Besides providing opportunities for many students to receive education at a lower cost than traditional education, distance education ensured full access and freedom for students [9].

Cognitive-behaviorism and theories of social-constructivism argue that learning takes place within a person, and even socially constructivist views hold that learning is a social process that promotes the individuality of the individual in education. The Connectivist approach focuses on the learning process as well as what has been learned.

In the modern age, in which learning tools or the virtual learning environment have gained popularity, the quality of information learned and the importance of turning data into a knowledge process has become more important for distance learning [10].

Cognitivism often takes a computer information processing model. Learning is viewed as a process of inputs, managed in short term memory, and coded for long-term recall. Cindy Buell details this process: "In cognitive theories, knowledge is viewed as symbolic mental constructs in the learner's mind, and the learning process is how these symbolic representations are committed to memory" [11].

Constructivism suggests that learners create knowledge as they attempt to understand their experience while behaviorism and cognitivism view knowledge as external to the learner and the learning process as the act of internalizing knowledge. Constructivism assumes that learners are not empty vessels to be filled with knowledge. Instead, learners are actively attempting to create meaning. Learners often select and pursue their learning. Constructivist principles acknowledge that real-life learning is messy and complicated. Classrooms that emulate the "fuzziness" of this learning will be more effective in preparing learners for life-long learning [12].

For Siemens, it is the connections and information flows that result in knowledge beyond the individual. Learning becomes the ability to tap into significant flows of information and follow those significant flows. He argues that "Connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity.

Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database) [13].

Behaviorism is a learning theory that considers learning to be a change in observable behavior that results from experience and lasts over time. Based on B. F. Skinner's concept that behavior changes because of contiguity or the pairing of stimuli, insights, goals, ideas, and any other change that exists only in the 'learner's mind are not considered.

It is a psychological theory based on the assumption that the environment determines human behavior through association and reinforcement [14].

Learning theories examine the depth of learning and quality of information absorbed as a result of a learning process are used as a basis for the research. They prove that a student is an active part of the learning process and not just its object. Students in online learning have an opportunity to choose time, place, and content they want to explore, learn, and acquire during the learning process. The conventional classroom is not the only space where learning can or must take place. On the contrary, online classroom gives more variety of learning if only appropriately implemented.

### 3. Methodology

A study in this research sought to analyze e-learning in B&H classrooms. Research was done by seeking to answer the questions:

1. What are the benefits of e-learning over traditional learning.
2. How different e-learning tools facilitate this approach to learning.
3. Examine students' attitude towards e-learning and their preferences.
4. Demonstrate how providing learning through an online platform encourages..I.T. literacy and provides opportunities for high school students to succeed in a globally competitive world.

The survey analyzes potentials for e-learning model implementation in secondary schools in Bosnia and Herzegovina and other educational institutions opportunities to define and create a national e-learning strategy. The survey focused on collecting information necessary to develop the e-learning model's adoption in secondary schools in Bosnia and Herzegovina. Survey respondents were students aged 16–19, both sexes, 150 in total. The survey was conducted in December 2018 in eight public schools across the country. The study adopted qualitative research, a student satisfaction survey, to explore students' views on the benefits online education has in Sarajevo and Bosnia and Herzegovina's educational process.

Data were collected through a student satisfaction questionnaire that was completed by students during school hours. Finally, after modifications and improvements were made to obtain a more efficient instrument, a pilot instrument was administered to students in two high schools in Sarajevo to ensure students understand the meaning of statements.

Few modifications were made in Section 3. to enable the final version of the questionnaire was given to the target population via personal contact.

The primary method of collecting data was through an open question survey distributed to students in different parts of Bosnia. For research purposes, schools

were chosen based on how often their students have access to computers or the Internet. Four schools from urban and four schools from rural areas were chosen, and questionnaires' were delivered directly to students by the researcher.

The Likert-type questionnaire with five responses was applied: 1- "disagree"; 2 - "disagree"; 3 - "neither agree nor disagree"; 4 - "agree" and 5 -completely agree." Categories were administered to students to respond to interaction (Section 2), prior experience (Section 3), students' competencies (knowledge, skills, and values) related to the virtual learning environment (Section 4), and cost of learning in a virtual learning environment (Section 5) statements or claims following Section 1 on "students' background information.

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 contact. The questionnaires were distributed to 8 schools in 4 towns of Bosnia and Herzegovina.

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. The respondents got familiar with the purpose of the survey and the process of completing the questionnaire.

All respondents voluntarily, independently, and anonymously filled in the questionnaire, and the estimated time to complete the questionnaire was ten minutes. Exploratory factor analysis, a principal component analysis method, was used to determine the survey's validity. Analysis of the data was obtained using the SPSS statistical software. The second section's questions were formulated as Yes/No questions, while statements in Section 1 and Section 3 consisted of Likert-type questions.

Quantitative data collected from the questionnaire were analyzed using SPSS to answer research questions. Data analysis procedures included factor analysis.

Multidimensionality of the instrument was tested, an analysis of the main components was carried out. To check the correlation matrix is suitable for carrying out factor analysis, the Kaiser-Meyer-Olkin test and the Bartlett test were conducted. The Kaiser-Meyer-Olkin test shows the proportion of variance that is common or can be explained by latent factors. When this test's value is more significant than 0.60, it is considered that data is suitable for carrying out factor analysis. In this case, the value is 0.870.

The Bartlett test checks if 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 would not make sense to carry out a factor analysis.

**Table 1** shows the factor structure of the particles, with the values of the characteristic root and the percentage of the explained variance of each component. Given the content of the particles 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).

The test must be significant with at least 95% security for 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. 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.

	Teach stud	Student	Cost	1	2	36	47	58	6	7	8
Teacher student	1	.669**	.119	.063	.064	-.008	-.134	-.018	-.081	-.132	-.050
Student	.669**	1	.016	.124	.145	-.108	-.081	-.067	-.093	-.045	-.010
Cost	.119	.016	1	-.025	.134	-.070	-.023	-.021	.090	.001	-.065
1. How often do you have access to information from the Internet?	.063	.124	-.025	1	.161	.162	.131	.103	.093	.117	.030
2. How often do you post messages on a discussion forum (asynchronous discussion)?	.064	.145	.134	.161	1	.244**	.215*	.300**	.284**	.103	.041
3. How often do you participate in a synchronous discussion (eg using a chat box)?	-.008	-.108	-.070	.162	.244**	1	.118	.267**	.093	.172*	.046
4. How often do you upload content to a website	-.134	-.081	-.023	.131	.215*	.118	1	.277**	.164	.217*	.243**
5. Have you listened to/attended online courses that involve using a discussion forum?	-.018	-.067	-.021	.103	.300**	.267**	.277**	1	.373**	.418**	.198*
6. Have you listened to/attended online courses that involve the use of conversation (synchronou)	-.081	-.093	.090	.093	.284**	.093	.164	.373**	1	.294**	.290**
7. Have you listened to/attended online courses in which materials and content were delivered o	-.132	-.045	.001	.117	.103	.172*	.217*	.418**	.294**	1	.233**
8. Have you listened to/attended online courses in which you used a self-assessment program t	-.050	-.010	.065	.030	.041	.046	.243**	.198*	.290**	.233**	1
*Correlation is significant at the 0.05 level (2-tailed).											
**Correlation is significant at the 0.01 level (2-tailed).											

**Table 1.**  
*Correlations.*



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

A statistically significant correlation was found between particles related to a previous experience 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 on the level of significance 0.069, or  $p < 0.069$  between the components teacher-student and the benefits of the virtual learning environment at the 0.01 level. 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 him to ask questions in constant communication, which is not common practice in the traditional classroom environment.

#### **4. Results and discussion**

The claims are divided into three sections.

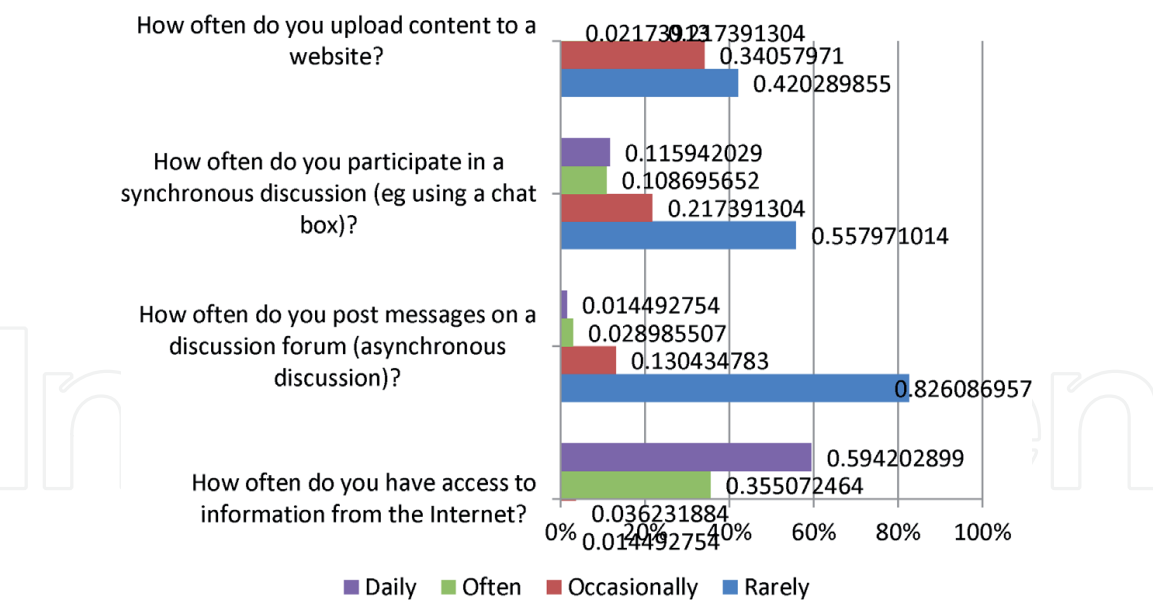
From **Figure 2**, it can be concluded that only 1.4% of respondents seldom answered the statement, "How often do you have access to information from the Internet," and 3.6% of students answered occasionally. In comparison, 35.5% of students responded that they often have internet access, and as many as 59.4% of students answered that they have internet access daily.

Slightly more than half of the respondents access the Internet daily, which indicates that most students regularly access the Internet searching for information that is not necessarily related to educational content.

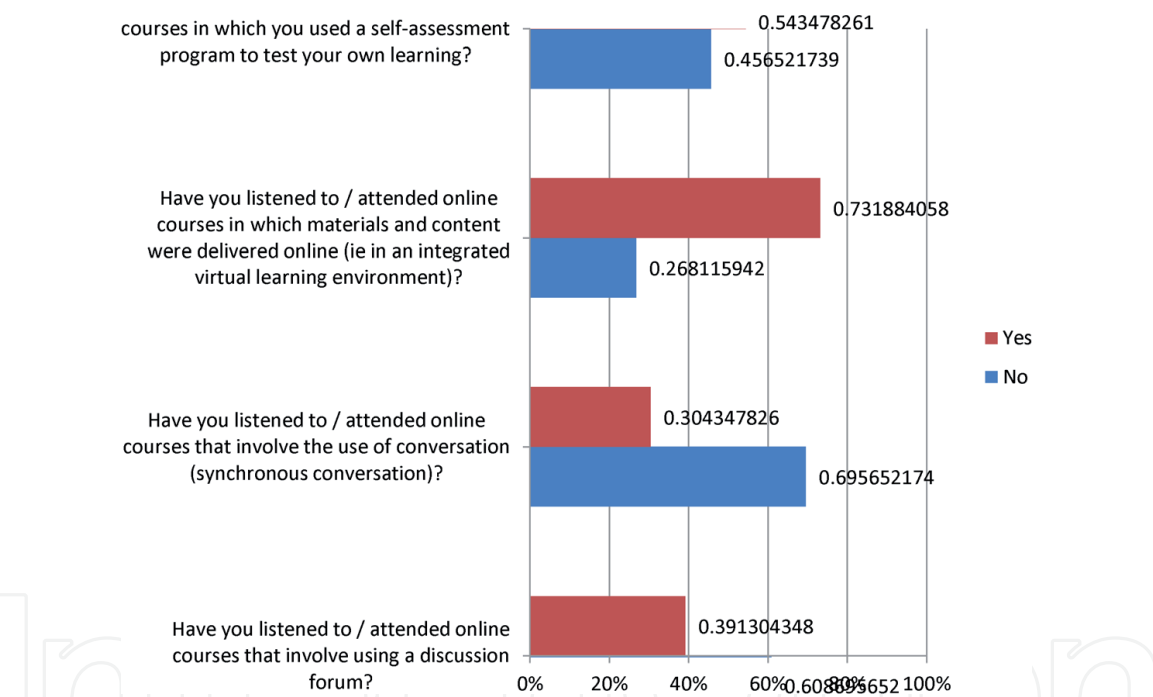
Previous Experiences in Computer Use show the percentages of student responses to claims related to students' prior experiences of listening to online subjects (**Figure 3**). The chart shows that as many as 69.9% of students used synchronous conversation, 73% listened to subjects where the content was delivered online.

These data confirm that students show great interest in online learning and online content that helps them acquire knowledge in a more appealing and exciting mode.

In the second group of statements related to previous experiences, respondents stated that they had the opportunity to attend an online course, which refers in part to the online learning week that is carried out in schools in Sarajevo Canton since the 2017/2018 school year. Educational materials and accompanying exams are uploaded on the Google online platform. Students are required to complete tasks and tests and upload them on the subject stream on the Google platform on the due date and time. A relatively low percentage of responses on the use of forums and synchronous discussion indicates that students had no experience in attending online subjects. That would require the use of forums and discussions with teachers and other students to fulfill the online course tasks, such as projects or case studies that are supposed to be completed with fellow students who take the same subject. Section3 examines the attitude of students towards the virtual learning



**Figure 2.**  
*Experiences in computer use.*

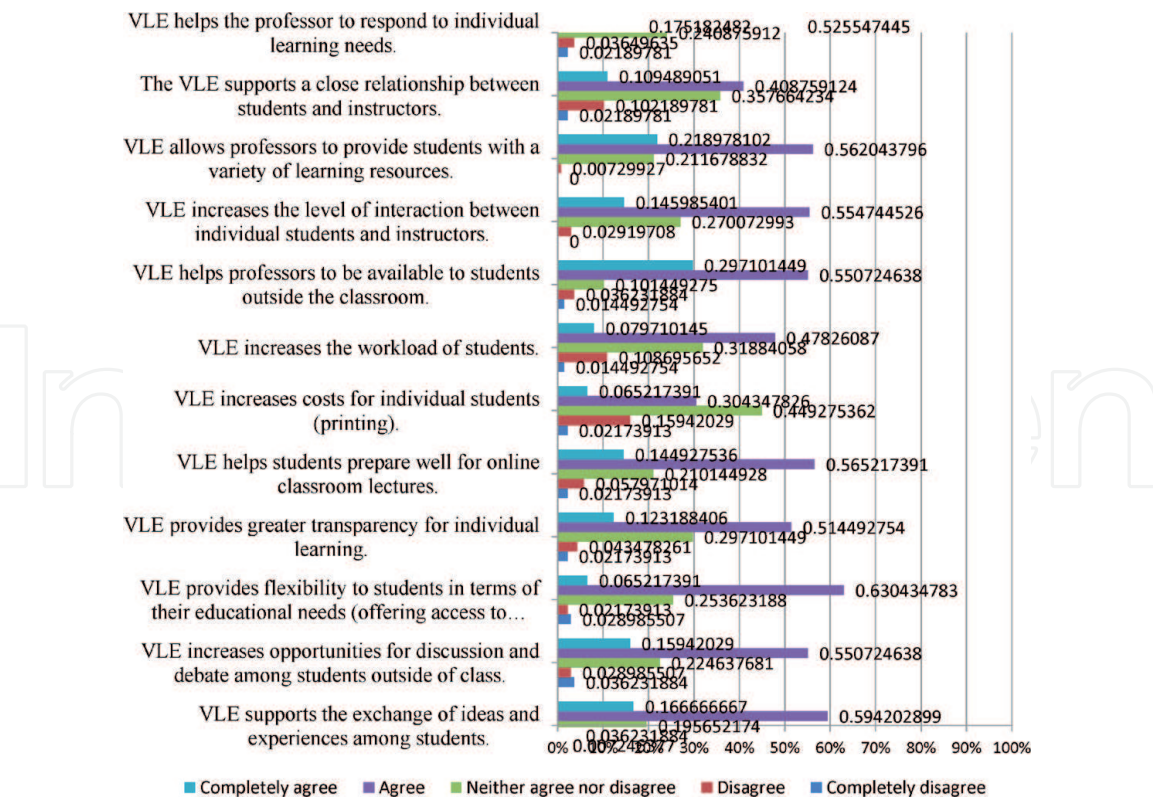


**Figure 3.**  
*Previous experiences.*

environment and the economic cost of VLE, which, in addition to financial costs, also includes the time and effort invested by students (**Figure 4**).

The results showed that the respondents generally have a positive attitude towards the virtual learning environment.

Students believe VLE helps them achieve a closer relationship with teachers and other fellow students; to be more precise, 70.1% of students agree that VLE enhances students and teachers' relationships. Additionally, 78.1% of respondents believe that VLE allows teachers to provide students with information from multiple sources, which is more than what they receive in a traditional classroom where teachers rely only on preapproved textbooks. They agree that a virtual environment increases constructive interaction between teachers and students, with 70.1% of respondents agree VLE allows students to ask questions to teachers at any time, not just within one school hour.



**Figure 4.**  
*The attitude of students towards the virtual learning environment and the economic cost of VLE.*

Online learning and a virtual environment let students have a flexible attitude towards learning, i.e., to access learning materials when they want and where they want, a statement with which 70% of respondents agreed. However, regarding the cost component, it is evident from students' answers that VLE increases students' workload, a statement approved by 55.8% of respondents.

It implies that students must invest much more time in independent work to successfully meet the requirements of online courses or online subjects as most of the work is done independently, without the teacher's supervision or control, which is inevitable in a traditional classroom.

Since e-learning requires a high level of self-discipline and personal time management, it may not be appropriate for certain students. Students who attend or take online subjects must be highly motivated to take full advantage of the media, as often, the experience of online learning can be impersonal. Those looking for more personal touch and face to face interactions are better in the conventional classroom where they can physically access teachers during the class.

It is more convenient for some educational institutions to pass on the cost of photocopying to students by putting all lecture notes and course brochures online. Such practices often mean that course materials are in an inappropriate format for online learning. Organizations that organize courses or schools that offer online courses need to develop new technical skills as well as course design skills to suit the new medium and make it easier for students to access the necessary materials without incurring high costs.

One of the essential items of online learning that students rated as positive is that e-learning offers discussion opportunities with other students and teachers. They do not usually have such options in a traditional classroom where time for questions is minimal, and the debate that (students find very useful for the learning process) takes place rarely in schools.

School programs do not offer the opportunity for discussion that goes beyond the official curriculum. Teachers are required to follow syllabi from which they

cannot deviate even when it benefited students. That is certainly a limiting factor and does not contribute to students' interaction as positive and desirable in the learning process.

A comparison of results obtained by examining the study of e-learning in Bosnia and Herzegovina with developing countries showed the development of online learning opportunities had been accompanied by changes in legislation related to online learning.

U.S. states and the District of Columbia passed 157 laws related to online learning between 2008 and 2012. Iowa and Wisconsin are among the states that have legislation to expand online learning opportunities and make them available to students.

In 2013, Iowa law initiated a model of an online learning program, called Iowa Learning Online (Iowa 2013 Acts, Chapter 121). In 2012, the Wisconsin Virtual School and the Wisconsin eSchool Network signed a Memorandum of Understanding with the Wisconsin Department of Public Administration (2007 Wisconsin Act 222) to meet state legislation requirements that provide schools with equal access to high-quality online education across the state. While this report focuses on two federal states in the Midwestern United States, the results may be beneficial to other states by potentially providing a valuable framework for considering online learning options and types of monitoring and support for the e-learning model [15].

Wisconsin high schools have used online courses to meet the needs of their students for several educational reasons.

Among schools in the state of Wisconsin that reported offering online learning in the 2012/13 school year, the reasons they cited as very important or somewhat necessary for enrolling students in online courses is:

- to allow students to get points from subjects they missed or had a negative grade (89%),
- to provide a subject that is not available (88%),
- to reduce schedule conflicts for students (86%),
- to provide an alternative learning environment (79%),
- to personalize the learning of students who have educational difficulties (76%).

One of the biggest challenges or problems faced by schools in Wisconsin and most commonly encountered in implementing online learning is the school administration's concern about the quality of online courses or online subjects offered [16].

In Bosnia & Herzegovina, each level of governance needs to develop its curricula based on the Common Core curricula, which should increase DSC's quality in IVET. The absence of established and reliable monitoring and assessment mechanisms, at both the state and the entity and Brčko District levels, prevents constructive policy development and tracking of the effectiveness of existing DSC programs. This is coupled with a lack of funding. The general infrastructure in schools for advanced DSC education relies mainly on donor investments and is therefore inadequate. There is also a deficit of ICT workers in the labor market [17].

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 adjust the curricula, and interests of students that is



applicable in the digital age. Changes and the adoption of new learning models are necessary to provide schools with an education that meets its students' real needs, followed by the rapid development of information technology. I.T. literacy as a prerequisite for integration into the global society and adaptation to the demands of students.

The success of schools will depend on their ability to meet future students' needs with their contemporary curriculum, the teachers' quality, and how the education content is delivered.

Despite the unfortunate economic situation and low standard of population, Bosnia and Herzegovina are showing a significant upward trend in the use of ICT. Additionally, the impact of globalization, the use of social networks, and immediate access to information provide students with opportunities to choose forms of education; therefore, a significant number of students want to take classes online. There are great opportunities in the technical, pedagogical, and business segments of e-learning, and its implementation should undoubtedly increase in the coming years. Education; therefore, a significant number of students want to take classes online. There are great opportunities in the technical, pedagogical, and business segments of e-learning, and its implementation should undoubtedly increase in the coming years.

## **5. Artificial intelligence assistants**

Artificial intelligence is another emerging technology that begins to change educational tools and institutions and change how the future might look like education. Artificial intelligence is already being applied in education, primarily in tools that help develop skills and testing systems.

Since educational solutions that involve artificial intelligence continue to emerge, it is believed that it can help fill gaps in learning and teaching and enable schools and teachers to work more than ever before [18].

Although most experts believe that teachers' physical presence is irreplaceable, there will be many significant changes in teachers' work and the best practices in education [19].

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 [20].

Artificial intelligence tools enable the creation of global classrooms accessible to everyone, including those who speak or use different languages or who may have visual or hearing impairments. Presentation Translator, for example, is a free plugin for PowerPoint that creates the subtitles for the materials teachers prepare for students in real-time. Additionally, it opens opportunities for students who cannot attend school regularly, among which are students struggling with chronic illness,

students with disabilities, gifted students, or those looking for a topic not being available in a school. Artificial intelligence can help break barriers between learning and traditional classes. It will provide opportunities for children to learn in a way that suits their personal needs and preferences as well as learning styles. For years, teachers are struggling to help students adopt knowledge and learn effectively while dealing with every student's individualized educational needs. It becomes challenging in an overcrowded classroom where everyone is expected to pass the same standardized test, regardless of their abilities.

The use of artificial intelligence has the potential to change the traditional and potentially damaging model of modern teaching that corresponds to a standard that should apply to all, in which all students, regardless of individual differences and preferences, should fit in. Machine learning algorithms have already begun to help teachers fill in knowledge gaps, pointing to subjects with which students have the most difficulty.

A personal tutor is another feature in the educational process that chatbots can do with ease, helping students identify problematic issues during their studies through interviews. The information thus acquired can then be used to create a personalized curriculum for each student individually. Chatbots would then follow students from the beginning to the end of formal education, record their progress, and provide feedback and suggestions. The individual preference for using artificial intelligence in the classroom is the solicitation in the assessment of tests and other repetitive duties.

The artificial intelligence in the assistant's assistant could teach lessons from the curriculum or provide additional information and metrics for learning the students they need, without disturbing the natural course of time or hindering the rest of the department [21].

With the advance of artificial intelligence, it becomes possible that the machine reads the expression on the face of the student, indicating that the machines are developing to the extent that they will be able to recognize the feelings of the person or the emotional state of the students. Machines will be able to modify the lesson to adapt it to the student's condition. The idea of adapting the curriculum to each student's needs is still not sustainable today but will be in the distant future for machines using artificial intelligence [22].

## **6. Virtual reality**

Virtual reality (abbreviate V.R.) simulates multiple senses, including vision, hearing, and touches, immersing students into the artificial world like no other technology. In this way, virtual reality occupies students in the learning environment. When the V.R. handset is placed, which leads to a simulated setting that completely distances them from the actual environment. The primary object of virtual reality is a visual simulation. Each handset aims to perfect its approach to creating a 3D environment. Each V.R. handset sets the screen (or two - one for each eye) in front of your eyes, eliminating any interaction with the real world. There are usually two lenses for automatic focusing between the screen and the vision adjusted based on the eye's unique movement and positioning. Visual displays on the screen are displayed using a mobile phone or an HDMI cable connected to the computer [23].

Virtual reality allows learners to learn through practical experience because students are immersed in a world that simulates real life. Learning through experience has been proven to be the most effective way of learning, and research has shown that it increases the quality of learning and retention by 70–90%. Through this type of learning, the information is more meaningful, and those who learn can

connect with it because they use information in their way through their responses and behaviors.

Research has shown that virtual reality can increase engagement and improve retention learned that the fundamental challenges that a traditional school is struggling. Some of the benefits of experiential learning with virtual reality are that repetitive learning can dramatically be improved by visualizing learning materials while providing a safe learning environment. When students make mistakes during travel, the consequences are minimal because they appear in a safe and controlled virtual world. Students learn the theory about a particular topic, which they can then experience in an interactive 3D environment, which gives pupils an unforgettable learning experience [24].

These virtual adventures can be embedded in the human brain's emotional center 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, virtual reality can deceive the brain's core to feel that a dinosaur or emotional depression is being haunted 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 film.

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 virtual reality were more emotionally involved in these contents than those available through a two-dimensional, conventional video [25].

At the beginning of last year, the U.S. teachers met 55 million new students to offer new tools to capture students' attention and inspire their imagination with virtual reality.

Hundreds of new intriguing experiences, many of which are free, can transfer students back through history where they can enjoy critical historical events or travel through our solar system without actually taking a school bus [26].

## **7. Conclusions**

The online program and online classes' organization enables students to access content and fulfill tasks according to their time organization. Knowledge is acquired at place and time that increase the opportunities for personal growth and development. Most students use the Internet every day and communicate with peers on social networks, which undoubtedly contributes to their readiness to accept new I.T. 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. Students, when being asked to respond on issues concerning the virtual learning environment and the application of e-learning tools, have confirmed that e-learning offers opportunities to acquire knowledge and skills that are not available in the schools they have attended.

There was a statistically significant correlation between previous experiences that 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. Students enrolled in this research have a highly positive attitude towards e-learning, which leads to the conclusion that students are willing to learn using I.T. solutions in the classroom.

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. Necessary prerequisites for successfully implementing the e-learning model are acquiring appropriate technological infrastructure, sound educational content produced by teachers who possess computer skills, and a culture that fosters learning and knowledge sharing in a virtual environment.

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