

DDLm - QUALITY STANDARD FOR ELECTRONIC EDUCATION PROGRAMS IN HIGHER EDUCATION OF BOSNIA AND HERZEGOVINA

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Contribution to the state of the art

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Abstract: The Web-based technological revolution has brought new teaching opportunities and concepts. This expands the range of educational opportunities based on new digital technologies, while certain obstacles and dangers appear that this type of education brings with it at the same time. Electronic education systems should be flexible and it would be ideal if able to meet the specific needs of each student individually. On the other hand, it is extremely important to standardize teaching electronic content, define all vertical and horizontal processes in the electronic education system, and set quality standards that must be respected. Higher education institutions must take an active part in the development and implementation of information technologies in teaching processes. DDLm (Demand-Driven Learning Model) clearly defines the structure of Web-based teaching delivery, so that it essentially defines the quality standard of e-learning programs based on Web technologies. The problem of non-standardization of electronic educational content, poorly defined processes in the system, such as the delivery of electronic content, control activities, personalization or irregular updates, is present everywhere in the world, and so with us. The research conducted in this paper examines the population of students of higher years of study, as well as students of the second and third cycle of study at 5 universities in Bosnia and Herzegovina, in order to get a clear picture of the current state of electronic education in our country. The survey was conducted on 565 students between October 2016 and January 2017. Following the methodology of scientific research, the empirical research was primarily conducted through a survey questionnaire, where primary quantitative data were stored in a database and further analysed, after which we reached the relevant scientific knowledge.

Keywords: Electronic education, DDLm standard, LMS.

INTRODUCTION

Educational institutions that provide teaching in an online environment must pay particular attention to the design, implementation and distribution of electronic educational content, which predominantly is now multimedia. Creating quality electronic educational materials is a very serious and difficult task. With the increasing prevalence of teaching in electronic form, institutions providing this type of teaching are inevitably entering the market race for creating high-quality multimedia educational content. On

the other hand, many educational institutions are predominantly focused mainly on the delivery of electronic educational content, taking into account only technological parameters or visual criteria, while neglecting educational goals, which is not a correct approach. In doing so, the basic Mayer principles [1] [2] of the organization and rules of visualization of multimedia educational content are ignored and grossly violated. Effective e-learning models must be guided by sound pedagogical principles and be flexible in order to adapt to the needs and goals of students. The

literature recognises different teaching and learning strategies – linear and constructivist; some authors advocate teacher-centred and other processes- and procedures based learning, but each model deserves attention and consideration as the choice for selection of the learning model should depend on the goals of the program and the needs for the trainees (students) [3].

DDL M – QUALITY STANDARD FOR ELECTRONIC EDUCATION PROGRAMS

The following group of American and Canadian authors was particularly concerned with the quality standards and the issue of the implementation of electronic educational programs. Colla MacDonald et al [4] set a quality standard in the design, development and distribution of electronic education programs - DDL M (Demand-Driven Learning Model). DDL M clearly defines the structure of the delivery of WEB-based teaching.



Illustration 1: DDL M – Quality standard for electronic educational programs [4]

DDL M looks at the delivery of e-learning programs from multiple angles and at different levels:

- **Structure** - Understands the basic needs of online education learners, creates a stimulating environment that affects students’ motivation. Other pedagogical strategies are developed

and periodic examinations are made of the students through tests, quizzes and the like.

- **Content** - must be understandable, authentic and based on previously acquired knowledge.
- **Distribution** - interactivity, ease of use of the distance learning system, tools for navigating the system and manipulation of electronic educational multimedia content should be ensured and encouraged.
- **Service** - must provide administrative and technical assistance, accessibility to the system with mandatory optimization and must provide a communication channel to provide prompt answers to the queries, which are usually communicated via e-mail reserved for technical support, although support may also be provided by telephone, video link, chat, forum etc.
- **Outcomes** - online education users expect lower study costs (travel, food, lodging, time, e-textbooks ...), while on the other hand, they expect specialized knowledge and skills equal to delivering classical classroom instruction that will enable them to compete at the labour market.

Delivering this type of teaching and meeting quality at all levels, as described by the DDL M, requires significant financial investment presenting a major obstacle to quality online education, which is especially noticeable in economically underdeveloped countries, including our country. On the other hand, even if the necessary financial investments are provided, there is an equally big and serious problem, which is the lack of skilled people who understand the principles of multimedia and modern e-education and who should be prepared to put enormous effort into creating quality multimedia educational content according to the set quality standards. Communication and interaction between trainees and responsible teachers in such systems are necessary, but unfortunately, it is often insufficient or non-existent. Distance learning systems also raise other issues, such as data protection, copyright protection, privacy policies, the autonomy of the environment and content, server capacity, limits on the data flow through the network, technology choices, licensed software, compliance with online education laws etc. Online education requires constant monitoring

of teaching processes and timely implementation of necessary corrections.

RESEARCH

The Survey [5] was created as a web-based application, and Drupal 7 (a content management system) was used as the platform. Most of the collected surveys were realized through a printed form on-site at the premises of the home universities with the presence of a control person, which made the students aware of the importance of the survey and gave an additional dose of seriousness during the filling, as recommended by prof. dr. Goran Milas [6, p. 467]. A total of 565 students were surveyed. The largest number of respondents was at Pan-European University APEIRON, Banja Luka (294 or 52.04%). Following are represented by University / University "Vitez" (78 or 13.81%), BLC - Banja Luka College (68 or 12.04%), International BURCH University (68 or 12.04%) and finally Faculty of Electrical Engineering at University of Banja Luka (57 or 10.09%).

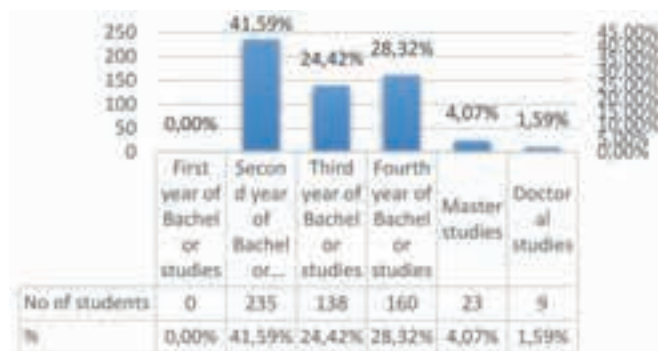


Illustration 2: Year and type of studies

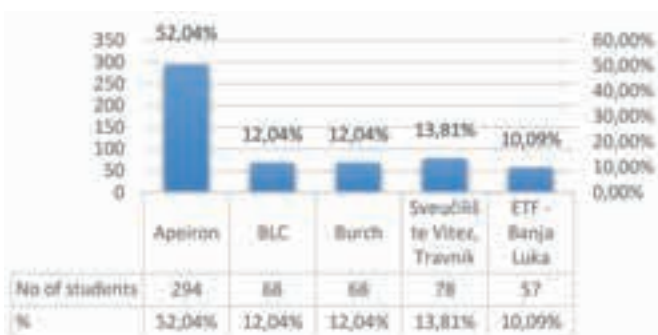


Illustration 3: Number of respondents by the educational institution

The surveyed students were mostly students in the second, third and fourth years of the first cycle

academic studies. A particular quality of the research is given by the participation of students of the second and third cycle, ie masters, masters and doctoral studies. The following chart shows student participation by year and type of study.

The survey sought answers to the questions:

- What is the representation and utilization rate of ICT in higher education in Bosnia and Herzegovina?
- To what extent are educational institutions prepared to use new ICT technologies in teaching?
- What are the effects of the use of multimedia in e-Education in Bosnia and Herzegovina taking into account all the specificities of this educational space?
- How much is e-education represented in higher education in Bosnia and Herzegovina?

The infrastructure, tools, method and concepts of collecting, processing and publishing multimedia content through e-education system were investigated. The readiness of the teaching staff and students to accept and use new educational concepts based on modern ICTs with the indispensable use of multimedia in e-Education is analysed and suggestions are given on how to improve the existing e-education in BiH.

The research fully or partially answered the following questions:

- To what extent are ICTs represented in e-Education in our country?
- What is the willingness of teachers and students to use ICT in e-Education?
- What is the relation of educational institutions to e-education in BiH?
- What are the most commonly used e-Learning models in higher education in BiH and why?
- What technologies and tools are used in the creation of multimedia content and what is the quality of the content?
- To what extent does the existing information and communication infrastructure provide the technical prerequisites for quality e-Learning delivery?
- In what direction will e-Education move in BiH?

This paper does not present all the results and all considerations for the above questions and the

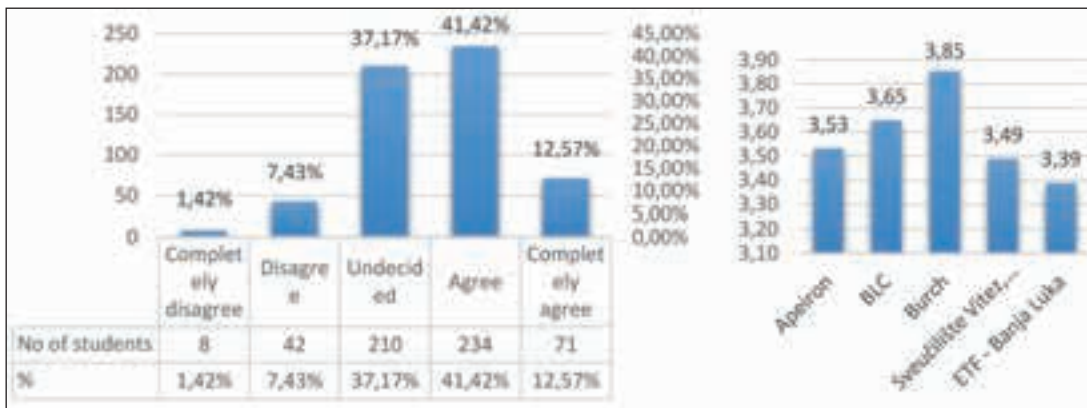


Illustration 4: Survey claim 1 results

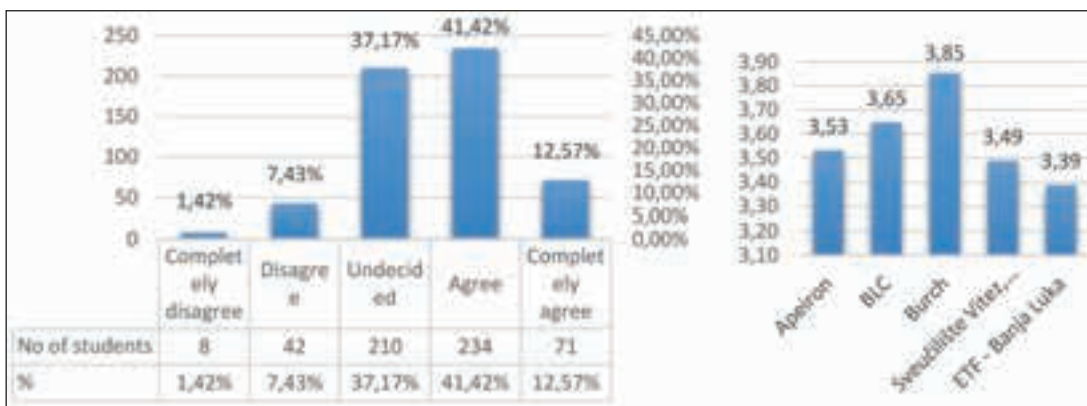


Illustration 5: Survey Claim 2 Results

results obtained due to its nature and limitations. That is why in the following charts we will be based solely on the quality of teaching via the DLS system of distance learning at the observed institutions.

Survey Claim 1: The distance learning system provides me with quality educational resources, essential for my study.

Average rating 3.56

The marks obtained are even and range from 3.39 to 3.85. The average rating is good, but there is still room for improvement. Learning resources come in a variety of multimedia forms. It is interesting that Pan-European University Apeiron has around 10,000 hours of mounted video material published at all times in its closed Distance Learning system (Learning Cubes 4.0), which are recordings of direct instruction from the classroom and related exercises. The survey shows that students use multimedia educational electronic resources and that they are important.

Survey Claim 2: It is important for me to access educational materials at the moment, regardless of the place and time of access.

Average rating 4.13

Educational materials in DL systems are most commonly found in a closed environment, for which access requires authentication through unique user data. Instant access is the standard of using DL.

Survey Claim 3: The materials in the DL system are a great complement to the classic classroom teaching.

Average rating 3.65

Most respondents felt that the DL systems they access were a great complement to classic classroom teaching. E.g. Pan-European University Apeiron performs Screen Capture of the screen, which is displayed in HD quality combined with accompanying classroom video. This is how the exercises in the Higher Programming Languages-C ++ are per-

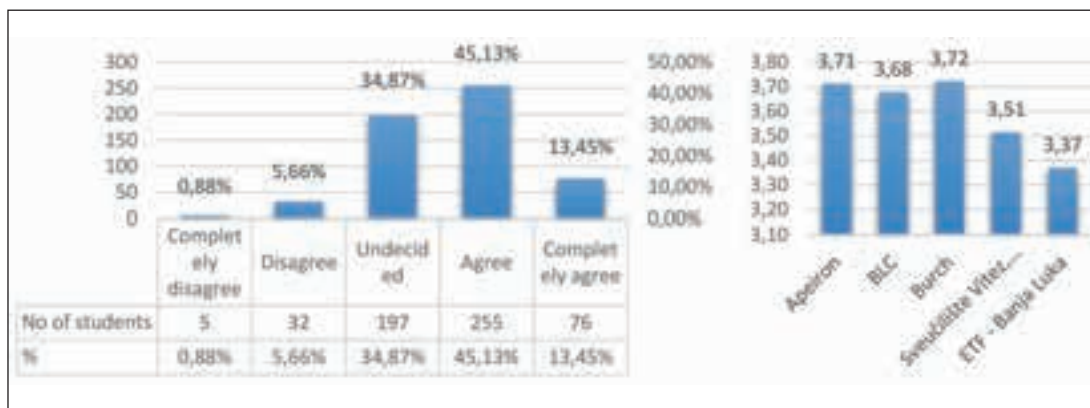


Illustration 6: Survey Claim 3 Results

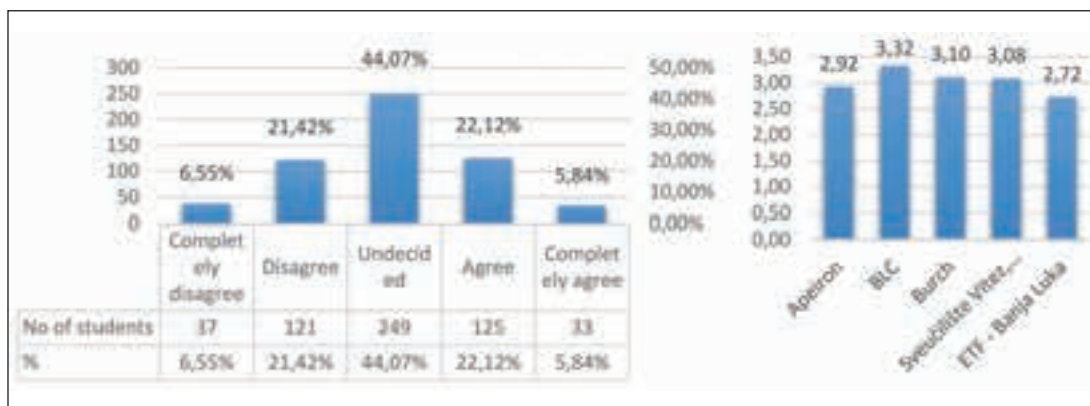


Illustration 7: Survey Claim 4 Results

formed in the computer room with video projection, where the students monitor the performance of the tasks (programming tasks) with the lecturer, and then the recorded activities from the lecturer’s screen are later thoroughly reviewed and the tasks are taken home (the programming code is perfectly visible). Some teaching activities require dominant classical teaching where the role of multimedia via the DL system is diminished. An example of such an activity is the practical fabrication of a denture in the dental laboratory of the faculty.

Survey Claim 4: The DL system is a more important resource for me to study than classical classroom teaching.

Average rating 2.99

The results of this survey claim prove that in Bosnia and Herzegovina a hybrid model of learning is represented, which is a combination of the best practices of classical educational forms innovated through interactive teaching and online educa-

tion supported by information and communication technologies. The result (2.99) shows that classical teaching and multimedia learning through the DL system are equally important to students. The graph shows the small differences and models preferred by the observed institutions, so the BLC tends to multimedia learning through the DL system, while the ETF Banja Luka prefers to provide multimedia-assisted teaching in the classroom.

Survey Claim 5: I based my study solely on the DL system, I do not attend the classical teaching.

Average rating 2.45

Full-time students are obliged to attend classroom instruction, while extramural (part-time) students do not have this obligation or their attendance is diminished and in this context, the grade of 2.45 should be considered. That’s why DL systems for part-time students are of particular importance. A hybrid form of learning can also be recognized in

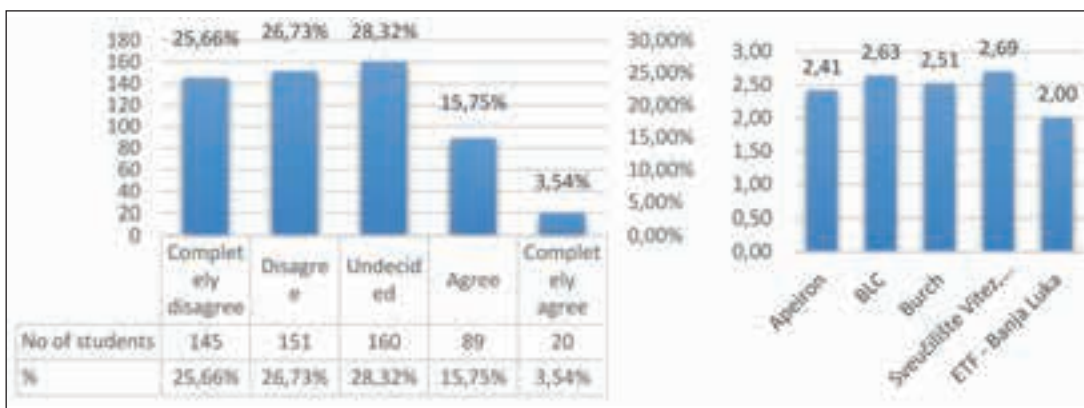


Illustration 8: Survey Claim 5 Results

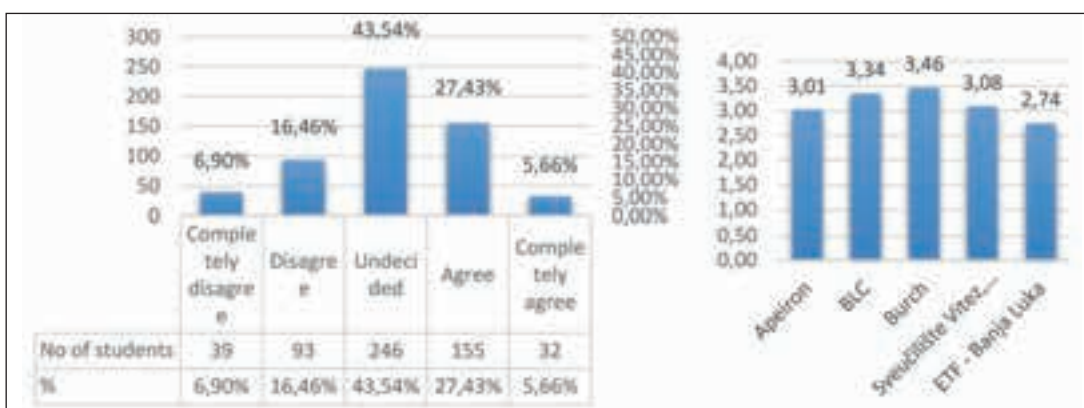


Illustration 9: Survey Claim 6 Results

this survey question, that is, a combination of classical educational forms combined with e-education.

Survey Claim 6: DL study fits my way of studying.

Average rating 3.08

Just over half of the respondents accept DL teaching as a study method that suits them. This does not mean that the other half does not use DL, as can be seen from the results of the statement made earlier: “The distance learning system provides me with quality educational resources essential for my study (Score 3.56).” Existing DL systems still need to be done more interactive and enrich them with even better quality and more interesting and useful multimedia electronic educational materials for students. Then this average grade can be expected to rise.

Survey Claim 7: The multimedia materials in the DL system are well organized.

Average rating 3.45

Distance Learning systems are composed of a number of subsystems, such as course creation and guidance systems, testing systems, and up to systems for monitoring progress and student status. DL systems must provide students with access to and delivery of various types of multimedia electronic educational materials in a logical manner. Synchronizing all these systems and providing logical use is a big deal, but that’s what students expect from a DL system.

Survey Claim 8: The quality of multimedia in DL is good.

Average rating 3.48

The average score of 3.48 is good, but there is certainly plenty of room for raising the quality of multimedia materials. We can relate the survey claim to one of the previous statements stating: “The distance learning system provides me with quality educational resources that are essential for my study.” - (Average grade 3.56).

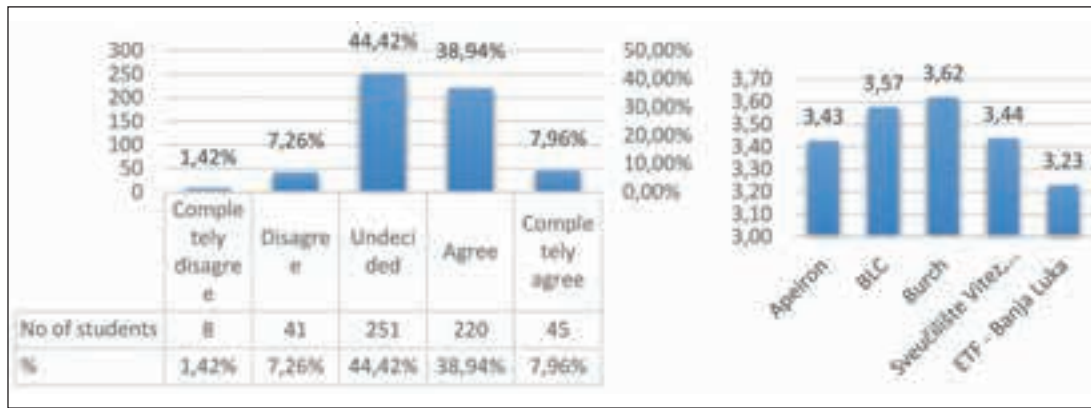


Illustration 10: Survey Claim 7 Results

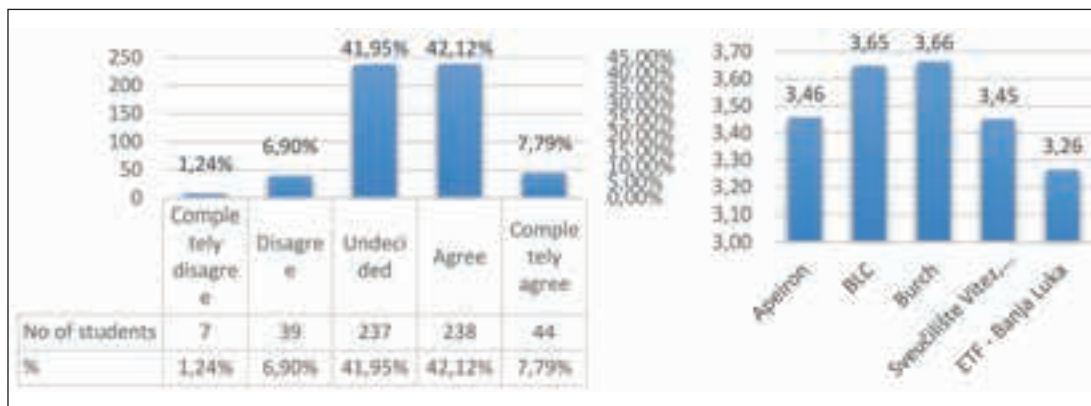


Illustration 11: Survey Claim 8 Results



Illustration 12: Comparative analysis (Quality of multimedia materials in DL systems)

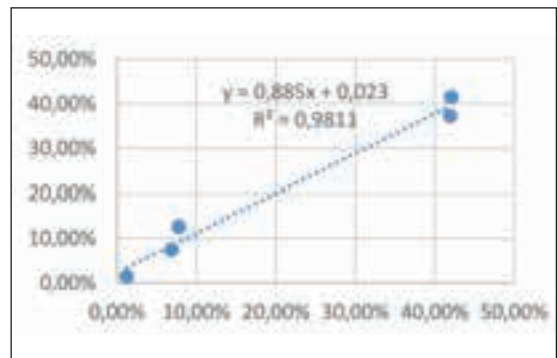


Illustration 13: Correlation analysis

Survey Claim 9: Many multimedia materials are missing from the DL system.

Average rating 3.17

The result obtained should not be viewed solely in a negative context. Previous survey statements have positively evaluated the quality of multimedia materials and new multimedia concepts, so a score of 3.17 should be seen as a need for knowledge delivery systems to become even better and that most of the multimedia materials needed can be

found by students within the DL. The monitored universities should positively accept the student criticism expressed by the results of this survey statement and work on improvements every day that are of interest to both universities and students

Survey Claim 10: Communication with professors and assistants via DL is good.

Average rating 3.35

Primarily, the role of students in DL systems is

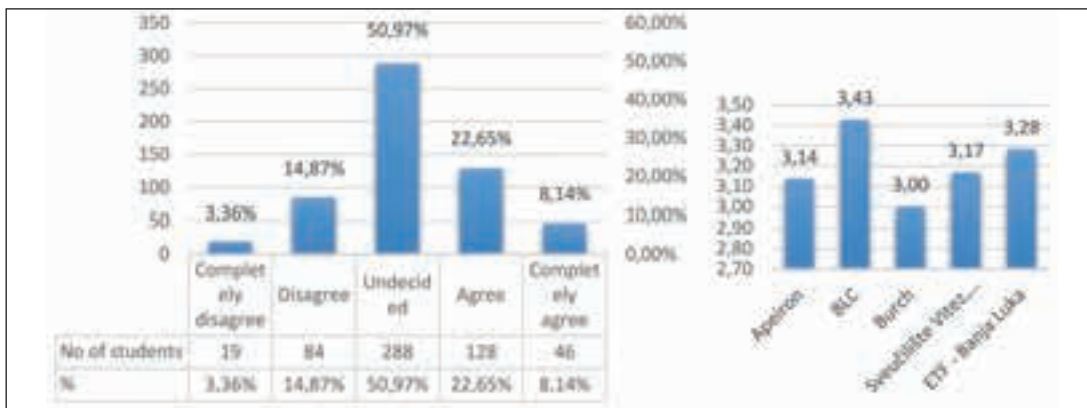


Illustration 14: Survey Claim 9 Results

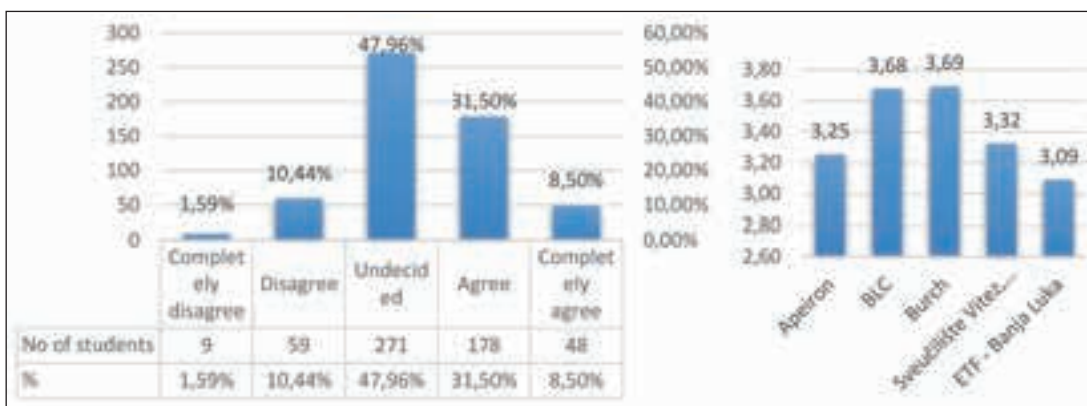


Illustration 15: Survey Claim 10 Results

to learn, and this requires planning, motivation and the ability to analyse and apply the content offered. This is where the role of the professor is primary, as the professors in collaboration with the assistants, plan the curriculum, taking into account the needs of students and the specifics of creating multimedia educational materials and multimedia communication that can take place in real-time or be delayed. The systems enable pre-scheduled online communication, exchange of messages and documents, or the joint collaboration of professors, assistants, and students on a single document (all observed institutions have a Microsoft Office 365 suite supported, which supports this), and many other features. It all shows that there are preconditions for quality online communication between professors, assistants and students, and the average rating obtained indicates that there is still work to be done to improve this kind of communication.

Survey Claim 11: Administrator support in the DL system is good.

Average rating 3.50

Administrator support for the system can be viewed in two ways:

- 1. Professors and Assistants as Administrators** - They are moderators of their respective subjects and as such have frequent communication with the trainees at the course level. They can reorganize a virtual object or detect perceived technical problems that they can sometimes solve on their own or seek the help of an appropriate professional technical person
- 2. Administrators (technical persons)** - They only deal with technical matters. They take care of the stability and security of the system, receive complaints and eliminate any technical problems identified. They work on the introduction of new modules and other functionalities including constant communication with the professors and the educational institution that employs them (the introduction of new functionalities usually requires consider-

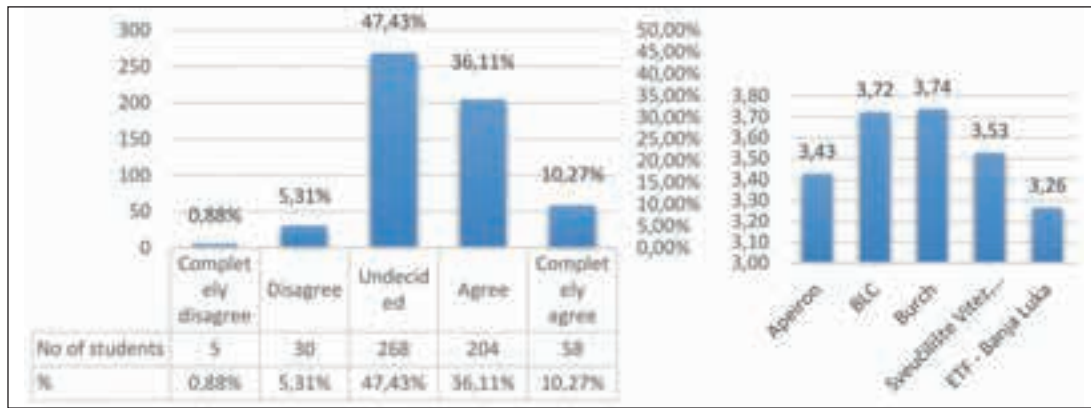


Illustration 16: Survey Claim 11 Results

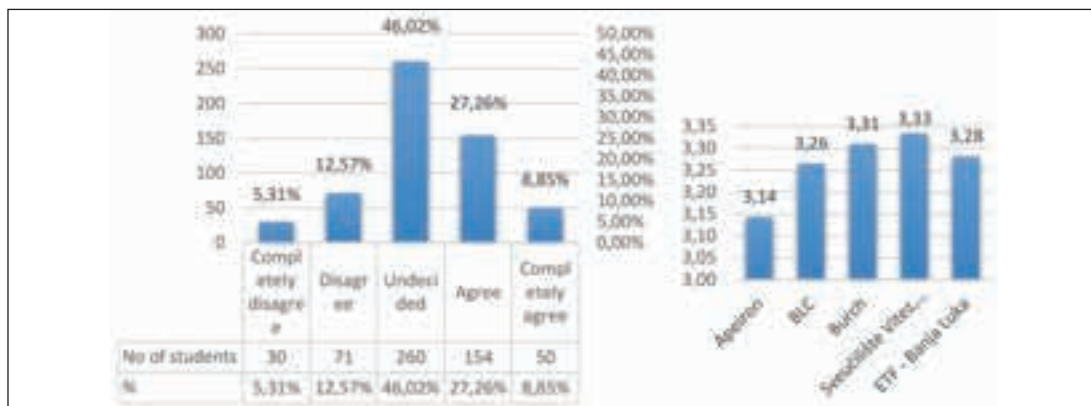


Illustration 17: Survey Claim 12 Results

able financial investment, which is approved by the University Administration).

The average score of 3.5 is very good and shows that the DL systems under review have provided administrative support which could be better in the coming years.

Survey Claim 12: DL provides the ability to test knowledge (tests, quizzes, online discussions, etc.).

Average rating 3.22

Today, all modern Distance Learning systems have the abilities to test knowledge, create tests, lead discussions, advance students etc. The question is how much these possibilities are used. Technically, there are no problems to provide testing and automatic knowledge testing, where the answers offered are selected or to link related terms offered. The problems arise in case of answers that should be descriptive or thoroughly written. The automatic assessment then falls out of the game, as the systems do not currently have sufficiently developed

artificial intelligence that can intelligently analyse and score such answers (this is an ongoing issue). The observed problem is that these simple forms of assessment are not used to the full extent. The reason for this is a non-systematic approach to solving the problem identified, that is - there is no clear position of the University Board that the teaching staff is obliged to create a number of online tests or quizzes that can be easily published within the existing LMSs. The surveyed educational institutions conduct certain online examinations, but there is certainly still plenty of room for this type of testing and verification of the knowledge shown. The right solutions lie in intelligent two-way communication [7] between intelligent tutoring systems and students where the e-learning system contains intelligent methods for analysing and evaluating users' knowledge and skills, as well as controlling e-learning processes, monitoring and optimization.

Survey Claim 13: Studying through the DL system has more advantages than disadvantages.

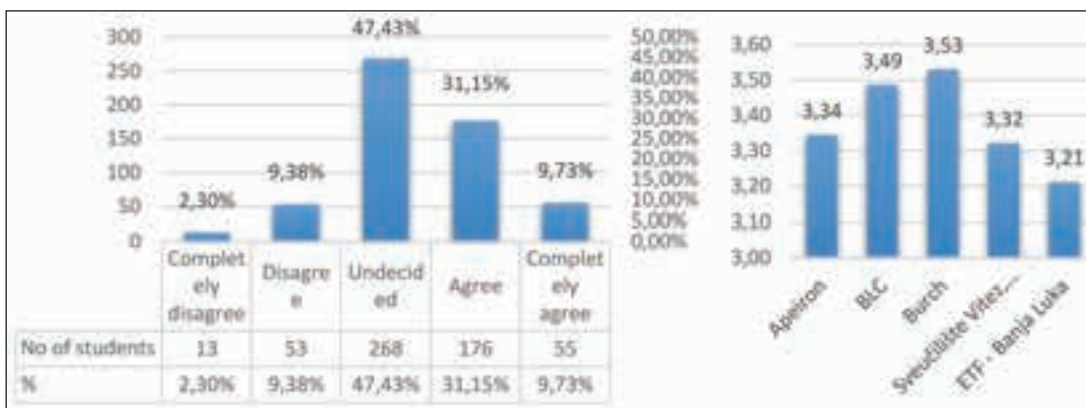


Illustration 18: Survey Claim 13 Results

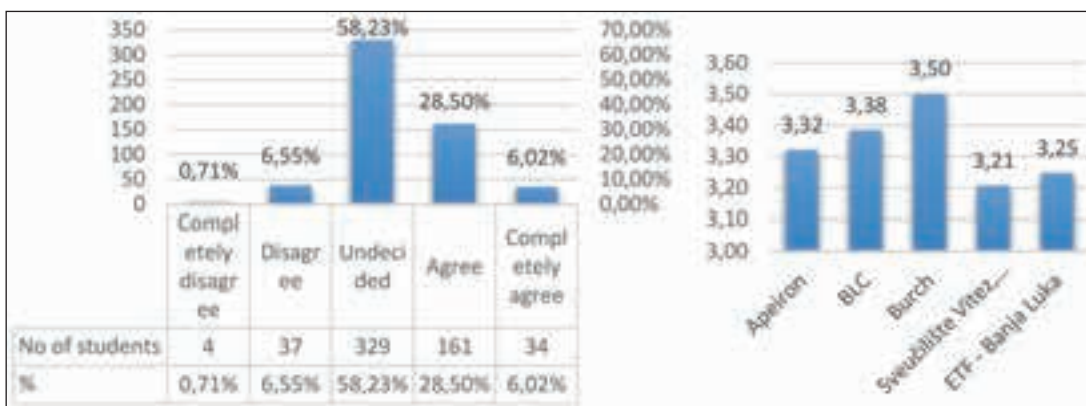


Illustration 19: Survey Claim 14 Results

Average rating 3.37

Students rated this statement positively, with an average score of 3.37. It is felt that the Distance Learning mode of teaching at the observed universities is appropriate for students and is increasingly becoming an indispensable part of their studies.

Survey Claim 14: Multimedia content in the DL system is uniform.

Average rating 3.33

The uniformity of the content and the establishment of certain visual and technical standards that should be adhered to are extremely important. Thus, the Pan-European University Apeiron Banja Luka has set the visual and technical standard for publishing recorded lectures and exercises in video form. This standard describes image size and resolution, fps rate, video layout, meta-tags, video compressor and amount of video compression, audio compressor and amount of audio compression. When creating multimedia materials, the Mayer principles of

creating multimedia materials that give them some uniformity and quality standards must be taken into account. The results obtained on this survey claim can be compared with one of the previous statements: "Multimedia materials in the DL system are well organized."

Survey Claim 15: The multimedia content in DL is interesting and of high quality.

Average rating 3.44

Creating interesting and quality multimedia educational materials is a very serious and difficult task. With the increasing prevalence of teaching in electronic form, institutions that provide this type of teaching are inevitably entering a competitive marketplace for creating high-quality multimedia educational content. On the other hand, many educational institutions are predominantly focused on the delivery of electronic educational content, taking into account only technological parameters and visual criteria, neglecting educational goals (ne-



Illustration 20: Comparative analysis

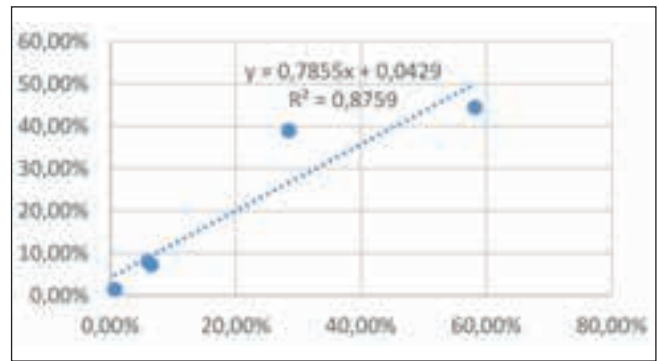


Illustration 21: Correlation analysis

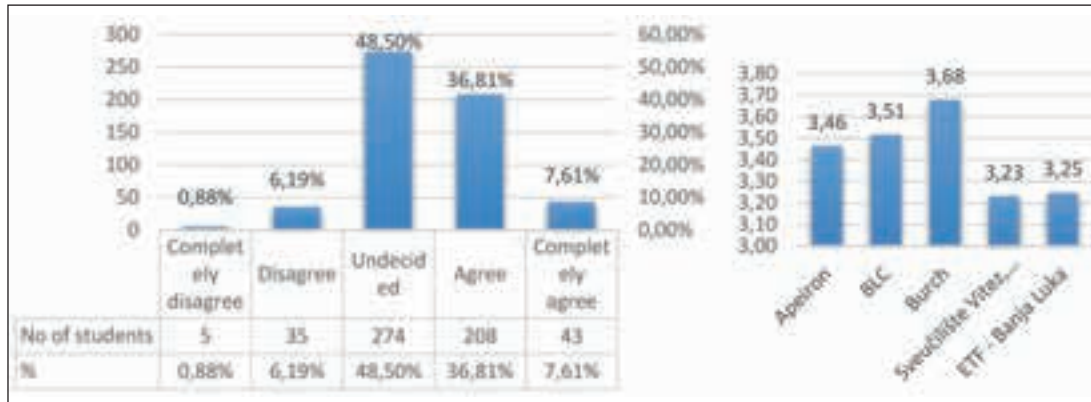


Illustration 22: Survey Claim 15 Results

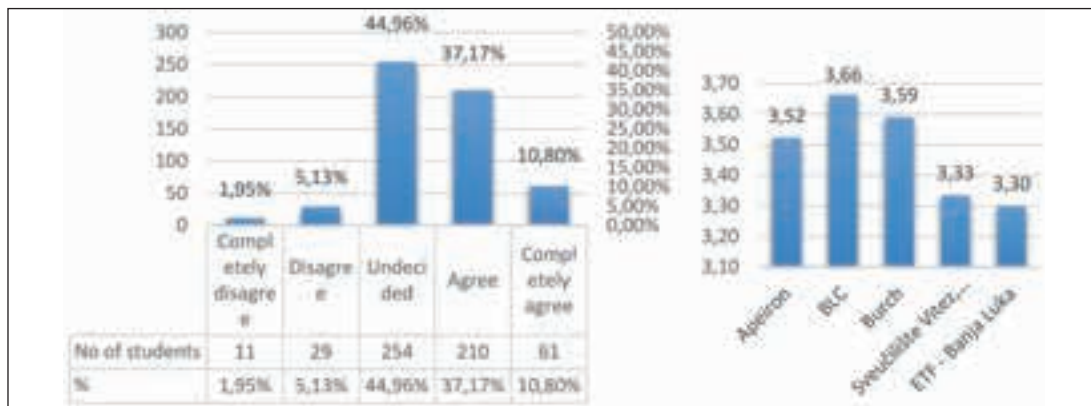


Illustration 23: Survey Claim 16 Results

glecting the basic Mayer’s principles of organization and rules of visualization of multimedia educational content). The knowledge, experience and skills that students acquire are the most relevant indicators of the quality of e-learning delivery. The resulting average score of 3.44 indicates that the observed educational institutions have made considerable efforts in standardizing the quality of multimedia electronic educational content.

Survey Claim 16: Staying on DL is comfortable, the connection is stable, and educational multimedia content is started and executed smoothly.

Average rating 3.50

Multimedia systems process, store and publish multimedia information. All of these actions require certain prerequisites, the most important of which are stability and data flow over the Internet and to meet hardware and software preconditions, both

from the server and client-side. Only then can we talk about a comfortable use of DL systems. Particular attention must be paid to optimizing multimedia materials to avoid unnecessary memory usage and speed up data flows through the network. Optimization also requires a standardization, which should not be detrimental to the quality of multimedia educational content, while optimized multimedia content, on the other hand, must meet the established audio and visual criteria for their smooth listening or viewing.

CONCLUSION

The academic community must be able to embrace the development of new IT technologies and outstanding multimedia capabilities in order to provide more dynamic teaching and learning, more efficient use of space, time and financial resources. It is evident that there are no umbrella policies or standards in the delivery of e-learning that higher education institutions adhere to, nor that such a standard shall be obtained in the near future. All observed institutions have implemented their own solutions and policies for publishing and using multimedia educational forms in the form of various open and closed multimedia educational information systems. It has been observed that the delivery of teaching via distance learning systems, both in the Republic of Srpska and in the Federation of BiH, is conditioned primarily by limited financial resources and poor IT infrastructure. Perhaps the biggest problem is the lack of understanding, that is, the lack of vision and initiatives on the part of the University Administrations to set financial frameworks and to find accordingly creative and acceptable solutions for the implementation of DL and in general to provide the necessary material and logistical support conducting e-learning. However, the observed 5 Institutions in this paper are positive examples that investment in eLearning pays off and delivers excellent and measurable results. They have entered the educational market where the technical equipping of the institution and IT support in carrying out educational processes are extremely important factors. The knowledge, experience and skills that students acquire are the most merit factors that set good universities and colleges apart from the bad ones.

Many educational institutions in Bosnia and Herzegovina are predominantly focused on delivering electronic educational content, taking into account only technological parameters and visual criteria, while neglecting educational and didactic goals, which is by no means good. With the exception of the 5 educational institutions observed in this paper, in most cases in the remaining higher education institutions, there is an under-utilization of existing personnel and technical capacities, which, with the appropriate organization, can give good results in the implementation of e-education in the current conditions.

E-education in BiH has already crept into all its pores with a tendency to raise the quality of multimedia educational forms and the participation of teaching staff in the active process of creating electronic educational materials and interacting with students through various multimedia systems, based on the WEB. This research undeniably confirms this. In the future, major developments in all fields of e-learning should be expected. First of all, one must keep in mind the rapid development of artificial intelligence that can find application in such systems. Then the individual needs of the students could be fully monitored, adjusted to their predispositions, learning styles and the speed of learning the course material. The development of artificial intelligence and intelligent tutoring systems will allow each student to have their own personal e-Tutor, available 24 hours a day. Certainly, in the future, many interesting IT solutions await us and it will be interesting to observe how all this will affect the execution of teaching processes, both in the world and in our country. We hope that higher education of Bosnia and Herzegovina will fully embrace these new multimedia educational concepts and actively participate in their further development.

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