

# Challenges of using computer-based educational technologies in higher education

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**Abstract**—The level of higher education faces great needs and challenges in the use of computer technology. The technology-based learning process has several important priorities. In particular, the learning process is flexible and comfortable; It is much more exciting and creative; The learning material is comprehensive and teaching/ learning process is of high quality. However, the process, along with the priorities is fraught with many problems and challenges. In this paper, we aim to conduct research and determine what hinders the introduction of computer-based educational technologies and to work out the recommendations for the educators to enhance the quantitative and qualitative quality of the use of computer-based educational technologies. The survey was conducted using online survey, Interview, Focus group and Experiment methods. The following conclusions were made by analyzing the results: students preference is in favor of computer-based educational technologies; Not all the staff implementing higher education programs use computer-based educational technologies in the educational process; HEIs have poorly renovated equipment; The quality does not meet modern requirements; Professors lack of competence; Readiness to actively use computer-based educational technologies and participate in the trainings; To respond the results: It is important to review the training courses in the field of computer technology in the educational programs of HEIs and focus on the use of computer educational technologies; Making a mandatory requirement to use of computer-based educational technologies in the process of planning and implementing educational programs; Plan trainings in the field; To enhance the quality, the studies and surveys should be conducted by HEI quality assurance services.

**Keywords** — Computer-based educational technologies; educational process; e-resources; mobile applications; e-platforms.

## I. INTRODUCTION

A computer has become an integral part of a human's life in the modern world. One can hardly find the field of activity that doesn't require the application of computer directly or indirectly to achieve the desired

results and meet high-quality demands. Technical progress puts the educational system under high demands, which, regardless of the level of education, considers the use of a computer to be the most essential in the teaching process. It has been decades since there were attempts to implement information technologies in the educational process and other fields as well. [7] There are some instances of application of computer technologies in the early educational process by finding, preparing, demonstrating various electronic resources. Judging by the example of Georgia 'The Professional Standard of the Educator-Teacher' approved in 2018 can be the relevant document to confirm above mentioned discussion. The role and significance of computer is even more crucial on the school education level. Besides, the rapid spread of information, communication technologies in social and economic fields brought the necessity for every single citizen to acquire the basic skills in order to become a full-fledged member of the information society [2]. Schools put emphasis not only on the application of computer technologies by primary school students but the development of the information technology competences. In the Georgian Education system, for instance, according to the primary document "Georgian National Curriculum", regulating the general education, the school subject – Information and Communication Technologies, has been taught up to the current period to the first and second-grade students (with the duration of one semester).

However, since the second semester of 2020–2021, putting forward the distance teaching component in the conditions of Covid 19 across the globe has drawn the issue of distance teaching to the peak of attention along with the enhancement of ICT (Information and communication technologies) competences in school students.

**Main part.** In literary sources, electronic information and communication technologies are defined as follows: ICT is technology that supports activities involving information. Such activities include gathering, processing, storing and presenting data.

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Increasingly these activities also involve collaboration and communication. Hence IT has become ICT: information and communication technology [7]. Information and Communication technology (ICT) is a broad term used to describe a transmission or idea exchange using equipment, tools, or networks. Examples of ICTs include: the Internet, cell phones, and personal digital assistants (PDA).

To enhance students' competence in information and communication technologies Georgian government decided to pilot the subject "Computer Technologies" in about 400 schools since the second semester of 2020–2021. Moreover, this subject will become mandatory after the first semester of 2021–2022 for the second, third and fourth-grade students in Georgian schools. Naturally, the society and parents' attitude towards the abovementioned issue is quite heterogeneous due to the fact that some of them strongly believe that children, especially, junior students, spend excessive time using computers. They believe that introduction of the subject in the school curriculum will make their kids even more addicted to computers. However, it doesn't represent the object of our research. We focus on the relevance of computer-based educational technologies and the significance of their application in any stage of education, among them junior school education. Not to mention the basic and secondary education, where the educational process relies mostly on computer technologies, the demand for a skilled teacher is quite high and the students' competencies are comparatively close to the requirements and needs of their application. The teaching/ learning's objectives of the "National curriculum" aim at developing pervasive skills and values, such as critical and creative thinking skills, collaboration, communication, ethics, entrepreneurship, showing initiative and action, orientation in time and space, research, independence. It includes the application of communication and information technology which involves important skills to the learner, such as: network search, dissemination of information, finding and using electronic resources in the teaching process.

In respect of applying computer technology, higher education faces the greatest needs and challenges. It is logical since the application of computer-based education technology at this level of study is unanimously crucial in teaching, as well as the learning process. The technology-based teaching process has several priorities:

- The teaching process is flexible and comfortable;
- The teaching process is much more exciting;
- The learning process is more creative;
- It enhances motivation;
- It is easier to achieve the learning goals – the learners can obtain necessary information more easily, in less time and with making fewer efforts.
- The study material is easy to comprehend;
- The quality of teaching/learning is higher;
- It facilitates the enhancement of information-communication competences [4];
- It fosters PBL (problem Based learning);
- It facilitates the development of the ability to simultaneously own various competencies, including

computer technologies and information sorting (knowledge management).

This list can be endless taking on board the field, teaching course, topic, objectives and others. Nevertheless, the application of computer-based educational technologies, along with other priorities, is connected with lots of problems and challenges. There is a certain list of problems that can be noticed at a glance, even with a naked eye. Among them there are professor and teacher insufficient competences (both, in terms of the technology ownership, as well as resource preparation); the obsolescence of computer equipment caused by the rapid development of technologies; the problem with access to technology; the problems connected with Internet frequency; the low level of student activity (in terms of doing assignments); taking control of the process of working on assignments independently.

Since on the one hand, we are fully aware of the importance and necessity of computer-based educational technology and on the other hand, we realize the challenges and barriers of its complete and quality implementation, we set the aim to conduct the research and determine what hinders the implementation of computer technologies and what recommendations can be made for the representatives of the education sector to enhance the quantitative and qualitative quality of the use of computer-based educational technology.

Research progress: The research was carried out in two directions due to the meaning and context of the term: Computer-based information technologies': On the one hand, we needed to explore the practice of using computer in teaching. On the other hand, those educational resources can be prepared and applied in the teaching/learning process using computer technology.

To find out the role, importance, frequency and problems revealed in the teaching process at the higher education level, we carried out the standard survey with the help of quantitative methods. 323 academic/invited staff from 12 higher education institutions of Georgia participated in the online survey including 174 (53,87%) women and 149 (46,13%) men.

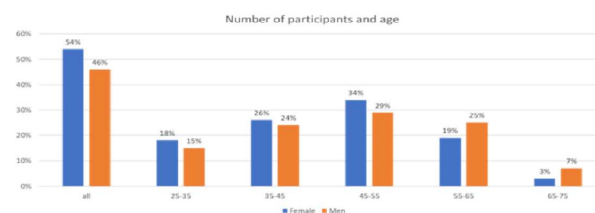


Figure. 1. Research on the use of computers and educational technologies in higher education

As it was expected, 88% of respondents actively use computers in the learning process, 12% – use it less frequently. Among the interviewed students, there was no respondent who does not use a computer at all in the learning process.



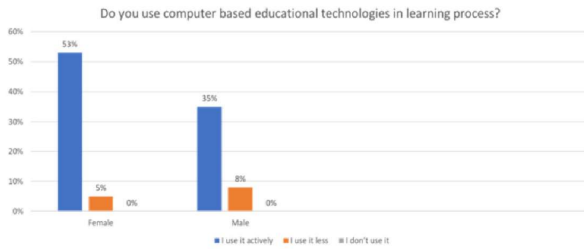


Figure. 2. Do you use computer based educational technologies in learning process?

It should also be noted that the indicator of the percentages is distributed approximately equally among all Higher Educational Institutions. There were two highly important factors in this study: the age indicators of the participants and the question of how long they have been actively using the computer in the learning process. It is noteworthy that with age, the age of computer-savvy (users) professors decreases, although naturally, it does not appear in all cases.

Another important indicator was given to us by the research on the issue that refers to another matter: this is how many years the computer has been actively used by professors in the teaching process. It turned out that only in the last one year only 21% of respondents have been actively using computers. We think that these professors exactly belong to the category of professors who use computers only for some special needs or in case of urgent need (and it can be said – when it is compulsory and under duress) due to the transition from face-to-face learning to distance learning. 12% of the respondents have been using computers for teaching for the last 2-3 years, 18% for the last 5 years and more, 49% for more than 5 years.

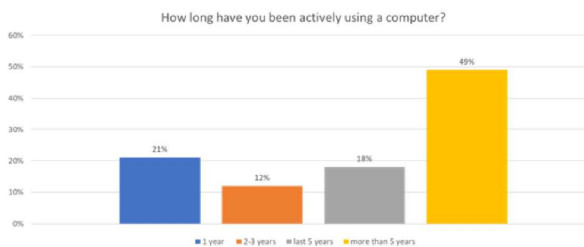


Figure. 3. How long have you been actively using a computer?

Taking into consideration the fact that the study involved specialists from different fields, all training courses due to some certain specific characteristics do not allow the systematic use of the computer (for example, the board is a more important tool in teaching mathematics than using the computer, physical education and sport trainings are also conducted in a specific way quiet differently etc.). We think the results obtained can be considered statistically reliable.

In the second phase of the study, we explored the share of educational programs that use different types of digital tools (electronic resources) in teaching. The Emphasis was placed on the use of different types of electronic resources (both ready-made and prepared by the staff themselves), as well as the use of different platforms in teaching (for example, Moodle, Zoom, Teams, mobile applications, etc.).

As the research showed, almost half of the professors – 47.4% use computer educational technologies with some frequency, although this is not

the active use in all cases.

In the third stage of the research, which was conducted at Batumi Shota Rustaveli State University, the experimental method of research was used: In order not to damage any training course and not to interfere with or prevent teaching-learning process itself, as well as its quality, we have chosen a training course that allows both forms of teaching (with or without using computer educational technologies), Accordingly, we have chosen a foreign language training course.

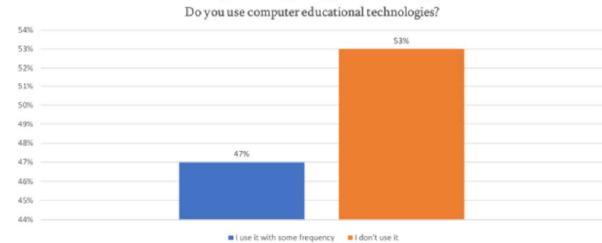


Figure. 4. Do you use computer educational technologies?

We also selected control (number of students 150) and experimental (number of students 150) groups. In the control group, we measured the frequency of use of computer digital tools and the results of their usage in different ways:

A) The syllabus of the training course was analyzed in order to determine the extent to which the use of computer-based educational technologies was envisaged in the syllabus;

B) interviews were conducted with the lecturers of the training course;

C) a focus group was held with students;

D) The learning process in the control group was carried out in accordance with the syllabus planned in the syllabus of the training course and educational technologies (presentation programs, technology spreadsheets, graphic packages) were used a total of 4 times during the semester. At the end of the course, the students' assessments of the control groups were analyzed. The academic performance of the students was as follows:

- A – 5%
- B – 11%
- C – 25%
- D – 34%
- E – 25%

As for the experimental group, we selected those weeks from the syllabus that allowed us to use computer technology without changing the course content and learning outcomes (We have ensured compliance with teaching-learning and assessment methods and the use of various types of computer educational technology). Presentation programs, Microsoft educational programs, Dropbox, technology project, word processors, spreadsheets, graphics packages were used.

Discussions were carried out based on an animated film screening, a written assignment (topic) was uploaded to the Moodle platform, cases were reviewed on the Zoom platform, and the groups were automatically split, and presentations prepared in different formats were actively used during the teaching-learning process in the groups. At the end of the course, the students' assessments of the control groups were analysed. The academic performance of the students

was as follows:

- A – 12%
- B – 14%
- C – 38%
- D – 31%
- E – 5%

A comparative analysis of experimental group and control group student assessments revealed significantly that the experimental group student scores were significantly higher than those of the control group students.

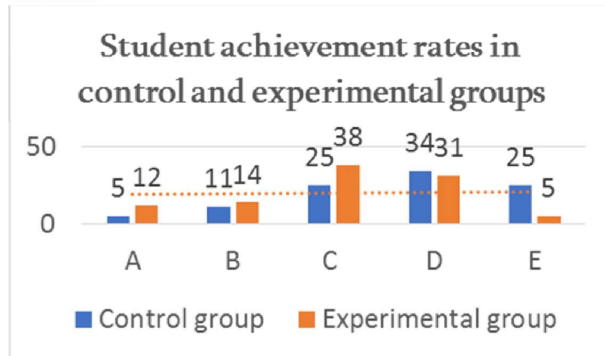


Figure. 5. Student achievement rates in control and experimental groups

In addition, a focus group with students and interviews with leading course lecturers was conducted to research student satisfaction. Analysis of the results of qualitative research showed that the diversity of educational technologies and intensive use in the learning process increased students' motivation, interest, involvement, responsibility, independence, group work, presentation and other skills.

The interview revealed that despite the important steps taken by HEIs, it is not able to update the computer equipment in its possession at the required pace, which significantly hinders the process of setting foot for modern technologies; Also, professors find it difficult to select and use adequate technologies for course content; Nevertheless, there was a willingness on the part of the professors to use computer-based educational technologies in the presence of appropriate conditions and training in this area.

The conducted experiment unequivocally revealed the importance of using computer-based educational technologies in the educational process. The "triangle" of results itself is noteworthy, which means the comfort and self-esteem associated with the implementation of the learning process by the lecturer, the increase of students' interest, motivation, level of involvement and the increased quality of teaching-learning process.

#### CONCLUSION

- Students prefer teaching-learning practices (training courses) where computer-based educational technologies are actively used;
- Despite the requirements set by higher educational institutions, for the implementation of innovative approaches in the educational process, the staff members still do not fully or accordingly use computer-based educational technologies in their teaching-learning process;

- Despite significant steps taken by HEIs, the computers and existing technical equipment in their possession is outdated / old/ can no longer support technological progress in a very short time;
- The quality of using computer-based educational technologies does not meet modern requirements;
- Professors have difficulty in selecting and using adequate and appropriate technologies for their course content;
- Professors are ready to use computer-based educational technologies actively in case of appropriate training courses in this field.

#### RECOMMENDATIONS:

Based on the research carried out at our university, the following recommendations should be given:

- to review the training courses in the field of computer technology in the educational programs of higher educational institutions and to focus on and concentrate on the usage of computer educational technologies (because all adolescents, especially all students, already master elementary ICT competencies);
- The use of computer-based educational technologies should become a mandatory requirement in the process of planning and implementation of educational programs;
- To plan trainings and workshops for professors how to use and implement computer-based educational technologies in teaching process;
- The research conducted by higher educational institutions quality assurance services should include a study of the state of the usage of computer-based educational technologies and take care of developing the quality of their use.

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