Trakia Journal of Sciences, Vol. 21, Suppl. 1, pp 236-241, 2023

Available online at:
http://www.uni-sz.bg
ISSN 1313-3551 (online) **doi:10.15547/tjs.2023.s.01.040**

PROBLEMS OF INFORMATION TECHNOLOGY EDUCATION

K. Kirilova*

Department of Pedagogics, Faculty of Applied Informatics and Statistics,
University of National and World Economy, Sofia, Bulgaria

ABSTRACT
PURPOSE: Information technologies occupy an important place in modern education. This is necessitated both by digitalization processes and by increased public expectations and the labor market. Creating and improving young people's digital skills is a key priority of the education system. In this context, the development aims to systematize some of the main problems facing information technology education. METHODS: The applied methods are related to: literature review; survey to identify the problems in information technology training, analysis of possible technological solutions for conducting information technology training. RESULTS: The main results are aimed at systematizing the main problems of information technology education. CONCLUSIONS: The conclusions are in the direction of identifying the main problems in information technology education in the high school stage of secondary schools.

Key words: information technologies, education, digitalization.

INTRODUCTION

Digitization in the field of education is important and a prerequisite for the creation of conditions for the acquisition of digital knowledge and skills that meet modern trends and the requirements of the labor market. Technology is now an integral part of the education system. This applies both to management approaches in education and to their practical application in learning. Digital educational tools occupy a key place in the entire educational process and are the basis of its development. They are a tool for implementing innovative learning methods and have a major role in the process of technology integration in different sectors. This applies to the natural sciences, mathematics, engineering, arts and more. This integration provides an opportunity for creativity, creative thinking, communication, solving real problems and is important for the socialization of students and the creation of an appropriate educational environment. This, in turn, is a prerequisite for acquiring digital competences. They are extremely important and are embedded in the European Commission's Digital Competence Framework. The skills of working with digital data, creating digital content, communicating with digital technologies, identifying and solving specific problems in a digital environment provide a good opportunity for realization in the labor market. In this regard, it is appropriate to identify the barriers to the acquisition of digital competence and to take measures for their timely prevention. The acquisition of digital skills starts with school education and in this context it is important to define the main problems in information technology education. This aims to improve the learning process and increase the digital knowledge, skills and competencies of the students, according to the requirements of the labor market and their future realization. The use of innovative teaching methods and the application of modern technological solutions are a prerequisite for improving the entire educational process.

***Correspondence to**: *Katya Kirilova, Department of Pedagogics, Faculty of Applied Informatics and Statistics, University of National and World Economy, Sofia, Bulgaria, 1700 Sofia, Student District, UNWE, e-mail: katia.kirilova@unwe.bg, phone: +359 2 8195 451*

METHODS

Modern scientific literature is rich in research in the field of digitization and technology development. There is also a lot of research on the application and impact of new technologies in the educational process. According to some authors, information, and communication technologies (ICT) provide a variety of methods and digital tools that open new possibilities in the classroom. They allow us to support the educational process by organizing it in a way that considers the individual needs of the learners. They also build important digital competencies necessary for the dynamic world we live in (1). It should also be noted that the increase in global data volume leads to the need to use modern information technologies and the growth of data is one of the main reasons for the need for the digitization of business processes (2). This also applies to the educational processes. Digital classrooms are equipped with modern technological solutions that enable the application of innovative approaches to effective learning. Through interactive whiteboards and tables, 3D printers, tablets, projectors and other digital tools, students actively participate in the overall learning process. An important place in information technology education is occupied by digital environments. According to some authors, they have the potential to create an interactive and fun learning environment, as they contain activities that meet educational standards, learning objectives, provide feedback and can achieve high educational outcomes (3). According to other authors, in addition to being an independent academic subject, information technology knowledge can be formed by integrating it into the education of other subjects, and this form is usually used to increase the motivation for students' cognitive and educational activities (4). To modernize education and training and promote digital technologies, the European Commission takes measures to increase digital skills and funds research and innovation activities for digital learning (5). This shows the challenges facing education in the conditions of a dynamically developing digital generation. According to research, the teacher, in the second decade of the 21st century, is faced with the challenge of being a moderator between the different communities of participants in the educational process. The teacher is expected to create more favorable conditions that stimulate active learning and motivate students' interest. A significant part of the new challenges facing Bulgarian teachers is related to building attitudes and developing skills for integration (6). One of the important problems in the education of students is the extent to which the methods and means used by teachers meet the modern requirements imposed by changes today and the labor market (7). The main application in the current development is the survey method, which is applied through a pre-created survey card. This fully corresponds to the review of the author's claims and to establish the problems of information technology education in secondary schools, the survey was developed using Google Forms, implemented in an electronic environment, and distributed via a QR code. The study is intended for high school students and aims to establish the main problems in information technology education. 54 respondents aged 15-18 participated in the survey. After the collection of the data, they were processed and presented for the purposes of the present development. The provided answers to the open questions are systematized, analyzed, and synthesized, and main conclusions and conclusions are presented. They aim at students themselves to define the main shortcomings and make recommendations for improving information technology education.

RESULTS

The survey was conducted among high school students in Bulgarian schools. It is aimed at identifying the problems in information technology education. The respondents were aged between 15 and 18 years, and their percentage distribution is shown in **Figure 1**.

As can be seen from the figure, the largest number are students aged 16, followed by those aged 17. The percentage of students aged 15 is the smallest. This distribution is important from the point of view of the scope of the studied topic. It shows that the study included people studying different disciplines, during a different period with different teachers. It should also be noted that 22.2% studied information technology over a longer period and can make a comparison. They can also point out major problems and shortcomings arising from the development of the studied material. For this purpose and to identify the main problems in information technology education, learners must distinguish between informatics and information technology. The results of this question are presented in **Figure 2**.

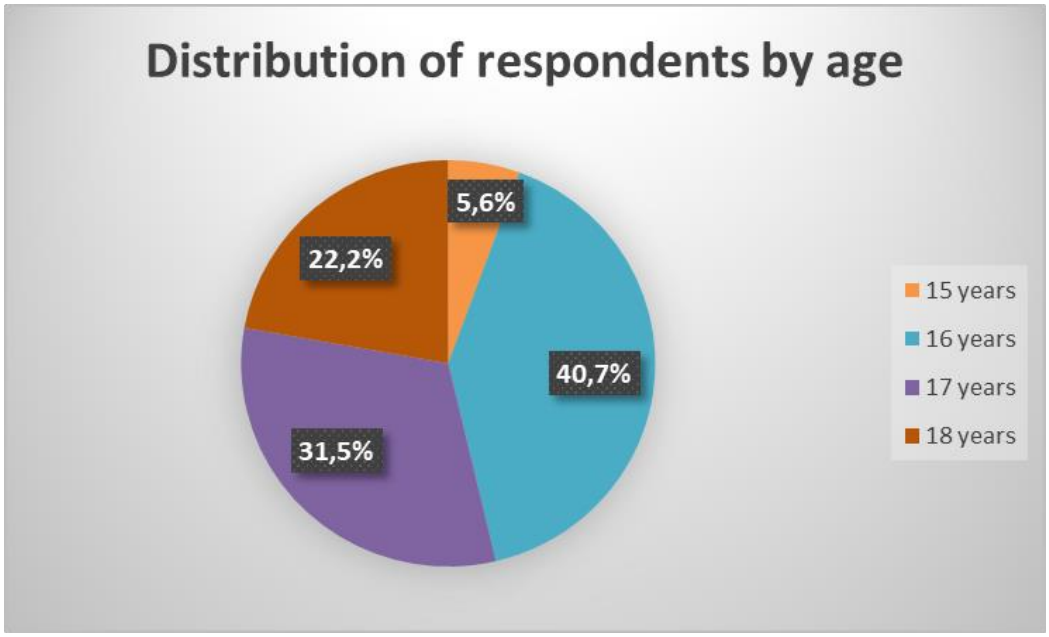

Figure 1. Distribution of respondents by age

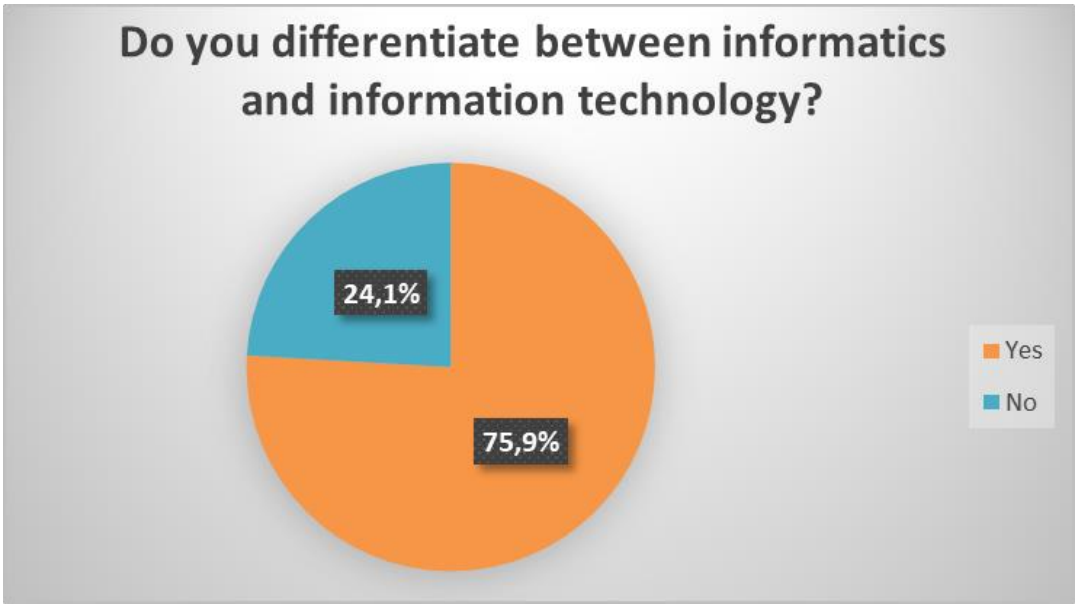

Figure 2. Do you differentiate between informatics and information technology?

As seen in the figure, 75.9% of students differentiate between informatics and information technology, which is essential to clarify the problem areas in information technology education. To be able to define specific and correct measures to solve these problems, this distinction is important, since it is possible for the problems to be the same, similar, but also very different. In several cases, the problems in information technology training are of a technical nature. The need for modern technical means of learning, web-based applications, high-speed Internet connection are dictated by the progress of digitalization and the application of technology in the educational process.

Figure 3 shows that 48.1% of students can use the Internet freely at school at any time. 27.8% of students do not have an Internet connection, and the remaining 24.1% have an Internet connection only in the computer rooms. This shows that access to the Internet is a problem for some students, as half of them do not have

free access to the Internet at school. On the other hand, 72.2% of the students have Internet access in information technology classes. Various technical means are necessary for their implementation. **Figure 4** presents the results of the question "What technical means do you use?", with respondents being given the opportunity to indicate more than one answer. The answers can be grouped into three groups according to the percentage of respondents:

- Up to 30% - tablet, 3D printer and scanner.
- From 30% to 50% - multimedia projector and interactive board.
- Over 50% - laptop and computer system.

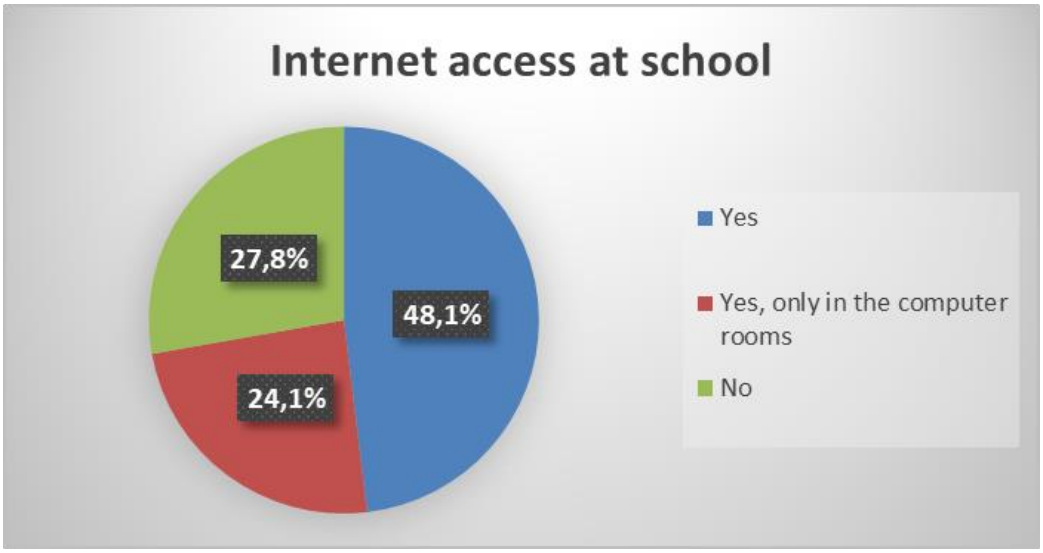

Figure 3. Internet access at school

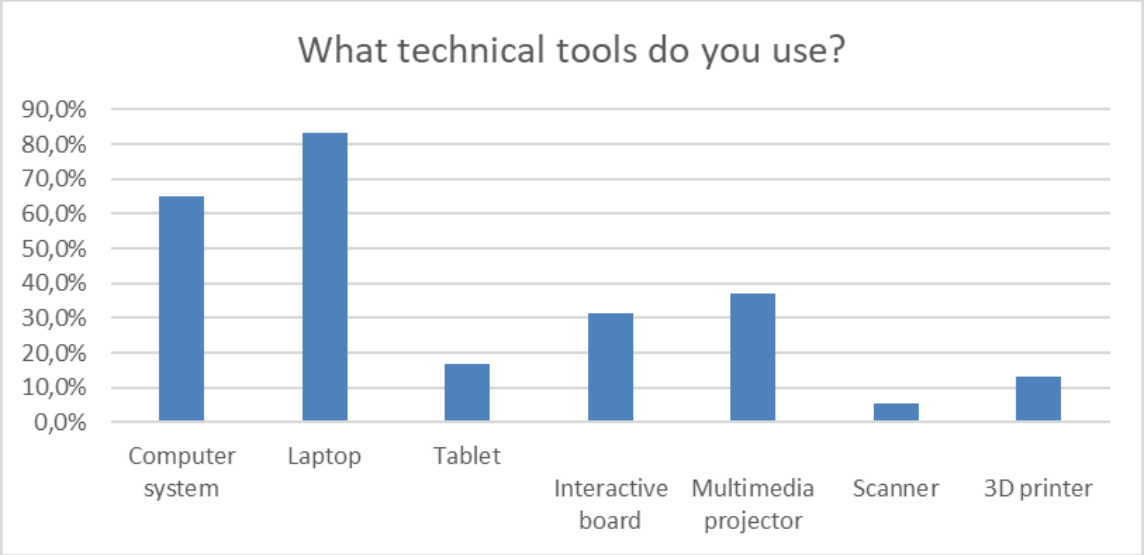

Figure 4. What technical tools do you use?

As can be seen from the graph, laptops and computer systems are used the most, and tablets, 3D printers and scanners the least. As a result of constantly developing technologies, the interests and needs of students are changing, and this gives rise to the need to integrate new technologies into the learning process. Technology is central to the IT teaching methods used. From **Figure 5 and Figure 6,** 87.0% are satisfied with the teaching methods, and 77.8% of the respondents use innovative information technology training methods.

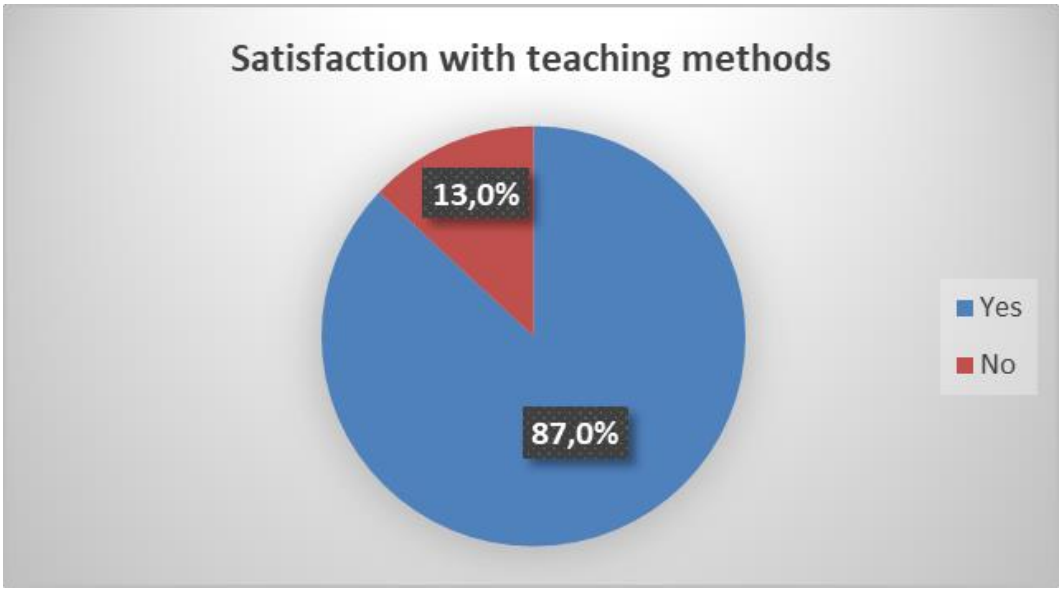

Figure 5. Satisfaction with teaching methods

In terms of teaching methods, most of the learners use methods that they approve of and value as innovative teaching methods. Only 13.0% do not approve of the methods used by teachers, and 22.2% do not consider them to be innovative.

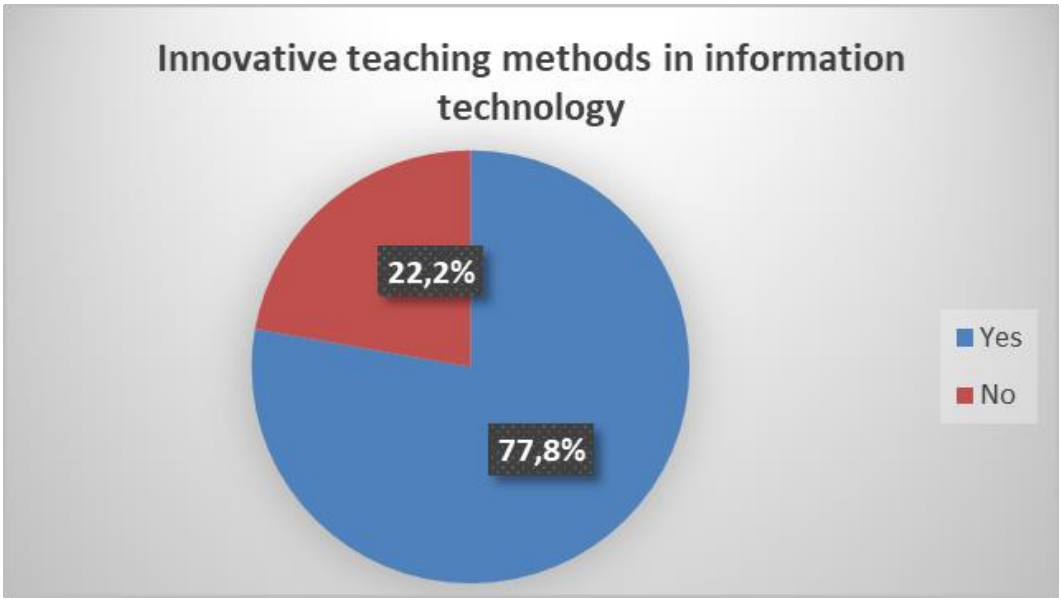

Figure 6. Innovative teaching methods in information technology

The application of innovative methods in the educational process has a key role in its effectiveness. According to some authors, the working role of teachers also includes the application of innovative methods in the learning process, which is accompanied by an increase in the requirements for the knowledge, skills, and performance of teachers in this field (8).

Regarding the shortcomings of information technology training, the respondents indicated the teaching method, the lack of internet, unnecessary and outdated teaching material, lack of working computers for each student. Some of the respondents point to the lack of special study subjects as a drawback.

The recommendations for improving information technology education are in the direction of improving the technical base, such

as access to high-speed Internet at any time and the application of more technology in the learning process. On the other hand, it is recommended to use innovative teaching methods, without duplication of teaching material, but with an emphasis on upgrading. All these questions have a direct bearing on the better preparation of students. Higher training is a prerequisite for excellent realization on the labor market. In this direction, there are many studies that determine the place and role of modern information technologies in the implementation of comprehensive concepts for the work of career centers (9).

CONCLUSION

The conducted survey and the analyzed results show the main problems in information technology education in the high school stage of secondary schools. They can be systematized into three main groups. The first group is related to the technical and technological problems of information technology education. The application of modern technological solutions, specialized equipment, high-tech equipment and connected classrooms always requires high-speed Internet. Creating conditions for learning in a digital environment and overcoming technical and technological barriers is a step towards solving basic problems in the learning process. The second group of problems is related to teaching methods. Traditional teaching methods have been replaced by innovative methods with a focus on technology. The integration of new technologies provides an opportunity to apply innovative teaching methods. To apply innovative teaching methods, to provide conditions for the acquisition of digital skills and competences and to develop the students' creative ideas, modern digital means are needed, responding to the dynamically developing technologies and needs of the population. The third group of problems is related to the educational content. It is necessary for students to distinguish between informatics and information technology. According to 24.1% of respondents, the two concepts are identical. This is the reason why some of the respondents point to the lack of special study subjects. Upgrading the material in information technology education is of fundamental importance for the acquisition of digital knowledge, skills, and competences. The analysis of the results of the conducted survey and the systematization of the problems is a prerequisite for the definition of specific solutions to overcome them. This will greatly improve the educational process and meet the needs of the modern digital generation.

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