

# Application of Information Technology and Serious Games in Education

Galya Georgieva-Tsaneva

*Institute of Robotics, Bulgarian Academy of Sciences, Sofia, Bulgaria*

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**Abstract** – In today's information age, new technological advancements are coming quickly and confidently to the education of scholar and students of all ages and in all levels of education. Internet-based information systems, large-volume databases, serious educational games are innovative tools that are used today in training and make it more attractive and more effective. Video training, serious games, clinical patient information databases can be used in medical training to enrich the learning process. Simulation games have the opportunity to give a preliminary experience to future medics in a safe environment for the individuals being treated and for the medical students. The paper aims to present some of the results of a study conducted in Bulgaria on the entry of new technologies into medical education. The students' opinion about the new technologies and their desire to use them in their educational process were sought.

**Key Words:** training in medicine, information technology, serious educational games, physiological clinical data

## 1. INTRODUCTION

Educating medical students is a responsible task, given the importance of protecting and restoring human health, which is one of the essential things necessary to sustain life and one of the most important things that excite a person throughout his or her life. The advent of new technologies in health and medical education is both a matter of modernization and a responsibility for human health. In October 2006 in one of his documents [1] the World Health Organization defined health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

Serious educational games designed for the field of education must have specific learning objectives, help to achieve pre-set educational outcomes, develop creative thinking among consumers, develop decision-making skills and create incentives to take reasoned, thought-out risk when taking action.

In medical education, game-based learning enables students to develop their skills through practice [2].

Using modern advanced technologies: simulation, virtual and mixed reality methods, visualization, creating a realistic environment and leveraging the benefits of dynamics, serious games today claim to be the basis of new gaming-based learning.

Serious games in medical training can be computer games; digital games to be used on smartphones, tablets, interactive whiteboards and other electronic devices (game consoles, etc.) that are directly related to the purposes of medical training. Learning through serious games is done by engaging the history of the game, the attractiveness of the gameplay, which adapts to the specific capabilities of each player. During the game, learners learn to explore, experiment, compete with one another, and collaborate with one another [3] [4].

Serious games combine the necessary concentration of learners in learning with challenging actions and using the skills of the user to the fullest [5]. Scientific studies suggest that serious games are increasingly used as a means of engaging students' attention [6].

Combining virtual and mixed reality, the dynamics of the game with the solution of educational tasks is a challenge for the creators of serious learning games, teachers and students who use them. The curriculum, knowledge, and skills that students are tasked with learning must be embedded in the game model, and this can be a difficult endeavor. [2]

In the scientific literature have been identified six serious game attributes: the game is played by one or more players; the game has a predetermined purpose; certain rules are respected; create conflicts in the game process; artificial character; pedagogical aspect of the game [7].

## 2. RESEARCH BACKGROUND

Graafland, Schraagen, and Schijven [7] conduct an interesting and very useful study of 17 popular serious medicine games that have been created for educational purposes and some of them can be used in surgical training. Considered by the authors 17 games are specified according to game type, platform, educational purpose, target groups, multiplayer character and implemented in clinical practice. Fifteen of these games are a game-based simulation, which demonstrates the interest and usefulness of simulation games in medical training. Target groups of games: physicians, nurses, students, surgical trainees, emergency medical personnel, etc. Of all 17 games examined by the authors, only one was implemented in a multimodal training course. The results of this study show that interest in serious games in medicine is high, but their use in clinical practice is still a question to be addressed.

In their research study [8], the authors conduct an analysis of the impact of serious games on students' engagement and

educational outcomes obtained through the use of serious games.

The authors of work [9] provide an overview of serious games that are relevant to human health, treatment of diseases and educational games. Researchers analyze 21 serious games in these areas (researched by different authors from 2003 to 2011).

The work [10] examines the interplay between serious games - the educational process and places emphasis on the results of game-based learning.

In addition to educational medical purposes, serious games in the field of medicine can be used to build management and leadership skills in medical professionals. The authors of [11] study the characteristics that serious games need to possess to train professionals in the skills of being leaders and leaders; are also researching the most relevant game scenarios in the field.

Research on serious games in the field of health (medicine, nursing, healthcare) was conducted in works [12] and [13]. In their study, the authors of [12] classified serious games according to their predefined purpose, the medical illness for which they were intended; potential users of the game. Researchers also pay attention to serious games that help to create healthy habits in humans by doing exercises and dancing.

### 3. RESEARCH ON THE USE OF MODERN TOOLS IN TRAINING

Video materials are nowadays used a lot in the medical education process in Bulgaria. Video algorithms have been created for medical procedures that are viewed repeatedly by the training students [14] [15]. Video presentations, Internet tests, e-lessons are tools that have been widely used in the higher education process in Bulgaria.

This paper shows some of the results of a study of the use of Internet-based tools and serious training games for the purposes of the educational process. The results are summarized in Table 1. The study was conducted at the universities in Bulgaria and aims to give an idea of the students' interest in medical information located on the Internet and their desire to include serious educational games in their educational process. The voluntary survey was answered by 162 respondents.

The highest percentage of students (85.19%) answered positively to the question "Do you use Internet-based medical information (physiological clinical data, such as cardiac information) in your educational preparation?"

There is a high percentage (53.7%) of students who answered positively to the question "Do you use medical data analysis software systems in your education?"

The percentage of those students who responded positively to the question "Do you use serious medical games in your education training?" is 32.72%. This percentage is low,

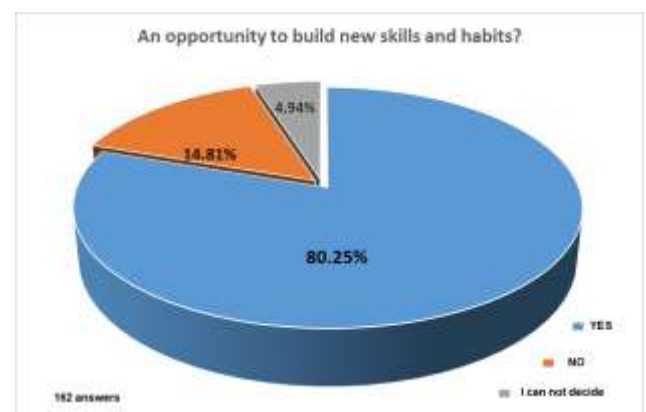
indicating that the use of medical games in the educational process is not very common in education at this stage.

It can be concluded that the entry of serious educational games into medical education in Bulgaria is forthcoming. Efforts should be made on this issue by teachers, students and developers of serious games in the field of medical education.

**Table -1:** Survey students' opinions on the use of Internet-based resources

Internet-based tools☒	"Yes"	"No"	"I can not decide"
Internet-based information tools	93.21%	4.93%	1.85%
Internet-based medical information☒	85.19%	11.73%	3.08%
Medical data analysis software systems	53.7%	30.24%	16.05%
Internet-based serious medical games☒	32.72%	64.81%	2.47%

Figure 1 presents the answers to the question „Do you think that using serious educational games will give you new skills and habits (for example: reacting quickly in an unfamiliar situation)?“ Of the 162 students, 130 said that the use of serious educational games created new skills and habits that could be useful to them, except in education and in other areas of life. 24 of the students asked answered "No".



**Fig -1:** Serious Games and the creation of new skills and habits☒

### 4. CONCLUSIONS

The paper presents the introduction of new technologies in medical education in Bulgaria and presents the students'

opinion on the use of modern information methods and tools in their medical education. The study shows students' high interest in using Internet-based tools, databases, software systems and serious educational games in their learning.

Serious educational games can develop in the students new skills and habits that will be useful for them both in future careers and in other areas of life.

In the field of medicine, serious games can be used to train medical professionals through simulations and to help create practical skills such as injecting, performing surgery, training a student's psychomotor apparatus, and developing laparoscopy skills, and other procedural skills. Thus, future healthcare professionals can gain experience in an environment that is safe for the patient. The use of new technologies in the field of medical education can increase students' confidence in their own capabilities.

Serious educational games and software analysis systems can also be used in the postgraduate training of medical professionals.

For the future development of games in the field of medical education, it is of the utmost importance to create fruitful cooperation between educators, doctors and creators of serious games in order to be able to create successful educational games in medicine that solve certain educational problems and integrate successfully the dynamics of the gameplay with the educational goals of the training.

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## BIOGRAPHIES



Galya Georgieva-Tsaneva, PhD, is an Assistant Professor at the Institute of Robotics of Bulgarian Academy of Sciences, Bulgaria. Her scientific research interests include medical information system, investigation of Heart Rate Variability of ECG data, serious games, wavelet and fractal analysis, computer networks and communications, coding and compression of information, fractal modeling and teletraffic engineering; web accessibility, interactive systems and systems with functionality for people with special needs.