A COMPARISON OF SOME GAME APPLICATIONS FOR LEARNING COMPUTER SCIENCE

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Abstract. This thesis explores the potential of game software as a learning tool for computer science education. Through a comparative analysis of various game software options, the study identifies key features that contribute to effective learning, including versatility in subject matter, interactive and visual learning methods, and platform accessibility. It categorizes software based on its focus (specific vs. universal) and learning method (interactive/practical vs. visual/practical). The discussion highlights the importance of considering individual learning goals, preferred styles, and budget when choosing game software.
Keywords: gamification, digital learning, game tool, game-based learning, game.

Introduction. The widespread introduction of computer technologies since the beginning of the 21st century has brought about a significant transformation in education. Teachers in colleges and universities are improving teaching methods through the use of digital technologies. One of the promising areas of development of modern information technologies is the use of gamification technologies.

The purpose of the work is to analyze and characterize ready-made some game application and services for learning computer science.

Formulation of the problem. Today the problem of creating a gamification environment for the le of future informatics bachelors is relevant. Game software as components of the gamification environment are its basis and reflect its functionality. To design a model for using a gamification environment, it is necessary to take into account several of its key components, including: purpose, definition of the target audience, selection of game services and platforms, creation of tasks with gamification elements, feedback from the acquirer, technological infrastructure and methodological recommendations for the implementation and use of the environment.

Solving the problem. There are many software tools that can be used to create a gamification environment in higher education institutions. Among the most famous are: Kahoot!, Quizizz, Classcraft, Codewars, CodeCombat, HackerRank, Cisco Packet Tracer, Nand2Tetris, Scratch, Educational Minecraft, CodinGame, Quizlet, Blooket. Let's take a closer look at each of them.

Kahoot! is an interactive quiz platform for students of different ages and educational groups. At the end of the quiz, the platform provides detailed statistics on the results of each participant, including the number of correct and incorrect answers. The platform can be accessed through a web version or a mobile application, making it available for different types of devices [1].

Quizizz is an online platform for conducting quizzes and tests for pupils and students of different levels of education. It allows you to create quizzes on any topic and use them both in the classroom and at home. Quizizz automatically evaluates test results and provides detailed reports on the performance of each participant. Quizizz requires an Internet connection and supports various types of devices [13].

Classcraft is a learning platform that uses the concept of a game to engage students and create a favorable learning environment. Classcraft has a system of motivation through experience points and rewards that participants receive for completing tasks. The platform also provides teachers with analytical data on student progress and performance. To use Classcraft, you need an internet connection and a device with a web browser, as well as an account and class and assignment setup [2].

Codewars is an online platform for learning programming by solving problems. The tool offers a variety of tasks in different programming languages, divided into levels of difficulty. To use it, you need Internet access and an account on the platform [3].

CodeCombat is a programming learning platform that offers a game-based approach to skill development. The tool supports various languages, including Python, JavaScript, Java, C++, and

offers interactive lessons with instant feedback. CodeCombat has different levels of task complexity and an active community of users for discussions and collaboration. Using this tool, you can customize your learning to your needs, and all you need is the Internet and an account to access it [4].

HackerRank is an online platform for developing programming skills, algorithmic and technical understanding. It is used for learning, preparing for technical interviews, and solving problems of varying complexity. The application supports many different programming languages, such as Python, Java, C++, JavaScript, Ruby, and others, allowing users to use the language they are most comfortable with. The platform can be integrated with educational programs and educational institutions to support programming training and prepare for a career in the IT field. To use HackerRank, teachers or students need access to the global Internet and a registered account on the platform. Players should have basic programming skills and a desire to improve them by completing tasks on the platform [5].

Cisco Packet Tracer is a virtual platform for modeling network configurations and experiments developed by Cisco Systems for training and practical use in the field of networking. Packet Tracer allows you to create and configure a variety of network topologies, including LANs, wireless networks, and Internet connections. Users can explore and test various network protocols such as TCP/IP, OSPF, VLAN, DHCP, and others. Packet Tracer can be integrated with Cisco Networking Academy curricula and contains interactive exercises and scenarios to prepare students for certification exams. To use it, you need access to a computer with the software installed and the Internet [6].

Nand2Tetris is an educational project that offers a unique approach to learning computer science, starting with basic logic elements and ending with the creation of your own computer and operating system. To participate, you need to have access to a computer with development software installed, such as an integrated development environment (IDE), a text editor, and a terminal [7].

Scratch is a web-based platform developed by MIT Media Lab designed to teach programming and develop creative skills. Scratch uses a graphical interface for programming, so users can create programs by dragging and dropping blocks to represent different commands and operations. Scratch is available in a web-based version, so you can use it on any device with Internet access and on any OS [8].

Educational Minecraft is an educational version of the popular video game Minecraft, designed specifically for educational purposes. To use Educational Minecraft, you need to have access to a computer or game console that has the Minecraft game and the educational module installed. Internet access is also required to download materials and updates [9].

CodinGame is an online platform for learning programming and solving programming problems through games. CodinGame has APIs that enable its integration with other services and development tools. The platform supports various programming languages, including Java, C++, Python, JavaScript, and others. Some CodinGame tasks are available for open use and can be used in universities in programming courses. Since CodinGame is accessible through a web browser, users just need to have an account on the platform and a desire to learn programming [10].

Quizlet is an educational platform that provides tools for creating, teaching, and learning learning material through flashcards, quizzes, and other methods. The tool is intended for students, teachers, learners, teachers, and anyone who wants to improve their knowledge and skills. To use Quizlet, you need Internet access and a registered user account. The platform is accessible through a web browser and mobile applications on iOS and Android [11].

Another gaming platform is Blooket. It is designed to create and deliver interactive lessons and games for learning. The tool provides teachers with tools to create cards with questions, answers, and illustrations for further use in the classroom. The platform has a collection of different types of games, such as quests, bingo, crosswords, associations, and many others, so teachers can choose the best format for teaching different subjects and topics. The platform is free for teachers and students, but may contain paid additional features to enhance the learning experience [12].

Summarizing the above possibilities of game tools, we can identify characteristics for their comparative analysis:

1. The versatility of the tool (this criterion can assess the wide use of the platform for different subjects or limited use only for specific topics or disciplines).
2. Names of disciplines in which a particular tool can be used.
3. Teaching methods that can be used with the tool (verbal, visual, practical, interactive, research, differentiated).
4. Type of supported device (availability of the platform on different devices can be a web version, mobile platform, desktop version).
5. Purpose - the main goal of using the platform is considered.
6. Game genre.

Table 1.

Comparative analysis of game tools

Gamig tool	Versatility	Disciplines in which you can use	Teaching methods with which it is advisable to use the tool	Device type	Appointment	Game genre
Kahoot!	Universal	Various topics	Interactive, practical	Web version, mobile application	Development of skills	Quiz
Quizizz	Universal	Various topics	Interactive, practical	Web version, mobile application	Development of skills	Quiz
Classcraft	Specific	Various topics	Interactive	Web version, mobile application	Motivation and engagement	Role play
Codewars	Specific	Programming	Practical, differentiated	Web version	Motivation and engagement	A game for solving programming problems
CodeCombat	Specific	Programming	Interactive, practical	Web version, mobile application	Interaction and cooperation	Role-playing game for learning programming
HackerRank	Specific	Programming	Practical, differentiated	Web version, mobile application	Development of skills	A game for solving programming problems
Cisco Packet Tracer	Specific	Computer networks	Visual, practical	Desktop version, web version	Development of skills	Network simulator
Nand2Tetris	Specific	Computer architecture	Practical, research, visual	Web version	Development of skills	Adventure game (exploratory)
Scratch	Universal	Programming	Practical	Web version, mobile application	Development of skills	Game designer
Educational Minecraft	Universal	Various topics	Visual, practical, differentiated	Desktop version, web version, mobile app	Motivation and engagement	Simulation (includes elements of an adventure game)
CodinGame	Specific	Programming	Practical, differentiated	Web version, mobile application	Motivation and engagement	A game for solving programming problems
Quizlet	Universal	Various topics	Verbal, visual	Web version, mobile application	Development of skills	Training application
Blooket	Universal	Various topics	Interactive, differentiated	Web version, mobile application	Training	Interactive game

Analyzing Table 1, we can state that there are a large number of ready-made game tools that are universal and can be used to study any section of computer science. However, most of them are focused on learning programming. As for the methodology of game-based learning, most tools should be used in combination with visual, practical, and interactive teaching methods. These techniques involve direct user interaction with the learning software, such as writing code or solving problems. For example, Scratch or CodeMonkey can be used to teach programming to beginners. To increase students' interest in the game, Minecraft will be useful: Education Edition will be useful.

Also, many of the above tools are cloud-based, have a browser version, and can be used on any operating system and from any gadget. In this aspect, it is appropriate to develop new or deploy existing game applications on academic clouds [14]. In addition to the characteristics listed in the table, other factors should be considered when choosing gaming software, such as cost, availability of a community of users, support, and the target audience of students who will use the applications.

Conclusion. After analyzing learning environments, including quizzes, role-playing games, online problem-solving platforms, simulations, constructors, and learning apps, we can state that learning platforms offer different methods and approaches to learning, from interactive quizzes to hands-on programming tasks and project builders. Many game learning platforms provide the ability to personalize learning and adapt to the individual needs and level of knowledge of each student. They can be used in a variety of areas of computer science such as programming. networks, web design. etc. In general use of various learning platforms can contribute to an effective and engaging learning process, increase motivation, and develop a variety of skills for students.

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