НАУКОВО-ТЕХНІЧНА КОНФЕРЕНЦІЯ МОЛОДИХ ВЧЕНИХ

Актуальні проблеми інформаційних технологій

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19-20 жовтня 2023 року

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

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ІМЕНІ ТАРАСА ШЕВЧЕНКА

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REVOLUTIONIZING COMPUTER SCIENCE EDUCATION: THE POWER OF GAMIFICATION

Gamification is the use of game elements and principles in non-gaming contexts to motivate and engage individuals in various activities, including learning. This approach transforms traditional teaching methods into a more engaging and motivating experience, particularly for students pursuing computer science degrees. Computer science students often possess a natural affinity for technology, making them an ideal audience for gamified learning strategies. This article presents a review of several studies conducted by researchers, examining the effects of gamification on student motivation and academic performance in computer science education.

Gamification in education involves incorporating game-like elements, such as competition, challenges, rewards, and interactivity, into the learning process. This approach transforms traditional teaching methods into a more engaging and motivating experience.

Mehed and Filon conducted an investigation into the use of gamification to boost commitment and motivation among IT students. The research findings revealed that gamification was chosen by a substantial number of students, and it was recognized as a current global trend in IT education. The study observed a high level of focus and motivation among students, reinforcing the potential effectiveness of gamification in increasing student activity during the initial learning process [1].

Oktaviati and Jaharadak examined the positive influence of gamification among computer science students. Their research demonstrated increased student success, higher enrollment rates, and a greater interest in education. Their work suggests that gamification can be effectively applied to various subjects within computer science education [5].

P. Fotaris and colleagues investigated the development of gamification in computer science education. Their study indicated a significant positive impact on student learning and activity, particularly in early programming courses. Gamification tools such as Kahoot!, WWTBAM, and Codecademy were found to increase student interest, activity, and achievement. Students' positive reactions to gamification led to increased independent work and engagement [2].

Nuno H. Flores and Rui Pinto introduced quest-based gamification in computer science education under the name "World of LPRO." Their research showed a

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significant increase in students' final grades in courses supported by gamification, in contrast to courses without gamification.

When implementing gamification among computer science students, it's important to track progress, use statistical data, and link results to academic performance, according to Nuno H. Flores.

Effective gamification starts with well-defined learning objectives, particularly in the field of computer science, where these objectives can encompass programming skills, problem-solving capabilities, and a deep understanding of complex algorithms. These clearly articulated goals are essential for students as they provide a clear understanding of what is expected of them within the gamified learning context.

Gamification offers the invaluable advantage of real-time feedback, a critical component in computer science education, where trial-and-error learning is prevalent. This immediate feedback mechanism allows students to learn from their mistakes, adapt their strategies, and make timely improvements, enhancing the learning process.

Furthermore, gamification should be structured progressively, with increasing levels of difficulty. This progression serves as a motivating factor for students as they achieve milestones, encouraging them to continue their learning journey. In computer science, this might entail tackling more intricate coding projects and algorithmic challenges as they advance.

Incorporating rewards such as badges, points, or virtual currency can be highly motivating for computer science students. These rewards, coupled with recognition through leaderboards and digital certificates, promote healthy competition and instil a sense of accomplishment among learners [6].

Collaboration through group projects and teamwork is of paramount importance in computer science education, and gamification can be a catalyst for fostering teamwork by setting up cooperative challenges and competitions that necessitate students to work together effectively.

One crucial aspect of successful gamification in education is the ability to track progress and gather statistical data. This data is valuable not only for educators to comprehend student engagement but also for students to gain insights into their own learning process, as underscored by H. Flores and Pinto [3]. Utilizing data analytics tools enables educators to monitor student performance in real-time, encompassing scores, completion rates, time dedicated to tasks, and preferences for specific challenges.

Real-time leaderboards, which showcase the top performers in the gamified environment, cultivate a spirit of healthy competition among students, motivating them to enhance their standing and strive for excellence. This competitive aspect can be a driving force for heightened engagement.

Additionally, linking gamification results to academic grades serves as a potent motivator. Students perceive a direct correlation between their efforts in gamified tasks and their overall success in their computer science courses, motivating them to excel academically.

Furthermore, data-driven insights empower educators to tailor instruction to individual student needs, providing additional support where required and challenging

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high-achieving students with more advanced material, ultimately ensuring a personalized and effective learning experience.

While gamification can be a highly effective educational tool, it is essential that it is seamlessly integrated into the academic curriculum. Academic integration ensures that the skills and knowledge acquired through gamified experiences align with the broader learning goals of computer science programs. This alignment strengthens the connection between gamification results and student grades, emphasizing the importance of both aspects in a student's education [4].

Incorporating gamification into computer science education has shown potential in enhancing student motivation and academic performance. The studies reviewed here demonstrate a positive impact on student engagement and success. However, it is essential for educators to carefully design gamification elements to maximize its benefits while addressing potential pitfalls, such as the need for a more direct connection between gamification and final grades. Gamification, when effectively applied, can transform the learning experience in computer science education. Further research and experimentation are needed to fully realize its potential and address any challenges that may arise.

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