IRSTI 14.15.01 DOI 10.59941/2960-0642-2025-2-58-71

A Case Study on Using Gamification and Blockchain to Improve Student Engagement in Secondary Informatics in Kazakhstan

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Abstract. In Kazakhstan, where digital transformation of education is a national task, finding new ways to engage students of technical subjects like programming is increasingly important. Traditional instructional approaches often fail to foster student interest or develop practical competencies, especially among beginners. This study investigates how a game-based learning system can get high school students in Kazakhstan to enjoy learning programming and become more interested in their informatics course. Our recently created model is a gamified platform where students interact with it by entering real Python code. This code directly governs on-screen figures, dictating actions like maneuvering the protagonist past barriers or engaging in combat with adversaries. Consequently, users absorb programming concepts while honing their cognitive skills. The project's intent centered on transforming programming education into an engaging, purposeful, and accessible experience, particularly addressing the discouragement frequently experienced by newcomers to coding, who frequently perceive programming as overly abstract or cognitively demanding. The research encompassed two cohorts of secondary school students. One cohort utilized the gaming platform, while the other underwent conventional instruction. Both groups were presented with identical educational content. Nevertheless, the group immersed in the game environment demonstrated significantly increased enthusiasm, achieved greater progress, and excelled in practical coding assignments. This study demonstrates that students become self-confident, active, and inquisitive when a game model is introduced into their learning process. These findings suggest that gamification elements, when properly structured, can effectively support programming education objectives. The methodology demonstrates potential for adaptation to other practice-oriented disciplines within Kazakhstan's education system. This approach aligns with national digital transformation goals while addressing persistent challenges in technical education engagement. The study contributes to the growing body of evidence supporting interactive learning models in STEM education.

Keywords: gamification; blockchain; informatics education; secondary education; student engagement; motivation.

Қалай дәйексөз алуға болады / Как цитировать / How to cite:
Yermaganbetova, M., Serik, M., Zhumakhmet, A., Sakhipov, A. Case Study on Using Gamification and Blockchain to Improve Student Engagement in Secondary Informatics in Kazakhstan [Text] // Scientific and pedagogical journal "Bilim". – Astana: NAE named after Y. Altynsarin, 2025. – №2. – P. 58-71.

Introduction

Kazakhstan's secondary education is undergoing a radical change, with intensive digital literacy and STEM education as central pillars of its strategic education plan. As Khamza et al. (2024) indicate, this change is fostered by a national policy that views digital technologies as being at the heart of modern education, in response to Kazakhstan's intention to align its school system with the trajectories of global innovation [1]. This change is aligned with the country's vision to improve learners' IT competence, especially in fields such as computer science, that are significant for prospective economic growth. Nevertheless, interesting students in these fields remains a challenge, not just in Kazakhstan but across the globe as well. Zeybek and Saygı in their systematic review [2], point out that engagement in STEM is declining globally due to outdated pedagogies and a lack of context-driven learning, which reduces motivation, especially in programming. Traditional pedagogical approaches, founded often on theoretical lectures and static exercises, too often fail to engage students or equip them with hands-on skills, resulting in the absence of motivation and poor academic performance [3]. This issue is particularly pronounced in programming education, where abstract concepts can scare off beginners, especially at the secondary school level.

With these issues in mind, and others, many educators are using gamification to engage students in a more interactive and exciting way. Gamification refers to the inclusion of game design components, such as level-oriented tasks, interactive quizzes, and accomplishment-based incentives, in real-world (non-game) activities, such as classroom activities [4]. Indeed, new research indicates that gamification could drastically boost student motivation and engagement, especially in technical disciplines. Gamification transforms abstract theoretical concepts in programming into engaging, game-based tasks, potentially improving retention and engagement by 30% in similar environments [5]. In the context of digital education in Kazakhstan, which aims to become a strategic goal of the country's development, such approaches are considered essential in order to create a more accessible and stimulating learning environment [6]. As noted by Nurtayeva et al. in 2024 [6], universities and schools in Kazakhstan are actively integrating digital technologies to bridge the gap between modern workforce requirements and current curricula.

Moreover, parallel to the development of new-generation credentials, blockchain technology has been introduced as a potential solution in education that can provide secure and verifiable digital credentials [7]. One technology that addresses this barrier is blockchain, which allows a decentralized, tamper-proof ledger system that let’s students create digital badges or certificates they can display and share, proving their skills without needing traditional college, university or high school degrees. This technology could potentially improve accomplishment recognition because it presents a reliable and transparent approach to verify academic history and might encourage students by providing them with tangible and shareable evidence of their development [7]. Also blockchain can be used to store digital badges–micro-credentials awarded for specific learning achievements–thereby enhancing the credibility and transferability of student accomplishments. Badges recorded on a blockchain ledger are tamper-proof and student-owned, offering a novel means of recognizing skills that students can share across platforms or institutions [8, 9]. Research indicates that such mechanisms may increase learners’ investment in academic tasks by providing visible and lasting proof of success. In conclusion, although still emerging in Kazakhstan’s broader education system, this study demonstrates a practical example of blockchain use in a school setting and enhance trust in educational systems [10, 11]. Sakhipov and Yermaganbetova in 2022 examined the implementation of blockchain elements in Kazakhstan’s online educational platforms [11], highlighting their potential to improve data transparency, academic integrity, and institutional trust.

To assess the effectiveness of the platform, a quasi-experimental study was conducted with two groups of 10th-grade students from general secondary education institutions in Kazakhstan. The intervention group (n = 28) engaged with the gamified platform during regular informatics sessions, while the control group (n = 30) received conventional instruction using the same curriculum. Participants were selected based on availability and consent, and the study was organized in accordance with ethical standards. Participants engaged in a series of coding missions using Python, where they controlled in-game characters through real programming tasks. The study followed a mixed-methods approach: to assess student engagement and motivation, pre- and post-activity surveys were administered, and platform usage data (such as completed tasks, login frequency, and level progression) was analyzed. Additionally, students' informatics performance was tracked before and after the intervention to observe any potential academic impact. This data provided insight into how the gamified approach and the integration of blockchain-issued digital badges influenced learners' motivation and their perception of achievement value.

This paper presents a game-based platform developed to teach programming in Kazakhstani secondary schools. The platform combines interactive game elements – controlling characters with Python code to complete missions – with real coding tasks to make programming accessible and engaging for beginners. Blockchain technology was implemented in the system to issue verifiable digital badges, which students found highly motivating based on feedback that verifiable digital badges, issued using blockchain, were seen by students as significantly increasing the value of the rewards. The research aims to explore three main research questions:

1. *How gamified elements affect the students' engagement and motivation in informatics lessons?*
2. *How do blockchain-issued digital badges influence students' perceived value of achievement and motivation to persist in learning tasks?*
3. *What are the perceived advantages and disadvantages to students and teachers in using such a gamified platform?*

By examining these questions in a pilot among Kazakhstan's secondary students, this research seeks to contribute valuable perspectives from Central Asia–a region typically underrepresented in the literature on educational technology. It supplements Kazakhstan's broader initiative to promote innovative, student-focused teaching, leveraging prior research and classroom pilots to quantify effectiveness through proxies like participation rates and test scores.

Materials and Methods

Study Design and Participants

To evaluate the impact of gamified learning and blockchain-issued digital badges on student engagement, motivation, and academic performance, a quasi-experimental pilot study was designed and implemented. This exploratory research focused on comparing the outcomes of a gamified environment with those of traditional instruction in secondary informatics education.

The implementation of this controlled pilot study took place in Kazakhstan. The study involved two sets of 10th-grade students. Both groups were taught by the same computer science teacher. The first group (n = 28) used a gamified learning platform, while the second group (n = 30) followed the traditional learning method. The identical topics (algorithms and Python programming) were instructed for both groups.

All lessons, learning materials, and deadlines for assignments were the same in both groups. This was done to ensure fairness in the learning environment. To assess their initial academic level, student grades from the previous quarter were compared before the study began. The average score in the gamified group was 79.3%, and in

the traditional group, it was 78.5%. This difference was small and not statistically significant (p = 0.74). All students had access to a computer and basic programming knowledge.

Voluntary participation in the study was ensured. All students were informed of the purpose of the study and gave informed consent to participate. The study was conducted during regular class time and in accordance with normal school procedure. Personal information was never collected at any time. No school names or personal identifiers were collected, and anonymity and adherence to ethical guidelines were preserved. The study adhered to voluntary participation, informed consent, and age-relevant data collection procedures.

Gamified Learning Model

For this research, a previously developed gamified model was used, which worked as a multiplayer game. Students solved programming problems in an interactive environment. The platform allowed students to write code, receive instant feedback, track their progress, get help with debugging, and use hints or tools to support collaboration with classmates.

This platform was built using Backbone.js model (Figure 1) and was connected to a prototype through a RESTful API. The programming challenges focused on key topics such as loops, functions, and variables. Visual examples of these tasks are shown in Figure 2 and Figure 3.

Figure 1. The Backbone model used in the game

Both lessons and homework were presented within the context of the game's storyline. In some cases, student achievements were shown publicly in class to raise interest and motivation. The traditional group completed the same tasks using regular tools, without any game mechanics or special features.

Figure 2. Sample Task on Loops in the Gamified Model

Figure 3. Example of Task about Functions in the Created Model

Data Collection

Information was gathered through a mixed-methods approach that included quantitative measures alongside qualitative observations to facilitate a full understanding of learning outcomes. Both numeric (quantitative) data and experience-based (qualitative) information were included.

For the quantitative part, students filled out a survey after the study. This survey included two well-known tools: one to measure how engaged students felt, and another to check their level of motivation. Both tools used a 5-point Likert scale, where students rated how much they agreed with different statements. These tools showed strong internal reliability, with *Cronbach's alpha* values of 0.82 for engagement and 0.85 for motivation. The survey also asked students how satisfied they were with the course and how much they thought they had learned. In the group that used the gamified platform, more data were gathered by looking at how they used the system. This included how many tasks they finished, whether they joined extra tests, and how active they were in the forum. These details gave a better idea of how involved they were during the course.

For the qualitative part, students also answered open-ended questions in the survey. To deepen understanding, focus group interviews were conducted with four students from each group. The computer science teacher was also interviewed to share their view on how the platform worked in practice and what could be improved. These interviews helped explain what students thought about using game elements in their lessons. They talked about what they enjoyed, whether they felt more motivated by competition, and how they felt about using new tools like blockchain. The teacher's feedback added more context and helped understand how the platform fit into regular classroom activities.

While the study was limited in scale, its methodology demonstrates a replicable approach for evaluating gamified and credentialed learning systems in real-world school settings. The insights gained can inform larger-scale implementations and future comparative research.

Results

The pilot study provided a detailed understanding of how the gamified platform influenced learning in secondary school informatics classes. System logs from the gamified classroom showed high engagement: students managed to complete 92% of the required tasks, while 25 out of 28 students, representing 89%, took part in at least one additional test. A total of 93% of the students successfully completed optional tasks and received high grades, especially in Python-related assignments.

Students reported varying levels of engagement and motivation across the surveys between the two groups. The gamified class scored a higher 4.6 out of 5 (standard deviation (SD) = 0.4) of engagement compared to the control class's average output of 3.5 (SD = 0.6). This difference was apparent and statistically significant ($t(56) = 8.22$, $p < 0.001$, and large effect size, $d = 1.50$). In addition, the gamified class had higher motivation, averaging 4.5, than the control class's average of 3.7, also showing a significant difference ($p < 0.001$). With a high enjoyment score of 4.7 in the gamified class compared to 3.4 in the control group, the results suggest that students found the game-based learning environment significantly more engaging. This difference may be linked to the interactive nature of the platform, which introduced elements of challenge, progress, and immediate reward. Such features are known to support intrinsic motivation. Although the enjoyment levels in the gamified group were noticeably higher, it remains unclear whether this emotional response translates into more meaningful or sustained learning over time. Additional research would be required to explore the long-term educational impact of such engagement [12]. Table 1 presents the comparative feedback results, which indicate that the gamified method was well-received overall by the students.

Table 1. Comparative feedback scores from the pilot (Traditional vs. Gamified class)

Feedback Item	Traditional Class (Control)	Gamified Class
Engagement in classes (active participation)	3.5	4.6
Motivation to learn (interest/effort)	3.7	4.5
Enjoyment of course (fun in learning)	3.4	4.7
Perceived understanding of material	3.9	4.2
Course satisfaction rating	3.6	4.6

To better understand the impact of the platform, the interaction was examined from three different dimensions: behavioral (e.g., task completion), emotional (e.g., enjoyment), and cognitive (e.g., effort to understand). Results (Table 2) showed that the gamified class outperformed the control class in all areas. Emotional involvement showed the largest difference, with the gamified class students scoring on average 4.8 compared to 3.3 in the control group ($p < 0.001$, $d = 1.67$).

Table 2. Breakdown of Engagement Dimensions (Traditional vs. Gamified Class)

Engagement Dimension	Traditional Class (Control) Mean (SD)	Gamified Class Mean (SD)	t-value	p-value	Effect Size (Cohen's d)
Behavioral	3.6 (0.5)	4.5 (0.4)	7.14	<0.001	1.30
Emotional	3.3 (0.7)	4.8 (0.3)	9.18	<0.001	1.67
Cognitive	3.7 (0.6)	4.4 (0.5)	4.92	<0.001	0.89

The final assessment of the understanding of the material covered was conducted in writing for the two groups. And during the analysis of the results, it became clear that the gamified group learned the received material better. The gamified class obtained an average final grade of 84.3 points, which was more than their counterparts who were not being taught in gamified classroom settings and who obtained 78.6 points. In addition, a very high percentage–43%–of the students in the gamified group obtained 90 and above, compared to 20% from the conventional setting. Most significantly, even the worst performer in the gamified class scored 68, which was above the lowest score of 60 for the non-gamified class. These results confirm that incorporating game elements into the learning process enhances overall academic performance.

When comparing scores for different types of questions, results showed that the gamified group had better performance in practical programming tasks, averaging 85% compared to 77% in the control group ($p < 0.01$). That boost could be the result of the game-based practice they received. But for theoretical questions, the gap is smaller – 83% for the gamified group vs 80% for the control – and not statistically significant ($p > 0.1$). So, although the games appeared to help with certain skills, they didn't really move the needle on the theory front. The students also gave their takes on the numbers, adding a personal perspective. Most important, those in the gamified class said they loved receiving instant feedback and leveling up – it made learning seem much more rewarding. Once discussion began on how blockchain could securely track their progress, 68% of students expressed excitement about the idea of achieving something official and shareable, especially as it could flag their strengths and highlight any tech skills not yet mastered. Table 3 summarizes the dominant themes from their feedback, providing a more comprehensive insight into their preferred aspects of the gamified experience.

Table 3. Thematic Analysis of Qualitative Feedback from Gamified Class)

Theme	Frequency (n=28)	Percentage	Illustrative Quote
Enjoyment of Learning	22	79%	"It didn't feel like homework; it felt like playing a coding game."
Motivation from Progress	19	68%	"Leveling up made it exciting–I wanted to keep going."
Value of Blockchain	12	42%	"It would be interesting to have digital badges stored on the blockchain."
Collaboration	10	36%	"We worked together on quests – it was interesting and fun helping each other."
Technical Challenges	5	18%	"I forgot my wallet password, but the teacher helped me reset it."

Feedback from teachers reflected a mostly smooth experience. Students were highly active, and many asked for extra activities. A few technical issues were reported at the start, including login difficulties. Anonymous features, such as hidden scores, were added to reduce pressure for students who felt uncomfortable with competitive elements. While the gamified class showed moderate improvements in academic performance, the increase in participation and hands-on practice was clearly higher. This suggests that the platform encouraged active learning, especially during practical exercises, even though both groups understood the lecture content similarly.

Discussion

The findings of this pilot study support the effectiveness of using a gamified learning environment in secondary school computer science education. The use of game elements in the classroom led to a clear increase in student motivation and engagement compared to traditional learning. Students in the gamified group demonstrated approximately three times the level of active participation and interest, suggesting that such platforms may be a valuable tool for transforming how learning is delivered. By introducing an interactive, multiplayer platform, routine programming tasks were turned into engaging challenges. The gamified class was more engaged in lessons and activities, showing that game-based learning makes education both enjoyable and effective–it transformed the classroom from a passive environment into an active, productive space where students thrived [13, 14].

RQ1: How gamified elements affect the students' engagement and motivation in informatics lessons?

The first research question (RQ) focused on how gamified elements influence student engagement and motivation during informatics lessons. The results revealed a strong positive effect. On the engagement score, students from the gamified platform averaged 4.6, compared to the control group, which averaged 3.5 ($p<0.001$, $d=1.50$). The motivation scores were also the same (4.5 versus 3.7 for learners in traditional class, $p < 0.001$). Peer learning also seemed to play a role, as students were encouraged to participate when they saw their classmates making progress.

RQ2: How do blockchain-issued digital badges influence students' perceived value of achievement and motivation to persist in learning tasks?

For the second research question the response derived from students' reaction to it. Around 68% of students expressed interest in the idea of receiving blockchain-based records of their progress. They believed it would help make their achievements feel more official and shareable, which could further motivate them. Others replied that they would be glad to exhibit their skills with assured credentials, even if they had not mastered the technicalities of blockchain.

This aligns with previous research suggesting that verifiable digital badges can increase learners' sense of ownership over their progress and provide tangible recognition for micro-achievements [15]. From a psychological standpoint, the ability to display blockchain-based accomplishments creates a perceived increase in social and academic capital, which may reinforce positive learning behaviors [16]. Although blockchain was integrated into the system, many students admitted they were not yet fully aware of the technical workings behind it, which suggests a need for further digital literacy support. This highlights a potential barrier: digital badges may lose motivational power if students do not fully understand or trust the underlying technology. Furthermore, reliance on technological solutions for validation could risk overshadowing intrinsic motivation if badges are perceived merely as extrinsic rewards rather than indicators of genuine growth.

RQ3: What are the advantages and limitations that students and teachers see in the utilization of such a gamified platform?

From a practical perspective, the platform was user-friendly and needed minimal technical instruction for the instructor. Students, including those who were usually quiet, became more active and asked for additional tasks to “level up.” Most students (79%) found the system easy to use, and 68% appreciated the teamwork features and progress tracking.

This demonstrates a clear benefit of gamified systems: they foster inclusivity and student-driven engagement through low-barrier participation and built-in social motivation mechanisms. Features like visual progress bars, point accumulation, and class-wide challenges appeared to democratize participation, especially for students who are typically less involved in conventional settings [17]. This is consistent with findings in gamification literature, which point to increased autonomy, relatedness, and engagement when students interact with systems that offer meaningful feedback and goal-oriented progression.

However, the disadvantages also need to be noted. There were a few of those witnessed: four of them did undergo some stress due to leaderboard standings, which was addressed by implementing anonymous scoring. What this means is that competitive elements, although encouraging some, are dis-incentive or stress-triggering in some. Gamification designs thus need to aim for a balance between challenge and participation, avoiding the implementation of mechanisms that promote over-comparison. Teachers must be sensitive to personality heterogeneity and stress response in students.

Technical issues, i.e., log-in problems at program start-up, were also infrequent and easily solved. While they did not disrupt learning flow in this trial, they do indicate the necessity for robust infrastructure when deploying such programs on a mass scale. A larger deployment, especially in the public schools where equipment heterogeneity is the rule, will not be quite as smooth. Accordingly, future versions of the platform should consider offline access, mobile support, and backup protocols to ensure fair usage across different educational environments.

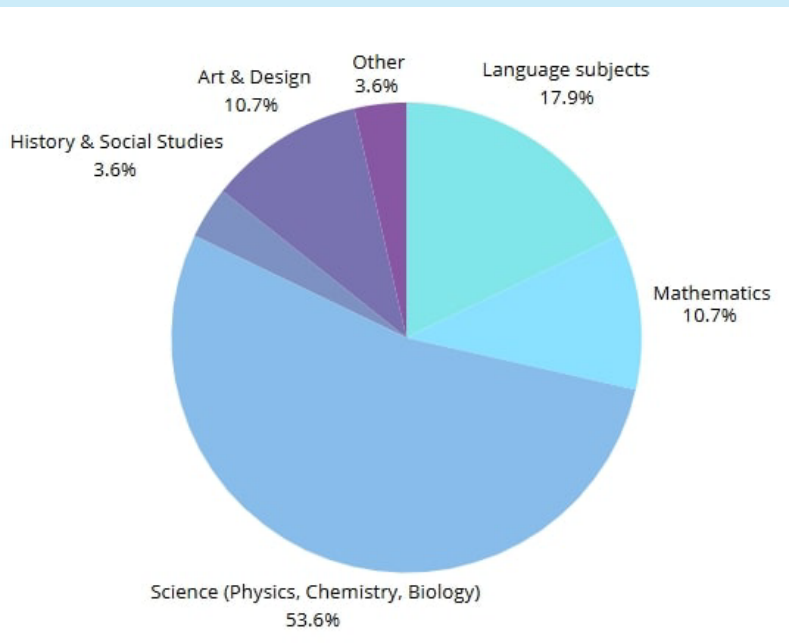

Figure 4. Preferred Subjects for Applying the System (Student Responses).

Figure 4 illustrates students' views on which subjects they would like to use the platform in. Mathematics came first (e.g., 45%), science second (e.g., 30%), informatics third (e.g., 20%), and others fourth (e.g., 5%) according to open-ended survey comments.

Performance results further support the advantages of gamified learning. The gamified activity group scored higher on end-of-test scores (84.3 vs. 78.6, $p = 0.024$, $d = 0.59$) and performed better on real-world coding assignments (85% vs. 77%, $p < 0.01$). On theory questions, the gap between the two groups was narrower (83% vs. 80%) and not statistically significant ($p > 0.1$). This means that although gamification is immensely helpful in building up practical skills, its effect on theoretical knowledge can be quite insignificant [18]. According to the teacher, both groups approached the lectures in a similar way, but the gamified class invested more time in practicing–this appeared to be the key difference.

The results show that this type of learning system can be particularly useful in secondary education subjects that involve applied knowledge. It helps students not only understand theoretical concepts but also gain practical experience. The interactive approach keeps students engaged, making learning more hands-on and dynamic. Plus, the platform's flexibility means it can easily adapt to future tech upgrades, like advanced progress tracking [19, 20].

Blockchain technology has great potential in this kind of scenario. It offers a secure and transparent way to record student achievements. Once stored, this information cannot easily be changed, which builds trust in the records. That aids users to place greater belief in the material. It could also create stronger connections between schools, students, and institutions by providing reliable, verifiable credentials [21, 22].

In order to have a full picture of the value of blockchain in education, further research must be carried out in more diverse settings. Different students have different needs and tendencies depending on their age, culture, and learning style. A larger study may be able to help determine if blockchain increases engagement, makes learning skills easier, and better prepares students for the future.

But blockchain is not a panacea and has some drawbacks. Some problems are connected with ensuring data security, integrating blockchain into existing systems used at universities, as well as ensuring equal access to the technology for all students [23, 24]. These processes require great efforts, but their resolution can have a significant influence on the education system. The resolution of these issues will render the blockchain a beneficial instrument for the development of education. It can simplify the process of learning and skills development, as well as the introduction of new things into the educational process in Central Asia. Central Asia is evolving actively, and blockchain has the potential to render these transformations more effective and equitable [25].

Limitations and Future Work

This study was limited in scope due to its limited sample size and duration of intervention. While the initial findings are positive, further study in multiple schools and locations would be required in order to trial the applicability of the findings more generally. Long-term retention, teacher training requirements, and cross-subject application of the platform are issues that future research may address.

Conclusion

This study shows that gamified learning can help students stay focused and take part more actively. The platform used in the study turned coding tasks into small challenges. This made students more likely to complete their work. In the gamified class, 92% of tasks were finished. Most students (89%) also joined extra activities on their own.

Survey results backed this up. Students who used the platform felt more engaged and more motivated. They gave an average score of 4.6 for engagement and 4.5 for

motivation. The control group gave lower scores–3.5 and 3.7. Final test results followed the same pattern. The gamified group scored 84.3, while the control group scored 78.6. The biggest gains were seen in coding practice, where students could try, fail, and try again with help from the system.

Students shared why the platform worked for them. Most said learning was fun. Many liked tracking their progress. The level-based system helped them stay on task. It gave them a clear sense of growth. About 68% said they liked the idea of using blockchain in education. They felt it could make their progress feel more real. Some liked the thought of showing their skills outside of school. Students also saw how this kind of platform could be used in other subjects. When asked, 45% chose math, 30% picked science, and 20% wanted to keep using it in computer science. This shows it could be used in other lessons that involve practice.

There were a few problems. Some students felt stressed by the leaderboard. This was fixed by hiding names. A few login issues happened early on, but they were solved quickly. Overall, the platform helped students enjoy learning, stay motivated, and do better on coding tasks. It was easy to use in a regular class. The platform also demonstrated flexibility for future scaling, including advanced features like blockchain-based achievement tracking and expansion to other subjects.

This type of system has significant potential for use in schools both in Kazakhstan and beyond. It is particularly well-suited to subjects that emphasize the development of practical skills. With minor modifications, the platform can be utilized more comprehensively in a series of disciplines and learning contexts. Through active participation and independent learning, it enables learners to become more responsible for their learning process, thereby resulting in greater participation and more meaningful learning outcomes.

Funding

This research is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19678847).

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Қазақстандағы орта білім беруде информатика пәнін оқытуда оқушылардың белсенділігін арттыру үшін геймификация мен блокчейнді қолдану бойынша тақырыптық зерттеу

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Аңдатпа. Қазақстанда білім беруді цифрлық трансформациялау мемлекеттік міндет болып отырған жағдайда, бағдарламалау сияқты техникалық пәндерге оқушыларды тартудың жаңа жолдарын іздеу ерекше маңызға ие болуда. Дәстүрлі оқыту әдістері, әсіресе жаңадан бастаушылар үшін, оқушылардың қызығушылығын оятуға және практикалық дағдыларды қалыптастыруға жеткіліксіз болып жатады. Осы зерттеуде оқу процесіне ойын элементтерін енгізу арқылы жоғары сынып оқушыларының бағдарламалауға қызығушылығын арттыру мен информатика пәніне деген ынтасын күшейту мүмкіндігі қарастырылады. Жасалған жүйе Python бағдарламалау тілінде нақты код жазу арқылы экрандағы кейіпкерлерді басқаруға мүмкіндік беретін ойын платформасы ретінде құрылған. Бұл код кейіпкердің түрлі әрекеттерін – кедергілерден өту, қарсыластармен күресу және басқа да тапсырмаларды орындауын анықтайды. Осылайша, оқушылар ойындық тапсырмаларды орындай отырып, бір мезгілде бағдарламалауды меңгеріп, когнитивтік дағдыларын дамытады. Жобаның басты мақсаты – әсіресе абстрактілі ұғымдарды қабылдауда қиындық көретін және оқу барысында мотивациясы төмен оқушылар үшін бағдарламалауды қызықты, мақсатты және қолжетімді ету. Зерттеуге орта мектептің екі тобы қатысты. Бір топ геймификацияланған платформаны қолданды, ал екінші топ дәстүрлі оқыту әдістерімен білім алды. Екі топ та бірдей оқу мазмұнын меңгерді. Алайда, ойын элементтері енгізілген платформаны пайдаланған оқушылар едәуір жоғары белсенділік көрсетіп, жақсы нәтижелерге қол жеткізді және практикалық бағдарламалау тапсырмаларын сәтті орындады. Зерттеу нәтижелері көрсеткендей, ойын форматы қолданылған жағдайда оқушылардың өз-өзіне сенімділігі, белсенділігі және танымдық қызығушылығы артады. Бұл деректер геймификация элементтері дұрыс құрылып, орынды қолданылған жағдайда бағдарламалау пәнін оқытудың мақсаттарына тиімді қолдау көрсете алатынын дәлелдейді. Ұсынылған әдістеме Қазақстанның білім беру жүйесіндегі басқа да тәжірибеге бағытталған пәндерге бейімдеуге әлеуетті. Мұндай тәсіл елдің цифрлық трансформацияға бағытталған ұлттық мақсаттарымен үндес келеді және техникалық пәндерге оқушылардың қызығушылығын арттыру мәселесін шешуге септігін тигізеді. Бұл зерттеу STEM саласындағы интерактивті оқыту модельдерін қолдайтын дәлелдер қорын толықтыруға үлес қосады.

Кілтті сөздер: геймификация; блокчейн; информатика пәні; орта білім; оқушы белсенділігі; мотивация.

Тематическое исследование использования геймификации и блокчейна для повышения вовлечённости учащихся в изучение информатики в среднем образовании Казахстана

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Аннотация. В условиях, когда цифровая трансформация образования в Казахстане является государственной задачей, поиск новых способов вовлечения учащихся в технические дисциплины, такие как программирование, приобретает особую актуальность. Традиционные методы преподавания часто оказываются недостаточно эффективными для пробуждения интереса у школьников и формирования практических навыков, особенно у начинающих. Настоящее исследование рассматривает, каким образом система обучения в игровой форме может способствовать повышению интереса старшеклассников к программированию и усилению их вовлечённости в курс информатики. Разработанная система представляет

собой игровую платформу, с которой учащиеся взаимодействуют путём написания реального кода на языке Python. Этот код напрямую управляет персонажами на экране, определяя такие действия, как преодоление препятствий или сражение с противниками. Таким образом, учащиеся осваивают программирование в процессе решения игровых задач, одновременно развивая когнитивные навыки. Целью проекта стало превращение обучения программированию в увлекательный, целенаправленный и доступный процесс, особенно для тех, кто сталкивается с трудностями восприятия абстрактных концепций и испытывает демотивацию на начальном этапе обучения. В исследовании приняли участие две группы учащихся средних школ. Одна из них использовала игровую платформу, в то время как другая обучалась с применением традиционного подхода. Обе группы проходили одинаковый учебный материал. Тем не менее, учащиеся, использовавшие геймифицированную платформу, продемонстрировали значительно более высокий уровень вовлечённости, достигли больших успехов и показали лучшие результаты в практических заданиях по программированию. Результаты исследования свидетельствуют о том, что при использовании игровой модели учащиеся становятся более уверенными в себе, активными и любознательными. Эти данные позволяют утверждать, что элементы геймификации, при условии их грамотной интеграции, способны эффективно поддерживать цели преподавания программирования. Представленная методика обладает потенциалом адаптации и к другим прикладным дисциплинам в рамках образовательной системы Казахстана. Такой подход согласуется с национальными целями цифровой трансформации и одновременно отвечает на актуальные вызовы, связанные с вовлечённостью школьников в технические предметы. Исследование вносит вклад в расширение доказательной базы в поддержку интерактивных моделей обучения в сфере STEM-образования.

Ключевые слова: геймификация; блокчейн; обучение информатике; среднее образование; вовлеченность учащихся; мотивация.

Material received on 04.01.2025