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Using a Combination of Gamification Approaches to Evaluate the Perceived Engagement of Middle School Students on Phishing Material: A Quantitative Survey Research Study

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ABSTRACT

This research paper investigates the use of three different kinds of gamification elements to measure and compare the perceived engagement level of middle school students in cybersecurity material.

Due to the lack of engagement often felt by students during traditional lecture-based practices, gamification has been making its presence in the education of various disciplines such as cybersecurity. Yet, while current research focuses on one kind of gamification, there lies unanswered questions regarding whether there is a gamification type that is perceived as more engaging for students than another.

In an attempt to answer this question, a presentation on the topic of phishing was created and presented to two middle school classrooms. Following, participants played a Blooket game on the subject of phishing, focusing on three types of gamification: rewards-based, competition-based, and leaderboard-based. These features were blended within a singular activity to determine how participants perceived their engagement within the overall gamified experience.

The findings obtained via participants' engagement ranking on a scale of 1 to 10 indicated that participants overall had a positive experience with being engaged in the phishing material, yet the failure to reject the null hypothesis indicates that students did not perceive one kind of gamification to be significantly more engaging than the others.

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INTRODUCTION

Gamified practices within the education system have seen a rapid rise in popularity, where different game features are embedded into curriculum to establish an engaging experience for students. Khoshnoodifar et al. (2023), PhD students in education and health sciences, define gamification as incorporating "game elements" into something that is typically not associated with games. These gamified experiences include digital applications such as Duolingo to teach users languages through rewards and points, Kahoot to help people review material in a competitive environment, and Khan Academy to teach core subjects like English, mathematics, and science through experience points and badges. This approach to engaging students has made its presence known across numerous disciplines, one of which is cybersecurity with a specialization in phishing (Shahzadi et al., 2025).

Today, roughly 92% of children in the United States go online each day (Lastdrager & Gallardo, 2017, 229). As the digital world has become more widely used and accessible to users, it has consequently come with a spectrum of risks to humans and their online security (van Steen & Deeleman, 2021). Hence, given the increasing prevalence of online attacks and the necessity for cybersecurity awareness, gamification has been coupled with cybersecurity education to develop an engaging experience that fosters a culture of proactive cyber protocols (Shahzadi et al., 2025).

Through successful implementation, phishing education benefits from gamification because the engaging nature of the learning platform helps individuals detect and approach phishing scenarios in a more secure way (Shahzadi et al., 2025).

LITERATURE REVIEW

To understand this topic further, this paper will first explore the history of gamification, its constituents, and the various forms it can take. Then, it will go into engagement as defined and measured in the study.

Evolution of Gamification

Today, gamification is most commonly recognized for its implementation in digital game-based learning applications. However, contrary to popular belief, gamification dates back to the early 1900s, where brands like Cracker Jack put prizes in their products as an incentive to lure in more customers (Khaitova, 2021). Later, in 1980, project MUD1 was created; the first virtual multi-player dungeon game system that paved the way for using game elements in non-traditional game contexts (Khaitova, 2021). The concept of gamification as it is now understood incorporates three main elements: the game elements, the game design, and the non-game context elements (Khaitova, 2021). These pieces go together to create a cohesive gamified tool that can be distributed to different age groups and disciplines.

Gamification Application

While gamification has three fundamentals, there are many differing factors that make gamification unique. According to Wang (2021), a writer for The University of Chicago in the Academic Technology Solutions, gamification can vary in terms of length, the level of learning acquired by players, single use versus repeated use, and the amount of technology utilized within the game. When gamification is implemented correctly, it has been shown to sometimes increase students' academic performance, as well as improve their soft skills such as creative thinking and networking (Latorre-Cosculluela et al., 2025). From a cognitive standpoint, Selawsky (2021), a senior Java developer and Java tutor at Learning Tree International, explained that gamification also helps release positive neurotransmitters such as dopamine and endorphins.

Reward-Based Gamification

Gamification in the form of an incentive involves offering a prize to players, often based on performance while playing the game (Richter et al., 2014). The incorporation of external factors such as a monetary reward or a treat corresponds to fueling one's external motivation during the game. Therefore, there lies an apparent gray-area associated with players' engagement being driven by their intrinsic motivation, or simply a personal determination for the reward (Lounis et al., 2014). Nevertheless, extrinsic motivators are combined with an educational subject, such as phishing, to make players' learning experience more captivating (Lounis et al., 2014).

Leaderboard-Based Gamification

Leaderboards are widely used in games to create a carefully arranged list of online personas based on a unit of measurement. Through the willingness of players to reach the top of the leaderboard, players become more engaged in the game and its contents (Landers et al., 2015). Upon integration, leaderboards may offer a more immersive and participatory experience.

However, while the overall literature surrounding leaderboards includes positive experiences, Cigdem et al. outline some noteworthy concerns such as the engagement of players being short-term, and a possible imbalance between actual learning and focus on the leaderboard experience.

Competition-Based Gamification

Competition in gamified learning environments can be another successful approach to engaging students when applied appropriately (Sepehr et al., 2013). According to Sepehr et al. (2013), gamification with the incorporation of mechanics such as experience points and badges in a way that promotes healthy peer-to-peer rivalry is classified as competition-based. These competition-inducing elements provide a path for students to complete tasks with the goal of fulfilling the overall objective of the game (Udeani &

Akhigbe, 2020). In addition, competition supports collaboration and learning how to both accept, and face game-based challenges (Udeani & Akhigbe, 2020). Ultimately, competition during phishing education exacerbates player engagement through its collaborative and communicative nature.

Engagement

Whether the approach to gamification is reward-based, competition-based, leaderboard-based, or a combination of the three, they share one common feature: their ability to engage students in a way often not possible through traditional teaching practices. In fact, for cybersecurity education in particular, the unfamiliarity of concepts coupled with long lectures can lack engagement, especially for students with no cybersecurity background or prior knowledge (Williams et al., 2024). The term engagement can be categorized into three groups: emotional– how players feel, cognitive– how players think, and behavioral– what players do. For gamification in particular, engagement falls into the emotional category for students (Schöbel et al., 2023).

Current Gap & Approach

While the usage of gamification-based learning has become widely recognized in educational settings worldwide (Khaitova, 2021), most research, such as a study conducted by Ros et al. (2020) on a gamified "Cybcourse", only had the goal of uncovering the effects of gamification in their specific game of choice. Williams et al. (2024) add that the steady shift towards a gamified world has further raised curiosity regarding the best practices and methods of application to optimize learning effectiveness. For example, Williams et al. (2024) found story-based Capture the Flag (CTF) learning to a be highly effective kind of gamification, while Latorre-Cosculluela et al. (2025), in a similar study on students' academic performance when learning through gamification, found ClassDojo to be a useful gamified learning tool. These studies focus on a singular game and its effects, as opposed to leaning towards an approach with a combination of game types. When it comes to directly gaining insight on player perceptions of the different gamification methods and game styles, however, there is an apparent gap in which specific forms of gamification are more or less helpful in fostering student engagement. As a result, educators are left uncertain about which games they should maneuver towards to optimize student engagement.

This gap will be further investigated in this paper with the following research question: *How does the perceived engagement level of middle school students compare across reward-based, competition-based, and leaderboard-based gamification within a combined gamified experience on phishing?*

Hypothesis

Based on the current literature, gamification and cybersecurity education are intertwined, as cybersecurity needs to be engaging to properly educate children (Williams et al., 2024). As the digital landscape has become a larger threat to users, it is important to find the most effective kind of gamification to educate and engage students (Latorre-Cosculluela et al., 2025). Thus, the hypothesis for this study is that middle

schoolers will like leaderboard and competition-based learning the best due to the competitive aspect that comes with each, which will thus correlate to a better perception of engagement with the phishing material.

METHODS

Research Design

The purpose of the study was to explore reward-based, competition-based, and leaderboard-based gamification and their perceived impact on middle schoolers' engagement within a gamified cybersecurity experience. A quantitative survey research methodology was used due to a survey that was administered once the game had terminated. The quantitative part entailed the numerical rankings that participants gave on their engagement with the incorporation of each kind of gamification. From start to finish, the study had three main components. After consent and assent were given, participants listened to a presentation about phishing, played a Blooket game via the "Gold Quest" mode on the information in the presentation, and filled out a brief post-game reflection regarding their engagement rankings of the game types. In the "Gold Quest" mode, players are given a question on phishing and four answer choices. If the correct answer is chosen, players pick one random prize from three unknown prizes. These prizes include extra gold, losing gold, and being able to swap gold with other players. However, if a question is answered wrong, participants receive a three second penalty and no prize for that round. At the end, the person with the most gold wins. These steps ensured the cybersecurity, gamification, and engagement aspects were in context with one another.

Sampling

Middle school students were chosen as the ideal participant group due to their increased susceptibility to online threats, as well as their apparent preference for gamified learning. The recruiting process began with a letter of intent that was issued to two middle school teachers at the same educational institution. Located in the email was a consent and assent form for the educators to distribute to parents and their child for completion if interested. Due to the limited legal capacity of individuals under the age of 18 to consent for research participation, a digital signature was necessary from both the participant and their parent or guardian. The study included 15 participants, all of whom were in the seventh grade.

Limitations

As a result of the numerous forms that gamification can take and the lack of feasibility to study all, a focus was put on three types. In addition, due to the study taking place in the Bay Area, participants may have had prior knowledge or more knowledge than someone who lives in another area. Furthermore, the

participants in the study attended an affluent public school in the Bay Area that required exceeding a testing score threshold for admission. This situation presents itself as a limitation because participants may have had more intellectual awareness about phishing than students in a public school without testing for admission. Last, the primary specialization of this study was gamification and participant perception, rather than cybersecurity, meaning that education in this discipline may be limited.

Ethical Considerations

Due to the ethical considerations associated with conducting human research, names displayed on the survey and the game results were anonymized.

RESULTS

In order to explore the implementation of gamification in regards to students' perceived engagement, the quantitative data was analyzed with both descriptive and inferential statistics. Descriptive statistics provided general mean scores of engagement rankings of different kinds of gamification, which were further tested via an inferential ANOVA test to determine if one group was more statistically different than the other groups (Social Science Statistics Calculator). A one-way ANOVA test was chosen as opposed to a two-way factorial ANOVA test because three independent variables were identified as opposed to two. This was seen through comparisons among the three gamification types and how they affected the engagement of the 15 seventh-grade participants differently.

Increasing Ranking Scores

To begin, the rankings of each participant regarding their perceived engagement with the incorporation of a reward, competition, and leaderboard were compiled. Following anonymization, a simple mathematical calculation of the mean score and standard error of each gamification type revealed that, on a scale of 1 to 10, participants on average felt that a reward ranked 8.67 on the engagement scale. Competition followed next, ranked 8.2, and the leaderboard aspect ranked a 7.2 (Figure 1). For the following variables, the standard error ranged from 0.39 to 0.45. All three variables were between 7 and 9 on the engagement ranking scale.

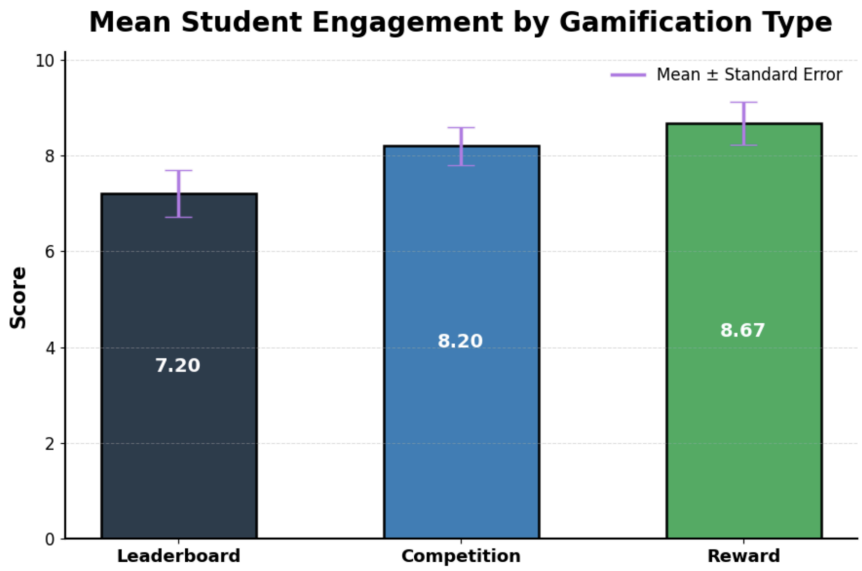

Figure 1: Bar graph of the average engagement scores via descriptive statistics.

Gamification-type Clusters

Across the three kinds of gamification, the lowest and highest scores ranged from 4-10 (leaderboard) or 5-10 (competition and reward). However, it became increasingly apparent that the number of engagement ratings of a 10 increased from leaderboard, to competition, and finally to the reward (Figure 2). While one student gave a 10 out of 10 to the leaderboard, competition had four ratings of 10, and the reward prompted seven responses of 10. Ultimately, the differing clusters of scores affected the spread of the data points in regards to their mean. Leaderboard-based gamification concluded a variance of 3.60, while reward scores had a variance of 2.98, and competition scores yielded a variance of 2.31.

Leaderboard	Competition	Reward
4	5	5
4	7	6
5	7	7
6	7	7
6	7	7
7	7	8

7	8	8
7	8	9
8	9	10
8	9	10
9	9	10
9	10	10
9	10	10
9	10	10
10	10	10

Figure 2: Table of the participants rankings based on perceived engagement.

Lack of Statistical Significance

An ANOVA test was conducted to determine the statistically significant relationships between leaderboard and competition, leaderboard and reward, competition and reward, and finally, all three types of gamification. The test was conducted with two hypotheses in mind: (1) There is no relationship between the different kinds of gamification, and (2) a relationship is present among the different kinds of gamification. After the test was run with an online ANOVA calculator, a p-value was produced for each of the four groups. Leaderboard and competition produced a value of 0.122, leaderboard and reward produced 0.066, competition and reward resulted in a value of 0.657, and all three variables had a p-value of 0.117 (Figure 3). Due to all of the values exceeding the 0.05 significance threshold, results failed to reject the null hypothesis. Ultimately, there is no statistical significance between favoring competition, reward, or leaderboard gamification for optimizing student engagement.

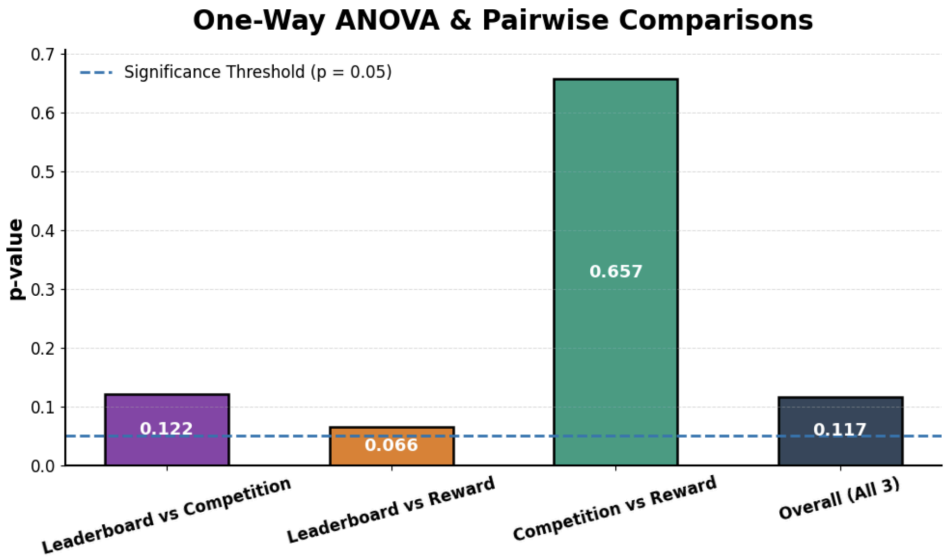

Figure 3: ANOVA test p-values compared to 0.05 significance threshold.

DISCUSSION

The effect of gamification on students' engagement is consistent with the findings of Vranešić et al. (2019), who studied the influence of a reward system on an Information and Communication Technologies course. With focusing on reward-based gamification specifically, Vranešić et al. (2019) determined that while students felt fondly of the reward-system, their semi-scattered data reflects that the situation and chosen reward also play a factor in the motivation of participants. Even though reward-based gamification ranked the highest among participants within the study, different factors such as those referenced by Vranešić et al. (2019), could contribute to differing ending scores. Similarly, findings of Huang & Hew (2015) semi-emulate the findings of the study. With a focus on two groups, one which could go the extra measure for a reward, and another which had no option for a reward given, participants were only motivated to complete the extra tasks for the incentives. Although a group without an incentive given was not present, based on the high mean score for the reward category, it seems as though participants would have feelings in conjunction with the results from Huang and Hew (2015).

In terms of different gamification elements, such as points, levels, and scoreboards, Khoshnoodifar et al. (2023) also failed to reject the null hypothesis, determining that their different kinds of gamification did not vary much in comparison to one another. However, Hadi Mogavi et al. (2022) and Toda et al. (2018) reflect that while gamification can be extrinsically motivating, there are underlying concerns that gamification may bring. While the improper implementation of gamification was not looked into, it is important to note that in the context of the research question, gamification must be implemented ethically and appropriately to successfully engage students in the educational material.

Next, while descriptive statistics would say reward-based gamification is the best form of gamification to be implemented into future cybersecurity education programs, the failure to reject the null hypothesis ultimately concludes that there is no appropriate way to say which kind of gamification educators should indefinitely maneuver towards. In other words, one kind of gamification was not found to have a significant difference to reach a large-scale conclusion. However, it is important for cybersecurity educators, in an effort to implement gamification, to determine what kinds suit their learning objectives and their classroom the best. With this adhered to, the field of cybersecurity can become a more engaging environment for learners.

These findings also raise important considerations addressed in previous scholarly works, such as that by Ros et al. (2020), who emphasized the importance of leveraging a game for the study that meets key criteria. The game must be able to adhere to the instructors' educational goals, as well as make sure to consider the location and audience of the game (Ros et al., 2020). Due to the study using a pre-designed Blooket game, specifically the "Gold Quest" mode, the game or the mode of choice used may not have been the best in evaluating the engagement of the participants in regards to the study. Also, the shifting implementation of each kind of gamification could have been presented differently, including offering a different reward, adding competition in a different aspect of the game, or changing the leaderboard system to rank the students based on a different variable. Last, games are subjective, meaning that each individual holds different beliefs in terms of desire or interest in the game. This ultimately means that the audience of the game plays a role in the study results.

In addition, this study presents some other noteworthy limitations that could have hindered the effectiveness of the data. The first limitation stems from the sample size of the study. If there were a larger sample size, results may have successfully rejected the null hypothesis or reflected a different conclusion. In addition, with the ever-changing landscape of technology, the perception and actual implementation of gamification mechanisms can shift within the game and among middle school students. With the only criteria being middle schoolers, and all students ended up being in seventh grade, results could be different with a focus on different variables. For instance, results may also differ depending on characteristics such as gender, grade level within middle school, and upbringing.

CONCLUSION

From the research exploring the engagement of students in regards to different kinds of gamification, it is clear that between rewards-based gamification, leaderboard, and competition, there is no clear gamification-type that should be focused on within cybersecurity education programs. In other words, one kind of gamification will probably not see drastic differences in the engagement of students than another kind of gamification. Similarly, while reward-based gamification was highly regarded via a descriptive statistical analysis, Vranešić et al. (2019) and Huang and Hew (2015) emphasized that the reward given and the context play a role in the outcome of participants.

Future Directions

These results further open the door to studies that have either a more targeted sample size, or a sample size that is larger. In addition, although some sources focused on just gamification (Vranešić et al., 2019), and others focused on cybersecurity as a whole (Karl, 2024), limited sources focus on the combination of both cybersecurity and gamification. Future work in these disciplines can determine if there truly is a more desirable way to incorporate gamification techniques into cybersecurity education programs in the nation. Also, new gaps have arisen, with questions regarding if there may be different kinds of gamification suitable for different genders, if different cybersecurity topics might be more appropriate for different game-styles, and why gamification should or should not be implemented in educational settings. Not only can these topics be further explored and tested, but researchers can separately hone in on different kinds of gamification individually as opposed to adding in the different kinds within one game. Finally, any future research endeavors should consider utilizing coding to create personalized gaming platforms that are made with the intention of solely teaching cybersecurity.

REFERENCES

Cigdem, H., Ozturk, M., Karabacak, Y., Atik, N., Gürkan, S., & Aldemir, M. H. (2024). Unlocking student engagement and achievement: The impact of leaderboard gamification in online formative assessment for engineering education. *Education and Information Technologies, 29*(18), 24835-24860. https://doi.org/10.1007/s10639-024-12845-2

Hadi Mogavi, R., Guo, B., Zhang, Y., Haq, E.-U., Hui, P., & Ma, X. (2022). When gamification spoils your learning: A qualitative case study of gamification misuse in a language-learning app. In *Proceedings of the Ninth ACM Conference on Learning @ Scale* (pp. 175-188). Association for Computing Machinery. https://doi.org/10.1145/3491140.3528274

Huang, B., & Hew, K. F. (2015). Do points, badges and leaderboard increase learning and activity: A quasi-experiment on the effects of gamification. In Y.-J. Lan et al. (Eds.), *Proceedings of the 23rd International Conference on Computers in Education (ICCE 2015)* (pp. 275-280). Asia-Pacific Society for Computers in Education. https://library.apsce.net/index.php/ICCE/article/view/3213

Karl, T. (2024, April 29). *Understanding the importance of cybersecurity awareness training*. New Horizons. https://www.newhorizons.com/resources/blog/the-importance-of-cybersecurity-awareness-training

Khaitova, N. F. (2021). History of gamification and its role in the educational process. *International Journal of Multicultural and Multireligious Understanding*, *8*(5), 212-216. http://dx.doi.org/10.18415/ijmmu.v8i5.2640

Khoshnoodifar, M., Ashouri, A., & Taheri, M. (2023). Effectiveness of gamification in enhancing learning and attitudes: A study of statistics education for health school students. *Journal of Advances in Medical Education & Professionalism*, *11*(4). 230-239. https://doi.org/10.30476/jamp.2023.98953.1817

Landers, R. N., Bauer, K. N., & Callan, R. C. (2015). Gamification of task performance with leaderboards: A goal setting experiment. *Computers in Human Behavior, 71, 508-515.* http://dx.doi.org/10.1016/j.chb.2015.08.008

Lastdrager, E., Carvajal Gallardo, I., Hartel, P. H., & Junger, M. (2017). *How effective is anti-phishing training for children?* In *Proceedings of the Thirteenth Symposium on Usable Privacy and Security (SOUPS 2017)* (pp. 229-239). USENIX Association. https://www.usenix.org/system/files/conference/soups2017/soups2017-lastdrager.pdf

Latorre-Cosculluela, C., Sierra-Sánchez, V., & Vázquez-Toledo, S. (2025). Gamification, collaborative learning and transversal competences: Analysis of academic performance and students' perceptions. *Smart Learning Environments*, *12*(2). https://doi.org/10.1186/s40561-024-00361-2

Leedy, P. D., & Ormrod, J. E. (2025). *Practical Research* (11th ed.). Pearson. https://drive.google.com/file/d/1nOuQ-llRvipCbJOwtPx8DRfL8GI1QvX5/view?usp=sharing

Lounis, S., Pramatari, K., & Theotokis, A. (2014). *Gamification is all about fun: The role of incentive type and community collaboration*. In *Proceedings of the 22nd European Conference on Information Systems (ECIS 2014).* Association for Information Systems. https://aisel.aisnet.org/ecis2014/proceedings/track12/13/

Richter, G., Raban, D. R., & Rafaeli, S. (2014). Studying gamification: The effect of rewards and incentives on motivation. In T. Reiners & L. C. Wood (Eds), *Gamification in education and business* (pp. 21-46). Springer. https://doi.org/10.1007/978-3-319-10208-5_2

Ros, S., González, S., Robles, A., Tobarra, L., Caminero, A., & Cano, J. (2020). Analyzing students' self-perception of success and learning effectiveness using gamification in an online cybersecurity course. *ICEE Access*, *8*, 97718-97728. https://doi.org/10.1109/ACCESS.2020.2996361

Schöbel, S. M., Janson, A., & Leimeister, J. M. (2023). Gamifying online training in management education to support emotional engagement and problem-solving skills. *Journal of Management Education, 47*(2), 166-203. https://doi.org/10.1177/10525629221123287

Selawsky, J. (2021, May 12). *Gamification in education: A new type of interactive learning*. ELearning Industry. https://elearningindustry.com/gamification-in-education-new-type-interactive-learning

Sepehr, S., & Head, M. (2013). *Competition as an element of gamification for learning: An exploratory longitudinal investigation*. In *Proceedings of the First International Conference on Gameful Design, Research, and Applications, (Gamification '13)* (pp. 2-9). Association for Computing Machinery. https://doi.org/10.1145/2583008.2583009

Shahzadi, A., Ishaq, K., Nawaz, N. A., Rosdi, F., & Khan, F. A. (2025). Unveiling personalized and gamification-based cybersecurity risks within financial institutions. *PeerJ Computer Science, 11,* e2598. https://doi.org/10.7717/peerj-cs.2598

Toda, A., Dias Valle, P. H., & Isotani, S. (2018). The dark side of gamification: An overview of negative effects of gamification in education. In A. I. Cristea, I. I. Bittencourt, & F. Lima (Eds.), *Higher Education for All: From Challenges to Novel Technology-Enhanced Solutions* (Communications in Computer and Information Science, Vol. 832, pp. 143-156). Springer. https://doi.org/10.1007/978-3-319-97934-2_9

Udeani, U. N., & Akhigbe, J. N. (2020). Gamification as an instructional approach under collaborative and competitive modes: An analysis of students learning outcomes in biology. *International Journal of Innovative Technology Integration in Education*, 4(1). https://ijitie.aitie.org.ng/index.php/ijitie/article/view/129

van Steen, T., & Deeleman, J. (2021). Successful gamification of cybersecurity training. PubMed. https://pubmed.ncbi.nlm.nih.gov/34491845/

Vranešić, P., Aleksić-Maslać, K., & Sinković, B. (2019). *Influence of gamification reward system on student motivation. In 2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)* (pp. 766-772). IEEE. https://doi.org/10.23919/MIPRO.2019.8756848

Wang, Z. (2021, November 23). *Introduction to the use of gamification in higher education: Part 1*. Academic Technology Solutions, *University of Chicago*. https://academictech.uchicago.edu/2021/11/23/introduction-to-the-use-of-gamification-in-higher-education-part-1/

Williams, L., Anthi, A., Cherdantseva, Y., & Javed, A. (2024). Leveraging gamification and game-based learning in cybersecurity education: Engaging and inspiring non-cyber students. *Journal of The Colloquium for Information Systems Security Education*, *11*(1), Article 8. https://doi.org/10.53735/cisse.v11i1.186