

GAMIFICATION FOR THE STREBER-APP – ENGAGING STUDENTS IN A MODERN COMPETENCE ORIENTED ASSESSMENT APP

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Abstract

Gamification—the integration of game-related elements into non-game contexts—offers a promising approach to increasing engagement and sustained use of digital learning applications. This paper presents the gamification-enhanced redesign of the Streber App, a mobile-optimised web application implementing the CREPS method (Create, Review, Enhance, Practice, Score), which supports competence-oriented learning through structured self- and peer-assessment. Originally developed in 2020 for a media technology university course, the Streber App has since been deployed across multiple courses and used by approximately 700 students. Within the app, learners create, refine, and evaluate multiple-choice questions based on course content. Peer evaluation focuses on quality, correctness, and complexity, while high-quality contributions are selected for further practice. Each phase of the CREPS workflow is incentivised through a points-based reward system, encouraging active participation and reflective engagement. A prior quantitative evaluation demonstrated strong overall acceptance of both the method and the application but also revealed concerns regarding long-term user engagement. Interestingly, a global high-score leaderboard—although pedagogically peripheral—was consistently identified by students as a motivating feature. In response, additional gamification elements were introduced, including user levels and a weekly resetting high-score system, with the aim of fostering sustained motivation and enjoyment of use. The enhanced application was translated into English and Slovak and piloted in a plant physiology course in Slovakia. Usage data indicated distinct participation patterns, ranging from students who substantially exceeded the workload required for course completion to those who engaged only at a minimum level. Findings indicate that the added gamification features positively influence student motivation and engagement, even though only a minority of learners are willing to invest effort beyond formal course requirements. The results highlight the potential of targeted gamification to support long-term engagement in competence-oriented digital assessment environments.

Keywords: CREPS, Streber-App, gamification, peer assessment, mLearning.

1. Introduction

The rapid scientific and technological transformation of recent decades has significantly influenced education, with artificial intelligence (AI) emerging as a key driver of change across learning environments (Al Farsi et al., 2024; Cukurova & Kent, 2019; Munir et al., 2022). These developments intensify the need for innovative teaching models capable of addressing growing knowledge demands while effectively leveraging digital technologies. At the same time, the integration of new technologies into education continues to present recurring pedagogical and organizational challenges (Moya & Camacho, 2024).

Higher education is therefore increasingly expected to move beyond knowledge transmission toward competence-oriented learning that fosters self-regulation, evaluative judgment, and sustained engagement. Digital and mobile learning environments are frequently viewed as enablers of such learner-centred approaches, offering flexible access to educational activities and supporting continuous interaction with learning content (Szymkowiak et al., 2021; Adams Becker et al., 2017; Uther, 2019). Mobile learning, understood as learning facilitated anytime and anywhere through evolving educational technologies, has consequently become a central pedagogical paradigm in contemporary education (McQuiggan et al., 2015; Schmiedl & Schmiedl, 2022).

Within these environments, long-term adoption depends not only on technical functionality but also on students' motivation, perceived usefulness, and willingness to engage continuously with the

system (Wang et al., 2024). Gamification—the integration of game-design elements such as points, rankings, levels, and feedback into non-game contexts—has therefore gained attention as a strategy to enhance engagement and enjoyment in digital learning, particularly among Generation Z students who favour flexible, interactive, and mobile-first learning experiences (Szymkowiak et al., 2021). Closely related, structured peer assessment supports competence-oriented education by promoting reflection, feedback literacy, and self-efficacy, provided that it is embedded in appropriate digital learning designs (Wang et al., 2024).

To address these pedagogical and motivational challenges, the CREPS method (Create, Review, Enhance, Practice, Score) was developed as a cyclical framework combining active knowledge construction, peer feedback, and iterative practice within scalable course settings (Schmiedl & Schmiedl, 2020; 2022). The Streber App operationalizes this approach as a mobile-optimised web application that enables students to generate, evaluate, and refine multiple-choice questions while engaging in continuous peer-supported learning. Previous evaluations demonstrated high acceptance and perceived effectiveness of both the method and the application, yet also indicated the importance of sustained motivation for long-term use.

This study investigates whether the integration of additional gamification elements in the Streber App increases student motivation, engagement, and sustained participation in a competence-oriented mobile learning environment. Against this background, the present study investigates the impact of additional gamification elements within the Streber App on student motivation and engagement in a competence-oriented mobile learning environment.

2. Methods

2.1. CREPS method and Streber app

The CREPS approach comprising the phases *create*, *review*, *enhance*, *practice*, and *score* was developed in early 2020 (Schmiedl and Schmiedl 2020). It provides a structured framework suitable for teaching groups of any size, without placing a substantial additional workload on instructors. The method emphasizes self-assessment and peer evaluation, both of which are essential components of competence-oriented education. Its core principle is a cyclical process in which students design and progressively refine assessment questions derived from the course content. These questions are subsequently reviewed by peers, who evaluate them in terms of accuracy, quality, and level of difficulty. High-quality questions are then selected for continued practice activities. Throughout the process, students earn points for their contributions, with higher-quality questions and constructive feedback leading to increased scores.

To support innovative teaching, learning, and assessment practices within a competence-based educational context, the CREPS methodology was implemented through the Streber App (Schmiedl and Schmiedl 2022). This web-based application is particularly designed for use in large student cohorts and operationalizes the CREPS concept in a digital environment (see figure 1). Instructors can divide a course into multiple modules, set specific timeframes for the creation and practice phases, and allocate point values to various student activities such as question development and peer review. While the application is optimized for use on smartphones, it is fully functional across modern web browsers on desktop devices as well. A key advantage of the Streber App is its flexibility, enabling students to engage in learning activities independently of time and location. The method focuses on the student's learning success and their motivation as well as on the applicability of the method in university courses and the usability of the Streber app.

The Streber app and CREPS method were applied to student groups that study biology and ecology at the Faculty of Humanities and Natural Sciences, University of Prešov. The content was created based on the 10 lectures and practices within the study course *Plant physiology*. The final course grade was based on three criteria, with the results from using the Streber app accounting for one component and carrying the highest weighting (70%).

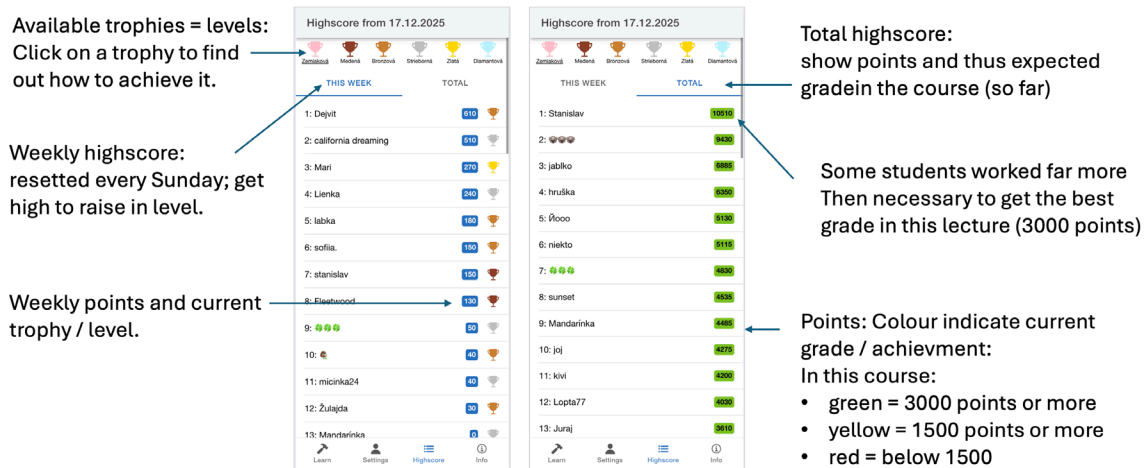
2.2. Questionnaire

At the end of the course, all 47 students were invited to complete a questionnaire about their semester-long work with the Streber app. A total of 41 students responded, corresponding to a response rate of 87%. The sample consisted of 29% male and 71% female students. The final grades of the students who participated in the survey were distributed as follows: A: 63%, B: 10%, C: 12%, and D: 15%.

The questionnaire comprised seven thematic sections with 36 sub-questions assessed using a Likert scale. A seven-point agreement scale was applied, ranging from *strongly disagree* (1) to *strongly agree* (7). In addition, two sections contained four open-ended questions with free-text responses.

The Likert-scale sections covered the topics: Learning benefit (4 questions), Motivation through the method (5 questions), Extrinsic motivation (6 questions), Motivation for long-term use (6 questions), Barriers and demotivation (4 questions), Honesty-related aspects (8 questions) and Perceptions of the Streber app (3 questions).

Figure 1. Gamification in the Streber app: weekly/total highscore and levels=trophies.



3. Results and discussion

3.1. Perceived learning benefits

Students reported very strong perceived learning benefits from the Streber app. Across key learning-related items, the majority of responses clustered in the upper agreement range (6–7). For example, creating their own questions, repeated testing, and long-term engagement with the app all showed high proportions of strong agreement, frequently exceeding one third to nearly one half of responses. Only marginal disagreement was observed, indicating consistently positive learning perceptions.

Learning through reviewing peer-generated questions showed slightly lower—yet still distinctly positive—agreement levels, indicating that creating one's own content was perceived as more beneficial than evaluating others' work.

3.2. Motivation through the method CREPS and its implementation, the Streber-App

Motivational and feedback-related items also demonstrated predominantly positive agreement patterns. Most students reported that the app supported self-assessment and critical thinking, and both giving and receiving feedback were evaluated positively, with agreement responses clearly outweighing neutral or negative categories. Written feedback remained motivating even when critical, indicating constructive acceptance of peer evaluation.

3.3. Gamification elements and motivational impact

The central aim of this study was to evaluate whether the gamification mechanisms embedded in the Streber app - namely points, overall rankings, weekly rankings, and trophy rewards - produced measurable motivational effects among students.

3.3.1. Awareness and behavioural engagement. Students demonstrated very high awareness (80% agreement level 6 and 7) that only accumulated points influenced formal course grading, while rankings and trophies had no direct academic consequences. Despite this explicit knowledge, gamified competition remained behaviourally relevant. Around 66% of respondents agreed (6–7) that they regularly checked their ranking position, and roughly 70% reported feeling motivated by their ranking visibility.

Active attempts to reach higher weekly rankings or better trophies were somewhat weaker but still notable, with about 50–55% indicating agreement. During the course, this became evident as several participants competed for first place in the high-score ranking, surpassing the total number of points required for a grade A by a substantial margin.

In contrast, only about 39% agreed that comparison with other students is irrelevant, while a similar proportion selected neutral or disagreement categories. This pattern suggests that social comparison retained meaningful motivational influence, even when not explicitly acknowledged.

Notably, students with lower overall course grades, and consequently lower high-score positions, reported significantly more often that their ranking was irrelevant.

3.3.2. Sustained motivation and competitive dynamics. Long-term engagement indicators were strongly positive. Approximately 73–83% of students agreed (6–7) that the app helped them stay engaged throughout the semester and should be used in future subjects.

At the same time, boredom or purely grade-driven usage showed markedly lower agreement, with only about 15–20% selecting agreement levels, while the majority responded neutrally or negatively.

This indicates that engagement was not dominated by extrinsic pressure alone but instead reflects a hybrid motivational structure combining competitive extrinsic cues with intrinsic learning engagement.

3.3.3. Negative competitive effects. Potential negative consequences of leaderboard-based gamification were minimal. Only about 5–10% of students agreed that low ranking positions discouraged them or visibility of weak performance was demotivating.

In the Streber-App students were given the possibility to opt out of appearing in the high-score list; however, this would also have prevented them from viewing the ranking (an all-or-nothing configuration). None of the participants chose to opt out.

Thus, competitive visibility rarely produced negative emotional responses, contradicting common concerns in leaderboard-based gamification literature.

4. Conclusion

This study examined the motivational and learning-related effects of gamified peer-assessment within the CREPS-based Streber learning environment. The findings indicate that integrating gamification elements such as points, rankings, and progress indicators can positively support student engagement and sustained participation in competence-oriented assessment activities. Students reported clear short-term motivational benefits alongside continued interaction with course content over the semester.

At the same time, the results suggest that gamification functions most effectively as a supportive scaffold rather than a substitute for intrinsic motivation. The perceived learning advantage of self-generated questions over merely reviewing peer content further highlights the importance of constructive, active participation in digital learning processes.

Overall, thoughtfully aligned gamification can enhance engagement in mobile competence-oriented learning environments, but its long-term educational value depends on maintaining coherence between reward structures, meaningful learning activities, and academic integrity.

4.1. Future work

Several aspects emerged that were only marginally addressed in this study but warrant systematic investigation in future research.

First, the growing availability of artificial intelligence tools raises important questions regarding their role in question generation and review processes. Future work should examine whether AI-assisted content creation enhances learning through scaffolding and feedback or risks reducing meaningful cognitive engagement by outsourcing core learning activities.

Second, mechanisms for reviewing peer-generated questions require closer scrutiny. The current system allows superficial interaction or automated responses to gain points without genuine effort, highlighting the broader challenge of ensuring honesty and authentic participation in gamified assessment environments.

Future research should therefore explore technical, pedagogical, and ethical strategies to mitigate dishonest behavior, including improved detection of automated interaction, reward structures privileging depth over quantity, integration of reflective components that are harder to automate, and explicit promotion of academic integrity within gamified systems.

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