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# **Evaluating the Impact of Gamification on Learning Effectiveness in Technical Vocabulary Instruction**

## **Abstract**

With the rise of digital education, the integration of gamified elements has emerged as a potential strategy to enhance student engagement and comprehension in various academic disciplines. This study seeks to evaluate the impact of gamification on learning effectiveness in the domain of technical vocabulary instruction during an online course. A mixed-methods approach was employed, involving data collection from students enrolled on an online technical vocabulary programme offered by the Language Centre at Gdansk University of Technology. A quantitative analysis of placement test scores, the frequency of using course material and final grades was conducted to understand their impact on learning outcomes, and data from surveys provided insights into students' perceptions and experiences with gamified activities. The findings indicate that the incorporation of gamification positively influenced learning effectiveness during the online course. The participants demonstrated higher levels of motivation, active participation, and a deeper understanding of technical terminology achieved through gamified interactions. The study's outcomes contribute to the growing body of research on gamification's potential benefits in online learning environments, especially in the context of technical vocabulary instruction, and offer valuable implications for educators and course designers seeking innovative approaches to optimize learning experiences in virtual settings.

**Key words:** gamification, ESP, technical English, assessment, effectiveness, learning outcomes

## Introduction

The landscape of higher education is undergoing a transformative shift driven by student-centred pedagogical paradigms and the integration of technology into the educational environment. As universities strive to meet the diverse needs of today's digitally native student population, traditional teaching methods, once considered the cornerstone of academia, are now being supplemented and, in some cases, replaced by innovative approaches structured around Internet technologies. Among them, gamification has emerged as a strategy aiming to enhance student engagement, motivation, and overall learning outcomes.

Gamification refers to the application of game elements and principles in non-gaming contexts, such as education. By harnessing the appeal of games, including rewards, challenges, interactive experiences and story-based content, educators try to create dynamic and immersive learning environments that captivate and inspire students (Rincon-Flores & Santos-Guevara, 2021; Connolly et al., 2012; Kotuła, 2022; Mokwa-Tarnowska, Tarnowska, & Roszak, 2023). They believe that digital natives accustomed to instant gratification through online interactions, the razzmatazz of web applications and easily accessible technologies often find themselves disengaged in conventional lecture-based classrooms, bored with instructivist methods that have been domineering the teacher-controlled educational setting.

This research paper explores the multifaceted realm of gamification in technical language learning and teaching within higher education. It explores practical implementations and considers the implications it holds for the future of university education. The nature of the benefits derived from gamification is not yet fully understood, as only a limited number of longitudinal studies have been conducted, and their results are mixed as they primarily focus on the general usefulness of broadly understood gamification in education.

Lester et al. (2023) emphasize attitudinal, design-related and administrative barriers that can be overcome by educating technical staff and university administrators to support educators. Moreover, they note that gamification is likely to enter the educational process if perceived as useful, easy to use and not overly challenging for both teachers and students.

According to Mokwa-Tarnowska, Tarnowska, and Roszak (2023), a gamified language course is seen as attractive and engaging by technically-minded students partly due to its gamified format, but mainly due to its resources utilizing authentic

materials focusing on modern technological advances, interesting and provocative ideas, future trends and developments. However, their study only tested one gamified environment, leaving it unclear what impact more interactive courses with various embedded game-like elements could have on student engagement.

Saxena and Mishra (2021) add that most studies focus on using multiple game elements without separating and analysing their association with specific variables and effects in students. That is also confirmed by Dehghanzadeh et al., (2021), who state that research has yet to identify which game elements can effectively improve certain learning outcomes. Additionally, they note that the majority of findings are solely based on the perceptions of language learners and not actual learning outcomes.

Jayalath and Esichaikul (2022) hypothesise that integrating game thinking into the educational process, structured around the competency-based approach, can help improve learner motivation and foster competency achievement, an aspect they are currently investigating. Kalogiannakis, Papadakis, and Zourmpakis (2021) stress the necessity of clarifying the actual effects of gamification on motivation, learning-related behaviours, outcomes and teacher strategies, particularly in science education, as there is limited research in this area. According to Zainuddin, Chu, Shujahat, and Perera (2020), to fully understand the impact of gamification, we should investigate the pedagogical approaches used to create a gamified environment, including the competency-based approach, and the pedagogical models involved in game-based instructional design.

The certain ambiguity related to understanding the true nature of gamification can be partially attributed to the diverse interpretations of the concept of a 'game,' as explained by cognitive linguists. According to their insights, a game can be seen as a natural category with no necessary and sufficient features (Lakoff, 1987:16, 18, 21, 42, 62, 65; Kalisz & Kubiński, 1996). Thus, a wide array of games and their attributes can be harnessed to create gamified experiences, which in turn presents a unique challenge in researching the use of game elements in non-game contexts. Literature review shows that there is no rationale for choosing certain game elements over others (Khaldi, Bouzidi, & Nader, 2023).

Through empirical research, this paper aims to provide a further understanding of gamification's role in reshaping the landscape of higher education. It seeks to shed light on its potential effectiveness to improve technical English competence in students whose language skills range from B1 plus to C1 according to the Common European Framework of Reference (CEFR). This is done by evaluating students' learning outcomes and their overall performance based on the degree of engagement in learning on a gamified online course.

The impact of game-based instructional design on an improvement in knowledge and skills will be presented through the analysis of a course that was offered by the Language Centre at Gdansk University of Technology (GUT) in the summer semester of the academic year 2022/2023. The ideas shared in the

paper will be supported by quantitative research findings. The following research questions were addressed:

- How does gamification impact student motivation and performance?
- What are students' attitudes towards a gamified Moodle course in technical English structured around authentic resources?
- How effective can a gamified Moodle environment be to increase technical vocabulary in master's students?
- How do initial language skills and the frequency of using course material impact the final grade showing the ability to use contextualised vocabulary?

## **Gamified Environments and Gamification Methodology**

The experience of enjoyment and fun in gamified contexts is a fundamental aspect of gamification that appears to contribute to its effectiveness in engaging learners (Othman et al., 2023). Incorporating a compelling narrative or storytelling element can help participants immerse in the storyline, making their interactions feel like a part of an adventure.

Educational programmes with game-like elements are designed to present challenges that are neither too easy nor too difficult in an engaging and appealing story-based environment (Alrashed et al., 2023: 1226; Krishnamurthy, 2022). Overcoming them, that is achieving good scores in quizzes and high marks for additional activities is understood to provide a sense of achievement. Additionally, receiving rewards, whether in the form of points, badges and trophies, triggers positive emotions and enhances the fun factor.

Gamification alone may not effectively motivate students to participate in learning activities unless it is rooted in a cognitivist framework, which focuses on activities that involve active participation, problem-solving, decision-making strategies and critical thinking (Lyons, Fox, & Stephens, 2023). This could result in various learning outcomes, including cognitive, emotional, and behavioural development (Alt, 2023).

When gamified experiences align with a person's interests, goals and personality (Sanchez, Langer, & Kaur, 2020), they become intrinsically motivated to participate. This intrinsic motivation is a powerful driver of engagement (Qiao et al., 2023: 15–16). In the case of technical vocabulary instruction, contextualised vocabulary exemplified by authentic discourse, resources about state-of-the-art technologies and relevance to contemporary and future challenges aim to help students to self-direct their learning and keep them engaged throughout the whole online course (Mokwa-Tarnowska, 2017: 18–29).

Gamified experiences with quizzes provide immediate feedback on actions or progress. This keeps participants engaged and provides a sense of achievement, contributing to the overall enjoyment and satisfaction. It is noteworthy that not only summative feedback but also formative feedback, such as advice, encouraging comments and emoticons, helps students feel less isolated in an online environment and guides them throughout the whole experience.

When students are offered a choice, when they can decide which activity to choose to progress to the next stage, they feel in control over the learning process. As a result, they are more likely to have a positive experience. Moreover, making choices encourages students to take responsibility for their education. It fosters a sense of accountability. Additionally, allowing them to choose activities that align with their individual needs, learning preferences, strengths, and interests can lead to more effective and enjoyable learning. Finally, the process of making choices in learning is an opportunity for students to develop soft skills such as critical thinking and decision-making (Mokwa-Tarnowska, Roszak, & Kołodziejczak, 2018).

The visual and auditory elements on a gamified course, including graphics and sound effects, can contribute to the overall positive perception of the learning experience. Well-designed and aesthetically pleasing gamified environments enhance the user experience.

All of the above-mentioned factors involved in gamification methodology were used to develop the Moodle course ‘My Interstellar Colony Mission (MyICM)’, which is offered by the Language Centre at Gdansk University of Technology to master’s students. Moodle was not designed for gamification, but it can be adapted to utilise game-like elements in English for Specific Purposes (ESP) courses. Moreover, it is the university’s primary Learning Management System and is well protected against data security breaches.

The course mimics a traditional 14-week workload with 14 stages over 5 levels. Each stage offers three paths: two for self-paced study and one for extra activities, some involving face-to-face meetings. To progress, participants must score 60% in one of two “Test Yourself” quizzes and can try two “Challenge Yourself” quizzes for more points. The course structure resembles a board game, with horizontal moves within stages and vertical ones between stages. The colour scheme denotes seniority, with darker colours for higher positions obtained as the story develops and stages are successfully passed through. Participants collect trophies (badges) as they advance in a narrative of building a distant colony, learning contextualized professional and formal English. Quizzes encourage engagement with materials, while additional activities boost scores through critical thinking and writing. Default icons are hidden for visual appeal, using clickable images to guide participants to subpages. Feedback is provided through percentage points, written comments, recorded stimuli and emoticons.

Contextualised technical vocabulary is introduced using authentic papers, videos and animations linked to the course and highlighted by means of other

Moodle-based resources in the form of bulleted lists, tables, comments with examples, explanations and suggestions, followed by various activities developed with Moodle tools. The subsequent topic areas divided into stages include: job application procedures, habitation, food production, energy production, communication and transportation systems as well as regulations. The storyline guides students through coursework and also exemplifies appropriate, context-specific technical language.

## **Research Methodology**

Data for this study were gathered through an online questionnaire accessible via the Moodle course website upon the completion of the game. The questionnaire comprised 17 questions, including one open-ended, two about the placement test score and overall score presented on interval scales, as well as inquiries about the faculty in which the respondent is enrolled, the least and most interesting stages, and the most challenging stages, along with workload. These questions were represented using a nominal scale, where categorical variables do not possess inherent order. The remaining questions were structured using a five-point Likert-style scale, where respondents were instructed to rate their responses, facilitating a nuanced understanding of their opinions. Each question on the ordinal scale concluded with a request for participants to provide comments, offering deeper insights into the rationale behind their quantitative ratings, thus enriching the data collection process qualitatively.

The questionnaire's reliability and validity are confirmed through administering the same set of questions three times over three semesters to a group of students from the same university and a comprehensive statistical analysis of their responses. The questionnaire included standardised questions commonly used to assess online education and language courses. To maintain the integrity of the study, all participants received the same set of questions and underwent testing under identical conditions. This approach ensures that the findings remain unaffected by variations in question content or testing circumstances. Lastly, it is crucial to note that participation in the questionnaire was restricted to those who had successfully completed the gamified course, reaching the final stage. This selection criterion was applied to maintain methodological consistency. In total, 94 students enrolled on the course in January 2023; 84 passed it, and 72 completed the questionnaire.

Importantly, the questionnaire was intentionally designed not to request sociodemographic information from participants. This measure was taken to ensure the privacy and anonymity of the study's participants. This aligns with ethical standards for data collection.

The study yielded outcomes that exhibited a high degree of generalizability. This trend was consistently observed across the entire sample of participants, reinforcing the reliability of the results.

Quantitative data are presented as percentages. Ordinal data are expressed also as median, interquartile range and minimum and maximum values, and are represented in box plots. Data were analysed with correlation matrices and a linear regression model. Although the results presented in this paper were considered statistically insignificant with  $p > .05$ , they provided valuable insights into the educational value of a gamified environment. The statistical analyses were performed with RStudio.

## Results and Discussion

The survey participants consisted of students from six different faculties, which is visible in Figure 1: 16 of the Faculty of Applied Physics and Mathematics (APM), 5 of the Faculty of Chemistry, 5 of the Faculty of Civil and Environmental Engineering (CEE), 6 of the Faculty of Electrical and Control Engineering (ECE), 35 of the Faculty of Electronics, Telecommunications and Informatics (ETI) and 5 of the Faculty of Mechanical Engineering and Ship Technology (MEST). In total, 72 participants completed the questionnaire out of the 84 who completed the course.

The sample size, divided by faculty, is insufficient for analysing whether students' perceptions of their educational experiences differ based on their respective faculties. However, as all the participants are science and engineering students, they form a relatively homogeneous group. Additionally, being master's students, they possess a significant amount of educational experience and specialised knowledge acquired prior to the commencement of the gamified course in technical English. Therefore, despite the variation in faculties, it is possible to observe similarities in their attitudes and understanding of the added value of the course environment across the entire sample. This makes it a sufficient basis for analysis.

The data presented in Figures 1–11 and in Table 1 were collected and analysed by us with no support from other parties. The graphs for statistical analyses were generated using RStudio.

## Faculties

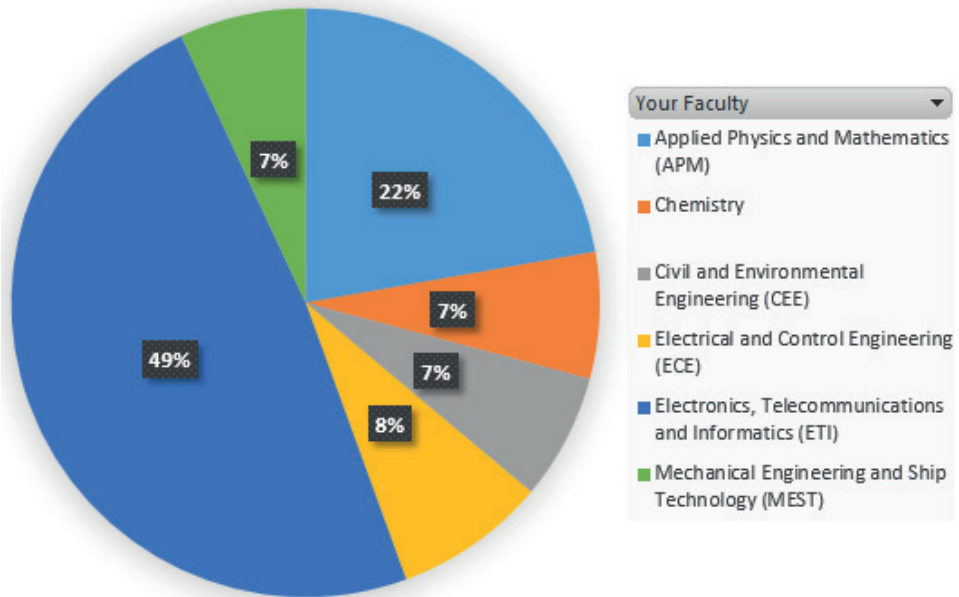
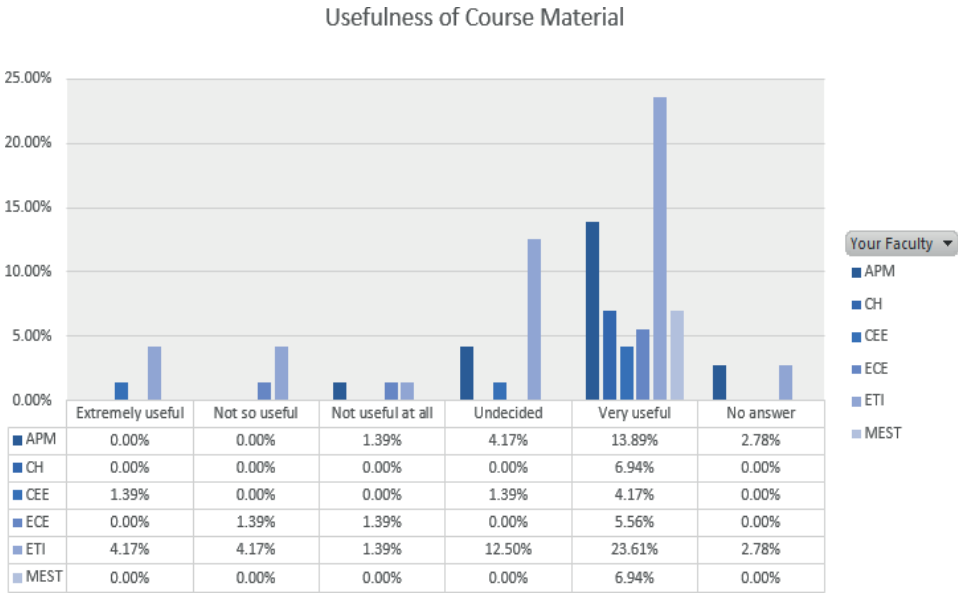


Figure 1. Survey participants by faculty

Note. Survey participants were divided by faculty to assess diverse academic perspectives.

The students were asked to evaluate the usefulness of the course materials, both resources and activities, to improve their language skills (Figure 2). More than half of the respondents, that is 66.67%, rated them as either ‘very useful’ or ‘extremely useful.’ The percentage distribution reveals an intriguing trend: students from the Faculty of Electronics, Telecommunications and Informatics, as well as those from the Faculty of Applied Physics and Mathematics, found these materials the most valuable. This finding is noteworthy, given that the former group exhibits less enthusiasm for topics unrelated to their specialisation in a traditional classroom setting. It seems that the storyline was engaging enough to encourage them to pursue other areas as well, such as for example architecture and building constructions. However, a notable portion, 18.06% of the students, expressed no opinion. This may have resulted from them participating in a course structured around various technical topics for the first time, some of which were highly specialized and not immediately applicable to their main field of study. Around one tenth of the respondents (9.73%) did not recognise the educational value of the materials related to language skills improvement.



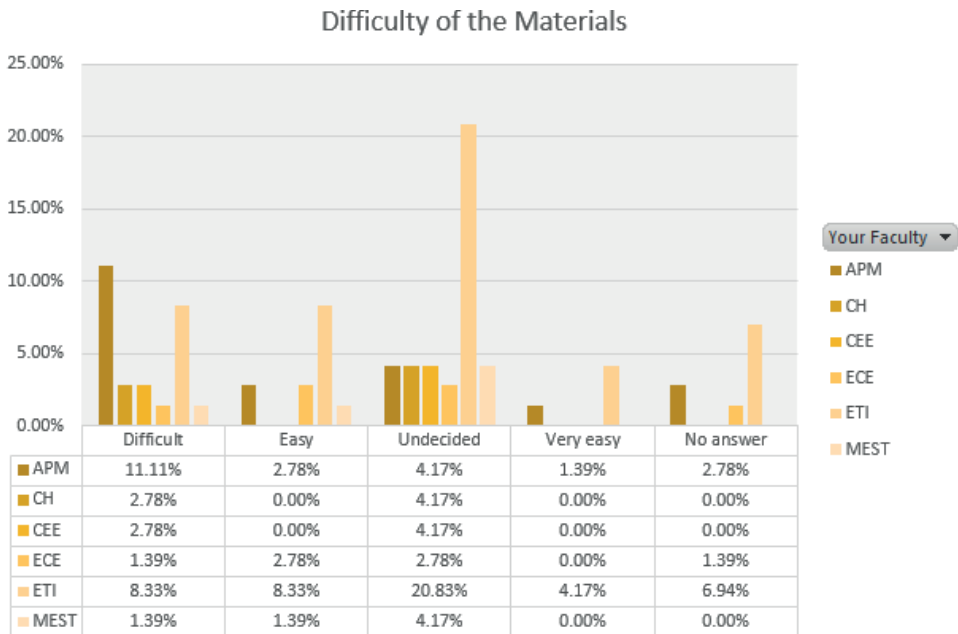


**Figure 2.** Usefulness of the course materials to improve language skills

Note. The usefulness of the course materials in improving language skills was highly rated by the students.

The resources were based on authentic materials so in many videos and articles the language was more difficult than in a typical coursebook for advanced students. Particularly, it was visible in the case of some of the jargon and prepositional phrases used. Nevertheless, for foreigners whose command of the English language is relatively strong and whose-subject specific knowledge is substantial, grasping the fundamental meaning did not present significant difficulties. That was evidenced by the responses to the question about the difficulty of the materials (Figure 3) and comments explaining the choice.

It is worth noting that no student marked the answer ‘very difficult’, only 27.78% found the content difficult, and as many as 40.28% were undecided. Additionally, 11.11% opted not to provide a response.

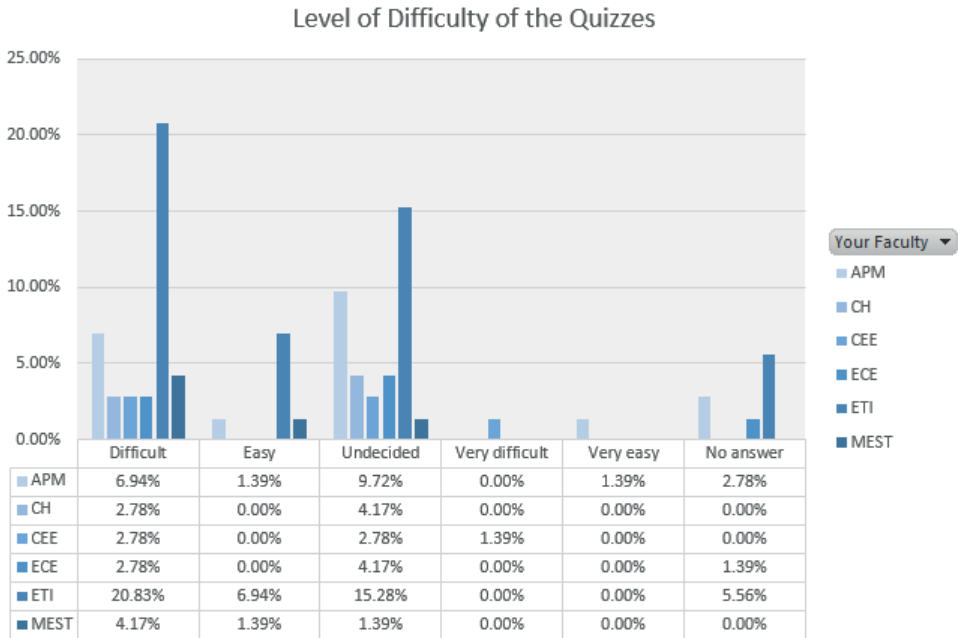


**Figure 3.** Perception of the difficulty of the materials

Note. Students' perception of the difficulty of the materials did not vary significantly across the faculties, with some exceptions.

Compared to the perception of the difficulty of the course materials, the resource-based quizzes were deemed significantly more challenging (Figure 4). Just over two fifths of the respondents (41.67%) rated them as difficult, with 1.39% finding them very difficult. Similarly, an equivalent number of respondents considered them very easy, and for 9.72% they were easy. Much like the perceived difficulty of the course materials, students from the Faculty of Electronics, Telecommunications, and Informatics tended to view these quizzes as demanding.

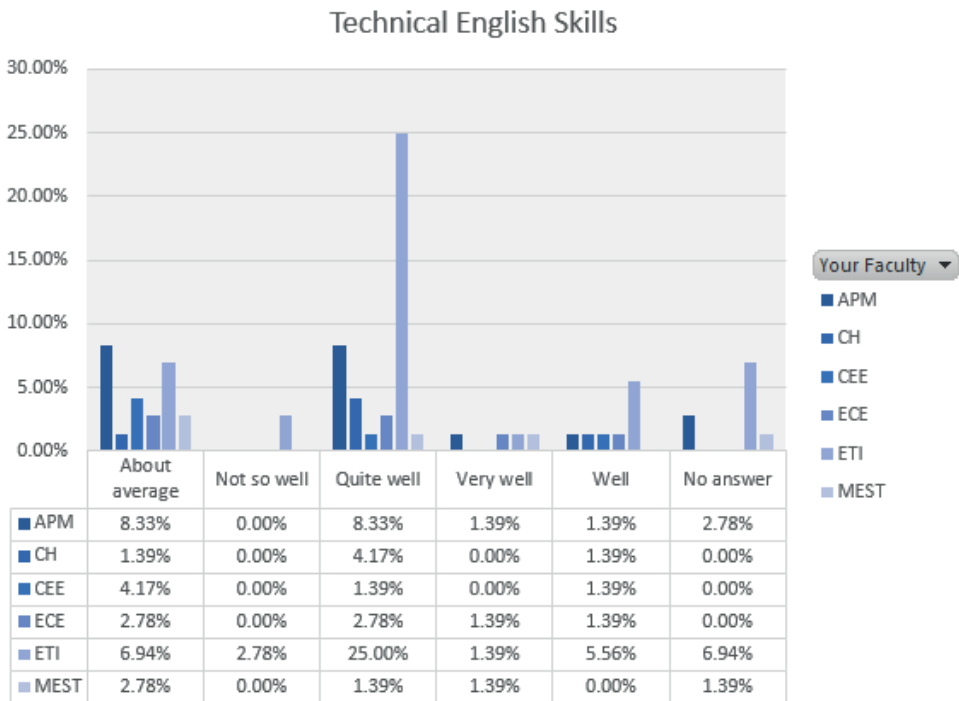
These quizzes assessed the use of context-specific prepositions and collocations, making them potentially more intricate for students more accustomed to reading mathematical notations and physics formulas. The comments explaining the choices indicate that students are not accustomed to closely analysing the language of the text but rather tend to focus on the meaning itself. Furthermore, some students did not recognise the educational value of the quizzes, which often aimed at teaching them less obvious or not directly translatable collocations.



**Figure 4.** Perception of the difficulty of the quizzes

Note. The students’ perception of the difficulty of the quizzes was generally consistent, though a few found them challenging.

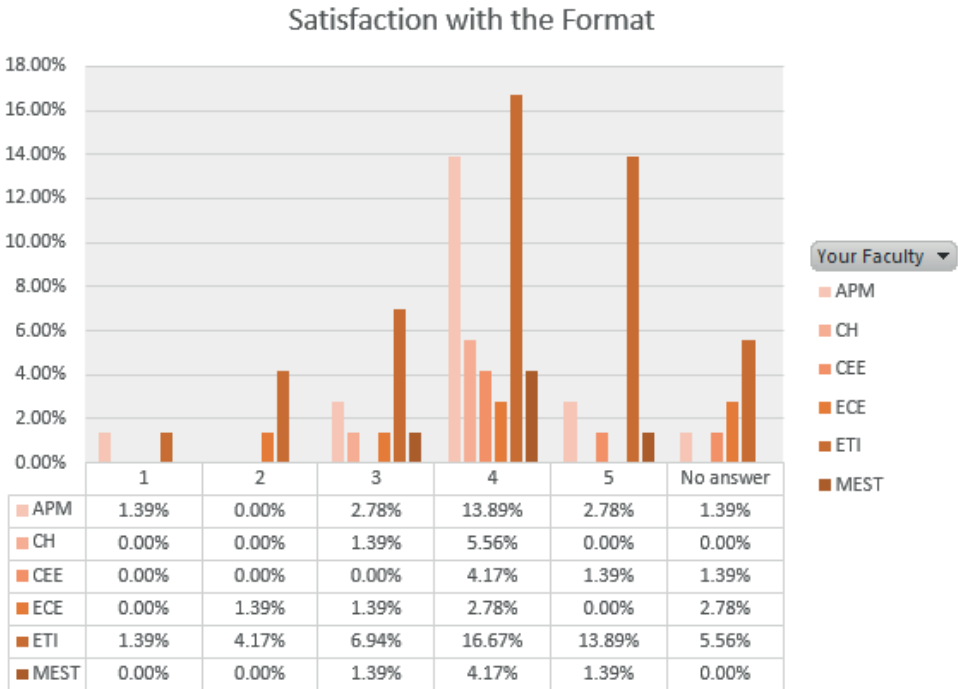
The students were asked to objectively evaluate their ability to use technical English based on their performance and comments they had received on their work (Figure 5). The majority, which constitutes 86.12%, were satisfied with the outcome, with 5.56% who rated it as very good, 11.11% as good, 43.06% as quite good and 26.39% as about average. Only 2.78% expressed their dissatisfaction and 11.11% did not opt for any answer. No students chose the ‘rather badly’ or ‘badly’ responses. The distribution of answers can be explained by the students achieving the 60% threshold pass in the vast majority of the quizzes. However, the top performance, which in a traditional context exceeds 90% score, was rarely recorded. Some of the students lost points by attempting the quizzes without reading and watching the resources, which they confirmed in the questionnaire.



*Figure 5.* Assessment of technical English proficiency based on performance and comments received

Note. The assessment of technical English proficiency was based on performance and comments received, revealing a range of skill levels among participants.

Generally, the students were satisfied with the gamified format of the course (Figure 6). This assumption is based on the fact that they had not previously engaged in a similar educational experience, which they confirmed in various additional comments. A positive response came from 34 (47.22%) participants who gave it grade 4, and 14 (19.44%) who chose the highest rating. Only two students expressed strong disapproval, and four evaluated it low by choosing grade 2. Four of the low scores came from participants with final grades in the 55%–64% range, one from an individual who scored above 70%, and one from a student who just passed the course (40%–49%). While participants were familiar with the general concepts behind this gamified Moodle-based course, they did not consider the format a significant factor in providing added value.



*Figure 6.* Satisfaction with the course format on a scale of 1 to 5, with 5 symbolizing the highest level of contentment

Note. Satisfaction with the course format was measured on a scale of 1 to 5, with 5 symbolizing the highest level of contentment, and the above average score indicated a generally positive response from participants.

Altogether seven respondents stated that they were not satisfied with the gamified experience (Figure 7), which is consistent with the answers provided for the question about the satisfaction with the course format. A similar number – 55 students, which accounts for 62.5%, expressed their positive attitude. It can be inferred from these results that the gamified format employed in the course was, for the majority, not only well-received but also sufficiently engaging. The positive responses suggest that it effectively motivated and inspired the participants, encouraging them to work at their own pace and ultimately yielding satisfactory results. This trend supports the understanding that the gamified structure of a course manages to foster a sense of engagement among the participants. Moreover, thus constructed gamification appears to stimulate a self-directed learning pace, enabling participants to progress in a manner that suits their individual preferences and capabilities.

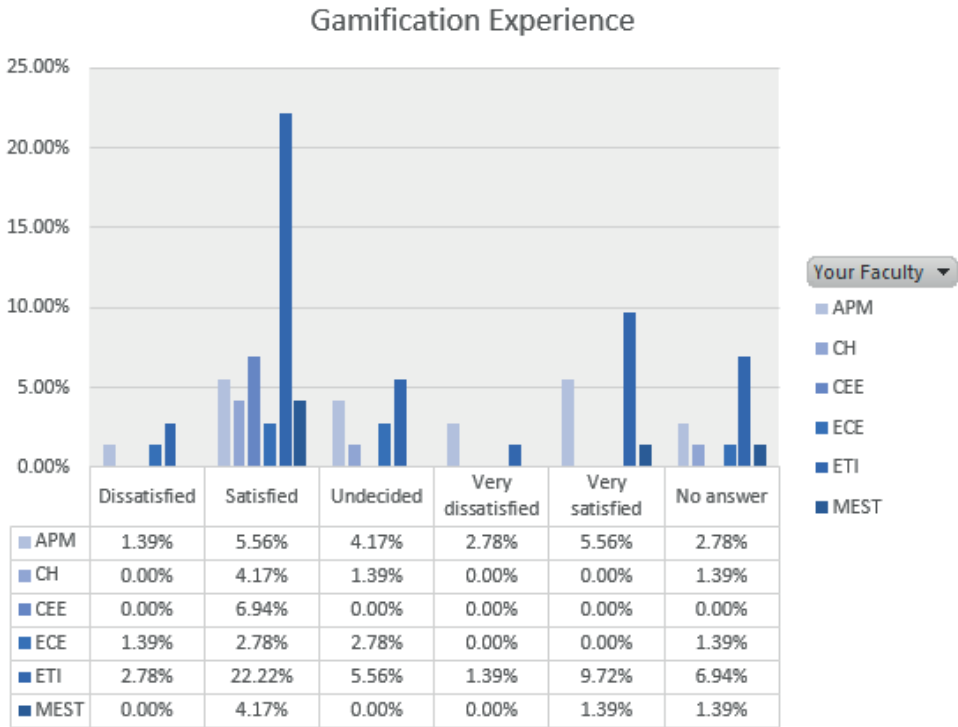


Figure 7. Participant ratings of gamification experience

Note. Participant ratings of the gamification experience reflected a high level of engagement and satisfaction.

Interestingly, as Figure 8 shows, the majority of the students stated that the gamified course met their expectations in terms of quality learning (20.83% of the ‘strongly agree’ answers and 51.39% of the ‘agree’ ones). The percentage of positive responses is even higher, that is 80%, if they are calculated against the total number of participants who decided to mark one of the options provided – seven students did not give any answer. It can be assumed that if the students considered their learning experiences in such a positive way, they treated the environment as effective for technical vocabulary instruction and improvement in technical English language skills.

The five students who did not treat this gamification experience as an example of quality learning scored in the range of 55%–64% and only one above 70%. This shows that either the course content and structure were not sufficiently engaging or the students did not have time for learning or it was difficult for them to self-direct their learning, as four of them stated that they had worked irregularly. Their perception of quality learning may be rather related to teacher-led instruction in a traditional classroom setting.

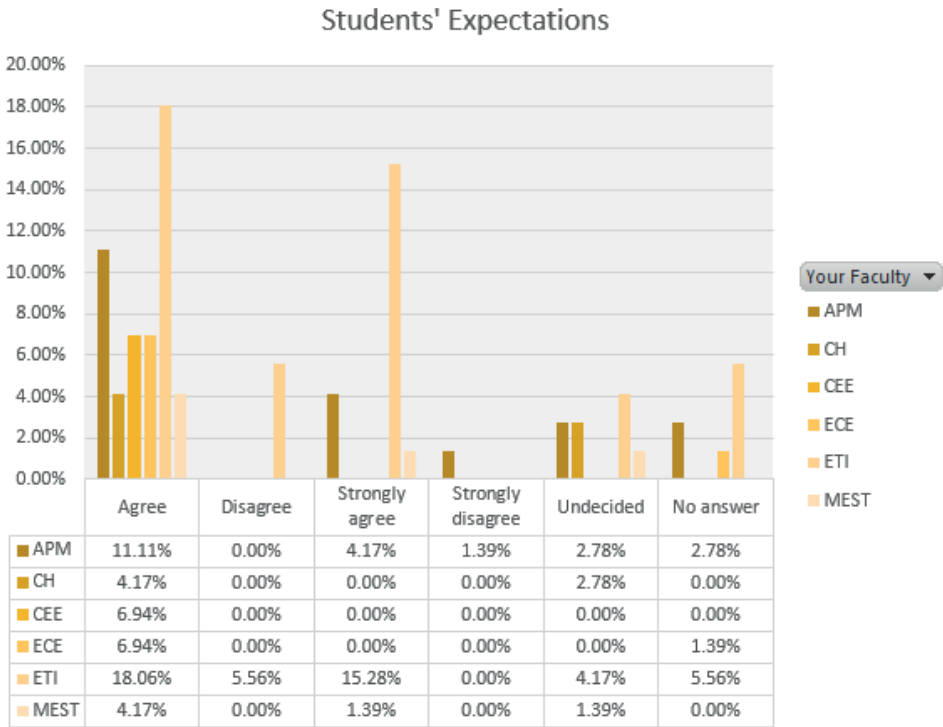


Figure 8. Expectations in terms of quality learning

Note. Expectations in terms of quality learning were met or exceeded for the majority of participants in the online gamified program.

Figure 9 demonstrates the absence of correlations between the placement test scores, measured on an interval scale ranging from 30 to 120, and the final grades, assessed on a scale ranging from 40 to above 70. The Pearson correlation coefficient ( $r = 0.12$ ) indicates no significant linear relationship between higher placement scores and higher final grades. This finding is reinforced by a calculated p-value of 0.3, which exceeds the threshold of 0.05, indicating that the result is not statistically significant. Therefore, based on this statistical analysis, it can be inferred that higher scores in the placement test did not necessarily translate into higher grades in the course.

The course content was designed to engage students in learning, with an emphasis on ensuring that the language used in the instructional materials was not overly challenging for technically-minded students, especially master's students who often need to use English to enhance their specialized knowledge. Furthermore, the content varied in terms of language difficulty and complexity, and course participants had the flexibility to choose which tests and challenges they wanted to attempt. As a result, students with lower-level skills were able to achieve learning outcomes similar to those of advanced students.

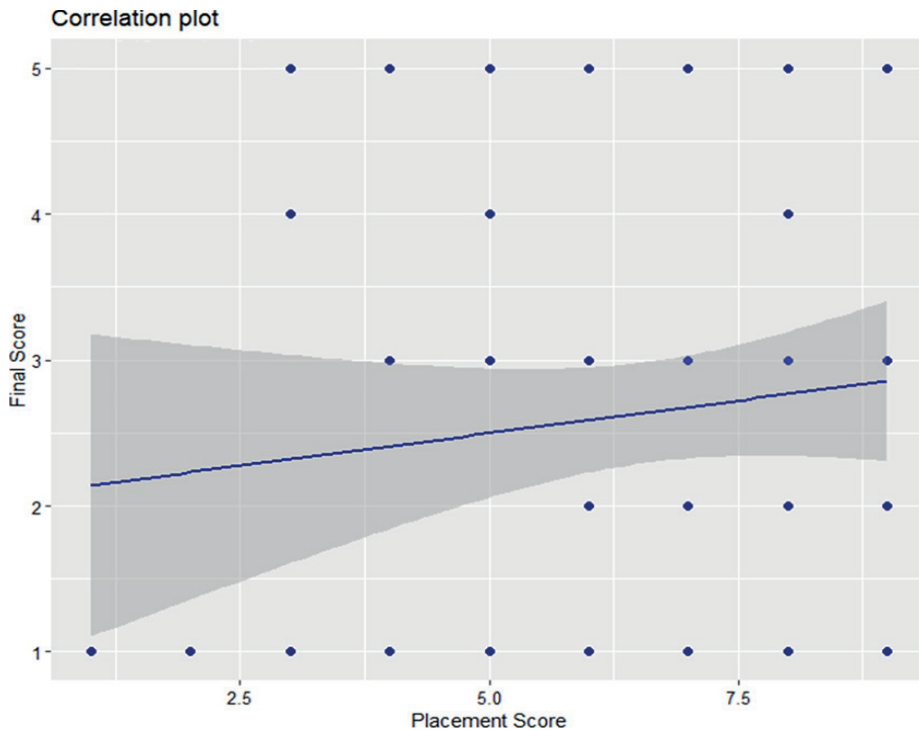


Figure 9. Correlation between placement test scores and final grades

Note. Placement Test Score Bands:

Band 1 – 31–40 marks; Band 2 – 41–50 marks; Band 3 – 51–60 marks; Band 4 – 61–70 marks; Band 5 – 71–80 marks; Band 6 – 81–90 marks; Band 7 – 91–100 marks; Band 8 – 101–110 marks; Band 9 – 111–120 marks

Final Grade Bands:

Band 1: 40%–49% (equivalent to grade 3); Band 2: 50%–54% (grade 3.5); Band 3: 55%–64% (grade 4); 65%–69% (grade 4.5); Band 5: 70% and above (grade 5).

Figure 10 further confirms the absence of a correlation between the frequency of using course materials and final grades ( $r = -.02$ ,  $p\text{-value} = .08$ ). Students were surveyed to rate their usage frequency on a scale ranging from 1 to 7, where 1 indicated minimal usage (i.e., the least frequent course website access), and 7 represented intense usage of more than three hours per week. Notably, 27.78% of students reported an average of 2 to 3 hours, aligning with the assumed workload. Conversely, an equal proportion of students worked irregularly, accessing the course website at intervals of every other week or less frequently, without specifying session durations. The statistical analysis reveals no discernible linear relationship between these two variables; students who accessed the course website more frequently did not achieve higher scores.



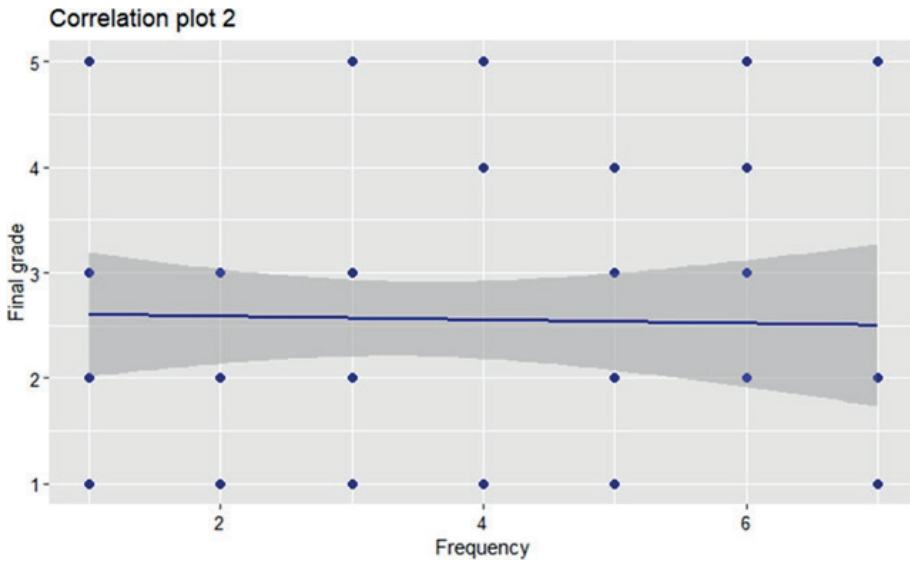
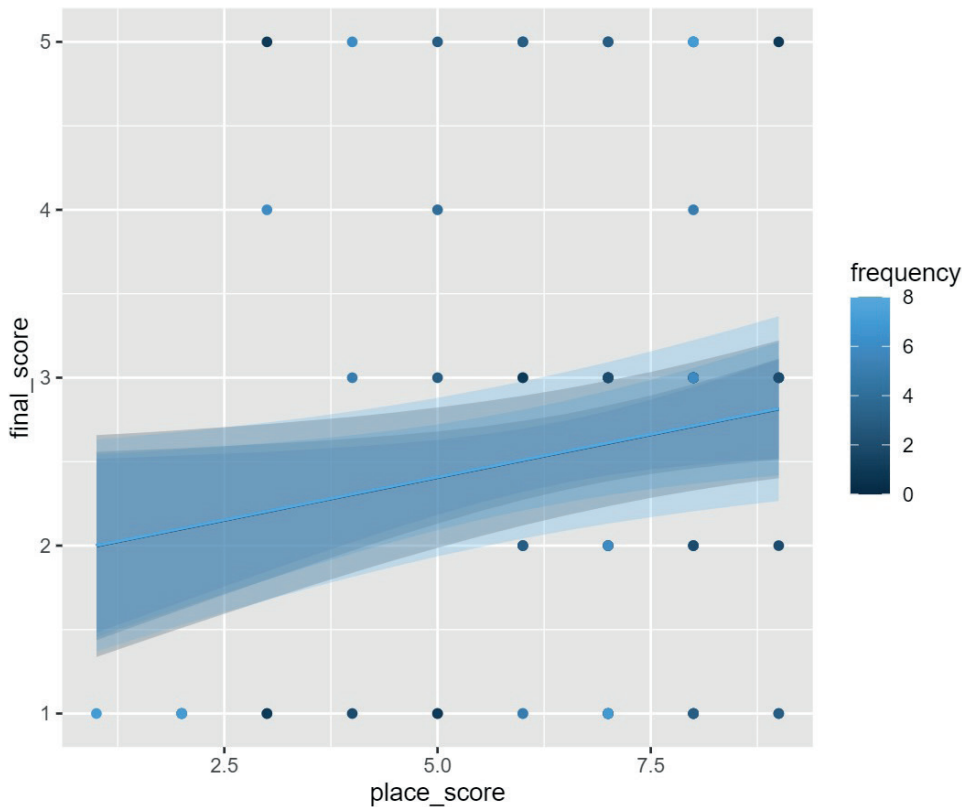


Figure 10. Correlation between frequency of using course material and final grade

Note. Frequency intervals: 7 – More than 3 hours a week, 6 – 2–3 hours a week, 5 – 1–2 hours a week; 4 – less than an hour a week; 3 – every other week; 2 – once a month; 1 – other.

The data analyses indicate that there is no significant predictive relationship between the final grade and the examined independent variables, specifically the placement score and the frequency of using course material (Figure 11). To assess this, a multiple linear regression model was employed, and the regression yielded statistically non-significant results. This conclusion aligns with the model results. According to F-statistics ( $F(2, 63) = .67$ ) none of the independent variables are useful in predicting the outcome, R-Squared coefficient ( $R^2 = .02$ ) indicates that the outcome cannot be predicted by any of the independent variables. The overall p-value = .5166, which exceeds the threshold of .05, indicates that there is a non-significant relationship. The individual predictors were examined further and indicated that placement score ( $t = 1.14, p > .05$ ) and the self-reported frequency of studying ( $t = .01, p > .05$ ) were non-significant predictors.



*Figure 11.* Correlation between placement test scores, frequency of using course material and final grades

Note. The analysis revealed a correlation between placement test scores, frequency of using course material, and final grades, indicating that higher engagement with the material often led to better outcomes.

As seen in Table 1, the mode – the most frequent number – in the placement score category is band 101–110 (19 students out of 72). The median band stands at 91–100. This indicates that, overall, the students had fairly advanced general English language skills before the course began. Moving to the final grade category, the mode is 40%–49%. Considering the passing threshold at 30%, this grade, achieved by a significant proportion of students (23 out of 72), is relatively low. The median for the final grade falls within band 3, specifically 55%–64%, which proves that a sufficient number of students were able to meet the requirements set for this online course at a fairly satisfactory level. Regarding the frequency of using course materials, the median falls within interval 3, meaning the students worked every other week. Interestingly, the mode for this category mirrors the median, which may have resulted from the students not being able to efficiently self-direct their learning, but it shows consistency in the obtained results.

Table 1

*Comparison of medians, modes, minimum, and maximum values of placement test scores, final grades, and frequency of course material use across course participants*

	<i>Median</i>	<i>Mode</i>	<i>Min</i>	<i>Max</i>
<b>Placement Score</b>	7	8	1	9
<b>Final Score</b>	3	1	1	5
<b>Frequency</b>	3	3	1	7

Note. The comparison of medians, modes, minimum, and maximum values of placement test scores, final grades, and frequency of course material use across course participants provided a comprehensive overview of the performance and engagement levels within the cohort.

The statistical model's validity and reliability is supported by the fulfilment of crucial assumptions. Both linearity, which ensures that the relationship between independent and dependent variables can be effectively represented by a linear model, and homoscedasticity, which indicates consistent residual variance across all levels of the independent variables, are met. Consequently, the sample is representative of the population.

In summary, based on the statistical analyses and the fulfilment of model assumptions, it should be emphasised that neither the placement score nor the frequency of using course material can reliably predict the final grade in the dataset. These results emphasize the need to explore other factors or variables that may influence academic performance. It appears that learning styles, cognitive factors, intrinsic and extrinsic motivation, self-regulation, and personal interests and goals have a more significant impact on learning outcomes in a gamified learning environment than initial language skills and the frequency of using course materials.

## Conclusions

The analysis of the survey results has shown that gamification can have a positive impact on the effectiveness of technical vocabulary instruction. The novelty of the created environment enhances student engagement and motivation. Game-like elements appear to make learning more enjoyable and encourage students to actively participate in the learning process. The element of surprise, resulting from the course's structure that reveals itself when participants successfully complete subsequent stages, serves as an additional stimulus to continue their coursework.

Furthermore, gamified learning experiences can be adapted to individual learners. This personalization can help students progress at their own pace and

address their unique learning needs. Although some students worked irregularly and accessed the course website at different intervals, they managed to meet the requirements and pass the course. The vast majority exceeded the 70-percent threshold, enabling them to finish with the highest grade. However, they had to do some extra tutor-marked assignments, not obligatory but adding additional percentage points granted by the tutor at the end of the course.

The effectiveness of gamification depends on the context in which it is used. It may be more effective for certain subjects or age groups and less so for others. This was partly supported by the students' comments, which indicated that they enjoyed the storyline about building a colony on another planet. They understood the reasons behind incorporating different topics and they did not object to studying context-specific vocabulary unrelated to their specialisation. Additionally, the workload and passing threshold requirements set for each stage were not overly burdensome, allowing students to allocate less effort, though not entirely avoiding it, to the sections that demanded more specialized knowledge, which they might have lacked as students pursuing an unrelated master's degree. It is worth emphasizing that many of the specific language structures and vocabulary identified and targeted in the quizzes can be applied when speaking and writing professional texts across various disciplines. In a traditional setting, master's students doing an English course at Gdansk University of Technology would not be exposed to contextualised technical language in context unrelated to their specialism. Thus, it can be concluded that the building-colony-based online course with a board game-like structure and various rewards engaged them in learning a variety of technical vocabulary.

While gamification can make learning fun or lighter when compared to a traditional classroom setting, it is crucial to strike a balance between entertainment and educational goals. Games should align with learning objectives and not become distractions. In this case, the colony building scenario did not infantilise the participants. It managed to introduce them to a variety of technical subjects. The course was built based on authentic materials, i.e., scientific articles, documentary programs, podcasts, and lectures. The resources discussed new technologies currently in use and showcased innovative solutions that are still in the testing phase, which encouraged the students to immerse in topics not necessarily related to their specialisation but building general education competence in technical subjects.

The long-term impact of gamification on learning is still a subject of research as shown in the referenced literature. While gamified activities can result in short-term increases in engagement and motivation, as supported by the data collected in this study, their long-term effectiveness may vary. Furthermore, the gamified course was promoted to approximately 250 master's students, but only 94 chose to enrol, and 10 dropped out at various stages. A significant majority, well over 50%, preferred attending teacher-led traditional classes. The reasons can vary, but

definitely one of them was the feeling of isolation the students suffered from during the COVID-19 pandemic, which they feared would again negatively influence their learning. Moreover, in-person contact hours with the teacher remain a much more preferred method for learning a foreign language for the students of Gdansk University of Technology.

Finally, it seems to be difficult for university students to self-direct self-paced learning required on an online course. However, the gamified experience, the element of innovation in teaching in particular, supposedly resulted in the students enjoying their learning experience and increasing the knowledge of technical vocabulary in focus to a satisfactory level.

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## Ocena wpływu gamifikacji na skuteczność uczenia się słownictwa technicznego

### Streszczenie

Wraz z rozwojem edukacji cyfrowej, gamifikacja stała się potencjalną strategią zwiększającą zaangażowanie i przyrost kompetencji studentów w różnych dziedzinach akademickich. Niniejsze badanie ma na celu ocenę wpływu gamifikacji na skuteczność uczenia się angielskiego słownictwa

technicznego. Wykorzystano dane zebrane od studentów studiów magisterskich Politechniki Gdańskiej, zapisanych na semestralny kurs języka technicznego, oferowany przez Centrum Języków Obcych. Przeprowadzono analizę porównawczą wyników testów diagnostycznych, ocen końcowych oraz częstotliwości korzystania z materiałów kursowych przez studentów. Dane z ankiet dostarczyły wglądu w postrzeganie przez studentów zgamifikowanych aktywności. Wyniki wskazują, że wprowadzenie gamifikacji miało pozytywny wpływ na skuteczność uczenia się w trakcie kursu online. Dzięki interakcjom wynikłym z wprowadzenia elementów gamifikacji, uczestnicy wykazali wyższy poziom motywacji, chęć aktywnego uczestnictwa oraz głębsze zrozumienie terminologii technicznej. Wyniki badania stanowią przyczynek do dyskusji na temat korzyści z gamifikacji w nauczaniu online, zwłaszcza w kontekście nauczania słownictwa technicznego, i oferują cenne wskazówki dla edukatorów i projektantów kursów, którzy poszukują innowacyjnych podejść zmierzających do optymalizacji doświadczeń edukacyjnych w wirtualnych środowiskach.

**Słowa kluczowe:** gamifikacja, techniczny angielski, ocenianie, efektywność, efekty uczenia się

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## **Evaluar el Impacto de la Gamificación en la Efectividad del Aprendizaje en la Instrucción de Vocabulario Técnico**

### **R e s u m e n**

Con el auge de la educación digital, la integración de elementos gamificados ha surgido como una estrategia potencial para mejorar la participación y comprensión de los estudiantes en diversas disciplinas académicas. Este estudio busca evaluar el impacto de la gamificación en la efectividad del aprendizaje en el ámbito de la instrucción de vocabulario técnico durante un curso en línea. Se empleó un enfoque de métodos mixtos que implicó la recopilación de datos de estudiantes inscritos en un programa de vocabulario técnico en línea ofrecido por el Centro de Idiomas de la Universidad de Tecnología de Gdansk. Se realizó un análisis cuantitativo de las puntuaciones de las pruebas de ubicación, la frecuencia de uso del material del curso y las calificaciones finales para comprender su impacto en los resultados del aprendizaje, y los datos de las encuestas proporcionaron información sobre las percepciones y experiencias de los estudiantes con las actividades gamificadas. Los hallazgos indican que la incorporación de la gamificación influyó positivamente en la efectividad del aprendizaje durante el curso en línea. Los participantes demostraron niveles más altos de motivación, participación activa y una comprensión más profunda de la terminología técnica lograda a través de interacciones gamificadas. Los resultados del estudio contribuyen al creciente cuerpo de investigación sobre los posibles beneficios de la gamificación en entornos de aprendizaje en línea, especialmente en el contexto de la instrucción de vocabulario técnico, y ofrecen valiosas implicaciones para educadores y diseñadores de cursos que buscan enfoques innovadores para optimizar las experiencias de aprendizaje en entornos virtuales.

**Palabras clave:** gamificación, ESP (inglés con fines específicos), inglés técnico, evaluación, eficacia, resultados de aprendizaje

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## **Оценка влияния геймификации на эффективность обучения технической лексике**

### **Аннотация**

С ростом цифрового образования интеграция игровых элементов выходит на передний план как потенциальная стратегия повышения заинтересованности и понимания студентов в различных академических дисциплинах. Это исследование направлено на оценку влияния геймификации на эффективность обучения в области обучения технической лексике во время онлайн-курса. Был использован комбинированный подход, включающий сбор данных от студентов, обучающихся на онлайн-курсе технической лексики, предлагаемый Языковым центром Гданьского технологического университета. Проведен количественный анализ результатов вступительных тестов, частоты использования учебного материала и конечных оценок для понимания их влияния на результаты обучения, и данные из опросов предоставили представление о восприятии и опыте студентов с игровыми активностями. Выводы свидетельствуют о том, что внедрение геймификации положительно повлияло на эффективность обучения во время онлайн-курса. Участники проявили более высокий уровень мотивации, активного участия и более глубокого понимания технической терминологии благодаря игровым взаимодействиям. Выводы исследования способствуют росту объема научных исследований возможных преимуществ геймификации в онлайн-учебных средах, особенно в контексте обучения технической лексике, и предоставляют ценные рекомендации для преподавателей и разработчиков курсов, которые ищут инновационные подходы для оптимизации учебного опыта в виртуальных средах.

**К л ю ч е в ы е с л о в а:** геймификация, английский для специальных целей (ESP), технический английский, оценка, эффективность, результаты обучения