Gamifying Classroom Presentations: Evaluating the Effects on Engagement Across Demographic Factors

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Abstract:
Despite the increasing recognition of the importance of active learning methods and initiatives aimed at promoting them, lecture- and presentation-based teaching remains the dominant instructional strategy in many fields. Major reasons for this include teachers' lack of time for preparing more engaging learning activities, as well as their lack of know-how and confidence in applying active learning methods. However, not all active learning methods demand much additional effort on the lecturer's part or require a significant time investment to learn. A case in point is gamification, at least at the basic level of introducing immediate feedback, extrinsic performance rewards, and a playful frame. Combining such light-weight gamification with traditional presentation does not require much time for preparation, but may help increase audience engagement.

When teaching various game-related courses, we designed classroom presentations in the form of a quiz: before providing a new piece of information, a question about the current topic was asked, and the audience had a chance to answer. Correct answers were rewarded with points and the winners of the quiz received a prize. Our objective was to find out what level of engagement a gamified presentation could reach. We used the model of flow and a short questionnaire at the end of every presentation in order to collect feedback from a diverse assortment of students both at the university level and in continuing education. An analysis of the resulting data suggests that gamification led to participants being moderately engaged in the activity. Comparing the results across various demographic categories indicates that such factors as age, gender, nationality, and occupation have little to moderate effect on participants' engagement.

Keywords: gamification, classroom presentation, active learning, engagement, quiz, demographic factors

1. Introduction

Play occupies much of our early educational journey, owing to such advocates of play in early-childhood education as Froebel and Vygotsky. Yet, the older we get, the less we tend to play in the classroom. By the time we advance to higher education, we seemingly "graduate" from play altogether, with lecture being the dominant teaching method. Adult learners, after all, are expected to be motivated and self-directed enough to acquire information regardless of the teaching method. But are they indeed? Not if you look at course feedback, which suggests that students consider traditional lectures to be boring and unmotivating. This is reflected in the famous saying describing lecturing as the transference of the lecturer's notes into the students' notebooks without passing through the brains of either.

Incorporating more playful activities in the classroom could help challenge this perception. However, lectures and teacher presentations are difficult to avoid altogether, due to practical reasons: they are easier to prepare; they can cover more material in a limited time; they do not require pre-existing familiarity with the subject matter on the learners' part.

Gamification could be the middle ground, allowing teachers to make their lectures more engaging without demanding that they eschew the lecture format altogether or requiring the commitment associated with other active learning methods such as game-based learning. But would such an approach actually help? And would it help *everyone* or only a subset of learners who are more receptive to gamification?

The present article seeks to offer an answer by evaluating the effects of gamifying a class presentation on student engagement in the context of a series of workshops featuring diverse participants. Methodologically, this study combines design-based research and a survey: first, a lecture was re-designed as a gamified quiz; then, feedback was collected from the learners, and Csikszentmihalyi's (1990) model of flow was adopted to evaluate the results. In the process, the following research questions were posed:

1. How can a gamified presentation be designed?
2. To what extent can a gamified presentation improve student engagement?
3. How does students' performance influence their engagement levels?
4. How does the learners' background influence their engagement in a gamified presentation?

2. Theoretical background

Gamification is often defined as the use of game elements or metaphors in non-game environments (Deterding et al. 2011) in order to influence behaviour, improve motivation and enhance engagement. While sometimes criticised as vague or reductive (Tulloch 2014), this definition has been employed by many practitioners seeking to make various tasks more effective or enjoyable (Brühlmann 2013). In education, aided by the increased availability of technology in the classroom, gamification has been employed at various scales, from individual exercises and lectures to entire courses (Dichev & Dicheva 2017).

One of gamification's purported benefits is the ability to increase engagement in an activity, that is, to keep participants focused, interested and enjoying themselves, which, in an educational setting, can improve learning outcomes (Hamari et al. 2016). Engagement, according to Brown and Cairns (2004), is a starting point and precondition for deeper immersion in an activity; it can be promoted through such game elements as fun, socialisation, identity, challenges, clear goals, rules and feedback (Cheong et al. 2013).

Many of the above elements map onto Csikszentmihalyi's (1990) concept of flow, which denotes a pleasant state of mind whereby one is so absorbed in an activity that they lose track of time and forget about other things. Engagement has indeed been found to correlate with flow (Shernoff et al. 2014; Hamari et al. 2016).

Csikszentmihalyi describes flow as comprising the following dimensions:

1. *Clear goals*
2. *Unambiguous feedback*
3. *Balance between challenge and skill*
4. *Sense of control*
5. *Concentration*
6. *Action–awareness merging*, i.e. deep and effortless involvement whereby participants feel oneness with the activity (Brühlmann 2013)
7. *Losing self-consciousness*
8. *Time transformation*, i.e. time passing faster than expected.
9. *Autotelic experience*, i.e. performing the activity for its own sake (Brühlmann 2013)

The first three dimensions (skill–challenge balance, clear goals and unambiguous feedback) are preconditions for flow to occur; control and concentration are middle-level flow-enabling factors, which simultaneously result from the lower-level factors and contribute to flow; action–awareness merging, time transformation and losing self-consciousness are evidence of flow occurring. Finally, autotelic experience is effectively flow itself. Sillaots and Jesmin (2016) visualised the relationships between the flow dimensions as follows:

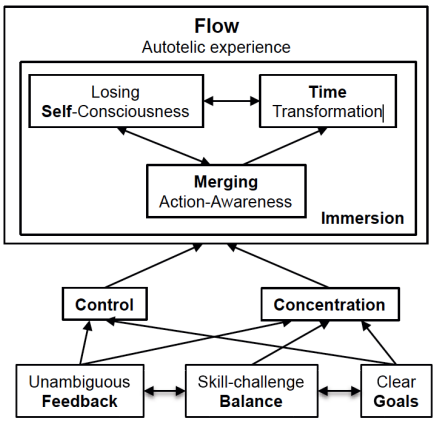

Figure 1. Model of Flow (nodes describe flow dimensions and arrows between nodes describe potential causalities between flow dimensions). Source: Sillaots & Jesmin 2016.

Several studies have attempted to gamify presentations or traditional lectures in higher education, many of them with the purpose of achieving engagement and/or flow. Pettit et al. (2015) interspersed various questions throughout presentations, which students answered using clickers. The researchers combined a wide array of game elements and mechanics to make each lesson unique, and survey results indicated increased student engagement and interest in the subject. Students highlighted individual competition and question variety as particularly important engagement factors. Tanaka et al. (2016) similarly found that a gamified quiz improved motivation in 44% of learners, but pointed out that while competition excited some students, it discouraged others. Sailer and Sailer (2020), combining two active learning methods, applied gamification in a flipped classroom setting and argued that team competition, rather than individual competition, leads to higher fulfilment of students' need for social relatedness and thus higher motivation.

Pechenkina et al. (2017) performed a survey of a large sample, confirming that post-lecture and pre-tutorial use of gamified mobile quiz apps improved learners' engagement and academic performance. Conversely, Nakada's (2017) use of paper-based tests to gamify lectures, while raising student satisfaction, failed to show improvement in academic achievement. Korkealehto and Siklander (2018) showed that the degree of improvement in engagement varies between different gamification platforms, and Jones and Wisniewski (2019) discussed how individual platforms' technological limitations may compromise their effectiveness.

While the studies above come from different countries — the US, Japan, the UK, Australia and Finland — few attempts have been made to examine the cross-cultural aspects of gamification. A systematic review by Subhash and Cudney (2018) suggests that gamification is adopted across the globe, but some nations, such as Spain and the US, emerge as leaders in the field, whereas in other cultures both teachers and students might be reluctant to embrace gamification. This may be in part due to historical differences in the ways national education systems function; but this also, as Khaled (2015) argues, may have to do with cultural biases inherent to current gamification design practices, which prioritise mastery, competition and hierarchy — values that hold less appeal in cultures that prioritise egalitarianism and social harmony. Indeed, comparative studies by Kim and Kim (2018) and Machhammer (2019) demonstrated that both Austrian and Korean students were receptive to gamification, but expressed preference for different gamification elements, with Austrian students displaying a stronger preference for "cognitive fun" elements such as narrative, aesthetics and freedom to fail, while their Korean counterparts focused more on reward elements such as badges and levels, as well as on social interaction. Overall, such comparative studies have been scarce and offered limited contextualisation, with a recent systematic review by van der Poll et al. (2019: 495) concluding that "[m]ore research is needed to explore the sociocultural factors that influence the adoption of gamification".

Other demographic factors such as age and gender have likewise not often been examined in the context of gamification in education. A notable exception is a study by Pedro et al. (2015), which found boys benefitted from gamification more than girls. Koivisto and Hamari (2014) found the opposite was the case, but their study did not specifically focus on education; another major conclusion from their study was that the benefits of gamification diminish with age.

In light of previous studies' inconclusive, and at times contradictory, findings and their limited consideration for demographic factors, we believe there is room for another quiz-based study that examines the effects of gamifying classroom presentations and was conducted with participants from different backgrounds.

3. Methodology

3.1 Gamification design and implementation

The first stage of the present study was rooted in design-based research and involved designing a gamified presentation in order to increase student engagement during an introductory lecture on the subjects of gamification and game-based learning. Following Werbach and Hunter's (2012) gamification framework, the design was broken down into the following steps:

1. We defined the *expected behaviour* as participants being engaged in the presentation and not distracted by other activities.
2. Wishing for the participants to enjoy the learning experience, we set the *measurable objective* for students to experience engagement and flow at least at the lowest positive level (5 on a scale from 1 to 7).

3. The *target group* were participants in short workshops (90 minutes) or, more often, week-long courses on game design, gamification or game-based learning. Their demographic data displayed significant variation, but all were united by a shared interest in games and play, making gamification a reasonable choice of approach.
4. The main *extrinsic motivator* was a point system, whereby participants would get a point for each correct answer and scores were kept on a whiteboard visible to everyone. At the end of the quiz, the winners received a small prize (a chocolate or box of sweets).
5. Quizzes, in and of themselves, provide only a limited challenge based on factual knowledge and time constraint and are rarely engaging per se. But, depending on the context, they may still involve *intrinsic motivators*: in our case, we aimed for evoking the feeling of competence and joy at giving the correct answer, as well as the social engagement of having a discussion and receiving rich feedback.
6. *Feedback* was offered by the instructor immediately after each answer, either purely verbally or in the form of a slide with accompanying commentary. Participants could also offer their own feedback, which they did on many occasions.
7. When designing the *progression*, we decided against disclosing the number of questions to the participants to allow some flexibility (in many cases, the final questions had to be skipped due to a lack of time). However, all participants knew that the activity would last 90 minutes and had an overview of everyone's progress on the whiteboard.
8. The *entertaining elements* involved included the game-like challenges of the quiz, the social engagement and discussion, as well as the variety of the questions.
9. The design culminated in *implementation*: participants were invited to play a quiz game. After the rules were explained, participants were divided into small groups (group sizes varied between the sessions). Each topic covered in the lecture was preceded by a question, with teams having a chance to answer. After this, the correct answer was revealed on the next slide, followed by a deeper discussion. Some of the questions tested the participants' attention and were easy to answer; others were more challenging. Some questions only had one correct answer, while others were more open-ended, with a long list of suggested answers and an opportunity for each team to earn a point. While correct answers were rewarded with a point, incorrect answers were not penalised. An example of the content of the presentation (without the questions) is available here: https://www.slideshare.net/martinsillaots/gamification-46372304. At the end of each session, participants were asked to fill in a short online questionnaire, as discussed below.

3.2 Survey design

The next stage of the study involved designing and carrying out a survey to evaluate the effects of gamification on workshop participants' engagement and flow. The data would be collected from a series of workshops whose participants came from a variety of cultural and professional backgrounds, making it difficult to describe a clear population for the study. It was, rather, the specific occasion that brought them together: attending a short course on gamification, game design or game-based learning. Due to the use of convenience sampling, generalisations from this research are problematic; at the same time, the diverse assortment of participants is arguably indicative of this field of learning, which has inspired interest in practitioners from various backgrounds.

Measuring flow in the context of a short workshop presented a challenge. Several instruments exist for measuring flow, including Experience Sampling Method (ESM; Hektner, Schmidt & Csikszentmihalyi 2007), Flow State Scale (FSL; Jackson & Marsh, 1996), GameFlow (Sweetser & Wyeth, 2005) and variations and updates of the above. However, these instruments tend to require too much time commitment to be usable in a 90-minute workshop. Drawing inspiration from ESM and FSL, we designed a shorter questionnaire where each dimension of flow was measured with a single question, with some questions deriving directly from FSL:

1. *Clear goals:* The purpose of the task was clear to me.
2. *Feedback:* I knew how I was doing while performing.
3. *Skill-challenge balance:* The task was slightly above my competences.
4. *Control:* I could control what I was doing.
5. *Concentration:* It was easy to focus on the task.
6. *Merging action-awareness:* I performed automatically.
7. *Losing self-consciousness:* I stopped worrying about other issues.
8. *Time transformation:* Time passed faster than I expected.

9. *Autotelic experience:* The experience left me feeling great.

A 7-point Likert scale was used for each question (1=strongly disagree; …; 7=strongly agree).

Additionally, background information was collected, including gender, age and occupation. Participants were also asked to disclose their team's result in the quiz. Finally, they were offered an opportunity to provide free-form feedback on the experience. The questionnaire is available here: tinyurl.com/gamificationfeedback.

263 responses were collected in total. Of these, two records were removed from the database due to being duplicate entries. Additional data fields were created to reflect relevant background information:

- *Age groups*
- *Occupation groups*
- *Occasion* (90-minute workshop or a week-long course)
- *Country*

After this, the total flow was calculated for each record as the arithmetic average of the flow dimensions listed above. However, the first five dimensions (clear goals, feedback, skill-challenge balance, concentration and control) are flow-enabling factors, meaning they are necessary prerequisites for flow, but not sufficient to guarantee it occurring. Due to this, Sillaots and Jesmin (2016) have suggested measuring the level of flow based on the higher-level dimensions, which provide evidence of flow: merging action-awareness, time transformation, losing self-consciousness and autotelic experience. Calculating flow from all nine dimensions tends to produce higher results compared to measuring it based on the four evidence dimensions. In the present study, too, there indeed was a small but statistically significant difference: the level of flow based on all nine dimensions averaged 5.41, whereas the result based on the four higher-level dimensions was 5.30 (the difference is 2.0%; $t(260)=3.741$ with $p<0.001$). For the present article, we decided to calculate flow based only on the four flow evidence dimensions. This was done in order to avoid distortions related to essential gamification elements such as clear goals and feedback, which tend to be evaluated positively in most cases.

In addition to the flow level, we also calculated the totals for each of the flow dimensions (arithmetic average and standard deviation) in order to evaluate the presence of all flow elements in the gamified activity. We also calculated flow for sub-groups based on gender, age range, occupation, country and occasion in order to see whether there are any significant differences between the sub-groups. Finally, we examined the correlation between the flow level and the ranking of the respondent's team at the end of the gamified quiz.

In order to check reliability, we evaluated the internal consistency of the collected data by calculating the Cronbach's Alpha of all variables. The result was 0.828, suggesting good internal consistency ($\alpha>0.7$). The t-test and ANOVA were used to assess differences between the levels of flow for different groups.

4. Results and discussion

4.1 General statistics

The gamified presentation, with minor variations, was used 24 times between April 2016 and February 2020. Feedback was collected on most, but not all occasions: sometimes, we ended up running out of time before we could collect it or the discussion was so active that the instructor was reluctant to interrupt it by asking participants to fill in a questionnaire. The present study only evaluates the occasions on which feedback was indeed collected.

Overall, 558 learners took part in the presentation. Of them, 261 (47%) responded to the questionnaire.

Seven times, the 90-minute presentation was a standalone activity; on 17 occasions, it was used as an introduction to a bigger course. In most cases (17 out of 24), the participants were school teachers or higher education professionals. In three cases, the participants were university students. On the other occasions, the attendees were from a wide range of organisations and had different backgrounds: entrepreneurs and corporate employees, government officials, police officers, game designers and developers. Geographically,

the participants came from across the globe; the nations with the highest representation were Thailand (60 participants), Estonia (31) and Greece (12).

4.2 Flow dimensions, engagement, and performance

All of the flow dimensions averaged on the positive side of the scale. The highest value is associated with the first flow dimension: clear goals. This may not, however, necessarily indicate flow: introducing the goals of an activity is standard practice in education, and our gamified presentation was no exception. The lowest average was for the third dimension (skill–challenge balance), in response to the prompt "The task was slightly above my competences". This suggests that there is room for improvement (or balancing, to use a game design term) in terms of skill–challenge balance, which is a challenge often encountered when gamifying classroom activities (Sailer & Sailer 2020). The question itself, however, offers no indication as to whether the tasks were too easy or too difficult (or alternated between the two). Some insights into that can be gleaned from participants' free-text comments, as discussed below.

Table 1: Total average values of individual flow dimensions

Question	Average	St. Dev.
1 - Goals	6.06	1.08
2 - Feedback	5.83	1.20
3 - Balance	4.25	1.88
4 - Control	5.63	1.30
5 - Concentration	5.73	1.27
6 - Merge	5.00	1.49
7 - Self	5.13	1.53
8 - Time	5.42	1.49
9 - Autotelic experience	5.66	1.30

The overall level of flow was calculated based on elements 6–9, i.e. the four flow evidence dimensions: action–awareness merging, time transformation, losing self-consciousness and autotelic experience. The resulting value was 5.30 with a standard deviation of 1.13. The answer to RQ2 ("To what extent can a gamified presentation improve student engagement?"), then, is that it can do so to a reasonable degree, since the data suggest that the quiz participants experienced a fair degree of flow, which in turn suggests engagement. While a gamified quiz is perhaps not as immersive as a full-fledged interactive game, engagement in an activity is the first, basic step towards immersion (Brown & Cairns 2004) and it stands to reason that flow experience would trigger it.

There is a small negative correlation (-0.14) between respondents' performance, i.e. their team's placement in the quiz, and their level of flow. The answer to RQ3 ("How does students' performance influence their engagement levels?") is thus that students who perform worse experience flow to a slightly lesser degree. This does not necessarily mean that poor performance "kills" flow. It could be that participants who are less motivated by competition pay less attention to the score and are less engaged in competitive activities in the first place, meaning that the below-par performance is the result, not the cause, of lower flow and engagement. This interpretation supports Tanaka et al.'s (2016) conclusion that competitive classroom activities are not equally engaging to all learners.

A fundamental limitation of this approach is that, since we only examined the flow levels for participants in the gamified quiz, it is impossible to say to what extent participant engagement resulted from the gamification as opposed to the content of the lecture itself. It might be that the participants would have been engaged in a non-gamified lecture to a similar degree because they found the subject itself interesting. Yet, our teaching experience strongly suggests that gamification did account for at least some of the engagement, and participants' free-form reflections, discussed below, further support that point.

4.3 Demographic factors' effects on flow

The hypothesis behind RQ4 ("How does the learners' background influence their engagement in a gamified presentation?") was that not all learners experience flow equally, and neither is everyone likely to be engaged in the gamified presentation to the same degree. In order to establish whether that was the case, we compared flow levels between different sub-groups.

There was a small difference between male and female participants' flow levels, but it was not statistically significant (t-test p=0.651). Contrary to Pedro et al.'s (2015) findings, which suggested that boys benefit from gamification more than girls do, as well as to Koivisto and Hamari's (2014) opposing claim that women report greater benefits from gamification, we found no evidence that either gender is significantly more receptive to gamification. The study by Koivisto and Hamari, however, did not examine the educational context; rather, it focused on gamified exercise. The mismatch between our results and those of Pedro et al. could be due to cultural differences (such as women in certain cultural contexts having more exposure to digital games), the age difference (Pedro et al.'s respondents were aged 12–13, whereas ours were adults), or the nature of the specific gamification design itself. It should also be pointed out that the study by Pedro et al. was based on a small sample (16 participants), which makes it difficult to extrapolate its findings.

Table 2: Level of flow by gender

Gender	Flow (4D)	St. Dev.	N
Female	5.14	1.12	138
Male	5.24	1.16	115

Table 3: The levels of flow by age groups

Age Group	Flow	St. Dev.	N
15–19	4.90	1.41	8
20–29	5.09	1,13	87
30–39	5.64	0.95	63
40–49	5.42	1.09	49
50–59	4.96	1.33	24
60–69	5.54	0.86	6

While most of the age groups we analysed cover a decade, there were no participants aged under 15 (in fact, all participants but the one 15-year-old were aged 18 or more). The flow level was the highest in the 30–39 age group. This could be the "sweet spot" because at this age participants are likely to be well-familiar with digital technology and games in order to appreciate the benefits of gamification and be interested in it and yet have enough experience of education and professional trainings to not expect them to rival actual video games in terms of engagement. Conversely, the youngest age group (15–19) reported the lowest level of flow. This could be due to having more exposure to games, which could lead to having higher expectations towards the gamified activity. The difference between these two groups is statistically significant (p=0.033; ANOVA(5;231)=2.676), while the differences between the other groups are not. This does not support Koivisto and Hamari's (2014) conclusion that the benefits of gamification decline with age, which could have to do with the fact that their findings come from a different context — exercising — where age differences may manifest themselves differently.

We also attempted to group flow levels according to the respondents' occupations. The table below features the most common occupations among the participants (other occupations had too few representatives to be included).

Table 4: The levels of flow by occupation of the participants

Profession	Flow	St. Dev.	N
Developer	4.55	1.07	7
Lawyer	5.25	0.89	21
Student	4.93	1.28	45
Teacher	5.35	1.13	111

Teachers reported the highest engagement levels, perhaps owing to the fact that the presentation's focus on gamification in education and game-based learning spoke to their pre-existing interest in education. By contrast, software developers were the least engaged. This might be due to their greater experience with digital games or due to the use of PowerPoint slides and a whiteboard not conforming to their higher expectations of educational technology. At any rate, the differences between the occupations are not significant.

Finally, we compared the levels of flow reported by representatives of different nations. Four nations (Thailand, Estonia, Greece and South Korea) had five or more participants represented.

Table 5: The levels of flow by nation of the participants

Country	Flow	St. Dev.	N
Estonia	5.25	0.89	31
Greece	5.63	0.63	12
South Korea	6.67	0.62	5
Thailand	5.11	0.98	60

The South Korean participants reported the highest flow levels. However, this group also experienced language and communication issues throughout the event; coupled with the small number of respondents, this leads us to take the result with a pinch of salt. Otherwise, the differences between the nations do not reach statistical significance.

The lack of significant differences between the participants provides ample food for thought. It certainly does not refute Khaled's (2015) idea that current gamification practices are not equally well-suited to all cultures: not enough countries were represented in the sample to make that claim, and neither did we examine any cultural factors beyond merely asking participants where they came from. But the data do hint at the possibility that, in today's age of "digital globalisation" (Bughin et al. 2016), the effects of cultural factors on people's experiences of digital trends such as gamification may be less pronounced than before.

In sum, in response to RQ4 ("How does the learners' background can influence their engagement in a gamified presentation?") we may conclude that while age may have a small effect on participants' engagement, other demographic factors (gender, nationality, occupation) have shown no such effect.

4.4 Design considerations

The first research question posed by this study focused on the practicalities of designing a gamified presentation. The design process itself was discussed in Section 3.1. The remaining question is whether the design was adequate to the task.

The fact that, as the findings above demonstrate, the gamified presentation was able to generate flow and engagement suggests that, overall, the design was successful and the choice of Werbach and Hunter's (2012) framework was justified. We found no significant difference between participants in the 90-minute workshop and those who took the week-long course, suggesting that the quiz was suitable for both purposes.

Participants' free-form comments further prove this, with the following keywords being used recurrently: *great, fun, motivated, happy, interesting, dynamic, inspiring, happy, exciting, enjoyable, nice, informative.*

At the same time, some of the feedback reveals potential shortcomings in the design. One respondent criticised the quiz's premise of introducing potentially unknown information (rather than testing existing knowledge), pointing out that for many participants this resulted in frantically looking up information online after the question has been posed. While such spontaneous information search can be viewed as active learning, it does not constitute fair competition, which was perhaps what irked the respondent. Another respondent said he enjoyed the activity, but "was surprised how much I was concentrating on points and comparing [our team's performance] with the other groups"; this suggests that the extrinsic element of points may have overtaken the intrinsic enjoyment of discussion and learning new information for some of the players. Yet another participant was critical of the fact that teams were not allowed to venture another answer to the same question after an incorrect one; the rule was implemented to balance the progress of different teams, but ended up making some feeling that they were not given a fair shot (for example, if a teammate had shouted out an incorrect answer before they had a chance to offer theirs). The same feeling was expressed by a few more respondents who felt their teams were not given a fair opportunity due to other teams shouting out answers more quickly (for questions with a single correct answer, whoever provided it first earned the point). Finally, some respondents found the experience too routine or the content too theoretical; one suggested that their time would be better spent playing "real games".

Some of these considerations could inform the design of a future gamified quiz: for example, the emphasis on competition could be counterbalanced with some collaborative tasks to appeal to less competitive participants; and a digital platform could be used instead of a whiteboard to allow all teams to provide an answer rather than move on to the next round as soon as one team has answered correctly. Other suggestions may point to the inherent limitations of gamification: however well-designed, gamification, by definition, will not produce a "real game" (although more game elements could certainly be added to further improve participant engagement).

5. Conclusion

The present study examined the design of a gamified presentation and the effects of its use in the classroom on student engagement. The results suggest that gamifying a classroom presentation by incorporating a quiz mechanic and a simple point system can lead to a moderate level of participant engagement. However, the effect shows some variation: participants on losing teams are likely to be somewhat less engaged, and there are age differences, with the 30–39 group being the most engaged. Other demographic factors (gender, professional background, nationality) have not been shown to affect the level of engagement to a significant extent.

While this study aimed to cover a vast territory by examining a wide range of factors, future research could examine individual factors such as gender or cultural background in more depth and across a variety of contexts. This would inform better gamification design in diverse educational settings and help practitioners improve the outcomes of their gamified activities.

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