

Teachers' perception and adoption of a gamified blended learning implementation in upper secondary education

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Abstract

The present explorative case study addresses teacher perception and adoption of a gamification implementation in five classes consisting of 127 students at an upper secondary school in Sweden. Multisession semi-structured interviews with three teachers involved in the implementation were conducted, followed by thematic analysis based on Moore and Benbasat's model for Adoption of information technologies. The main results indicate that adoption factors should be considered when implementing gamification in the classroom. This relates to connecting the gamification design to student progress, communicating with teachers on the relative advantage of the implementation, considering teachers' needs, such as technology support, preparation, collaboration and clarification, and visualizing the outcomes of gamification implementations to teachers.

Keywords 1

Adoption factors, Blended learning, Education, Gamification, Teacher perception, Upper-secondary education

1. Introduction

Motivating and engaging learning environments play a crucial role in student learning and behavior [1, 2, 3, 4]. Two approaches that have been suggested to increase motivation and engagement in education are gamification and Game Based Learning (GBL) [5, 6, 7]. Gamification is a motivational strategy in which game-elements [9] and gameful-design principles [8] are applied to a non-game context, and the interrelated concept of GBL, is the use of entire games for educational purposes [10].

For teachers, challenges might arise when implementing new technologies in the classroom. In Sweden, the risk of newly graduated teachers with inadequate information and computer technology (ICT) has been high, resulting in the underutilization of technology in the classroom [11]. Compared to other

OECD countries, Swedish teachers experience equivalent or more ICT competence but have less confidence in the effect of digitalization and less motivation to use information technologies [12]. This discrepancy calls for clarification in teachers' perception when implementing novel technologies in the classroom. There has to the authors' knowledge been limited applications of gamification in the classroom in a Scandinavian setting. Therefore, before presenting the present case study, previous studies related to the adoption of gamification and GBL implementations in a Scandinavian setting are reviewed.

Adoption of GBL can depend on teachers' individual traits and perception of games. In a survey study conducted with over 1500 primary and secondary school teachers in Finland, teacher adoption of GBL depended on teachers' openness to ICT as well as their self-efficacy and attitude [13]. In other qualitative studies

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conducted in Scandinavian settings, one concern expressed by teachers was the perception that games are distracting and risk resulting in less learning for students [1, 14]. Another disadvantage previously discussed with GBL is that teachers might be unfamiliar with computer games which may lead to anxiety or create aversion to use them for educational purposes [15]. It has also been acknowledged that some teachers are afraid to introduce games into their learning environment, as they presume that games are at their essence competitive, which can increase student anxiety [16].

Environmental factors such as compatibility with teaching and supportive organizational ICT culture has also been shown to effect teacher adoption of GBL [13]. In his doctoral dissertation, Berg-Marklund [17] criticized GBL for performing differently in live school settings compared to experimental settings due to teachers' varied knowledge or interest in digital tools provided in the classroom. To make educational games viable, Berg-Marklund [17] claimed that both educators and developers need to alter their working processes, their perceptions of games and teaching, as well as the way they collaborate and communicate with each other and other actors within the educational system.

In another study, Cruaud [18] interviewed two teachers who used a gamified application during one school year in their foreign language classes in upper secondary education. The first teacher had a positive experience and was active in the use of the application, whereas the second teacher viewed the implementation as unfavorable and interpreted it as a loss of control in the learning environment. Cruaud [18] argues that the divergence of the teachers' experiences can derive from the first teacher taking an active role and ownership of application while the second teacher took a passive role, had had an absent involvement in the design process and showed lack of confidence toward the application.

To deepen the understanding of teacher perception and adoption of gamification in the classroom the present study investigates teachers' experience of a gamification implementation. This is done through the lens of Moore and Benbasat's [19] model for Adoption of IT. Moore and Benbasat's [19] model is an adaption of Rogers [20] Innovation Diffusion Theory (IDT), which describes *how*,

why and at *what rate* innovation spreads. Moore and Benbasat [19] adapted the characteristics of IDT and refined the model as the following set of eight core constructs that could be used to study innovation in IT: 1) Relative Advantage, that is perceived as being better than its forerunner. 2) Ease of Use, that is degree to which an innovation is perceived as being difficult to use. 3) Image, that is perceived to enhance one's image or status in one's social environment. 4) Visibility, that is degree to which the individual can see others using the system in the organization. 5) Compatibility, that is degree to which an innovation is perceived as being consistent with one's existing values, needs, and past experiences. 6) Results Demonstrability, that is tangibility of the outcome of using the innovation, including observability and communicability. 7) Triability, that is degree of experimentation before adoption. 8) Voluntariness of Use, that is degree to which use of the innovation is perceived as being voluntary [19].

In the present case, gamification was implemented at a practically oriented upper secondary school in Sweden during seven weeks of a mathematics course. The aim and expectation of the gamification implementation was to increase the number of students passing the course, since the school had a previous problem of not enough students passing the course. In this study, an exploratory approach is taken to answer the following research questions: RQ1: What is the expressed teacher perception of a gamification implementation in upper secondary education? RQ2: Which adoption factors are expressed by upper secondary education teachers when implementing gamification in a blended learning course?

2. Methods

Three teachers were involved in the gamification project. Respondent 1 was a 48-year-old female with 30 years of teaching experience. Respondent 2 was a 33-year-old male with a five-year teaching experience, and Respondent 3 was a 50-year-old male who had been working as a teacher for 15 years. There were five classes with 127 students in total. Respondent 1 and 2 oversaw two classes each, and Respondent 3 oversaw one class. The courses had previously had low levels of digital

aspects included in the education. Respondent 1 had limited experience using Google Classroom, while Respondent 2 and 3 had used it before the gamification implementation. Respondent 1 and 3 had never heard of gamification previously while Respondent 2 was familiar with the term.

2.1 Gamification implementation

Prior to the implementation, the teachers created a Classroom (course) in the schools Google Classroom learning management system (LMS) consisting of digital course material, quizzes, videos and links to other learning resources. A gamified API was added to the LMS as a Chrome extension, adding a widget to the interface, which contained the game elements level, shop and achievements. The API was developed by a gamification studio. The implementation was done in a math course using a blended learning approach. The students worked with computers, provided by the school, and the LMS as an educational tool, as well as with analogue learning material during the lessons and at home.

The completion of achievements afforded experience points to the level element and included online activity i.e., doing math quizzes or logging into the LMS, as well as campus activity i.e., contributing to a classroom discussion or helping a friend. After the students had progressed in level, they were able to buy point for the upcoming exam through virtual coins earned in the shop. The game elements triggered automatically when the students performed different activities in the LMS. At the end of each lesson, the students did a digital exit ticket to repeat the days' lesson material. The implementation took place in the middle of the semester, from the beginning of November to mid-December. An open communication channel was set up between Respondent 2 and the gamification designers to assist the teachers with any technical issues. The gamification design and implementation has been presented further in the short paper "Don't be boring, the case of a gamified Google Classroom" [21]. The API can be viewed here: <https://docs.google.com/presentation/d/1zSepCeKgD7RVvDw12gQ6wy5IcFsXcmzJ-XcCOjQye3w/edit?usp=sharing>.

2.2 Data collection and analysis

To ensure the extraction of core information from the teachers while providing flexibility to inquire more deeply into the narratives that the teachers shared, a multisession semi-structured interview approach was taken [22]. The teachers participated in two semi-connected interview sessions, one in the beginning of the implementation and one after two months. The interviews were conducted online and lasted between 20 to 30 minutes per session and were all recorded after getting consent from the respondents. The interviews included questions related to the teachers' expectations with the implementation, their experience of gamification in the classroom and its effect on students and on their own working environment.

As recommended by Belotto [23] as a means to gain inter-rater reliability, both authors initially discussed the case and agreed on the research method. Interview questions were prepared before the first interview; first separately by author 1 and 2 and later discussed, revised, and merged. The questions for the second interview session were decided by the authors after the initial interviews to enable insights from the first session. Prior to the implementation Author 2 took part in the gamification workshop and participated in several meetings with the headmaster and the teachers. Author 1 therefore conducted the interviews to encourage the participants to talk freely of their experience.

After the interviews the recordings were transcribed word for word. In the analysis of the data the thematic coding process presented by Gioia et al. [24] was used, with the sense-making of the teachers being a focal study point. To reduce the error and bias generated when individuals processed sets of text-based data generated by qualitative investigation the authors used procedures of intercoder reliability checks [25]. The authors conducted three rounds of checks in the beginning, middle and at the end of the study. After author 1 had conducted the interviews, the transcripts were read though once and later coded into first order

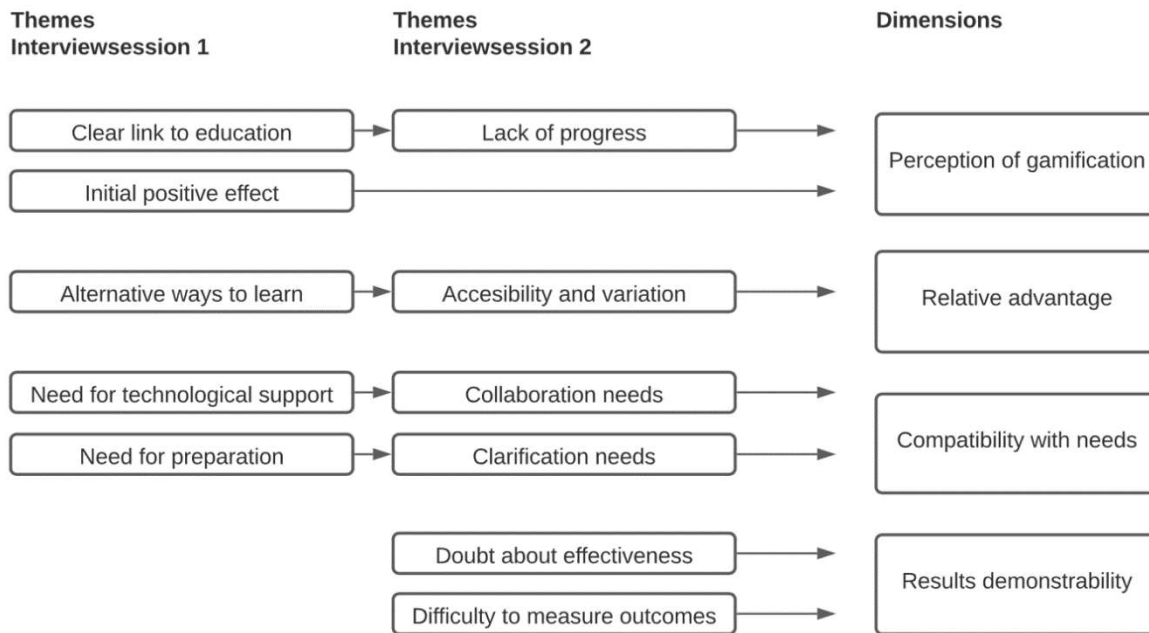


Figure 2. Themes and dimensions related to gamification perception and adoption factors

concepts. themes and dimensions were found related to the RQ1. Several codes could also be identified related to adoption factors. Therefore, the researchers created RQ2 from the data related to the factors that can affect the adoption of gamification. First order concepts related to RQ1 and RQ2 were thereafter studied and grouped related to RQ1 and RQ2 by moving related concepts closer to each other and by moving non-related concepts further apart. Concepts that were mentioned by one of the teachers and unrelated to the other concepts or irrelevant from the view of the research questions were discarded. From the clusters created by the first order concepts, second order themes were taken out as a summary of the main theme in the concepts. The same process was repeated when moving from second order themes into aggregated dimensions, with the second order themes first being clustered from relatedness and later summarized into aggregated dimensions.

3. Results

Four aggregated dimensions emerged based on the research questions (Figure 2.). The first aggregated dimension is the perception of gamification, whereas the remaining dimensions are related to the adoption factors: Relative advantage, Compatibility with needs and Results demonstrability. The five other

constructs presented by Moore and Benbasat [19] were not discussed extensively by the teachers and are not included. Each aggregated dimension with belonging themes and codes is presented separately below. For the sake of readability as well as some faulty grammar, the excerpts have been modified with the aim to make the respondent's statements easier to comprehend with precaution to maintain the meaning and content of each excerpt.

3.1. Perception of gamification

The teachers mentioned several Perceptions of gamification. The first theme was that the teachers comprehended the Clear link between gamification and education. In the first interview, Respondent 2 conveyed that the psychology behind gamification already exists in upper secondary school and Respondent 1 said that she understood the connection between education and gamification but that the connection was not always clear for the students. Respondent 3 mentioned that the concept of games could be applied to a school context. When asked about gamifications purpose in school, Respondent 3 said: *“The part with progressing, that it becomes clearer for them in a way. I believe that if they see the avatar do things and grow all the time, they want the avatar to grow all the time instead of themselves. And they do not always understand*

that the avatar is the symbol for themselves, so it drives them to progress”.

The second theme that emerged in the first interview session was the perception of gamification as having an Initial positive effect on the students. Respondent 2 and 3 mentioned that all the students did not interact with the gamification API but that it seemed to have positive effect for those who did. Respondent 3 expressed that positive comments had been given by the students and Respondent 2 said that the students started discussing gamification aspects during the lessons: *“They do not have anything against it (gamification) so to say. You realize that they compare with each other which is kind of what you want to get out of it. You want to hear that they start to buzz about it, hear them compare their progress with each other. As soon as that starts, it feels like the process began and will continue. I try to encourage those (the students) who do not do it to start, the ones who do not speak about it.”.*

In the second interview the third theme emerged as the respondents mentioned the Lack of progress for the students. Respondent 2 mentioned that it is important to include a path to the overall goal of the game and that the gamification should show a clearer indication of progress for the students. Similarly, Respondent 3 commented on the students not noticing gamification progress; expressed as the students not caring about if the avatar progressed and that it had not been visually clear for the students. Furthermore, Respondent 1 said that there had been a lack of clear connection between progress and effort for the students. This related to the visual separation between the exercises and the gamification API, expressed by Respondent 1 in the following way: *“The technology has worked, the only thing I have thought about, I do not know if I mentioned it last time, but that the widget lives its own life. You could have had the exercises at the same place and then it would be easier for the students to see, to click here and do the exercises and see the results. Now they (the students) got to do the exercises and then click on the figure on their own to see if anything happened. It was like a jump in between, so there was no....how can I say this, here and now experience that I am moving forward.”*

3.2 Relative advantage

Aspect related to the Relative advantage of the gamified blended learning implementation compared to the previous analogue education was discussed in the first and the second teacher interview, producing two themes. In the first interview the teachers experienced that the students were provided with Alternative ways for students to learn. Respondent 1 mentioned that the students had been offered more learning opportunities with the implementation. Respondent 3 brought forth that the more material that was available for the students, the better it was and that the computer could be used as an alternative tool for the students to use during the lessons when the book became boring. Furthermore, Respondent 3 mentioned that students who did not usually work on the computer at least did something on the computer and that it was a higher probability for the students to use the computer than the book at home. Respondent 2 highlighted that the LMS had provided more material for the students with the potential to learn and that the effect of the implementation was not seen as negative since it was used as a complement to what was already there to begin with: *“We have added more material and created better conditions for the students to study at home, with a system that is more fun. Therefore, I have a hard time imagining that it would be negative for anyone, even if someone chooses not to do it, they do not miss anything”.*

In the second teacher interview Accessibility and variation was also discussed as a positive consequence of the implementation. Respondent 1 mentioned that the student had gotten the opportunity to study and repeat the course material at home to a greater extent and that the content had become more accessible for the students. Respondent 2 mentioned that the students had realized that digital tools can aid them in their studies. Finally, Respondent 3 discussed that the implementation had resulted in studying becoming more accessible as the students could study from anywhere, and that the students had gotten access to more material and opportunities to learn with the digital add-ons in the course: *“It is good for those (the students) who do not get the chance during the lesson. Then you have everything there (on Google*

Classroom). Then the students have access to more learning material than just a book”.

3.3 Compatibility with needs

In the first interview session, the first theme identified and related to Compatibility with needs was Need for technological support. Respondent 3 mentioned that the technical support was low during the lessons and that not fully understanding how the technology works had led to higher work stress. Respondent 2 mentioned that there had been some initial technical difficulties and that if there would have been more technical issues the entire implementation risked failing. Respondent 1 expressed that some classes are more difficult to work with than others and that it can be more challenging to implement technological additions in disorderly classes: *“I think it is easier for some groups, depending on the group. Sometimes we have a disorderly group which does not start accordingly, or something happens that makes you lose the thread. Instead, if you have an easier group it becomes much easier to continue”*.

The second theme that emerged in the first interview session was the Need for preparation. Respondent 3 expressed a need for higher preparation and understanding for the technology. Similarly, Respondent 2 said: *“We had very short time to plan this, it was almost panicky with what we were supposed to do. We would need more time to plan the achievements and the grading part. More time overall to plan everything”*.

The third theme concerned the Need for collaboration. Respondent 2 mentioned that the teachers worked more coherently and collaborative and Respondent 1 mentioned that the teachers participating in the project had become more integrated in their day-to-day work. The respondents also mentioned the need for higher technological competence in the team. Respondent 2 mentioned that more teachers with digital competence would have made the implementation easier, and that a stronger support with the increased workload and with the planning was needed. Furthermore, Respondent 2 also mentioned the need for a more intuitive gamification system, more technical support and more guidance on how to design courses based on the existing research in gamification for learning. Similar to

Respondent 2, Respondent 3 said that it is valuable to have a driven person in the team, referring to Respondent 2: *“We are three people who divided the workload. You probably need to divide it otherwise it is a lot to do in the beginning. Respondent 1 did the majority of what could be done, he is the one who built the most (of the course). If you have a driven person, or a driven team, it becomes easier, if you have a technology savvy person who wants to put in more of an effort”*.

The final theme related to the Compatibility with needs emerged in the second interview and was related to Clarification needs. Respondent 1 mentioned several times that the value of gamification should have been expressed to the students along with information on how gamification functioned. Similarly, Respondent 2 mentioned that the teachers should have gotten a walkthrough of the different gamification parts with clear examples in the beginning of the implementation. Respondent 3 mentioned the need to be presented with a clear example of gamification before the implementation: *“I did not understand anything since I got into it (gamification) a little late, so it would be (an improvement) if I knew more what it was about. It is also difficult before you have done it and seen a clear example of how it looks, because then you could have mentioned it differently for the students in the beginning. It became confusing for them as well when I tried to explain something that I did not really understand”*. Respondent 3 expressed that gamification was expected to be more of a mathematics game and that gamification was not understood initially: *“I did not know, I had no idea, so I thought it would be more of this old, math king or pyramid game or something similar. There was something called the mystical pyramid or something a long time ago. That it would be more of a computer game in that case, that you pretended to walk into the room and got to solve exercises or something. So maybe I thought it would be like that. More of a game”*.

3.4 Results demonstrability

Aspects related to Results demonstrability was mentioned in the second interview session. Two themes emerged; the Doubt about effectiveness of gamification and the Difficulty to measure the outcomes. In the first theme,

Respondent 2 and Respondent 3 expressed that they were skeptical toward if the gamification implementation had been successful. Respondent 2 conveyed that the digital aspects had been positive but that the students had not reacted to gamification as much as expected. In answering if any effects had been noticed due to gamification, Respondent 3 responded: *“Not as much as I had thought. Or not as much as it could have been. I mean, it could have been more. They have not become like, “have to collect points”. I did not notice that. However, it adds more than it takes at least. It only adds so to say. But I did not notice what I expected, that someone wanted to build a stronger avatar. It probably has been too unclear, that the students did not realize it enough.”*

Finally, in the second theme Respondent 3 and 2 mentioned aspects related to the fact that the results were difficult to measure. Respondent 3 mentioned that it was problematic to define the valid cause behind improvements. Respondent 2 said that it was difficult to comprehend if improvements had occurred due to the intervention since student groups differ every year making comparisons unreasonable. *“We have two classes and one of them, despite being in the same program, sit quiet for maybe fifty minutes and count, whereas the other cannot sit quiet for five minutes. If I had only had the second class, I would have thought it (gamification) was amazing, but now it is hard to say. But I know that a lot (students) asked why they did not get points for this etc., and updated the page to get points, so I am not sure, but I believe that it is positive. But it is hard to say”.*

4. Discussion

Previous studies have shown low ICT skills [11] and lack of professional development and motivation toward using IT among Swedish teachers [12]. However, in the present study all the teachers involved in the implementation perceived a gamified blended learning implementation as initially positive, whereas two teachers later expressed doubt of the effects. Teachers positive experiences of gamification have been mentioned previous studies related to students motivation, communication, social skills [30, 31, 32], self-regulation [31, 32], collaboration [30, 33] and competition [33, 34]. In the present study the

teachers expressed that they understood the connection between gamification and education and perceived initial positive effects. The effectiveness of gamification was seen as being related to visualizing student progress, which indicates that gamification could be communicated and implemented as an indication of progress for students to increase teacher adoption. Correspondingly, other studies have suggested visualizing progress as a way to enhance competence driven motivation through gamification [35, 36, 37]. Future studies should therefore explore how communicating and implementing competence driven gamification related to the indication of student progress could influence teacher perception.

Compared to teachers reflections on GBL and previous concerns in the literature related to games being distracting [14, 38], the teachers in the present study did not mention similar concerns. Compared to GBL, which relates more to full-fledged games, gamification concerns parts of, instead of entire, games [9] and might, therefore be more comfortable to be adopted by teachers as a learning tool. Similar findings were shown regarding teachers' perceptions of gamification in a survey study by Alabbasi [35] who identified that few teachers viewed gamification as negative compared to those who viewed gamification as positive. The findings presented here, in relation to previous research, indicates that gamification might be easier to adopt by teachers compared to GBL. To support these claims, comparative studies between teachers' perception of gamification and GBL in education should be conducted.

Several themes related to three of the adoption factors presented by Moore and Benbasat [19] emerged from the interviews (Table 1.). These factors should be considered when implementing gamification in the classroom. The Relative advantage of a blended learning environment compared to the previous analogue education was expressed by the teachers as providing alternative ways for students to learn, higher accessibility and variation, and a more inclusive learning environment. The importance of Relative advantage has previously been suggested as a critical factor in online education [36], in which time saved and individualized feedback to students has been discussed as a relative advantage with blended learning [37]. From the teachers comments these aspects are however

Table 1

Teacher adoption factors

Adoption factor	Theme
Relative Advantage	Alternative ways to learn Accessibility and variation
Compatibility with needs	Technological support Preparation Collaboration Clarification
Results demonstrability	Doubt about effectiveness Difficulty to measure outcomes

more related to the digitalization than to gamification in itself. Communicating relative advantage aspects could be included to overcome adoption barriers for teachers when implementing ICT. Further studies should take the above aspects into consideration to broaden the understanding of the relative advantage connected to working with ICT for teachers.

Compatibility with needs was discussed in the teacher interviews, with four main needs being highlighted: technological support, preparation, collaboration and clarification. Technological support was expressed as being able to get support during lessons and the need for things to work in disorderly classes, as well as support in understanding the technology initially. Berg-Marklund [17] reached similar conclusions when studying teachers' position in GBL, arguing that technological barriers originating from the institution's digital infrastructure jeopardizing GBL implementations and usage. Preparation was also highlighted, referring to the teachers' need to have more time initially in the project.

Collaboration was seen as an essential component for the success of the implementation. Here the value for teachers to work in teams and assist each other, as well as having a technological competent person in the team is highlighted. This could provide assistance as well as accountability for the teachers to do their parts. Understanding the implementation ahead of time was also an important consideration for the teachers who wanted to have clearer presentations of gamification in the initial implementations.

Here, teachers should be shown clear examples of the technology to be implemented as to not create confusion and work stress. This aligns with previous studies that show that unfamiliarity with digital games as a disadvantage in GBL [15] and teachers can experience a loss of control and need for guidance when working with gamification [18]. Finally, Results demonstrability should be considered when implementing ICT in the classroom. Doubt about the effectiveness of gamification and the lack of measurable results was expressed by the teachers. Since digital technology enables a more data driven and visible approach [38], it is recommended that teachers are provided with tools that indicate the effects of the technology implemented. Here, more studies should be conducted on how such tools should be used to create a fair and motivating learning environment for students and teachers.

4.1 Limitations and further research

A main limitation with the study is the small sample size of the teachers being interviewed (n=3) making the results less generalizable. Moreover, the implementing gamification with an API could possibly cause delays and inhibit instant feedback to the student which could have affected the results. Another limitation is not being able to separate the adoption of gamification and adoption of the digital environment since they were adopted simultaneously. Further research should explore the validity and generalizability of the themes identified related to each factor and explore other themes that can affect teachers' adoption of gamification. Survey studies investigating the relationship between relative advantage and alternative ways to learn, need support with technology support, preparation, collaboration and clarification, and results demonstrability with doubt about effectiveness and measurability. Furthermore, more studies are needed comparing the adoption of gamified digital environments compared to the adoption of non-gamified digital environments.

5. Conclusion

This exploratory case study presents several recommendations for implementing gamification in upper secondary education.

Adoption factors should be considered, especially related to the Relative advantage of the implementation, Compatibility with needs and Results demonstrability. It is recommended that a gamification design highlights student progress and feedback, that communication with teachers highlights the relative advantage of the implementation, that the teachers' needs, such as technology support, preparation, collaboration and clarification, are considered, and finally that the gamification progress for the students can be visualized and explained to the teachers.

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