

Gamification Solution in Teacher Education

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Abstract:

Introduction: Achievements of students in higher education are influenced by several factors. From the students' perspective a key factor is the motivation, without which it is extremely difficult to make any progress, and from the teachers' perspective the conservative methodological culture is primarily responsible for the fact that students are often uninterested, apathetic, and therefore they do not meet the expected requirements at all or only at a low level.

Methods: In a pilot project we gamified the evaluation of a teacher education course at the University of Debrecen. We asked the participating students (26 students) at the beginning and at the end of the semester for their opinion on the evaluation system used. For this purpose, we used a short questionnaire that we compiled, which included both closed and open questions.

Results: At the beginning of the semester, this form of assessment was very new to most students, and the difficulty of the assessment was judged differently by the course participants. In the end, students completed an average of nearly 5 (4.67) of the nine optional tasks. There were some tasks that were rated as both enjoyable and developmental by many, but there were also some that were barely chosen. Overall, the vast majority rated gamification as good or better than traditional assessment based on completion of compulsory tasks.

Discussion: Gamification should be included in teacher education courses because first-hand experience can not only increase the intention to use the method in the future but can also influence the attitude of prospective teachers towards innovative teaching methods in a positive direction.

Limitations: The size of the sample and the content of the optional tasks used do not allow the generalisation of the results to the whole population.

Conclusions: Our results show that gamification can be an effective alternative to traditional education. It can increase student satisfaction, motivation and develop

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a broader range of competences, but it requires precise conditions and ownership. It would be useful to investigate the results of gamification assessment in other courses and how students' perceptions of the method change in courses where they are no longer unfamiliar with it.

Key words: gamification, methodological innovation, higher education, teacher education.

Introduction

The lecture has always been the dominant form of teaching in higher education, and for a long time it was the only form of information transfer that was aimed at many people (Péntek & Hantz, 2020). Its central role began to change very slowly due to continuous development - the various inventions (including the printing of books) - but this monologic teaching method has remained the dominant element of university education to this day.

However, this is not the sole responsibility of the educators. It is the way they were taught, the way they are used to, the way they are almost exclusively familiar with. They have not seen many other examples and have generally not acquired any other teaching skills. In fact, university educators are not generally expected to have any pedagogical or methodological knowledge when they start working in higher education, and in most institutions, they are not given any training of this kind afterwards. Therefore, the majority of higher education teachers do not have any pedagogical, psychological or methodological skills. Their work is based on patterns and techniques that they know and are used to, even though the effectiveness of the old methods is nowadays decreasing (Csillik et al., 2016).

The main reason for this decline in efficiency is that young people in the information society have a different attitude to learning and knowledge than previous generations. Students of the 21st century attach less importance to obtaining information within school, for them "extracurricular resources and online knowledge bases are at least as important as lectures given by their teachers in front of a blackboard" (Ollé, 2010, p. 22). The first place they turn for an answer to a question is the internet, where they can access an unimaginable amount of information in a matter of seconds. As a result, they learn more easily and with more difficulties at the same time than students of the last century. Easier, because they have access to a wealth of information and a rich resource base, but the ease of access often gives them a sense of 'knowing it all', which is essentially false, and as a result they find it much more difficult to commit information to their own internal memory.

This dichotomy does not, of course, affect everyone in the same way, especially as the mass nature of higher education means that students' values, motivation (Ambrose et al., 2010), prior knowledge and skills vary widely. In addition, many of these characteristics change and develop enormously over the course of their studies, further differentiating an already heterogeneous student population. Many factors could therefore induce a more motivating, diverse, and modern teaching-learning process.

1 Methodological changes

One of the barriers to change is the tendency of many higher education educators to treat students with a truly diverse set of characteristics as a homogeneous mass. They argue that the large number of students means that there is no opportunity to get to know them and develop personal relationships. This in turn means that individual characteristics cannot be taken into account, differentiation is not possible, and, in addition, as they say: they must make progress with the curriculum. This is why, as a result of retaining the conservative university approach, many university educators give (frontal) lectures even during practical courses and seminars; therefore, instead of developing students' skills, they predominantly focus on content and transferring knowledge. The aim of education is not only to impart knowledge, but also to develop the students' competences, thinking and opinion-forming. However, the classical method, the (frontal) lecture in its traditional sense, has the exact opposite effect, since an engaging, excellent lecturer, while maintaining interest, leads the audience through the 'thought process' he has 'drawn' in a clear and easy-to-follow manner. In this case, however, the audience has neither the time nor the opportunity to reflect, even though the line of thought presented by the speaker could take a completely different turn if other aspects and arguments were introduced.

Of course, it is not easy to give an engaging performance, not everyone can do it. This statement is backed up by a study in which the educators themselves were asked what they needed to improve. The interviewees identified lecturing skills as the main area for improvement, along with some other methodological elements (e.g. motivating students, differentiation, use of ICT tools and web applications) (Csillik et al., 2016). Perhaps this insight plays a role in the fact that, despite their lack of preparation, more and more educators are trying to generate interest and enthusiasm in the topic they are working on (Hughes & Overton, 2009).

A group of educators, abandoning the traditional monologue method, mixes lecturing with other teaching methods in an attempt to get students to interact in some way. This is why more and more solutions are being used in classrooms (e.g. anonymous polls, mini-tests, voting system competitions) to activate students and thus make a session more enjoyable. Another group of educators

aims to achieve this goal primarily by changing the traditional forms of teaching organisation rather than the methods. More and more places are introducing online courses, blended or hybrid solutions to change the conservative, teacher-centred approach, and put the learner at the centre. One of the solutions used is the "flipped classroom" method, which has gained popularity over the last decade.

Most people associate the method with Jonathan Bergmann and Aaron Sams (2012), who are considered to be the first documenters and developers of the method, although some (e.g. Hartyányi et al., 2018; Aydemir, 2019) date its emergence to the early 19th century. The essence of the "flipped classroom" is that it replaces the work students do in class and at home. During its implementation, the transfer of knowledge takes place in an active extra-curricular activity at home, mostly in a digital environment (instead of traditional university lectures, where students are mostly in a passive role). This also means that learning is largely relocated outside the classroom.

One possible way of implementing the flipped classroom, which can be easily transformed into practical activities, can be divided into four blended phases that follow each other in a cyclical manner (Ollé et al., 2017). In the first phase, the preparation of the topic and the students' attunement take place in the classroom in a present form. This is followed by the learning of the content made available by the educator in a digital learning environment. This content is typically a short video, which may be a lecture by the educator or material from some other source, which may be supplemented by digital content in other formats. The educator usually supports this process in some way. The third phase also takes place outside the classroom. The students then interpret and process the information individually, often using it to create a product. The final phase of the cycle takes place again in the classroom, where questions are discussed together, the knowledge acquired is deepened, practical applications are made, and the products are presented. The method thus alternates between distance learning outside the classroom and traditional contact learning, making it perhaps the most popular form of blended learning.

By alternating the phases, the time spent in the classroom becomes much more valuable, as active, activity-based learning in the classroom not only helps to organise and retain new knowledge - thus supporting better understanding of the material and long-term retention of acquired knowledge - but also allows educators to better respond to students' needs through more intense, direct interactions. This can be particularly beneficial for lower-performing students who might not otherwise seek help (Goodwin & Miller, 2013). It also reduces performance gaps through personal feedback (Supiano, 2018).

While the benefits and the experience during the emergency distance education forced by the pandemic have led to the rise in popularity of the flipped classroom

worldwide, its use also faces several challenges. One problem is that the method is likely to be completely unfamiliar to most students. Moreover, it significantly increases their responsibility for the success of the learning process and requires a high degree of autonomy, i.e. an attitude and behaviour that was not, or only very rarely, required in the past. For teachers and educators, the changed teaching role may also be unusual, as the dominant activity will no longer be the transfer of knowledge, but the support and monitoring of student activities in the classroom and online. Overall, however, according to the 2017 Horizon Report of the New Media Consortium (Becker et al., 2017), blended solutions are expected to be one of the fastest growing educational innovations in the near future.

2 Gamification

Another popular methodological innovation of our time is gamification, i.e. the application of different game elements in some non-game environment (Deterding et al., 2011). There are several different theories about the origins of gamification. Some argue (e.g. McCormick, 2013; Werbach, 2015; Khaitova, 2021; Berezinska, 2022) that the term was first used in the 1980s by game developer Richard Bartle, who was asked to modify an online platform called Multi-User Dungeon (MUD) in order to make it more attractive to users. However, others (e.g. Marczewski, 2013; Burke, 2014; Furdu et al., 2017) argue that the term was first used in 2002 by Nick Pelling in the context of making electronic devices faster and more enjoyable with game-like user interfaces.

In the business world, however, game-based solutions and methods have been used for much longer to increase sales effectiveness. This has been done by motivating and engaging employees and consumers. These solutions were the early forerunners of the various point accumulation and loyalty programmes. (True, they were not called gamification at the beginning.)

The first loyalty reward schemes appeared in the early 20th century, a notorious one was the Green Stamps (Fox, 1968) introduced by S&H (Sperry & Hutchinson), which worked by giving customers a number or denomination of small green stamps proportional to the amount they spent at participating shops and petrol stations. The stamps were collected in albums and could later be redeemed for products from a catalogue. This temptation was a great attraction at the time and the system survived for a long time. Its heyday came in the 1950s and 1960s, when Americans exchanged their albums - sometimes filled with thousands of stamps - for various household items (Moran, 2018). The extent of its success is shown by the fact that many chain stores still use a similar solution today.

In addition to marketing management, gamification has also long been used in human resource management to motivate (Zichermann & Linder, 2013), with the

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Scouting movement providing an early example of another widely known application of gamification, alongside Green Stamps. Robert Baden-Powell laid the foundations of the movement's system in his 1908 work, in which the Scouts rewarded their members with badges in recognition of their achievements in various fields. Scouts may be awarded badges for the acquisition of a skill, for proficiency in an activity, for acting in accordance with the principles of the organisation, or for participation in a special event. The system is therefore very motivating for members, as the large number of badges worn on the Scout uniform is a sign of outstanding achievement.

The origins of gamification are thus both economic and human, yet it is only a few years since education systems started to explore and exploit its potential (Dichev & Dicheva, 2017; Faiella & Ricciardi, 2015).

But is this really the case? Is gamification really a novelty of the last decades? After all, the most common elements of games, rewards, points, badges, leaderboards, level progression, have long been present in education. Indeed, pupils are rewarded for desirable behaviour and punished for undesirable behaviour. Initially, they receive stars or stamps for completing tasks, which are later replaced by scores, which result in grades ('badges'), and those who perform well are 'promoted' at the end of each academic year. However, despite the obvious game elements, school does not generally attract students in the way that games (especially digital games) do, with most students describing school and school-related activities as a non-game experience.

Indeed, game elements alone do not evoke the same emotions in pupils as, for example, a video game. Games induce a range of powerful, positive emotions: they entertain, they create pleasure, curiosity, they challenge the players in new (often increasingly difficult) ways (Lazzaro, 2004). It could be argued that these emotions are present in an enjoyable lesson from a good teacher, but what makes a significant difference between the emotional impact of a lesson and a game is the issue of how to deal with failure. The game requires a lot of repeated experimentation, so the player sees failure as a natural consequence of learning something new about the game almost every time (Gee, 2008). In fact, for many games, it is the only way to learn how to play the game, because you have to fail many times to move on. At the same time, you can try as many times as you like to solve a problem, and usually at very little risk. In school, however, there are few opportunities for students to try, and when they do, the stakes are often high. Thus, unlike games, the education system generally offers very limited opportunities for repeated failure (Lee & Hammer, 2011).

School games are also at a disadvantage compared to games for other reasons. One such element is voluntarism, which, according to Katie Salen and Eric Zimmerman (2003), is one of the most important features of games. In fact, the players of a game decide of their own free will to participate in the game, but this

kind of freedom cannot be ensured in school. There, whether it is a 13+1 quiz or some kind of gamification assessment solution, pupils (sometimes) must play, they cannot remain passive and start reading or surfing the Internet, for example, just because they feel more like it.

The third important difference between games and school tasks is the frequency and speed of feedback. Games provide continuous and immediate feedback, thus enhancing intrinsic motivation (Hamari, 2013; Santos-Villalba et al., 2020), which is necessary to make the game enjoyable. Indeed, the player needs to be aware of his/her position in the game. For example, he/she needs to know how much time is left, how many points he/she has accumulated, or even how he/she has performed compared to other players. This feedback should be immediate and easy to understand, as it is an important benchmark. However, this is not usually the case in education, where the correction and marking of assignments and papers submitted can take days or even weeks, and feedback on the work done is often quite incomplete. Gamification assessment, however, differs significantly from traditional education in terms of feedback. The difference lies in the fact that there is usually not (or not only) one final task to be completed by the students, but many smaller tasks of different types, which can be chosen from and quickly assessed by the teacher, thus shortening the feedback time considerably. The assessment is therefore not a one-off exercise, but a continuous one, with a much smaller amount of work per task and alternatives allowing students to choose their own sub-objectives. Moreover, by completing a different task, the final result can be improved, so students do not have to worry so much. Smaller tasks mean a more even workload, and if the tasks are varied (not too difficult but not too easy), it is easier to maintain students' interest.

Even the simplest points and level system can have a very strong positive effect on the students and teachers involved (Sheldon, 2012). This effect is due to the points earned by completing each task, creating a sense of growth and progress (Fromann & Damsa 2016), as the overall score keeps increasing, bringing them closer to the goal they are trying to achieve. Smaller progress is also rewarded, so that they have a positive experience more often and therefore tend not to feel so burdened by the tasks ahead. They become more aware of their own activities, mistakes, and areas for improvement and, over time, will be able to set themselves goals more consciously. In addition, performance on individual tasks provides teachers with more detailed feedback, allowing them to monitor their students' progress and development, identify problem areas and tasks more accurately, and better understand individual preferences and abilities.

We consider these benefits to be of paramount importance, which is why we have adapted the assessment of a teacher education course at the University of Debrecen using a gamification solution.

3 Gamification in the evaluation of a university course

Most university courses end with an end-of-semester assessment (exam or assignment), or there may be two or three mid-semester assignments, the results of which are used to award a grade. These are almost always fixed assignments and fixed occasions, requiring a one-off or limited student activity and rather limited feedback (especially in the case of colloquia). To avoid this, in the spring of 2022, as part of a pilot experiment, we introduced a point-based assessment system for the course "ICT in Education" for student teachers. The students could choose from a variety of tasks according to their goals, needs and competences, so that they could shape their individual learning path, workload and time schedule. We did not only assign tasks with a deadline at the end of the semester, but there were also tasks that had to be completed continuously, and some tasks where the deadline was determined individually in the beginning of the semester (for example, a micro teaching activity where the "students" had to use a mobile device). The primary aim of the tasks was to develop the digital and problem-solving competences of future teachers, and to give the participants experience in the educational use of digital tools and software that can play an important role in the teaching and learning activities. Personal experience can significantly help future teachers to develop their methodological repertoire and to apply the possibilities they have learned in a relevant way to their own practical work (González-Fernández et al., 2022; Sajinčič et al., 2022).

The implementation of the tasks was based on the theoretical content of the course lessons and on the activities and exercises carried out there. For example, in one of the lessons, students were introduced to the formal requirements of a good presentation and were given the optional task of correcting formally incorrect slides. The involvement was also enhanced by the fact that the students could even choose the slides to be corrected themselves, based on principles discussed and checked in advance. The participants could choose to present an application suitable for teaching, or they could create a classroom illustration (using any software) that deliberately contained errors (which is an excellent way to attract the attention of students). Students could interview an in-service teacher working in public education about how he/she and his/her colleagues use ICT tools and solutions in their work, what advantages, disadvantages, difficulties they experience, etc. As an optional assignment, they could also complete a MOOC training course related to teaching or prepare a lesson plan enriched with ICT ideas and methods. The latter task was of higher value if the lesson material was also linked to a special day, but the connection did not have to be self-evident. For example, they could prepare a lesson plan with the topic of the World Day of Birds and Trees or the World Water Day for a literature or history lessons. There was only one task that was compulsory for everyone, and that was to know the software of an interactive whiteboard. It had to be proven

that the students were familiar with the features of the software and could individually create tasks with the software that could be used to enrich lessons. In order to complete the task, they were not only allowed to choose from the 4-5 software programs they had tried out in the course but were also completely free to choose which program they wanted to use.

Students were given a predetermined number of points for each task, depending on the quality of their performance, and the sum of these points was used to calculate the final grade for the course, the points for which were also known in advance. The total score could also be increased by attending classes, as extra points were awarded to those who did not, or only partially, use the three absences laid down in the study regulations.

4 Experiences, student opinions

The opinions of the students (26 students) who participated in the course were mapped at the beginning and at the end of the semester with a short questionnaire about the experimental gamification assessment system. At the beginning of the semester, most students were unfamiliar with this form of assessment, with an average of around eight points on a 10-point¹ Likert scale (and no one marked a value less than 5)². However, the difficulty of obtaining a grade using the assessment system was judged very differently by the course participants, as indicated by the average value of 5.53³ and the fact that all scale values were marked by the respondents.

At the start of the course, the interactive whiteboard assignment and the completion of a MOOC course were considered the most novel and, perhaps as a result of this, the most difficult, while the interview and interactive whiteboard assignments were considered the most interesting. The latter task thus elicited the most reactions, which may have been due to the fact that slightly more than half of the students had already encountered an interactive whiteboard in class during their previous studies (mainly in secondary school) and the others had generally heard something about this technical tool. Thus, several had their own experience or ideas about the use of the tool in the classroom.

The end-of-semester data showed that, on average, students completed nearly 5 (4.67) of the nine optional tasks. The most common task was to create an illustration with errors, but many also created lesson plans and/or digital escape rooms. Some students completed only two tasks, but there were also examples of

¹ 10 = very innovative ... 1 = not innovative at all

² However, this high value also indicates that despite the digital progress and methodological development, only very few people apply gamification solutions in public education.

³ 10 = very difficult ... 1 = not difficult at all

students completing six tasks. These figures are even more informative when you know that it was possible to achieve the point threshold for an A+ grade by completing up to three tasks to a good standard - all of which were worth high points. On the other hand, if someone had done all the assignments to an excellent standard and never missed a class, the total theoretical points obtained were nearly three times as the lower point threshold for an A+ grade, so students could really choose between assignments and tailor the practical mark for the course to their level of need.

Looking back at the assignments at the end of the course, students rated the micro-teaching and the interactive whiteboard assignment as the most enjoyable work. The former was liked by both the students who held the micro-teaching and those who "participated" in it, while the latter was attractive because of the great freedom (they could use optional software, create an assignment in any subject, for any age group, with any didactic purpose). These two tasks were not only considered by respondents as enjoyable, but also as self-developing, as was the lesson plan.

As a final question, we asked the participating student teachers, if they could choose which form of assessment (traditional or gamified) they would prefer. About a third of the respondents would have chosen gamification, describing it as more varied, enjoyable and constructive, but some respondents said that "we were given more freedom; we could use our creativity instead of a stale content". More than half of the students considered both approaches equally good: "In different ways, but both forms of assessment are motivating." However, there were also some negative comments: "The point-based method was not bad, although sometimes it would have been easier if I had just known that there was a test coming, I was going to do it and that was it. So a lot of times I was lost doing the assignments." The latter factor could certainly have played a role in why some (3) would choose the traditional form of assessment, but the exact reasons were not known as none of them gave reasons for their choice.

Conclusions

The various gamification approaches have not yet been widely adopted in public education and higher education, despite the fact that most studies published in the teaching-learning context have found the impact of gamification to be essentially positive (Al-Azawi et al., 2016). The papers mainly highlight that it aims to engage learners in an interactive system that motivates them to perform different activities (Gómez-Carrasco et al., 2019) and thus increase their engagement (Huang & Soman, 2013). Although a higher motivation level gives students more positive experiences, this does not necessarily guarantee a more permanent retention and storage of knowledge (Carrillo et al., 2019; Montenegro-Rueda et al., 2023; Siripipatthanakul et al., 2023). However, there is

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no doubt that varied tasks allow students to develop a much wider range of competences than traditional solutions (de Sousa Mendes et al., 2022). As well-designed gamification systems offer multiple pathways to success, they allow students to select their own sub-goals within a larger task. Less complex tasks, on the other hand, provide students with a more optimal workload that is better adapted to their individual needs, and their assessment and rewarding provide continuous feedback (Richter et al., 2015). In our pilot university course, we also provided students with a number of optional tasks to gain a practical grade, and the vast majority of students considered this solution as good or better than the compulsory tasks.

It is important to stress, however, that gamification is not a universal panacea that is a simple, ready-made solution to every problem (de la Peña, et al., 2021)! It is essential that "the teacher can use it and the student understands it", as one of the participating students reported it. It is therefore essential to establish a clear and unambiguous set of rules for the implementation of such an assessment system, in which the tasks, the deadlines and the associated rewards are clearly and predictably defined and made transparent. However, the creation of such a system is not an easy task and requires continuous refinement and modification in the course of new uses, and it is always advisable to gather feedback on the experience.

Another criticism of the method is that it uses extrinsic motivational tools, as students perform tasks in order to win rewards. Indeed, it is questionable how motivated students would be to do the tasks without rewards, and how far the rewards for tasks that become more difficult over time can be increased and what the lack of rewards triggers (Zichermann & Cunningham, 2011). But this is no different in the case of traditional solutions, as many students learn and prepare papers only for the sake of grades. However, as in traditional frameworks, well-executed gamification can achieve attitudinal change that persists even after the external reward system has been abandoned (McGonigal, 2010). It should also be remembered that "knowledge and skills acquired through external stimuli increase the sense of competence, proficiency, which can help the learner to increase his/her self-confidence and, in a given area, increase his/her chances of facing challenges independently" (Juhász, 2020, p. 41). Of course, this confrontation must also be learned, and learners must also accept that the freedom offered by the optionality of tasks implies that they will have much greater responsibility for their results. In fact, they will probably work more, as gamification only allows students with low levels of demand to work less. For the majority, on the other hand, it certainly means more work, but the optionality of the tasks allows for more varied and enjoyable activities than before, which means that students may not feel like they are learning.

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From the teacher's point of view, the construction and operation of a gamification system, the continuous and rapid assessment of tasks, also involves much more work than the traditional transfer of knowledge and subsequent accountability (Manzano-León et al., 2022). There is no question that it is considerably easier to deliver the material in a (frontal) lecture form and then to check the extent of mastery with closed questions, but the developmental impact of the two methods on students is also significantly different. While the traditional solution has only a small impact on the processes that take place in the minds of the students, gamification develops their knowledge acquisition and problem-solving skills, their creativity, and their flexible thinking. We believe this difference is worth the change, the extra work invested.

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