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Effectiveness and attractiveness of gamification carried out during the COVID-19 pandemic in the perception of high school students

**Efektywność i atrakcyjność grywalizacji realizowanej podczas
pandemii COVID-19 w percepcji uczniów szkół średnich**

Abstract: The gamification method has gained in popularity in recent years. Theoretical works in this field emphasize its attractiveness, which also affects the effectiveness of the implementation of tasks considered stereotypically as tedious and requiring concentration. By introducing game-specific elements into the learning process, participants usually engage in activities more, feel more motivated and remember the content discussed better.

In the article, the authors attempt to answer the question of how the method of gamification is understood and assessed by high school students. To this end, they conducted surveys in two research groups: in the first, which participated in lessons based on gamification, and the second, in which such activities were not carried out.

The text presents the theoretical assumptions related to the topic and the research part, presenting the aforementioned research process.

Keywords: questionnaire, research, gamification, games, pedagogy, high school.

Introduction

Gamification is a concept that is part of the edutainment phenomenon (Angel, 2016, p. 69). It defines educational activities whose educational character is made more attractive by a chosen form of play or is even overshadowed by it. The primary goal, however, remains the didactic intention and it is to it that all edutainment methods are subordinated. Thanks to ludic elements, learners remember the content of the classes better (Kapeła-Bagińska, 2019, p. 178; Lesniewicz, 2017, p. 68). As with other terms related to the broader digital environment (Kopacz, 2017, p. 24), gamification does not have a single, defined definition.

For the purposes of the following text, the authors assumed that gamification is the intentional use of all sorts of elements (interfaces, strategies, rules, problem-solving and motivation) of games for non-entertainment purposes (cf. Deterding et al., 2011, p. 11; Wozniak, 2015, p. 12; Selvi, Çoşan, 2018, p. 2019; Siadkowski, 2014, p. 8). Essential elements of gamification should be (Siadkowski, 2014, p. 8; Lazzaro, 2004, p. 3):

- purpose: must be specific and achievable for participants;
- emotions: the process should give pleasure, provide entertainment;
- game mechanics: the process should use mechanisms such as rewards, competition, surprise, bonuses;
- motivation: the whole should increase motivation to undertake specific tasks.

At this point, it seems justified to distinguish between the concepts of gamification and didactic game. While the former term refers to a way of organizing activities according to the rules typical of computer games, a teaching game is one of the problem-based methods (Okoń, 1975, p. 334). It follows that gamification is a broader term; it is a planned process, a way of organizing classes or tasks, a series of activities in which teaching games can be used - as one of the elements - but it is not necessary.

Despite significant differences, the principles of gamification planning are similar to those used in other methods of this type. Gamification should be (cf. Pietrasik-Kulińska, Szuba, Stańdo, 2017, p. 11):

- adapted to the age and knowledge and skills of participants: games too simple for pupils will be unattractive, while too difficult will discourage them;
- introduced with a specific purpose, bringing a new quality to the educational process;
- completed to give everyone a chance to succeed;
- organized in such a way that it is understandable for all participants.

The above rules should be applied to design gamification appropriately - both its duration, type of tasks and the rules themselves. The latter are supposed to be based on the mechanisms used in games - to educate out-of-the-box thinking, foster the activity of participants and thus increase their motivation (Selvi and Çoşan, 2018, p. 2019). At the same time, these are the main advantages of the method, which are mentioned in Polish and foreign publications.

The studies suggest that gamification should be a long-term process. Research confirms that it is more effective than and the participants have a chance to get more involved in it (Plechawska-Wójcik and Laskowski, 2018, p. 127; Lee and Hammer, 2021, p. 1). As for the type of tasks, they should foster the formation of critical thinking skills, use a variety of tools (both traditional and ICT) and be structured in such a way that they require effort and at the same time - do not take too much time.

The advantage of the described method, according to researchers, is also the attractiveness of gamification activities (Selvi and Çoşan, 2018, p. 2020; Lazzaro, 2004, p. 3), which results in their effectiveness. This may be due to the way it is organized - the rules will promote engagement, they will also be suitable for the dynamics and nature of the group. It can also be the result of incorporating elements typical of youth culture into the process - series, films, games liked by students (Łopatka-Koneczny and Wojtkowska, 2019, p.148). Popular cultural texts enliven difficult issues for adolescents and promote memorization, so they are willingly included in the didactic process (Kopacz, 2014, p. 31).

Rarely do the drawbacks of gamification appear in texts or research reports. One publication that points them out is *Game on! Using gamification in didactics, science and environmental protection* (Plechawska-Wójcik and Laskowski, 2018), in which the authors clearly point out that gamification should not be used as a reliable method to awaken motivation in a group every time. They emphasize that in the process of gamification the responsibility for organizing the learning process to a significant extent belongs to the student, which involves the need to prepare the group for such challenges and this is not always successful.

Research methodology

The purpose of this paper is to discover, how students understand and evaluate the use of gamification during lessons. To answer the main research question, the authors surveyed 111 high school students - some of whom were familiar with the method described, while others had no contact with

it. The purposeful selection of the sample was to allow for noticing possible differences in the perception of gamification.

The main research question was subordinated to the specific ones:

- how is gamification understood by students?
- if and what are the differences in the understanding and evaluation of this method by the two research groups?
- what are the advantages and disadvantages of the process according to the respondents?

Based on the above questions, a questionnaire was constructed. In May 2021, a survey was conducted among students of the first and second grade in one of the pomeranian secondary school. Therefore, the sample was planned in such a way that it reflects the structure of class profiles in the school and corresponds to the structure of class profiles of Tri-City secondary schools (54 students of mathematics classes, 25 students of humanities classes, 32 students of biology classes, including 48 boys and 63 girls aged between 14 and 18 years). Most students achieve average grades. Their motivation is neither lowered by grades nor increased by educational success. The survey was conducted via Microsoft Teams using the Google Forms tool used during the implementation of remote education during the COVID-19 pandemic. The metric asked respondents to provide their gender, grade, and age. A total of 61 gamification method respondents were analyzed. The remaining 50 individuals did not work with the gamification method.

A necessary addition to the description of the research groups is the presentation of the context of the research, that is, the gamification process carried out. As mentioned, the first research group was the students who participated in the Eras Literarias gamification challenge in February-April 2021 (during the COVID-19 pandemic teaching was carried out online, which could significantly affect the attractiveness of the method and the level of motivation and involvement of students). It was designed according to the requirements of the method:

- every student had a chance to succeed in it-that is, the game participants' performance did not influence each other;
- it was possible to plan the activity in advance - the number of tasks, possible additional points was determined at the beginning;
- the tasks could be completed at their own pace until a certain deadline - this was supposed to influence the students' sense of agency, give them an opportunity for possible consultations, and reduce the stress resulting from rushing;

- Exercises were creative in nature - requiring out-of-the-box thinking, theme development, which made potential cheating or teamwork more difficult;

- the reward of participation and engagement was valuable to the students, enhancing motivation.

Details of the challenge are presented collectively in Table 1.

Table 1. Tasks in Eras Literatias

ERA date SERIES	TASKS
introduction 25.01-30.01	Organizing your workspace.
Antique 1.02-6.02 <i>The Bridgertons</i>	<p>Organizing your workspace.</p> <p>1) After reviewing the material on antiquity and gathering your own notes, complete the Antiquity Rule Sheet (find an editable PDF version here).</p> <p>2. Regular study also involves certain rules. One of them is planning - the need to remind yourself, to set goals. Everyone has their own method for this - I use task lists (you can download such a sample study list here), I've also described on the blog how to plan studying and specifically - studying for exams. As part of this week's work, show how you plan your repetitions and learning - the way you choose.</p> <p>ADDITIONAL ASSIGNMENTS: 1.02-4.02:</p> <p>As was mentioned, the classical eras were governed by certain rules. They are so distinctive that we can easily identify which elements of clothing, art, and interior design are classical.</p> <p>Below you will find links to two versions of the same song - Girls like you by Maroon 5. The Bridgerton series used a cover of this song. Answer the question, how are the two renditions different? What was done to be able to use a contemporary song in a costume series and why?</p>
Bible 8.02-11.02 <i>Lucifer</i>	<p>The serial Lucifer was known as a great conversationalist. He knew exactly what each person wanted - and he knew how to get it. Choose three of the following biblical heroes and with the help of an Investigation Card collect some basic information about them to help you pass the exam.</p> <p>ADDITIONAL TASKS: 8.02-11.02:</p> <p>The Bible is a constant inspiration for more cultural texts. As an extra task, find as many symbols and references as you can in the following video promoting Lucifer. At least list 10, but I think you can easily find more.</p>
the Middle Ages 15.02-19.02 <i>The Witcher</i>	<p>TASK 1: The Witcher was a character whose primary mission was to kill monsters. Using the Card Generator of your choice, present 3 potential creatures that are associated with medieval culture - described in legends or other cultural texts.</p> <p>TASK 2: The Witcher were governed by a code of conduct. What points could be included in a medieval universal code? Fill in the worksheet or make a note according to your own idea.</p>
renaissance - entire era 21.02-26.02 <i>Downton Abbey</i>	<p>Complete the Renaissance Ethics form, which can assist anyone who wishes to discern the major trends of the next era. Also, be sure to collect all the materials and record them in the way you choose.</p>

<p>Renaissance - the works of Jan Kochanowski</p> <p>1.03-5.03</p> <p><i>The Crown</i></p>	<p>Imagine that John Kochanowski is alive today and applying for a job at a university. He needs to submit a resume and CV outlining his major accomplishments, works, life events, views, and interests.</p> <p>To create the document, use the familiar Canva.com website and the CV template. Of course, you can treat the task creatively and humorously include some information about the poet.</p>
<p>baroque</p> <p>8-12.03</p> <p><i>House of Cards</i></p>	<p>How did people of the Baroque era find themselves in all this? Complete this sheet, which will help you sort out the rather contradictory feelings and values that many people of that period felt. Additionally, on the basis of your work, choose one picture that you associate with the epoch and put a quotation from a chosen work of the period on it.</p>
<p>the enlightenment</p> <p>15.03-19.03</p> <p><i>The Bing Bang Theory</i></p> <p><i>Young Sheldon</i></p>	<p>Make a judgment on selected philosophies. Choose three that were created during the Enlightenment and evaluate how useful they can be to a person in the 21st century. The work can be done in any form - table, mind map, text...</p> <p>List at least two advantages and two disadvantages of each.</p>
<p>romanticism - romantic hero</p> <p>21.03-1.04</p> <p><i>Game of Thrones</i></p>	<p>Who was the romantic hero? Based on the works you've learned, create a thematic set of fiches that will help you repeat the necessary knowledge for your high school exams in later years.</p> <p>You can make fiches in Canva, Quizlet or any other tool of your choice. There must be at least 20 of them.</p>
<p>romantic mood</p> <p>8.04-1.05</p>	<p>Complete the chart below and find two cultural texts that can be juxtaposed with the image below. Present the similarities/differences in the form of your choice.</p>

As you can see, all the repetition was spread over almost three months of study. From the end of March onwards, the assignments were given less frequently due to the Easter holiday and school events. Also, the students' motivation decreased considerably after the first month, so it was reasonable to abandon the planned extra tasks, which were to occur every other week. In addition, every few weeks you could get a positive mark for your activity.

An important factor in motivating the test group was to link the topics of the tasks not only to repeated eras, but also to television series that most students are familiar with. In this way, the material presented became more attractive. Some of the participants declared that the challenge encouraged them to watch some productions, which proved to be valuable for various reasons.

Research results

The first question of the survey concerned the definition and essence of gamification itself. Respondents were given four answers, having the option to select as many as they wanted. The most frequently selected definition was „Use of quizzes and/or puzzles from time to time during traditional

lessons". This option was selected by exactly one in two respondents. Equally frequently indicated was „Use quizzes and/or puzzles every now and then during traditional lessons" (45% of respondents). Only 22% of respondents marked the answer: „Conducting a game cycle of several weeks based on a specific storyline, with puzzle elements", with most of them additionally marking other answers. Only 9% of the respondents understood gamification according to its definitions cited in the academic literature. This means that for the vast majority of high school students gamification is a set of activities related to different types of games, conducted both with the use of digital tools and in a traditional way during lessons. These can be one-off quizzes, puzzles, and all sorts of activities prepared by teachers in order to diversify the lesson, introduce the topic, or serve to systematize, consolidate or repeat the content of a given subject. Only a small percentage of students perceive the need for repetition and linking of subsequent activities into a longer cycle.

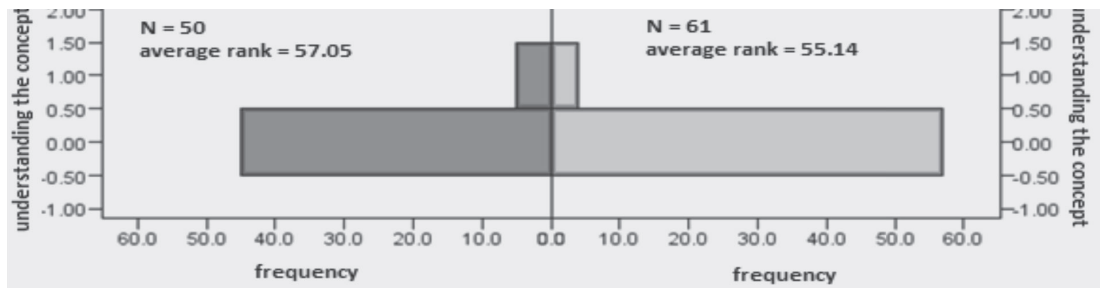


Figure 1. Indicating the correct description of the essence of gamification. Mann-Whitney U test. On the left the group not implementing gamification, on the right - working with this method.

Based on the Mann-Whitney U test (significance level $p=.510$), we can conclude that the experience of gamification does not affect the ability to define it correctly. Based on the graph above (Figure 2), we can see that a higher percentage of non-participants in the gamification-based challenge indicated only the correct answer.

The usually incorrectly understood concept of gamification translates poorly into the results obtained in the question about the number of teachers who use gamification elements as part of their subject instruction. The most common answer (68%) was „one or two". Ten respondents from the control group (9% of all respondents) declared that no teacher uses gamification. All others rated the number between 3-5. The non-appearance of a single higher response is particularly interesting when juxtaposed with the more than six months of remote teaching implemented in the 2020/2021 school year. This situation was already the second period of restrictions in education dictated by the pandemic situation. Teachers had the opportunity to familiarize

themselves with different techniques of remote work, as well as to find and test applications and portals related to gamification. It is an open question whether these results are the consequence of teachers' lack of interest in such forms of work in times of pandemic or are due to other factors¹.

When asked about the preferred frequency of gamification elements in lessons, respondents were asked to rate on a scale from 1 to 5, where 1 means never, and 5 means as often as possible. The results obtained are shown in the table below.

Table 2. Assessment of the appropriate frequency of gamification elements.

NO		The experience of gamification		Total
		YES		
evaluation frequencies	1	1	3	4
	2	6	6	12
	3	26	34	60
	4	15	17	32
	5	2	1	3
Total		50	61	111

The results obtained in both groups are very similar. For not experiencing gamification students, the mean score is 3.22 with a standard deviation of .79, while for the group experiencing gamification, the mean is minimally lower at 3.11 with an almost equal standard deviation of .80. The Mann-Whitney U-test with a significance level of $p=.591$ shows that there is no influence of the experience of gamification on the assessment of the frequency in which activities undertaken as part of gamification should occur. Pearson's Chi-square test with a significance level of $p=.836$ finally confirmed this conclusion. Participation in a challenge based on a ten-week cycle of gamification tasks did not make students want to work with this method either less frequently or more often than students who did not experience it.

Among the justifications for the choices made, the tendency to evaluate gamification as a method of „diversification” or temporary „relaxation” dominates. Respondents described it as „a nice change” and „pleasure and respite from normal lessons”, „a break from scribbling on a piece of paper”, while indicating that it should be „not too often, so that this form does not

¹ This question is partially answered in reports on distance learning and teacher education in this area (Buchner, Wierzbička, 2020, p. 16). However, the authors do not have enough data to determine what influenced the actions of the student teachers in the study groups.

become monotonous". Some people pointed out that „if there are too many such methods of conducting lessons, after some time it may become boring”.

There were some enthusiasts who see it as a chance to „learn through play”, listing the advantages: „we often get involved in this kind of task in a different way than in a typical lesson”, „in this way we will manage to assimilate knowledge better”. Some respondents added that: „gamification is definitely a better solution for e-learning”. On the other hand, there were more skeptical opinions: „I am not fond of this form of lessons”, „such tasks are sometimes tiring”, „I don't find this method to be any particularly important or enjoyable”. There were also strong opponents: „I don't learn anything in games during lessons”, „Unfortunately I am not a person who likes this form of learning.”

Some students tried to find a balance between traditional methods and gamification elements but a majority of students would like the gamification to be used periodically in order to consolidate knowledge and skills.

Then, respondents were asked to rate effectiveness on a scale from 1 (very low) to 5 (very high). The obtained data are presented in Table 3.

Table 3. Evaluation of the effectiveness of gamification

NIE		The experience of gamification		Total
		TAK		
assessment of the effectiveness	1	1	1	2
	2	2	5	7
	3	5	16	21
	4	28	27	55
	5	14	12	26
Total		50	61	111

Based on the Mann-Whitney U test with a significance level of $p=.043$, the effect of experience of gamification on the evaluation of the effectiveness of this method was found. Those who have worked with this method rate its effectiveness lower than those who have not.

Respondents were given the opportunity to speak freely in the form of an in-depth question. Those who had previously worked with the gamification method justified lower ratings by saying that: „sometimes there is not enough time to answer and we are not able to remember everything well”, „I do what is in the task (or at least I try), I focus on doing and not on learning and I remember little”, „they are not in my type of tasks and way of learning. I prefer others”. In addition, students pointed out that „not everyone likes this form”, „not everyone wants to play games”.

Some respondents associated the game more with „a break from learning or testing one’s knowledge than with learning”, and „if one does not take it seriously or the game is badly chosen/made, one may not take it seriously”. Also, when they occur „too often they can be tiring”, which can have the effect of reducing effectiveness.

The supporters of gamification and its high effectiveness are mainly attributed to the fact that it is not often used by teachers. A change from the „classical way of memorizing knowledge (working with a textbook or explaining something on the blackboard)” seems to be for many an interesting alternative, which is supposed to translate into greater involvement, and thus effectiveness: „learning and entertainment at the same time, it is more interesting than simply transcribing from the blackboard, which makes you more motivated”, „In my case, this method pays off. I can’t, and I’m not able to learn by just reading and memorizing”.

The factors that the respondents most often indicated as important for the effectiveness of gamification were: the creative nature of the tasks (78%), the inclusion of elements related to topics attractive to young people (46%), rivalry (41%) and the opportunity to win (43%). The experience of gamification did not change the proportions of the frequency of the indicated factors in the analyzed groups. However, there was a significant discrepancy in the frequency of indicating rivalry as a factor important to the effectiveness of gamification, as shown in the graph in Figure 5. Boys were much more likely to indicate this factor as important, encouraging them to become more active and more involved.

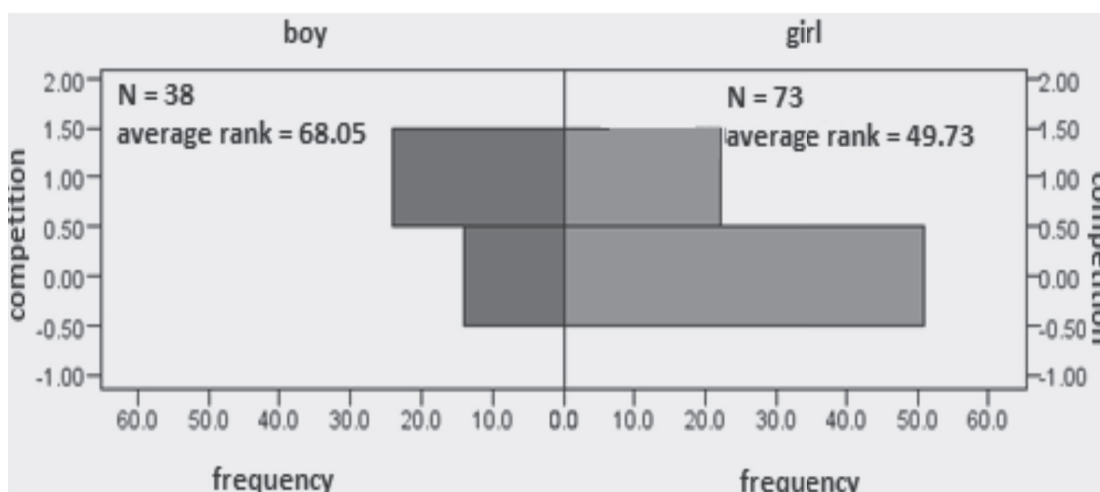


Figure 2. Assessment of competition as a factor important for the effectiveness of gamification by boys and girls

Based on the results of the Mann-Whitney U-test with significance levels of $p=.622$ for competition, $p=.978$ for the possibility of winning and $p=.115$ for the creative nature of the tasks, respectively, it was found that the experience of gamification had no effect on changing the perception of the significance of those factors mentioned in the questionnaire on the effectiveness of the method. The level of relevance of the inclusion of elements related to attractive topics among adolescents $p=.058$ indicates a greater appreciation of such adaptation of the cycle scenario by its participants. Finally, the significance level of $p=.023$ for the „other” response indicates that this factor strongly differentiates the responses of both groups. Noticeably, this option was more readily selected by the gamification testing group. The students pointed out the weaknesses of the conducted challenge, but also the elements that they thought reduced the effectiveness of their own activities, such as: „participant engagement”, „student motivation”, „organization on the part of the students”, „relevance to the baccalaureate”, „readability”, and „precision in the wording of the instructions”.

The results showing the evaluation of the attractiveness of gamification are interesting. Again the respondents were asked to rate it on a scale of 1-5, where 1 means very low effectiveness and 5 means very high. The collected data is presented in Table 4.

Table 4. Rating the attractiveness of gamification

NIE		The experience of gamification		Total
		TAK		
Assessment attractiveness	1	2	2	4
	2	2	1	3
	3	6	14	20
	4	16	22	38
	5	24	22	46
Total		50	61	111

The mean score obtained in the group that did not have the opportunity to experience gamification in its full dimension is 4.16 with a standard deviation of 1.09. The mean score in the second group is 4.0 with a comparable deviation of .98. The Mann-Whitney U test with a significance level of $p=.231$ indicates a slight influence of the experience of gamification on the assessment of its attractiveness. Analyzing the data presented in the table, there is a slight difference in the proportion of ratings 3, 4 and 5 between the groups. The first set of data is dominated by the value 5, while in the case of people working with the gamification method, the number of responses 5

is equal to the frequency of value 4, which is also reflected in the obtained averages. However, in both cases the attractiveness rating remains high.

When asked to rationalize their assessment, respondents described gamification similar to the previous answers. The greatest advantage of gamification seems to be its low popularity and the rare use of such a tool by teachers. The respondents also appreciated the more casual and, in their opinion, less stressful form of tasks carried out in this formula.

There were also voices warning against not using the potential of this method through poor preparation for such activity:

Most of the time they are very interesting, but some teachers find that quizzes are just a way to occupy a gap in the class time. It's all about the easy games and then apart from a gentle repetition of the material, for example, we have a competition of who will finish the quiz faster or win the game.

Students perceived that attractiveness and effectiveness depend on the approach and preparation of the teacher and the way the whole process is organized and conducted. Also similar for both evaluations was the identification of higher attractiveness or effectiveness with lower frequency of use of this method compared to traditional ways of teaching and acquiring knowledge and skills in high school.

Some of the statements cited earlier seem to support our hypothesis about the effect of using the tool in question as part of a subject's lessons on students' liking for the discipline. The results obtained are presented in the graph below.

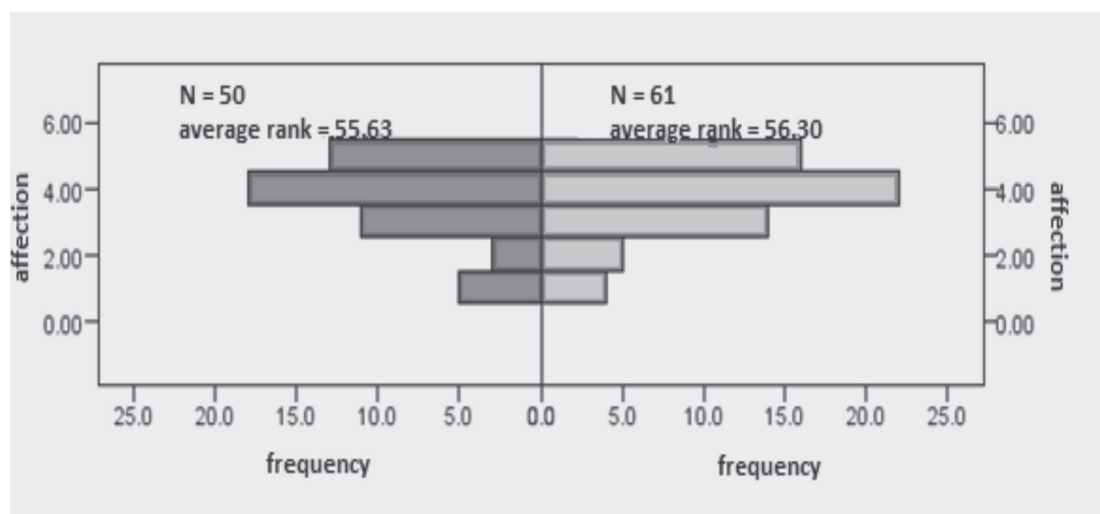


Figure 3. Influence of introducing gamification elements on liking the subject as assessed those not working with the method (left) and those testing it (right).

Based on the Mann-Whitney U-test with a significance level of $p=.909$, it appears that in both groups, respondents equally considered the introduction of gamification elements within the learning of a given subject as a factor that could result in an increase in liking for a given discipline. An additional analysis of the distribution of grades in the girls' and boys' groups, presented in Figure 6, turned out to be interesting.

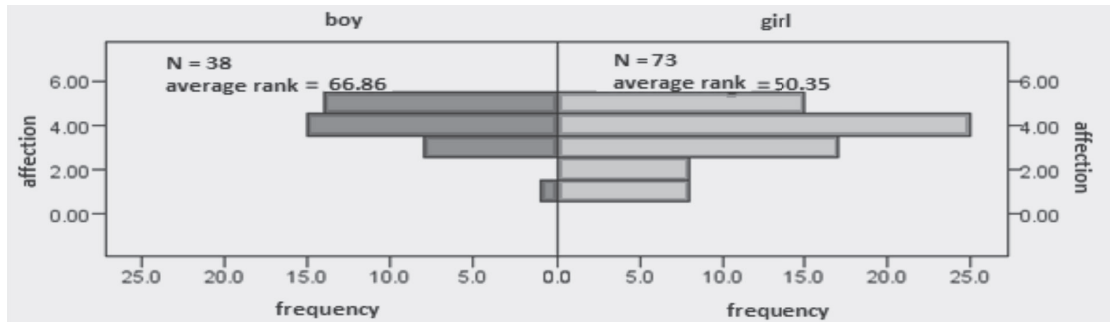
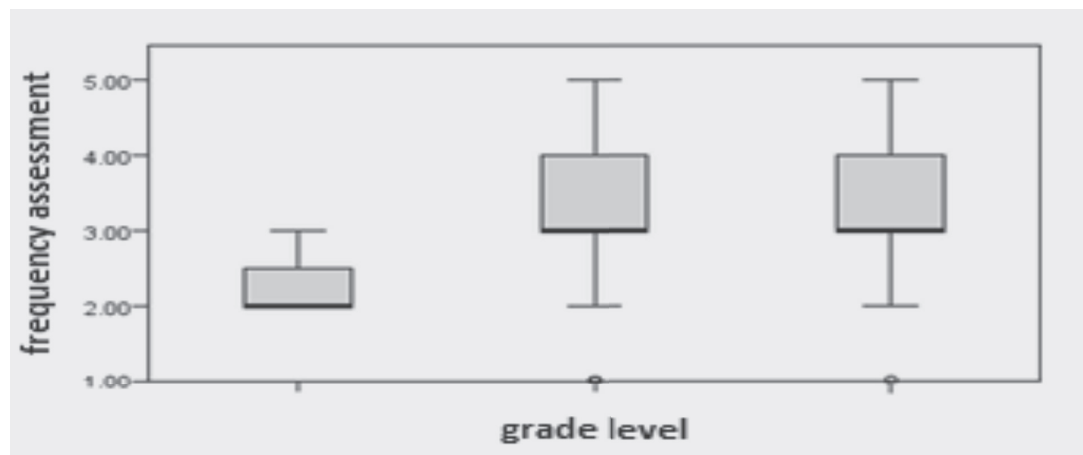


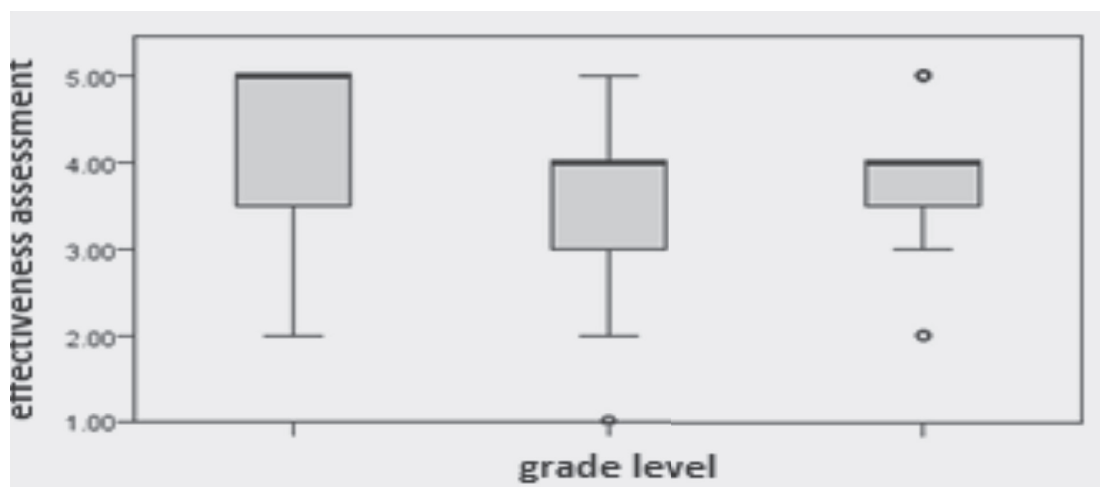
Figure 4. Effect of introducing gamification elements on subject liking as assessed by boys (left) and girls (right).

In this case the Mann-Whitney U-test with a significance level of $p=.008$ indicates greater liking for and interest in the subject induced by the introduction of gamification elements in lessons in the case of boys. An additional aspect worth considering is the fact that male students of all classes, including those whose profiles do not indicate any particular interest in the Polish language, declare an increase in their liking for this subject after a personal experience of gamification.

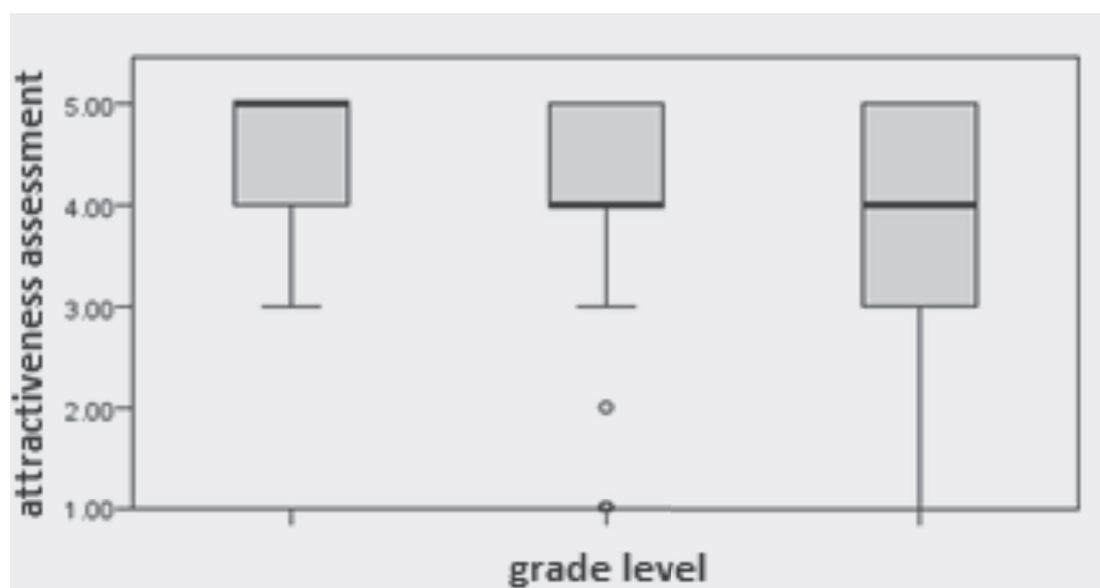
Next, the influence of the grades obtained in the subject on the perception of gamification introduced in the classes of that discipline was analyzed. Respondents were asked to indicate what average grades they receive in subjects where gamification elements were introduced. Then they were grouped into three categories: low grades, average grades and high grades. Then, the relationship between the obtained grades and the perception of gamification was examined. The results of the analysis are presented in the graphs below.



Figures 5. Optimal frequency rating of gamification as a function of grades earned in the discipline. From left: for low, average, and high grades.



Figures 6. Effectiveness rating of gamification as a function of grades earned in the discipline. From left: for low, average, and high grades.



Figures 7. Attractiveness rating of gamification as a function of grades earned in the discipline. From left: for low, average, and high grades.

On the basis of the Kruskal-Wallis test, with a significance level of $p=.836$ for attractiveness and $p=.771$ for effectiveness, no influence of the grades obtained in the course in which the gamification elements were implemented on the perception of its effectiveness and attractiveness was found. All respondents rated the attractiveness of the analyzed method as very high, while the effectiveness - as high, regardless of the level of experience in working with this method and the grades received from the discipline in which the gamification elements are introduced during classes. Possible reasons for such evaluations have been described earlier. The Kruskal-Wallis test at $p=.122$ revealed a slight correlation between the optimal frequency of gamification elements in the classroom and the grades achieved in the course. For low scorers, the mean indicated frequency was lower than for the other groups. This does not necessarily mean reluctance or lack of faith in the effectiveness or attractiveness of the method, which was confirmed by the tests described above, but rather a lack of desire to undertake any activity related to learning. Of course, there may be various reasons for such inactivity.

In the last question, respondents were asked to identify what factors they consider to be the most challenging element of gamification. Based on the Mann-Whitney U-test, two of them, the creative nature of the activities and persistence, are statistically significant ($p=.03$ and $p=.005$, respectively). A full summary of the tests performed is presented in Table 5.

Table 5. Summary of the test of hypotheses related to difficulty

	NULL HYPOTHESIS	TEST	SIGNIFICANCE	DECISION
1	The term distribution is the same for the category of the variable gamification.	Mann-Whitney U test for independent samples.	.653	Accept the null hypothesis.
2	The distribution of the creative nature of the activities is the same for the variable category gamification.	Mann-Whitney U test for independent samples.	.031	Reject the null hypothesis.
3	The distribution of competition is the same for the variable category gamification.	Mann-Whitney U test for independent samples.	.123	Accept the null hypothesis.
4	The distribution of rules is the same for the category of the variable gamification.	Mann-Whitney U test for independent samples.	.339	Accept the null hypothesis.

5	The distribution of persistence, motivation is the same for the category of the variable gamification.	Mann-Whitney U test for independent samples.	0.005	Reject the null hypothesis.
6	The distribution of others is the same for the category of the variable gamification.	Mann-Whitney U test for independent samples.	0.390	Accept the null hypothesis.

The interrelationships indicate that the factors that were considered the greatest assets in research and studies related to gamification - creativity and motivation - were also the most challenging for students. This may be due to several factors: overload related to remote learning (Plebańska, Szyller and Sieńczewska, 2020, p. 43), habituation to template tasks and limitations due to the need to use the digital tools indicated in the challenge. Sometimes students perceived creative tasks as not useful from the point of view of exam and called for more exercises based on writing and reading.

Pointing out the lack of persistence and motivation as a factor hindering the implementation of tasks confirms the conclusion stated in the theoretical part, that the gamification method should not be used as a remedy, and its course should be well thought out and planned. The use of games, puzzles or an appropriate storyline is not enough to make students eager to perform the exercises - at each stage of gamification, it should be evaluated and adjusted to the capabilities of the participants (even if some of the planned activities should be abandoned).

Discussion

The conducted survey can be considered an introduction to an in-depth reflection on the gamification method, its use at school, strengths and weaknesses. The results of the questionnaires clearly indicate that many elements of gamification promote the mastery of knowledge necessary to pass the matriculation exam. However, the effectiveness of this method is not based on the spontaneous and one-time introduction of the game to the lessons, but requires getting to know the students, the teacher's self-awareness, as well as appropriate methodological preparation.

The results presented above may provide a basis for further research. Undoubtedly, the same survey should be conducted on a larger study group, taking care to properly plan and apply gamification beforehand. Perhaps differences would be revealed between high and low performing students. There is also the question of what effect the age of the respondents has on perceptions of gamification; whether difficulties related to motivation would have arisen, for example, in elementary school, where grades are higher in

the hierarchy of values, or whether a pandemic had a decisive effect on the attitudes of high school students. The authors also recognize the need to deepen the themes of difficulties and drawbacks of gamification, as they are rarely found in studies. It seems reasonable to design qualitative research based on experimental methods, participant observation, which will allow to notice the reasons for the lack of motivation or problems with creativity, but also to describe good practices related to the process.

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