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An innovative method of gamification of errors and facts in school practice – a few words about its implementation in the context of maintaining students’ attention

Nowatorska metoda gamifikacji błędów oraz faktów w praktyce szkolnej – kilka słów o jej wdrożeniu w kontekście podtrzymywania uwagi uczniów

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Abstract

Aim. Balancing the attention deficit of students, thanks to the use of the latest activating method in teaching – gamification of errors and facts (taking into account student dysfunctions).

Methods. Among the research methods in social research, an international internet survey was used and another nationwide survey in groups dealing with SEN (special educational needs) and gamers on Facebook.

Results. Two proprietary algorithms of teacher motivation were created: an algorithm for maintaining attention and motivation for mentally strong students, based on the classic algorithm of computer game developers, and an algorithm for maintaining attention and motivation for mentally weak students, based on a modern algorithm for computer game developers.

Conclusion. It has been shown that problems with understanding the text result from the deficit of students' attention is now a problem for the entire digital generation. The level of general attention in the group of respondents with SEN was 25.13% and in the group of respondents without SEN – 31.89%. The rate of loss of attention in the group of respondents with SEN was 8.2% and in the group without SEN – 9.95%.

Cognitive value (original approach to the topic). The unusual approach to the topic consists of creating an original method of calculating the coefficients: the level of general attention and the loss of attention. An original method of activating teaching was created – gamification of errors and facts (taking into account student dysfunctions).

Keywords: SEN (special educational needs), attention, focus, activating method, gamification, error, fact.

Abstrakt

Cel. Równoważenie deficytu uwagi uczniów dzięki zastosowaniu najnowszej metody aktywizującej w nauczaniu – gamifikacji błędów i faktów (uwzględniającej dysfunkcje uczniowskie).

Metody. Wśród metod badawczych w badaniach społecznych wykorzystano ankietę internetową o zasięgu międzynarodowym oraz drugą – o zasięgu ogólnopolskim – w grupach dla osób ze specjalnymi potrzebami edukacyjnymi (SPE) oraz wśród graczy na Facebooku.

Wyniki. Stworzono dwa autorskie algorytmy postępowania motywacyjnego nauczycieli: algorytm podtrzymywania uwagi i motywacji dla uczniów silnych psychicznie, oparty na klasycznym algorytmie twórców gier komputerowych oraz algorytm podtrzymywania uwagi i motywacji dla uczniów słabych psychicznie, oparty na nowoczesnym algorytmie twórców gier komputerowych.

Wnioski. Wykazano, że kłopoty ze zrozumieniem tekstu wynikają z deficytu uwagi uczniów, co stanowi obecnie już problemem całego pokolenia cyfrowego. Poziom ogólnego skupienia uwagi w grupie respondentów ze SPE wyniósł 25,13% oraz w grupie respondentów bez SPE – 31,89%. Współczynnik utraty skupienia uwagi w grupie respondentów ze SPE wyniósł 8,2% oraz w grupie bez SPE – 9,95%.

Wartość poznawcza (oryginalność ujęcia tematu). Nietypowość ujęcia tematu polega na stworzeniu autorskiej metody wyliczenia współczynników: poziomu ogólnego skupienia uwagi oraz utraty skupienia uwagi. Stworzono autorską metodę aktywizującą w nauczaniu – gamifikację błędów i faktów (uwzględniającą dysfunkcje uczniowskie).

Słowa kluczowe: SPE (specjalne potrzeby edukacyjne), uwaga, skupienie, metoda aktywizująca, gamifikacja, błąd, fakt.

The need for this publication emerged from the cooperation of the management of the Tadeusz Kościuszko Technical School Complex in Leżajsk with one of the universities in Denmark. As part of one of the projects, teachers were trained in the modern activation method described in this publication. Applying it in practice makes it possible to diagnose the fruitfulness and validity of the method in the context of evaluating pupils' progress, especially in terms of activity, attention, and work motivation.

It appears that students' main problem is reading comprehension, and this is directly related to their attention span. In the medical literature, attention deficit disorder (ADD) was already described more than a century ago (Amen, 2020), so the topic of this paper is no newcomer. However, its most important asset is the presentation of the latest activating teaching method. Due to its versatility, it can be used in all subjects. It is a proprietary method of gamification of errors and facts, taking into account students' dysfunctions and motivating them to work. The novelty of the method is – among other things – to look at the teacher as a game developer. The authors of this publication therefore include the creator of original computer games – Marcin Prościak, as well as Polish language teacher Beata Prościak, and mathematics teacher Halina Samko. The introduction of the method in a modern school – according to the authors – will soon become almost a necessity, because at a time when students use the ChatGPT bot, which solves tasks in all subjects at the compulsory education level, and its creators send the message “adapt or die” to teachers, a change in teaching methods becomes inevitable (Gajewski, 2023).

This paper aimed to prove that reading comprehension difficulties are due to students' attention deficit, which is now already a problem for the entire digital generation. Its severity only depends on the amount of attention people devote to so-called “being on the Internet”, e.g., on Facebook, Instagram, Tik-Tok, and other social media and playing computer games. Many times people with dysfunctions do very well in life. Students – tired of constantly focusing their attention on digital media – find it difficult to focus their attention during lessons. Therefore, it is safe to say that the problem of lack of attention can no longer be attributed only to people with ADHD and ADD, but to the majority of students who enjoy the benefits of digital civilisation.

Methodology of research

The authors intended to conduct a worldwide survey that would provide an answer as to whether there is a general trend of lack of attention among young people nowadays. To achieve this, two survey questionnaires were created in Polish and one in

English with a worldwide scope. A total of 65 respondents with special educational needs (SEN) and 253 respondents without SEN took part in the two surveys in a national forum. The surveys were conducted on two dates (January and April 2023). They were developed partly based on publications in the field of attention (Jurek, 2014), but many questions are original, as it was important to show the problem from different sides. A list of the Facebook respondent groups surveyed is provided in the appendix. It is worth highlighting the international nature and extensive reach of the research, as evidenced by the number of members of the surveyed groups from SEN (Poland): approximately 7.8 thousand users, computer gamers (Poland): 21.7 thousand users, SEN (worldwide): 53.6 thousand users and computer gamers (world): 101 thousand users.

The survey exercises were divided into three parts of similar difficulty to test the level of focus in the different parts. The surveys can be accessed via links on the Internet, which have been included in the appendix.

Analysis of the research survey

The exact wording of the survey questions is quoted below, which are arranged in three thematic blocks. The purpose of this layout of the survey was to test whether respondents would get more or less confused as they completed the survey. This provided further clarification of their level of concentration (intensity) of attention (Janiszewska, 2007) depending on when they completed the survey.

Each part of the questionnaire contained an identical instruction, but different examples of words or numbers.

Exercise 1. How many antonyms are there in the sub-items in picture 1 (total)?

Part 1:

- a) incompatible, divergent, contradictory, equal, different, opposite
- b) failure, setback, success, defeat, defeat, pogrom
- c) necessary, unnecessary, useless, superfluous, pointless, unhelpful
- d) main, essential, central, fundamental, unimportant, supreme

Part 2:

- e) opposition, protest, refusal, acquiescence, prohibition, denial
- f) efficient, reliable, skilful, agile, active, operative
- g) indignation, wrath, agitation, anger, rage, annoyance
- h) sad, gloomy, dismal, depressed, sullen, sorrowful

Part 3:

- i) tired, weary, rested, exhausted, worn out, finished
- j) understandable, logical, obvious, accessible, difficult, readable
- k) discourage, alienate, inhibit, dissuade, persuade, discourage
- l) to save, to perish, to rescue, to find, to retrieve, to bring out

This was a task that required knowledge of the antonym and its definition, as well as a rich vocabulary and several antonyms. Only some respondents coped with it.

Exercise 2. There is one repeated number in each of the sub-items from the picture. Choose one repeated (repeating) number from each sub-item. Multiple choice questions.

Part 1:

- a) 200, 992, 192, 117, 191, 120, 120
- b) 552, 336, 354, 554, 332, 554, 355
- c) 121, 013, 103, 022, 013, 105, 212
- d) 483, 485, 483, 249, 825, 429, 843

Part 2:

- e) 617, 613, 622, 262, 217, 127, 217
- f) 276, 726, 528, 528, 753, 584, 573
- g) 675, 658, 675, 875, 639, 891, 569
- h) 018, 874, 271, 625, 625, 735, 906

Part 3:

- i) 239, 672, 875, 236, 438, 282, 672
- j) 911, 743, 343, 554, 277, 911, 902
- k) 665, 543, 674, 764, 246, 764, 322
- l) 544, 772, 745, 272, 879, 647, 772

Respondents were asked to perform only one activity, i.e., to find a repeated number. The task did not require more knowledge, so the number of correct answers was higher here.

Exercise 3. There are pairs of numbers in the picture in the subsections. How many pairs are not the same (the numbers are different from each other) (in total)?

Part 1:	Part 2:	Part 3:
a) 66,66	l) 372, 726	v) 744, 744
b) 111, 112	m) 2059, 5059	w) 4232, 4323
c) 3676, 3616	n) 34932, 34932	x) 35942, 35992
d) 15906, 15900	o) 234545, 234544	y) 648384, 688384
e) 699199, 699169	p) 26,62	z) 77,77
f) 78, 78	q) 669,696	aa) 188, 186
g) 356, 356	r) 2639, 2631	bb) 5795, 5759
h) 6338, 6336	s) 93878, 63878	cc) 66483, 66483
i) 44491, 44491	t) 331330, 333130	dd) 272777, 277217
j) 749777, 739777	u) 28, 28	ee) 89, 89
k) 49, 94		

In this task, respondents may have confused the shapes of similar numbers. The result may have been affected by a lack of understanding of the content of the question and an inability to understand the concept of a *pair of numbers*.

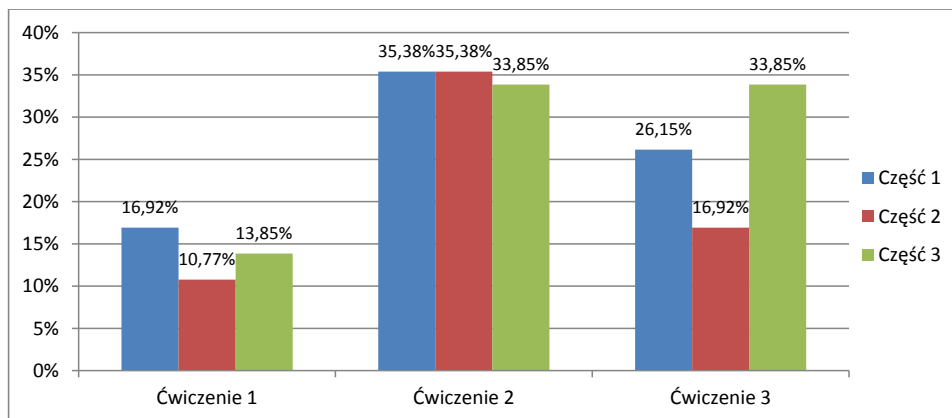
In the tables below, the quantitative summaries of the respondents' correct answers are included, with a breakdown between respondents without SEN and those who declare themselves to have SEN.

Table 1

Exercise results of respondents with SEN – number of correct answer

Results of exercises (65 SEN people)	Exercise 1	Exercise 2	Exercise 3
Part 1	11 (16.92%)	23 (35.38%)	17 (26.15%)
Part 2	7 (10.77%)	23 (35.38%)	11 (16.92%)
Part 3	9 (13.85%)	22 (33.85%)	22 (33.84%)

Source: Authors' own study.



Picture 1. Exercise results of respondents with SEN – number of correct answers.
 Note: *ćwiczenie* (pl) – exercise; *część* (pl) – part. Source: Authors' own study.

As can be seen, the group of SEN respondents achieved the best results in exercise 2, which did not require more knowledge and the respondents' attention was focused on performing only one simple thinking activity. Conversely, the worst results were achieved in exercise 1, which required a combination of knowledge and a thorough understanding of the instruction.

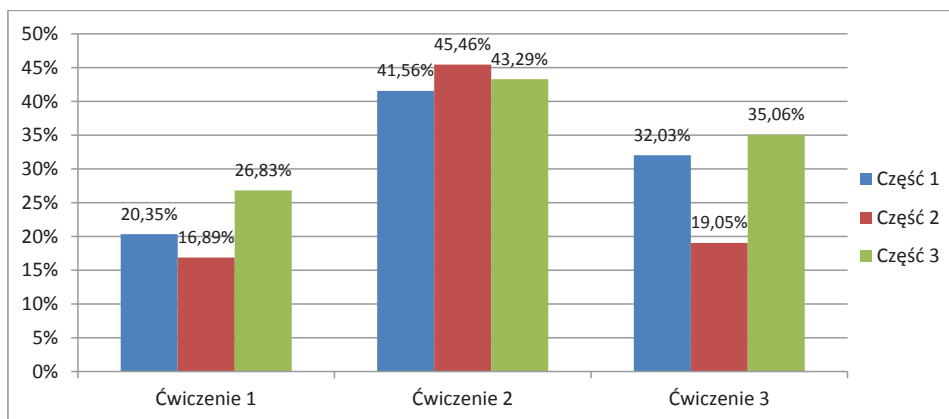
Furthermore, there is a clear tendency for respondents to lack focus at the beginning of the survey. As the survey was completed, respondents were more and more able to concentrate on the task, but towards the end, there was again a tendency for attention focus to decrease.

Table 2

Exercise results of respondents without SEN – number of correct answers

Exercise results (231 people without SEN)	Exercise 1	Exercise 2	Exercise 3
Part 1	47 (20.35%)	96 (41.56%)	74 (32.03%)
Part 2	39 (16.89%)	105 (45.46%)	44 (19.05%)
Part 3	62 (26.83%)	100 (43.29%)	81(35.06%)

Source: Authors' own study.



Picture 2. Results of exercises of respondents without SEN – number of correct answers. Note: *ćwiczenie* (pl) – exercise; *część* (pl) – part. Source: Authors' own study.

Similar was the situation in the group of respondents without SEN. They had the best results in exercise 2 and the worst results in exercise 1. As for the analysis of attention concentration during the survey, it was quite similar to the respondents with SEN. The initial and final exercises were conducted with less concentration of attention than the exercises in the middle of the survey.

The results indicate that the digital generation already operates on different standards than the older generation. Characteristically, it takes them a long time to reach a state of focus. Concentration of attention is short-lived and by the end of a task, they are already thinking about completing it as quickly as possible.

The results of the survey exercises were analysed using positional measures such as the median and the spread. The calculation of the author's coefficients: overall level of focus and loss of focus are also presented.

Level of overall focus

The level of overall focus of attention (abbreviated as Posu [*Poziom ogólnego skupienia uwagi*]) is an indicator to estimate the respondents' ability to focus their attention on the correct execution of the exercise. It is calculated by finding the median of the scores obtained in the different parts of the exercise. It provides an additional indication of the degree of performance of individual exercises.

Respondents with SEN:

Median_{ex.1} = 10.77%, 13.85%, 16.92%

Posu_{ex.1} = 13.85%

Median_{ex.2} = 33.85%, 35.38%, 35.38%

Posu_{ex.2} = 35.38%

Median_{ex.3} = 16.92%, 26.15%, 33.84%

Posu_{ex.3} = 26.15%

The level of overall focus of attention, for all exercises, in the group of SEN respondents is 25.13% (on average).

Respondents without SEN:

Median_{ex.1} = 16.89%, 20.35%, 26.83%

Posu_{ex.1} = 20.35%

Median_{ex.2} = 41.56%, 43.29%, 45.46%

Posu_{ex.2} = 43.29%

Median_{ex.3} = 19.05%, 32.03%, 35.06%

Posu_{ex.3} = 32.03%

The level of overall focus of attention, for all exercises, in the group of respondents without SEN is 31.89% (on average).

Loss of focus factor

The loss of focus index (abbreviated as Wusu [*Współczynnik utraty skupienia uwagi*]) is an indicator for estimating the loss of focus of respondents during the exercise. It is calculated as the spread of scores obtained in the different subsections of the exercise. It represents the maximum percentage of attention lost by the respondent during the exercise.

$$wusu = R(wusu_{max}) - R(wusu_{min})$$

An extremely high loss of attention score (wusu) may be an indication of suspect ADD in the respondent or the study group.

Respondents with SEN:

Range_{ex.1} = $R(wusu_{ex.1\ max}) - R(wusu_{ex.1\ min}) = 16.92\% - 10.77\% = 6.15\%$

Wusu_{cw.1} = 6.15%

Range_{ex.2} = $R(wusu_{ex.2\ max}) - R(wusu_{ex.2\ min}) = 35.38\% - 33.85\% = 1.53\%$

$$Wusu_{\text{cw.2}} = 1.53\%$$

$$Range_{\text{ex.3}} = R(wusu_{\text{ex.2max}}) = 33.84\% - R(wusu_{\text{ex.2min}}) = 16.92\%$$

$$Wusu_{\text{cw.3}} = 16.92\%$$

The attentional loss rate for all exercises, in the group of SEN respondents, is 8.2% (on average).

Respondents without SEN:

$$R(wusu_{\text{ex.1 max}}) = 26.83\% - R(wusu_{\text{ex.1 min}}) = 16.89\%$$

$$Wusu_{\text{ex.1}} = 9.94\%$$

$$R(wusu_{\text{ex.2max}}) = 45.46\% - R(wusu_{\text{ex.2min}}) = 41.56\%,$$

$$Wusu_{\text{ex.2}} = 3,9\%$$

$$R(wusu_{\text{ex.3max}}) = 35.06\% - R(wusu_{\text{ex.3min}}) = 19.05\%$$

$$Wusu_{\text{ex.3}} = 16.01\%$$

The attentional loss rate for all exercises, in the group of respondents without SEN is 9.95% (on average).

The research group distinguished between respondents with and without SEN. The study reveals that lack of focus is a problem for the entire digital generation, as the attentional loss rate and the level of focus are comparable among both SEN and non-SEN pupils. It appears that the attentional focus level of both SEN and non-SEN pupils is baseline low, as pupils perform consecutive tasks at a similar level. It is 25.13% in SEN respondents and 31.89% in non-SEN respondents. Moreover, it should be mentioned that the attentional loss rate is similar for SEN and non-SEN respondents. They are 9.95% for SEN respondents and 8.2% for non-SEN respondents. Apart from attentional focus, in some exercises, the respondents lacked knowledge and in others, they had problems with visual perception (especially spatial vision) because they confused digits with similar shapes. In exercises 2 and 3, the results are very similar and statistically comparable. The worst results were obtained by the respondents in the exercise that required knowledge of antonyms. It should additionally be mentioned that this was the only exercise in which students with SEN scored much worse than those without SEN. This may have been due to the nature of the task, which placed a premium on knowledge of multiple words and definitions of antonyms.

It is notable that among the 53,600 members of the international groups, among the more than 10 groups relating to SEN, only two people responded and a few people clicked the “like” button. Only one person was surveyed in English. A group member gave a relevant comment on the situation of children with SEN in the UK, in which he stated that his son only started the survey because after reading the first exercise he found it too many words for him and gave up.

Gamification

The English term *gamification* is translated (in Polish) in three ways: *gamifikacja*, *grywalizacja*, and *gryfikacja*. The term is defined as the use of game elements and game design techniques in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011), and its main aim is to influence behaviour by increasing motivation and engagement in an activity (Rodwald, 2019).

Game developers are geniuses at sustaining the attention of children and young people. It is therefore worth looking at the specifics of game developers' thinking to draw inspiration from them to motivate students to learn by focusing their attention on learning in a similar way as game developers. Zbyszko Melosik argues that modern young people are shaped by pop culture and consumerist lifestyles and avoid engaging more with anything (Kulig-Kozłowska, 2017). However, these are only part of the problems of the studied generation. Noteworthy among them is the fact that a lack of focus on things that are not interesting to them is prevalent in the contemporary digital generation. Young people are unable and unwilling to learn because it does not interest them. ADD generally affects childhood and subsides after education (Folger, Stern, 2018). It is also worth noting at this point the process of encoding, i.e. the placement of information in long-term memory. It involves paying attention to something, associating information with something familiar, analysing the information and focusing on its details (Zimbardo et al., 2017). We should add that some information does not get into the "memory bank" at all because we do not take notice of it when we are distracted by something or do not have the need to remember it, in which case the distraction of memory is caused by directing attention to something else (Zimbardo et al., 2017). Educational changes have also been forced by the labour market, as the demands for vocational qualifications have increased in all Western European societies and young people are continuing their education for much longer than before, and some even throughout their lives (Bartoszewicz, Gulińska, 2015).

Algorithms for sustaining attention

The famous game designer, Jane McGonigal, suggested that real-world problems should be solved through games. Hence the concept of *gamification*, which involves using game mechanics outside the game (Protasiuk, Gorączka, 2020). Furthermore, the concept of flow, concerning the level of difficulty adapted to the learner's skills, had to be taken into account. Assignments should not be too difficult, as the learner may be discouraged, nor too easy, so that the learner does not get bored (Protasiuk, Gorączka, 2020).

Nowadays, game developers mainly use instinct-based algorithms to sustain players' attention. In the older type of games, the player was motivated to act and their attention was sustained by giving them difficult tasks and repeated attempts to pass the same level – until they won and scored points. The weaker player would drop out of the game. The weak player generally wanted to improve, while the strong player wanted to experience the challenge and showcase his high skills. However, verbal violence, swearing, and insulting players occurred with those who were not mentally resistant to failure (Kucharek, 2022).

Therefore, developers of new games have changed the algorithm for dealing with players and absorbing their attention. The new games assume that losing is not to be felt. The player is supposed to have a constant feeling of adventure that allows him or her to “flow” in the game. Network games are based on competition with others, but the algorithm evaluates players and selects opponents so that each player feels the satisfaction derived from the game and develops his or her skills. The algorithm's job is to maximise the enjoyment felt by players. Most young people don't want to be upset about losing. However, the algorithm ensures that the best players play with the best, the weak with the weak.

To translate these systems into algorithms for sustaining teachers' attention in a school, it is worth taking into account the specifics of the school as well as the students' psychological problems and motivational needs. The biggest problem has always been students who are weak in their learning or those with dysfunctions. Hence the suggestion that the teacher (alone or in collaboration with a special educator or psychologist) should diagnose each student's reaction to failure. For students who are resistant to failure, the authors recommend the first, older algorithm, because a weaker student, being aware that his/her academic performance is inferior, can motivate himself/herself to learn after a failure and has the chance – by catching up – to be among the best. Conversely, those who react negatively to failure reduce this chance for themselves. In this case, the teacher could use a second algorithm. The second algorithm is that the student should not feel that he/she is not good at learning. Therefore, he or she should be given tasks that raise self-esteem. This is the case for students with dysfunctions, but not only. There are plenty of learners without dysfunctions who find it difficult to endure failure. These are the most difficult to deal with because it is up to the teacher (in cooperation with the school counsellor or psychologist) to diagnose the mental state of the student in case of failure and to take appropriate action together with the counsellor. He/she can either propose to such a student to visit the psychological-educational counselling centre or independently implement his/her motivational algorithm for mentally weak students. Hence, two motivation algorithms are proposed:

- an algorithm for sustaining attention and motivation for mentally strong students, based on an old algorithm from computer game developers,
- an algorithm for sustaining attention and motivation for mentally weak students, based on the new algorithm of computer game developers.

Additionally, the teacher – based on an opinion from the psychological-educational counselling centre – should assess individually, based on which algorithm to guide a dysfunctional pupil. Noteworthy is the fact that one innovative activating method of gamification of errors and facts takes into account two algorithms of student motivation proceedings. Hence, the author's motivational behaviour algorithms for students are distinguished:

An algorithm for sustaining attention and motivation for mentally strong students, based on the classic algorithm of computer game developers (zero-sum game). One player wins at the expense of the other (the first gains, the second loses) (Tomicki, 2019). They have to be mentally strong individuals.

- An algorithm for sustaining attention and motivation for mentally weak students (including those with SPE), based on a modern algorithm from computer game developers (non-zero-sum game model). One player's success does not necessarily entail another player's defeat and all can win or lose (in the absence of cooperation) (Tomicki, 2019). Even the weakest player should enjoy the game and be motivated to keep growing.
- As it turns out, in a group without SEN, the method of gamification of facts and errors, based on a game of mixed motives, can be applied. Players' preferences are partly convergent and partly contradictory. They choose either cooperation or competition. The method assumes that players are motivated by the chance to win and the opportunity to compare themselves with others. They need to be mentally strong individuals. Those who choose competition confirm the thesis of rankism and "competition-mania," i.e., chasing in education (Śliwerski, 2022). Even in management, it is now recognised that competition and cooperation are complementary processes, a duality that allows for better management of relationships (Śliwerski, 2022).

It is also worth reviewing a group with SEN, where a non-zero-sum game-based method of gamification of facts and factual errors is recommended. It uses a non-zero-sum game model because one player's success does not necessarily entail another player's defeat and all can win or lose (in the absence of cooperation) (Tomicki, 2019).

Some students play a zero-sum game. It refers to students who do not care about grades or learning at all. In the case of pupils who want to play a zero-sum game, the teacher may try to do something, but the student's actions may come down to Eric Berne's famous "Kick me" game. We encounter it when others try to help a person, but the person behaves more and more provocatively until he or she oversteps all boundaries. In this way, the person forces others to fulfil the "kick me" pledge (Berne, 2004).

The theoretical assumptions of the new activating method are thus in line with two crucial principles of teaching: "conscious and active participation of the learner in the teaching and learning process" by Czesław Kupisiewicz and "individualisation and socialisation" by Wincenty Okoń (Plewka, 1999). It is worth adding that the concept of the method consists of two assumptions: "a) a method (...) consisting of a specific selection and arrangement of component activities, b) a method consciously applied – planned and suitable for repeated use" (Uryga, 2002).

The method can be used in the short-term version (at least for five lessons) for repetition and consolidation or when introducing a new lesson topic. Whereas in the long-term version, it can be used for the ranking recorded on the class gamification scoring discussion sheets, with a view to the whole half-year. The teacher may assume that he/she enters the marks after a series of lessons of his/her choice, e.g., five, ten. He or she then reads out the names of the top five students in the ranking and assesses the engagement of the whole class, translating the points into grades (if the students have scored low, they can opt-out and move their points to the next ranking level). The reasoning behind this is that status is the greatest motivator for action. This is also the premise of the SAPS (Status, Access, Power, Stuff) theory, which was developed by gamification guru Gabe Zichermann. He distinguished four levels of rewards: status, access (powers), powers, real, and virtual objects (Protasiuk, Gorączka. 2020).

In the SEN group, each pupil gets an average activity grade at the end of the half-term or school year (regardless of any previous sub grades earned). In the factual gamification group, the teacher also gives an average activity grade at the end of the half-term or school year but does not enter a failing grade. If a student avoids receiving a failing grade in the factual gamification group, the student should receive a grade from the oral answer on that account.

Assignments in a group without SEN should contain elements of novelty, surprise, and the unknown. The primary aim of teaching should be to find errors. In contrast, in a group with SEN, tasks should retain elements familiar to the pupils and the main teaching objective is fact-based, truth-based learning.

From pedagogical practice – some remarks on the method of gamification of errors and facts

1. Proposed course of lessons (or series of lessons) using the method of gamification of errors and facts: The teacher assigns a range of material for students to prepare from the textbook and from various sources for those who are willing. He or she does this in such a way that the students (or parents) do not resent the students being overloaded with homework. Hence, it is recommended for those who are willing – especially in weaker classes (as far as new material is concerned). In the case of previously discussed material compulsory knowledge of the content of the reading, regardless of the class level – is compulsory for all.
2. Voluntary pupils elaborate on the material (in weaker classes also with the help of the teacher).
3. The teacher prepares the questions and acts as an impartial arbiter.
4. The teacher divides the class into groups without SEN and with SEN (based on the individual needs of the pupils and recorded in the notes on the gamified scoring discussion sheet) without making the students aware of which group has assigned them to.
5. Gamification scoring discussion in class.
6. The teacher uses a gamified scoring discussion sheet for the class (a form of ranking). Students have the opportunity to add questions during the discussion.
7. The teacher archives the points earned by the pupil in the gamification scoring discussion spreadsheet so that at the end of the half term it is clear who the champion is in the top five ranking.
8. Activity champions should be rewarded with end-of-semester grades as determined by the teacher, e.g., the top two with a six, and the remaining three with very good grades.
9. Marks for activity champions should be treated as additional bonuses on a half-termly basis.

For the new method of gamification of errors and facts, it is recommended to use a scoring discussion in a modified form. The authors of this paper have created an electronic version of the authors' Error and Fact Gamification Scored Discussion Sheet, which provides a tool to facilitate the automatic counting of student activity and its conversion into specific school grades. However, due to the volume of the article, it remains in the authors' collection (available for review). Additionally, a detailed description of the method with concrete examples of its use also remains in the authors' collection.

<p>Arkusz gamifikacyjnej dyskusji punktowanej metodą gamifikacji błędów i faktów © autorstwa dr Beaty Prościak, mgr Haliny Samko, Marcina Prościaka</p> <p>W celu dodania kolejnych kryteriów oceniania: proszę wypełnić kolejne poniższe pola pod obecnymi kryteriami. Za każdym razem, gdy uczeń spełni kryterium: proszę wpisać za każdym razem wyższą kolejną liczbę naturalną np. 1, następnie 2,3,4... w odpowiadającą mu komórkę. Gdy suma punktów ucznia jest podświetlona na kolor ŻÓŁTY: oznacza to, iż jest jednym z pięciu uczniów z najwyższą punktacją oraz kandydatem na mistrza aktywności. Proszę aktualizować liczbę przeprowadzonych lekcji. Wymagana liczba punktów na poszczególne oceny jest większa po każdej odbytej lekcji.</p> <p>Pola niedostępne do modyfikacji są oznaczone kolorem FIOLETOWYM! (Pola zawierają formuły) Pola do wypełniania przez nauczycieli są zaznaczone kolorem KREMOWYM oraz BIAŁYM!</p>		<p>Skala ocen (jedna lekcja - 100%):</p> <table border="1"> <tr> <th>6 (celujący)</th> <th>5 (bardzo dobry)</th> <th>4 (dobry)</th> <th>3 (dostateczny)</th> <th>2 (dopuszczający)</th> <th>1 (nie dostateczny)</th> </tr> <tr> <td>Pięciu najlepszych uczniów</td> <td>80%</td> <td>70%</td> <td>50%</td> <td>40%</td> <td>Poniżej 40%</td> </tr> </table> <p>Wymagane punkty:</p> <table border="1"> <tr> <td>14,42</td> <td>11,9</td> <td>9,8</td> <td>6,8</td> <td>Poniżej 6,8</td> </tr> </table>		6 (celujący)	5 (bardzo dobry)	4 (dobry)	3 (dostateczny)	2 (dopuszczający)	1 (nie dostateczny)	Pięciu najlepszych uczniów	80%	70%	50%	40%	Poniżej 40%	14,42	11,9	9,8	6,8	Poniżej 6,8	<p>Numer lekcji: 1</p> <p>Procent wymaganych punktów na drugiej lekcji: 70%</p> <p>Liczba punktów za wszystkie kryteria (na jednej lekcji): 17</p>																				
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Picture 3. A proprietary gamification scoring discussion sheet (created using a spreadsheet). Source: Authors' own study.

Among the recommendations for completing the sheet were:

- The worksheet is programmed in such a way that every student in the class has a chance to score points (depending on the class size).
- It is assumed that the minimum number of lessons required for this method is the number of students divided by five.
- It has been assumed that in one lesson of 45 minutes, the teacher can activate five students for the maximum number of points.
- It is also assumed that the student should complete at least one task each time.
- The grade depends on the degree of difficulty of the task completed by the student (depending on the extent to which the task was reproductive or creative, as signalled by the sheet).

To illustrate the character of the questions used in the gamification method of errors and facts, the evaluation sheet for student work used in the author's gamification scoring discussion sheet is provided below.

Table 3
Student work evaluation sheet

No.	Evaluation criteria	Points	Student 1	Student 2	Student 3
1	Presentation of factual information (at least two sources of information)	+2			
2	Task completed schematically (schematic response)	+1			
3	Task completed in a restorative manner (restorative response)	+2			
4	Task completed reproducibly enriched by self-education (at least two sources of information)	+3			
5	Creative task	+4			
6	Creative task enriched by self-study (at least two sources of information)	+5			
7	Taking a position – presenting a personal opinion	+2			
8	Perceiving analogies (similarities)	+2			
9	Commenting on or completing information	+1			
10	Drawing attention to an error	+1			
11	Speaking off-topic, deviating from the discussion plan	-2			
12	Start of discussion	+1			
13	Moving on to the next subject, according to the plan	+1			
14	Engaging another person in a discussion	+1			
15	Interrupting others, disrupting the discussion	-3			
16	Monopolising the discussion (speaking for more than 30 minutes)	-2			
17	Personal attack (inappropriate <i>ad personam</i> remarks)	-3			
18	Apology for inappropriate behaviour	+1			

Source: Authors' own study based on the literature (Zola, 1996).

Among the main questions to aid discussion in the gamification method of errors and facts are:

- Is this a false (error)?
- How do I correct this error?
- Is it true?
- Is it absolutely true?

It is still worth presenting an example of the character of possible discussion tasks (proposal):

- Find the errors in the tasks.
- How many answers were wrong in the tasks?
- Why do you consider the answers to be incorrect? Justify.
- Find the truth in the tasks.
- How many answers were true in the tasks?
- Why do you consider these answers to be true? Justify.
- Write in the correct order: true, false.
- How many answers were false in the tasks?
- How many were true answers in the tasks?
- Write a synthesising note yourself from the true information.
- Write (or elaborate on) two features each from two selected sources
- Compare the perception of the problem in at least two sources (similarities, differences).
- Explain the problem and present the implications of its solution based on at least two sources.
- Decide whether the authors view the issue as a contemporary problem (optional).

Research findings, conclusion

Based on the above observations and assumptions, the main content of the method of gamification of errors and facts can be identified. It serves not only to activate students but also to balance their attention deficit and to individualise learning. Its character can be described as cross-curricular, as through its use students can find an error and correct it, access reliable sources and know how to use them effectively. In addition, pupils acquire self-education skills to the extent that they can repair not only life's mistakes or find errors in a task but also repair broken machines and various types of equipment themselves. Hence, the axioms in the method of gamification of errors and facts can be regarded as:

-
- Motivating and activating students throughout the school year (possibility of objective summative assessment of student activity throughout the half-term or school year).
 - Learning from mistakes and facts.
 - Individualisation in teaching.
 - Adapting the requirements from the opinion of the psychological-pedagogical clinic for students with dysfunctions.
 - Cooperation of the teacher with a special educator or psychologist.
 - Improving the competence of teachers to work with foreign students.

It turns out that the problem nowadays is no longer the dysfunctions themselves, but the lack of attention span of the younger generation. The activities of a man with Asperger's syndrome, Elon Musk, who – despite his disorder – has become one of the richest entrepreneurs in the world (Jaroszewski, 2021), can serve as an example.

It is apparent from the above research that a new urgency of attention deficit is deepening among young people. It is no longer dependent on ADHD or ADD, but is characteristic of a whole generation of digital natives. Since teachers are already in contact with a whole new generation with completely different educational needs, they should also modify their teaching methods. When writing about a new perspective on teaching methods, one cannot dissociate oneself from gamification (Protasiuk, Gorączka, 2020). The innovative author's method of gamification of errors and facts is worth emphasising as it fits in with educational priorities (Priorytety, 2016).

Some remarks after applying the method of gamification of errors and facts

The method was applied in the second half of the 2022/23 school year in several secondary school classes. Here are some early observations:

- The method of gamification of errors and facts works most effectively in classes consisting of students with ambition and, furthermore, in the younger years. It has also been observed to produce good results with hyperactive, busy pupils who enjoy competition. Students are even capable of finding errors in their classmates' and their statements, which gives them satisfaction and encourages them to read more thoroughly. This phenomenon can be observed especially among students who play computer games, and there are more and more of them.
- It is preferable to start using this method in the first classes so that students gradually become accustomed to developing habits of activity.

- The gaming activity sheet is worth introducing at the beginning of the school year because then it is possible to get students used to the activity and select appropriate topics during which such sheets and methods can be used (especially repetition lessons). Moreover, during the six months, it is possible to plan for yourself an appropriate number of such lessons (a minimum of 5 and preferably 10).
- It would be useful to use the new method, especially for repetition lessons in high school graduating classes.

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Annexe

Link to survey in Polish: <https://docs.google.com/forms/d/e/1FAIpQLSfd4V2-SZ6-T96bU1vZhOFLCWYBR-KeOV-rUx2TrWosvTd8qQ/viewform> (2023, January).

Link to survey in English: https://docs.google.com/forms/d/e/1FAIpQLScEaHzUm_kQcVgt1t_v8SCpTmiFTm5nKloVce_7prermuoXGA/viewform (January 2023).

Link to survey in Polish (without SEN): <https://docs.google.com/forms/d/e/1FAIpQLSclChEm0wAmRWWhdlxTEKtdX0gyGzTfUXA9n11aswhBypiqfw/closedform> (2023, April).

Link to survey in Polish (SEN): <https://docs.google.com/forms/d/e/1FAIpQLSc43PICbUiPP3EKSfDc7khvBCtdCDrvkQ-iLp3mV5WVoxhNrQ/closedform> (2023, April).

Facebook groups participating in the survey:

SEN groups (Polish):

- Dysleksja a języki obce [Dyslexia and foreign languages] (1,500 users)
- Dysleksja i inne specyficzne trudności w uczeniu się – wsparcie i rozwój [Dyslexia and other specific learning difficulties – support and development] (4,400 users).

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- Oczami Dyslektyka – dysleksja, dysgrafia, dysortografia, dyskalkulia... [Through the eyes of a Dyslexic – dyslexia, dysgraphia, dysorthography, and dyscalculia....] (1,900 users)

Player groups (Polish):

- Sekcja Graczy [Players' section] (21,700 users).
- Gracze to My! [The Players are us!] (81,100 users).
- My, Gracze! [We, the Players!] (7,400 users).

SEN (international) groups:

- Dyslexia (25,000 users).
- Teacher's help for Dyslexia (3,500 users).
- Dyslexia and Learning Disability support group (15,000 users).
- Dyslexia Diagnosticians – Texas (3,200 users).
- Stealth Dyslexia Support (1,700 users).
- Dyslexia Help Africa (1,300 users).
- Dyslexia – International Support & Advice for Parents! (3,900 users).

Player groups (international):

- Gaming (222,000 users).
- Soesic Gaming: Gamerlivestreams, Twitch, Youtube, Game Keys, GamerBrands (50,000 users).
- RON GAMING (51,000 users).
- Memebyte – Gamers, Gaming, and Games (31,000 users).
- Anime, Gaming, Manga, Cosplay, and Everything Else (32,000 users).
- Gaming HQCommunity (55,000 users).
- Retro Gaming 101 – The Group (88,000 users).