LEARNERS' MOTIVATION THROUGH GAMIFICATION AND DIGITAL GAMES

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Abstract

In recent years, gamification has become an increasingly well-known practice being introduced in several fields, including marketing, social networks, and education in several school subjects. Gamification is the incorporation of game components, primarily those from video games, into nongame contexts to increase motivation and engagement in learning. It involves designing educational activities that can progressively present knowledge and guide students toward the achievement of lesson objectives. Many students who are not interested in learning through conventional teaching approaches could find a source of motivation in the application of gamification in the educational environment. The deterioration of student engagement and motivation that the education system is now facing can be partially addressed through the application of gamification.

In this research, we examined the link between gamification, motivation, and school performance of primary school students. Creating games for students to enjoy is just one aspect of it. We hypothesized that using the game in teaching would create a pleasant learning environment which would lead to an increase in motivation and engagement in learning and deep knowledge. The research was carried out at three levels: a survey on teachers' opinions towards gamification, a didactic intervention based on gamification (action research), and a focus group with the teachers involved. Our findings outline a paradigm for using gamification in the classroom, a sample of best practices, and student perspectives on gamification. Therefore, regardless of the subject taught, one of the best ways to increase interest in learning is through gamification. Provides students with a learning framework that makes every lesson engaging and interesting. To keep students interested in studying, whenever you feel that their learning interest in learning is reduced, the use of gamification can improve the situation.

Keywords: *gamification, motivation, digital games, engagement, school performance, primary school*

1. INTRODUCTION

Gamification is the application of standard game-playing components (such as point scoring, rivalry with other players, and rules of play) to promote participation. (Hitchens&Tulloch, 2018, Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). It is a highly effective and innovative approach to teaching and learning that is particularly beneficial for educators seeking to cultivate learning and creativity through game-based activities within the classroom. The utilization of play in the classroom as a pedagogical tool is efficacious in promoting problem-solving skills through a playful approach. This approach cultivates student engagement and facilitates a more profound understanding of the subject. Additionally, classroom play has been demonstrated to enhance the development of previously unknown skills and unlock students' spirit and attitude, thereby promoting divergent thinking.

The notion of gaming requires imaginative thinking and commitment on the part of both teachers and students, a method for fun learning involving different game mechanisms. An important mechanism in gamification is interaction and feedback, as the game involves having two players who constantly interact at the same time and provide feedback through their actions. Risk-taking and failure, another important mechanism, is risk-free because players can always restart the game from the beginning (Dichev&Dicheva, 2017). The concept of ownership pertains to the entitlement of a player to access the path leading to the game, while customization allows the player to tailor the game encounter to their liking. The game is widely played, not just by us humans, but even animals play it in some form. Children's need to play is not a cultural phenomenon, it is a biological need to survive. According to the renowned educational theorists of the 20th century, Jean Piaget and Lev Vygotsky, it has been

established that play is an essential element in the process of cognitive development that spans from infancy to adulthood. Educators promote experiential learning and raise students' motivation for learning by incorporating play into the classroom. To influence the learning experiences that we design for our children, we as instructors must comprehend, encourage, and use the concept of play. We can directly teach our students using a variety of games to increase the effectiveness of their learning. The games can be played differently, objectively, and without risk. Students may turn the classroom into a playground and become players. In today's fast-paced environment, teachers must present students with challenges that encourage efficient learning, the growth of essential skills, and their ability for creativity.

The biggest difficulties encountered are igniting and sustaining students' interest in classroom learning. We have been able to encourage student-centered, individualized learning and responsibility for their own development by incorporating play into the classroom. In contrast to the outside of the classroom, creativity is prioritized inside it. Creativity is characterized by curiosity, imaginative use, and critical thinking.

Teachers want to stimulate creativity in a setting that is devoid of danger, prejudice, and restrictions on success. Students are given the chance to try out ideas that might not always work, but allowing for failure teaches them the proper decision-making process for future ideas. The classroom can benefit from games, but using them in lessons is another matter. For instance, a digital infrastructure in the school is necessary for the deployment of digital games in the classroom; yet, some games can be used without this infrastructure (Seaborn&Fels, 2015). There is evidence to support the widely held belief that gamification improves certain engagement factors in corporate and educational settings (Ciascai&Dumitru 2020, Dumitru&Câmpean, 2022). Moreover, there is some evidence that gamification can help deeper cognitive and affective components, research has emphasized behavioral responses to it. By carefully choosing game attributes in accordance with the desired student experience and engagement outcome, the gamification framework should, for the first time, give practitioners the tools necessary to systematically build gamified learning experiences. The framework has the potential to enhance additional outcomes, such as student happiness and well-being across various settings and disciplines, even though we concentrate on learning outcomes. It can also be utilized to acquire crucial empirical data regarding the impact of the strategy on desired results.

Gamification is continuously being developed as an instructional strategy to raise learner motivation and engagement. According to research, there is a perceived relationship between greater motivation, time spent on tasks, and achievement. However, there is some evidence to suggest that gamification could be developed into a potent tool to foster student engagement for learning, achievement, and well-being (Dichev&Dicheva, 2017).

One major indicator of a student's academic success is motivation, which affects how much time and effort they put into their studies. The idea of incorporating game elements and concepts to encourage the learner is tempting given that games, which are known to create motivation and engagement, are notably popular. Gamification in education is the practice of incorporating game design features and game-like experiences into the development of instructional materials. It has been adopted to support learning across a range of contexts and subject areas as well as to address related attitudes, activities, and behaviors, such as collaborative methods, self-directed learning, finishing assignments, making assessments simpler and more efficient, incorporating exploratory learning strategies, and boosting student creativity and retention (Linehan, Kirman, Lawson, & Chan, 2011).

2. MATERIALS AND METHODS

The two main components of gamification are: usage for non-entertainment reasons and borrowing ideas from games, specifically the components that form games, without creating an actual game. Gamified technologies are thus like games, but not actual games. Because of this, gamification differs from terms like serious games, games with a purpose (GWAPs), virtual world games (ARGs), and others that refer to complete games (Seaborn&Fels, 2015).

As a result, the analysis of the understanding of the motivational mechanisms offered by gamification in educational contexts and its impact on learning is the main emphasis of this paper. What empirical evidence is there for the impact of gamification on motivational processes and learning effectiveness? What were the driving questions in this area? The idea of this questionnaire addressed to primary school teachers started from two main questions around which we built the items.

1. How involved are primary school students in math lessons in general?

2. How engaged are primary school students if gamification and fun didactic games are introduced in math lessons?

Other significant queries are raised by this survey.

- Are math interests high among the elementary school students?
- What immediate impacts of gaming are there?
- When are pupils in primary schools most active?
- Has the use of gamification and online gaming enhanced students' academic performance?
- How might the curriculum be made better?
- How far have we come in meticulously understanding how to apply gamification in learning environments?

By concentrating on empirical data rather than potentialities, beliefs, and preferences, the current study tries to shed a more realistic light on the research in this field. Given its rising popularity and the divergent opinions on its effective use in educational settings, gamification is not without controversy.

2.1. Methods and purpose of the study

The purpose of the current study is to question primary school teachers about students' engagement in math lessons. We asked 100 primary school teachers what activities do students enjoy most in math class, which activities do they find difficult, whether are they engaged and motivated in class to be active, and what does the teacher do to make math lessons more attractive for students? Participation in this survey was optional. The questionnaire was applied online using Google Forms.

2.2 Data collecting and procedure

The questionnaire was constructed in three main parts, as follows: the first part contains 15 questions about the teacher's activity in math lessons, the students' involvement and motivation in math lessons, whether they are content, engaged in class, and whether they have any concerns regarding the math curriculum.

In the second part the instrument had 12 items that were fragmented by having 7 questions adapted after researchers Eppmann et al. (2018) using Likert scale. The answers to the questions were given using the five-step Likert scale (1-strongly disagree, 5-strongly agree). For the interpretation of the results, the answers of type 1 and 2, respectively, 4 and 5 were summed, the results are interpreted as disagreement and agreement and at the end 5 simple items. The second part focuses only on gamification and aims to discover how well known this term is and how its methodology is used in the classroom, especially in math classes.

The last part of this questionnaire focuses on 7 demographic questions and items.

2.3 Participants

Demographically, 93% of the participants in this study are women and only 3% are men. While 57% of them work in cities, 43% do so in rural areas. Fewer than 500 students make up most responders (42%), followed by schools with an average enrollment of between 500 and 1,000 students (40%) and schools with more than 1,000 students (18%). 62% of all survey participants have completed grade 1, the highest level of schooling.

32% of the respondents are between 45-54 years of age, this age group being the one that ranks first among the respondents, the second place with 28% is the age group between 40 and 44 years, the third place with 17% the age group between 35 and 39 years.

The teaching experience of the respondents is divided as follows: most respondents (22%) have between 20 and 24 years of teaching experience, 18% have between 25 and 29 years of teaching experience, 16% between 15 and 19 years of teaching experience and 12% between 10 and 14 years of teaching experience. 54% of them have a bachelor's degree and 41% have a master's degree.

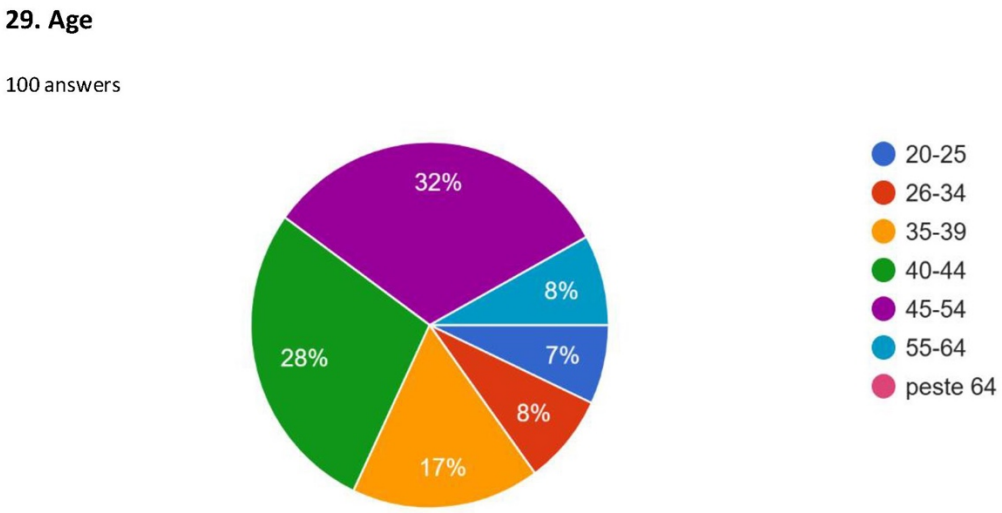

Fig. 1. Respondent's age

Most teachers who responded to this questionnaire have extensive experience in teaching primary grades. Educator Ioan Cerghit defined teaching as a sophisticated collection of didactic behaviors and acts that are designed to promote learning. In other words, through involving students in a novel learning experience, education involves change, going from what is to what should be (Cerghit et.al., 2001). These teachers' opinions are significant for the extensive teaching experience. They are familiar with multiple generations of students and aware of what works and what could be improved.

We believe that a skilled educator is aware of all the characteristics of effective instruction, including anticipating, planning, creating and specifying the nature of the changes (identifying the goals).

3. RESULTS

3.1 Respondents' opinions on the involvement of primary school pupils in math lessons

Respondents' opinions on the involvement of primary school pupils in math lessons were divided into several items, so when asked h*ow happy are your pupils to participate in math lessons.* 52% of them answered that their pupils are happy to participate, while 36% said that their pupils are very happy and 16% answered so-and-so.

On the next two items, namely: *How much do your students focus on math (MEM) activities; How often do your students focus on all math classes.* Teachers answered that their pupils concentrate a lot in math lessons (47%), 29% answered that they concentrate to the right extent in a math lesson and 21% answered that pupils concentrate very much in math lessons.

While the frequency with which pupils concentrate in math lessons was observed by teachers, the majority of 67% said often, 17% said they always observed their pupils concentrating in math lessons (in all lessons), and only 15% said that sometimes they concentrate in math lessons and sometimes not.

Survey item	Answers				
1. How happy are your students to participate in math class?	Not at all -	A little 1%	So-so 11%	**Happy** **52%**	Very happy 36%
2. How much do your students focus on math activities?	Not at all -	A little 3%	So-so 29%	**Largely** **47%**	Very much 21%
3. How often do students focus in all math classes?	Never -	Rare 1%	Sometimes 15%	**Often** **67%**	Always (at all lessons) 17%
4. How eager are students to participate in math class?	Not at all -	A little 2%	So-so 24%	**Largely** **52%**	Very much 22%
5. How often do you think students talk outside of school about what they learn in math class?	Never 3%	**Sometimes** **51%**	Weekly 27%	Daily 19%	
6. In general, how interested are students in math classes?	Not at all -	A little 8%	**Interested** **73%**	Very interested 19%	

Table 1. Respondents' views on student engagement in math lessons

In arithmetic lessons, the teacher's role in developing exercises is crucial. Teachers had open-ended and choice questions. When we categorized their responses, we discovered that 40 out of every 100 responses had the same word in their minds, namely the word games. Games promote player cooperation, which creates an environment for peer-to-peer education and the formation of learning communities. Because of the game's restrictions, teachers and students can see where the students' thinking has weaknesses, which helps them learn from their mistakes (Squire, K., & Jenkins, H., 2003).

Then, 38 replies made reference to didactic, mathematical, or logical-mathematical games. Moreover, there are 9 references to digital and online games and just one to gamification. There are 27 other references to practical activities. Here, teachers insist that when students work in groups, participate in class-wide competitions, and handle actual items, they are shown to be engaged in lessons, paying attention, and active. Teachers believe that children are drawn to touching and using math in practical settings. For instance, when they create or work with geometric shapes, when they measure using measuring equipment, or when they depict fractions in drawings. Worksheets, interactive whiteboard exercises, particularly those that engage students, riddles, digital-video games, music, and mental arithmetic with the abacus are all included in teachers' responses that suggest engaging activities for students in math class.

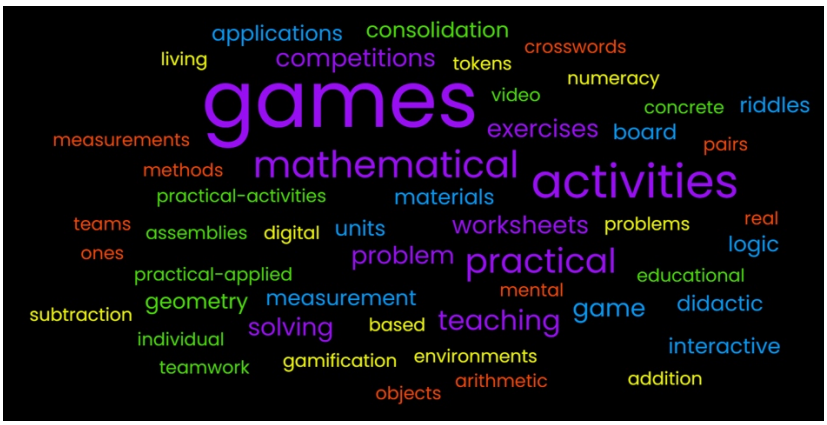

Fig. 2. Word chart: engaging activities in math classes, according to the respondents' opinions

Teachers' answers to the question of which activities of the math lesson do you think students find less interesting, show that assessment (27%) and revision (24%) are the least interesting activities for primary students. Teaching (14%), grading (13%), didactic games (12%) as well as worksheets (8%) are activities rated as uninteresting or disliked by students.

From their responses, it can be inferred that students are reluctant, fearful, or experiencing other negative feelings about having their knowledge in math, assessed. This is because they find it challenging to review the concepts they have learned, even though they are aware that a knowledge assessment through various types of tests will come next. Because young children typically enter school with a strong foundation of informal math skills, the classroom can also be a place where math anxiety can grow and thrive.

Studies conducted (Vinson, 2001) indicate that math anxiety may have origins with education and teachers, with math-anxious teachers occasionally leading to math-anxious students, in addition to the parental and societal variables. According to some experts (Gurganus, 2007), teaching by math-anxious teachers is characterized by excessive dependency on conventional instructional strategies. These: tests, flashcards, work spreadsheets, assigning the same work to each student, teaching from the textbook, focusing on just one solution to a problem, paying attention more on fundamental skills than concepts, and entire-class instruction cand form students to be anxious in math classes.

Both traditional instruction and the classroom environment can exacerbate arithmetic anxiety. The behaviors and standards that govern how students communicate are referred to as the culture of the classroom. Learning math in rigidly controlled classes can be difficult since there is no room for dialogue or disagreement, the priority is on finding the one correct answer, there is little incentive to reflect on one's thinking, and timed assessments are prioritized (White, J., & Anthony, G., 2012). These things were noted by the teachers in the question. W*hich activities in math class do they find less interesting?* It can be seen from the following figure that students do not like assessment, review, or grading time.

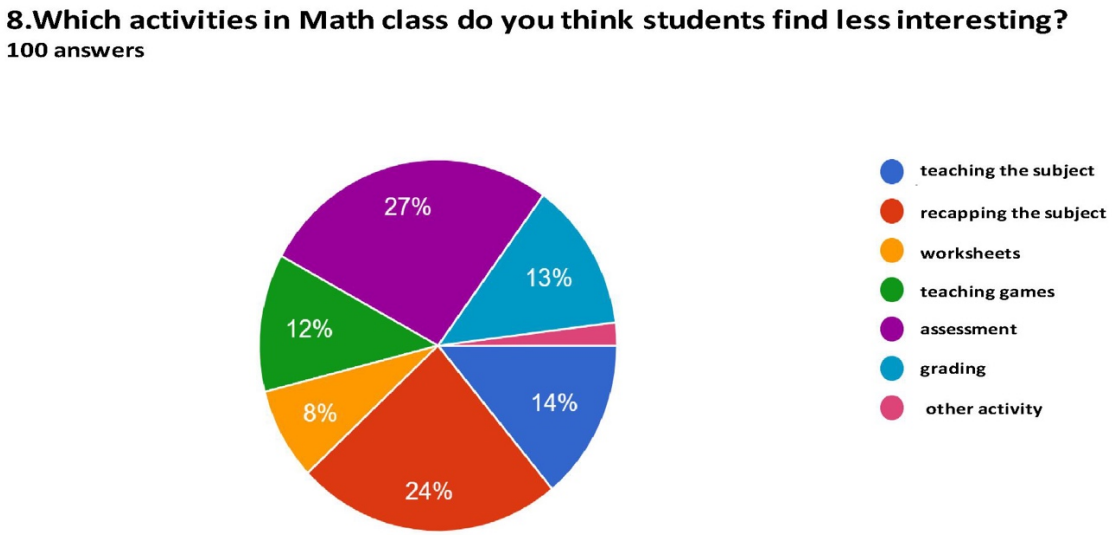

Fig. 3. Respondents' opinions on the activities that students find less interesting.

The purpose of the following research questions was to learn how teachers see their students when they are engaged in math lessons. Students enjoy hands-on activities, competitions, group projects, interactive lectures, getting up in front of the class to write on the board, didactic games, digital games, and working alone or in couples or teams.

We considered it crucial to learn what modifications elementary teachers would make to the math curriculum. We discovered that more than 50% of them pledged to streamline the curriculum and simplify the subject. They would not mix the areas of math and natural sciences as they currently do,

but rather divide them into two whole independent fields of study. They would assess, grade, and reinforce learning using games. A framework for learning through play and gamification, more enjoyable information, and interactive education through hands-on would also be given more importance.

Items	Answers
When they receive worksheets	5%
When working in pairs/groups	**21%**
When they go out to the blackboard	**19%**
When they raise their hand and are called	8%
When they are involved in a teaching game	**24%**
When involved in a teaching game digital	**22%**
Another part of the lesson	1%

Table 2. Respondents' opinions on when students are actively involved in math class.

We can observe from the table above that when there is a didactic learning game or when teaching with digital games, students are motivated and interested in math lessons. Additionally fascinating for students are hands-on exercises and interactive lessons.

4. DISCUSSION AND CONCLUSIONS

Teachers responded that they try to make math class more interesting for their students by showing a video (11%), presenting a story (20%), using fun worksheets (36%) and presenting online video games (20%). They also say that they often use didactic play (60%), digital play (22%), fun play (10%) and gamification only (5%) during math lessons. When asked about digital games used for teaching purposes, they responded overwhelmingly positive. 55% said that digital games used for teaching purposes make students more motivated during math lessons. Teachers say that digital games are valuable materials for educational activities (52%) and at the same time when students learn they feel relaxed and recreated. They observed that when used, they make students more engaged and more active (56%) than a traditional class using conventional methods. Teachers agree and say that digital games are good to use in assessing students (41%), for reinforcing material (51%), teaching new math concepts (68%) and are also easy to use in problem solving (67%).

By integrating students in activities that, if well structured, would yield helpful data for the many educational actors (teachers, parents, students, and school administrators), gamification can enhance the way formative evaluation is handled. One of the biggest issues is coming up with engaging game scenarios that may be used as evaluation assignments if they adhere to the standards for excellence for assessment, such as: fairness, validity, and reliability (Menezes & De Bortolli, 2016).

Item	Likert scale numbering.	Answers				
		1	2	3	4	5
1. Would digital teaching games in MEM classes make students more motivated?		1%	3%	9%	32%	55%
2. Would digital teaching games help students to be more active and engaged in MEM classes?		1%	4%	6%	33%	56%
3. Digital learning games are valuable and at the same time recreational activities.		0%	5%	14%	24%	52%
4. Digital teaching games are a good way of assessing knowledge in MEM classes.		3%	7%	16%	33%	41%

5. Digital teaching games are a good form of problem solving in MEM classes.	3%	7%	23%	33%	34%
6. Digital teaching games are used as a framework for teaching new lessons in MEM classes.	5%	10%	17%	34%	34%
7. Digital teaching games can help reinforce the material in MEM classes.	0%	2%	13%	34%	51%

Table 3. Teachers' responses on the qualities of digital games when used in math class

For the interpretation of the results, responses of type 1 and 2, 4 and 5 respectively have been summed and the results are interpreted as disagree and agree. Thus, for measuring teachers' opinions on the quality of digital games when used in math lessons the results look like this: 87% say that students are more motivated in lessons when digital games are used and 4% disagree. 89% say that students are more engaged and active compared to traditional math lessons, while 5% disagree. 76% say that digital games are recreational and valuable as activities in math classes while 10% disagree with this statement. Teachers (74%) say that digital games are a good way to assess students' performance in math class while 10% disagree with this form of assessment. 67% say digital games are good problem-solving activities, while 10% say they are not. Furthermore 68% of respondents think they are perfect as a learning framework for new lessons, only 15% disagree with this statement. At the end of this scale respondents were asked if digital games can help them to reinforce mathematical concepts and they agreed 85% with this statement and only 2% disagree.

Students who experience digital games in the classroom in a game-based learning (GBL) context are more engaged in activities when presented with a story that links all their problem-solving requirements. The story links the different requirements so that students have an overview of what they have learned. The pupils then get caught up in the story and actively engage themselves by focusing their attention on solving the requirements and problems, learning faster and achieving the lesson objectives (Kirriemuir & McFarlane, 2004; Barab, Arici, & Jackson, 2005; Dickey, 2005).

Overall, we observe that digital games are seen beneficial by the respondents as having qualities worthy of consideration for math classes, being alternatives for assessment, consolidation and teaching of mathematical concepts. It can eliminate anxiety about math, fear of marking and assessment in these classes, the students being motivated and encouraged to actively participate in the math classes in the primary classes.

At the end of the survey 5 powerful gamification questions were asked to test respondents' knowledge of gamification as gamification borrows the game elements from digital games and puts them into the field of research.

How to make learning more appealing for pupils is a concern for instructional designers or educators. When pupils are disengaged and unmotivated to learn, using game mechanics that incorporate motivational game aspects can be quite beneficial in various areas of education.

To improve student learning ability and motivation, game components are incorporated as intrinsic and extrinsic aspects. Giving rewards, for example, is an example of extrinsic motivation. Badges: the requirements in tasks should be difficult enough for the student to pass with flying colors. Points and levels should be used to create challenges. Feedback, leaderboards, points, and levels are the most used aspects in gamified lessons. The main benefit of gamification is the ability to add game elements to learning materials to make them more appealing or engaging. Lecture classes are viewed as dull by learners in the case of typical games educational style (Surendeleg, et.all, 2014). We asked teachers: How often do you use gamification in math lessons? (Gamification means applying the elements and techniques of a game: points, competition with others, feedback, recording scores, story-like scenario, avatar-like characters, etc.). 37% of them answered that they use gamification several times a week, or 27% of them said that they use it bimonthly, 23% once a month, 6% daily and 7% never use gamification in their math classes.

One hundred people responded to the question on when gamification is used in math lessons. 43% of them claimed to use it to organize and fix knowledge, 28% to systematize and summarize knowledge,

12% to draw students' attention at the start of math classes, 11% to assess knowledge, and only 6% to really teach knowledge.

A tale is only seldom used in math courses, according to 45% of respondents, 36% of them say they use stories weekly, 8% say they use stories daily, 8% say they use stories monthly, and 3% of respondents claim they never use stories in math lessons. As teachers for primary students, we all know the importance of story-telling in our classes. Moreover, by writing their own math stories, students can exercise both creativity and critical thinking. Stories in math classes provide the context for contextualizing difficult ideas while also adding a little human element to the arithmetic. L.L. Barkat discussed how literacy may teach young pupils' mathematical concepts like counting and number lines in the Edutopia article "Using Stories to Teach Math." Concepts can be presented in the form of teacher tales: actual or not genuine (Barkat, 2017). Teachers for primary school students know how important stories are for students. Putting the math concepts in the context of a story, it can be noticed that the students are eager to solve the given problems and to be actively involved in solving them. Also, as tools for gamification teachers use formative feedback in their classrooms, 71% of them agree that is an important tool and 28% use positive feedback. To reward good behaviors and results, teachers use praise (54%), happy face stickers (38%), candy (4%) and diplomas (4%) in their classes.

Through this investigation we have discovered which activities in math class are most enjoyed by primary school pupils. To now we have seen if they are happy to participate in class, how interested they are in participating in math class, how intensely they concentrate in class. We also found out that pupils like math lessons, but that there are some things that can be improved with the help of digital games and gamification of the lessons. From the benefits of their use, pupils find it easier to evaluate, mark and review their knowledge. Furthermore, the teachers outlined what they do to make their classes more interesting and engaging for their students through their responses.

We could observe that although they know the benefits of digital games and the elements that compose them, few of them apply in the classroom to achieve the objectives of the lessons. Although the literature says through various investigations and research that digital games and gamification can motivate and actively engage students in class, teachers still do not apply these elements as much as they apply traditional elements of teaching, assessment and grading.

When asked about gamification, most of them thought only about digital games and not about the elements that are derived from their mechanisms. Although teachers use: stories, rewards, diplomas, fun cards, digital games and interactive lessons with various prizes at the end, they do not realize that they could design lessons in a gamified form.

Additionally, respondents are hesitant to agree with the bulk of the issues. Possible causes include a lack of knowledge about the educational benefits of gamification, a lack of initial or ongoing training in gamification and digital games, pressure to follow the school curriculum, and a lack of computer literacy. By offering examples of best practices for the planning and execution of learning activities that incorporate games as a training framework, we believe it is essential to improve teachers' digital literacy through professional development activities. Teachers can then become proficient users of didactic games, which are growing more intricate and diverse as technology advances (Dumitru I., Ciascai L., 2020).

Students are more motivated, attentive, involved and more attracted to math lessons when gamification and digital games are used. This would change the face of traditional learning and bring it closer to what students already know: the world of games in all its forms.

Math class is alright to be taught according to the traditional model, but we believe that there is an opportunity to blend the modern with the traditional, especially in these times when teachers are teaching to a natively digitalized generation. Children are born accustomed to technology, they see it, they use it every day.

For these things to occur, the approach to gamified lessons would require more work from teachers to create materials, find content that can be adapted to gamified classes, and involve students and parents

in this process so that the classes have success that can be found in the school performance of the students.

But we must understand that not all concepts can be taught in a gamified format, and it is acceptable to approach classes in a conventional manner. However, we think that gamified classes woven into traditional ones would be a real success for education.

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