Chapter 7
Gamify Gamifying: Learning with Breakouts

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Game-Based Learning in Education

Playing has been always something intrinsic of human beings and some animals, as it is one of the most efficient learning transmission methods. Playing first became a learning experience for adult life to survive, and later, it became an initiation rite or a training activity. Nowadays, it is only a way to spend some time (Revuelta & Guerra, 2012).

These days, the way of playing has changed, becoming more abstract and multifunctional and dependent on electronic devices such as video consoles, computers, tablets, etc.

Until recently, video games were associated with various stereotypes and were considered negative for the mental and physical health of the players. However, subsequent studies have shown that video games, as well as other activities practiced in excess, could have negative results if a reasonable time is exceeded, but if playing habits are respected (e.g. adequate time, environment, online games moderation, etc.), this activity could be considered satisfactory and safe (Martínez et al., 2018).

Thus, movements such as the serious games have emerged, which urge the use of playful technologies for educational and training purposes. They investigate the educational, therapeutic and social impact of video games designed with or without pedagogical intention (López, 2016). Serious games can be used to train skills, and therefore they have a very interesting application in learning. Turning learning into a game makes the person using it to be very motivated towards it. In fact, gamification is built on the principles of games and, in particular, also on serious games to promote learning. That is, game-based learning is the application of game design to

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achieve some kind of behavioural change or the learning of some skills or knowledge (Felicia, 2020).

The movement has emerged to adapt to the needs of a new generation of students, often known as the digital generation (Generation Y, Z, Global Generation), whose distinctive characteristics should be recognized to ensure satisfactory pedagogical results and the necessary motivation on their part (Prensky, 2001). This generation has been familiar with digital technology from an early age (Hockly, 2011). They use digital devices frequently, and ICT (information and communication technologies) is the language with which they communicate, express themselves and understand the world around them. The digital generations also play a great deal of video games and are fervent users of social networks, sometimes in the form of virtual worlds. They often engage in activities that reward their perseverance, so they expect the same level of reward from educational activities.

On the other hand, we know that as teachers in the classroom we have sometimes had problems in engaging and motivating these generations to participate in traditional educational activities, perhaps because the format used for formal education has not been able to adapt to the needs, preferences and expectations of students.

Some educators have accepted the characteristics of the digital generations and are aware of the important role of play in education or vocational training. They have used immersive environments and play technology to reach their students, and recent advances in play technology have supported this shift in teaching. Today, there are many tools that make it easy to gamify the classroom. Thus, teachers who intend to create games can focus on pedagogical aspects instead of technical ones.

However, it must be clarified that gamifying the classroom, although it has a history of about 10 years, has also been surrounded by false myths or clichés that have made its implementation in the classroom not easy. Some of these myths, according to García-Ruiz et al. (2018), are:

- It is not about introducing playful objects as if they were toys, but about applying the elements of gaming to the learning scenario.
- It is about generating motivation, which is proven through play, but it is not a fad of an emerging resource.
- Gamification is not exclusive to education; it can also be applied to other disciplines such as psychology, human resources or marketing.
- You don't have to be an expert in technology, in games or in video games.
- You do not need extra economic resources to gamify the classroom, nor invest a lot of time in the design of a gamified project. It is important to know how the game works and to use creativity.
- Gamification is not used to entertain students in their free time. It is not a question of giving them a break, but to include gamification in the classes to get the most out of it.

Gamification and Cognitive Processes

The educational theories that support gamification in the classroom are diverse, and the main ones are cognitivism, behaviourism and constructivism (Vygotsky, 1978; Piaget, 1977; Skinner, 1974; Gagne et al., 1990). All of them give theoretical support to the idea that using methodologies based on the play promotes learning, although each one of them puts the focus on some elements in front of others.

In the **behavioural** approach, the subjects are not directly responsible for their learning activities; instead, they are conditioned to react to the stimuli. Behaviourism argues that we learn based on the reinforcing consequences we obtain when executing a behaviour.

For **cognitive** theories, the subject has an internal map (knowledge) that is updated by external events. These theories place special emphasis on the underlying cognitive process.

Finally, in **constructivist** theories, subjects learn by interacting with their environment and with their peers, implying a trial-and-error process and the ability of the subject to interpret past and present experiences and thus update their knowledge.

Not all games aimed at leisure respond to theories about how we learn; however, some of them intrinsically implement some known pedagogical concepts. For example, they usually include a high interactive intensity, specific objectives, continuous challenges and sense of commitment.

Norman (1993) associated these concepts with successful learning environments. To some extent, video games have behavioural, cognitive and constructivist characteristics. However, while the first pedagogical programs emphasized the first two theories, the most recent video games, due to their complexity, open endings and their collaborative nature, encourage the constructivist approach to learning. With video games, players can elaborate theories and hypotheses, test them and adjust their knowledge and skills accordingly. The latest video games, with realistic 3D environments and physical engines, allow simulation environments that react to the actions of players in a very realistic way.

In relation to cognition and learning processes, gamification can be analysed by several models such as Carroll's minimalist theory Carroll (1998), Vygotsky's zone of proximal development (ZPD) (1978) or Kolb's basic learning model (1984).

Kolb's (1984) basic model of learning illustrates the process of accumulation through which students modify their internal map (knowledge) based on the information and answers obtained from previous actions; they successively carry out active experiments, concrete experiences, reflective observations, abstract conceptualizations and return to active experiments. In a sense, the learning cycle in game-based methodology can be compared to Kolb's learning cycle: players experience failure or gain and then need to reflect and identify the cause of the failure. Following this analysis, they formulate hypotheses about the cause or causes of the failure and action plans to help them solve the problem and then test and evaluate their hypotheses.

Also, according to Vygotsky's concept of the zone of proximal development (ZPD), subjects should be helped with *scaffolding* and progressively made them more autonomous. The more they develop their skills, the less help they will be given. The autonomy of the subjects and the metacognitive skills are progressively developed.

This principle is also found in game-based learning; as it offers a simple learning curve, the first levels are usually simple so that players can become familiar with the mechanisms of the game and be more efficient (Barzilai & Blau, 2014). Players have to learn new skills to excel and, in a way, take responsibility for learning. This ability of video games motivates and involves students in their learning to improve themselves and is by far the most interesting feature to help teachers make learning an attractive and motivating activity (Erhel & Jamet, 2013).

Gamification with Breakouts

In recent years and in the field of leisure, new modes of entertainment and games have emerged, such as escape rooms, in which participants have to discover clues to get out, or escape, from the room they are in. The key to this type of game is to solve a series of clues related to the environment.

Derived from these have emerged the "breakouts", which are immersive games. However, in a breakout you do not have to leave a room where a group is locked up, but in this case the objective is to solve clues that will lead participants to open a box with different types of locks. To get the codes that open the locks, it is necessary to solve problems, questionnaires and enigmas, so that the clues are not limited to answering questions, but to solve real challenges and enigmas that turn the players into adventurers, detectives, etc.

According to Galanis and Duckworth,[1] quoted in De Leon (2017), the reasons why we should use breakouts in education are:

- They are tools capable of adapting to any curricular content.
- They promote collaboration and teamwork.
- They develop critical thinking and problem-solving skills.
- They improve verbal competence.
- They pose challenges to which one must persevere.
- They build deductive thinking.
- Participants learn to work under pressure.
- Students are the protagonists of their learning process.
- They are fun for everyone.

[1] Illustration accessible in Twitter at https://twitter.com/sylviaduckworth/status/687826202179014657/photo/1.

Reasons match perfectly with the constructivist theories about learning and also mean a very powerful way of learning.

Experience with Digital Breakouts

The present chapter deals with an experience carried out in two courses at university, with students from the Faculty of Education. The experience was carried out in the subject of *ICT for the Digital Society*, where they have to learn to use digital tools and resources for the classroom.

So, the aim was to get them to design gamified resources; at the same time, they learned through play. In other words, the aim was to make them learn by doing.

This was carried out in two groups, one in the first year of the double degree of Early Childhood and Primary Education and the other group in the second year of the Early Childhood Education degree.

Objectives of the Activity

The main objective was to use digital breakout as a learning methodology to design, in turn, gamified resources for the classroom.

This main objective is specified in the following specific objectives:

- Recognizing tools for creating gamified content such as Genial.ly or Google Forms
- Analysing the curricular levels for which to design the gamified resources and adapt them
- Learning by doing
- Reflecting on the importance of the game in learning
- Creating gamified resources for the Primary and Early Childhood Education's classroom

Procedure

Within the subject of ICT for the Digital Society in the university degree of Early Childhood and Primary Education, students work on how to create gamified resources using the tools Genial.ly and Google Forms.

This experience was carried out in two groups of students in the following way:

- A group of first year students from the Early Childhood and Primary Education degree composed of 40 students. This group was totally taught in-person.
- A second year group of Early Childhood Education composed of 69 students. With this group the teaching was totally online due to the situation of COVID-19.

In this way, several topics were proposed so that they could choose and generate educational resources for students between 11 and 12 years old in the first group and for students between 5 and 6 years old in the second group.

Tools Learning Phase

Before they begin the development of the resources, there is a phase of learning the tools with which students will design educational resources, which are mainly Genial.ly, although it is also explained how to work with Google Forms.

The tool Genial.ly has easy-to-use breakout templates and therefore has been the tool used by all participants to develop their resources.

In order for them to know the tools, the teachers provide different breakouts to the students so that they can play with them and discover how this methodology works. In this phase they are briefly taught how to create digital locks (Fig. 7.1).

The teacher's Genial.ly account was used to create the breakouts of the templates chosen by each group. This allows for the use of templates that students would not be able to use without a paid account and, at the same time, allows for greater control of the work to help them in their development.

Development Phase in Cooperative Groups

For the development of the resources, cooperative base teams composed of four or five members are initially designed. Each team will choose a theme to develop its breakout. These themes can be about:

- Mathematics curriculum content for students from 4 to 6 years old, in the case of future teachers of Early Childhood Education.

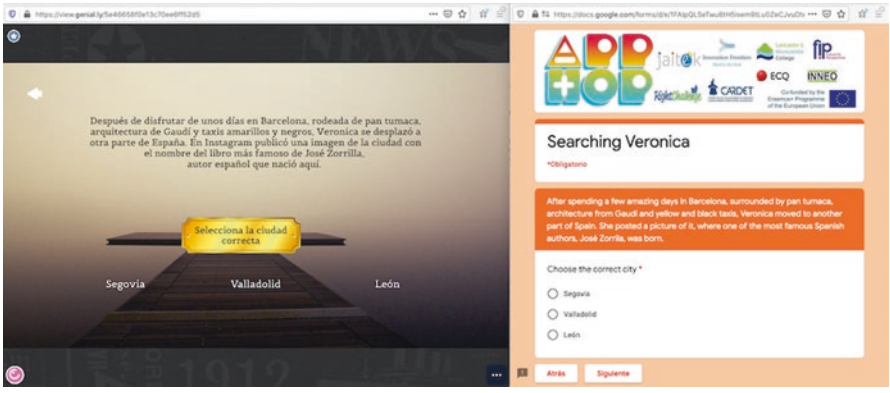

Fig. 7.1 Examples for students of breakouts using Genial.ly and Google Forms (own creation)

- For the case of the Primary Education stage, specifically for students from 11 to 12 years of age, the topics to choose from and to relate to some part of the curriculum are:
  - Environment
  - Climate change
  - Artificial intelligence
  - Computational thinking
  - Autonomy and personal independence
  - Blockchains

  Each team has to perform a number of tasks which are:

1. Create a common group account in Genial.ly using their university Google account.
2. Select a breakout model in Genial.ly at https://app.genial.ly/templates/games.
3. Send the choice to the teacher of the created email account and the chosen breakout model. He or she will create it and share it with that email.
4. The breakout must be digital, but it must also have a paper support of the process so that it can be used by a teacher.
5. Developing the breakout using digital locks.
6. Delivering the url, the code to be able to embed the breakout in other tools such as blogs and the documents related to the educational breakout created.

Once developed, the double-degree students of Early Childhood and Primary Education[2] presented their breakouts to all their classmates, then there was a vote and the three winners presented it at the *Educaparty* at the International Congress and Professional Fair Expo-eLearning (Fig. 7.2).[3]

In the case of the Early Childhood Education degree, they are still in the process of finishing the course, but they have already finished the breakouts and are in the phase of presentation to peers and voting (Fig. 7.3).

Finally, a questionnaire was given to both students and teachers (Appendix 1) about their satisfaction, learning and perception using this methodology. From the answers obtained in this questionnaire, we will comment on the data below.

Obtained Results

The objective of the questionnaire was to know the level of knowledge of both students and teachers about the gamification methodology. It also aimed to know the level of satisfaction of the development of the breakout activity.

[2] Breakouts developed can be found at https://sites.google.com/eduticuam.es/expolearning/.

[3] https://www.expoelearning.com/.

Fig. 7.2 Presentation of a students' group in Expo-eLearning Conference

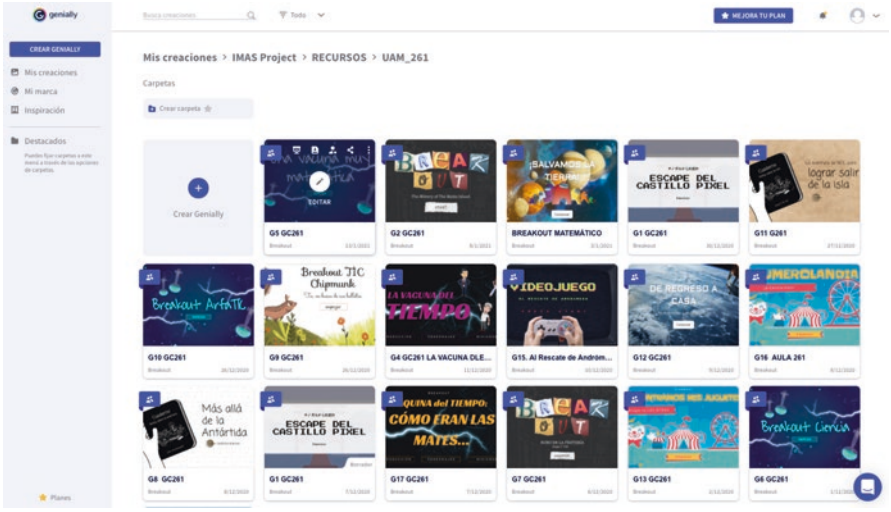

Fig. 7.3 Breakouts created by students of Early Childhood Education degree (own creation)

The results show that the activity in the classroom has been very satisfactory, both for the teacher and for the students, which makes us think that it is a methodology to continue using and deepening.

A total of 88 responses were completed and all incomplete surveys were deleted, which were another 8. Of these 88, 71 responses are from students, of which 66 were women, which is normal given the overwhelming majority of female students, especially in the Early Childhood Education degree.

With regard to the 17 responses from teachers, the distribution by sex is more equal, as there are 8 responses from women and 9 from men.

The initial impressions are quite similar in both cases and are very positive as it can be seen in Fig. 7.4 which includes both student and teacher responses.

As it can be seen, in general terms, when asked what they thought about gamification, a large majority said that gamification makes learning more fun. Also most of them, although a lower percentage than in the previous case, think that teachers can teach more and better through the game.

We will focus on the students' answers from the following question, since they are very similar to those from teachers, and we will only quote the teachers' answers if there are significant discrepancies.

One of the questions they are asked is to specify which tools, from a given list of options to create gamified activities, they know and to what extent. In this case, the results, as can be seen in Fig. 7.5, show that they know very well the tool used in the activity, Genial.ly, and also Kahoot, and at a medium level ClassDojo and Quizizz. There is more diversity of responses and less knowledge of the rest.

These results indicate that, for successive courses, the use of other tools could be considered to expand the design of gamified teaching activities.

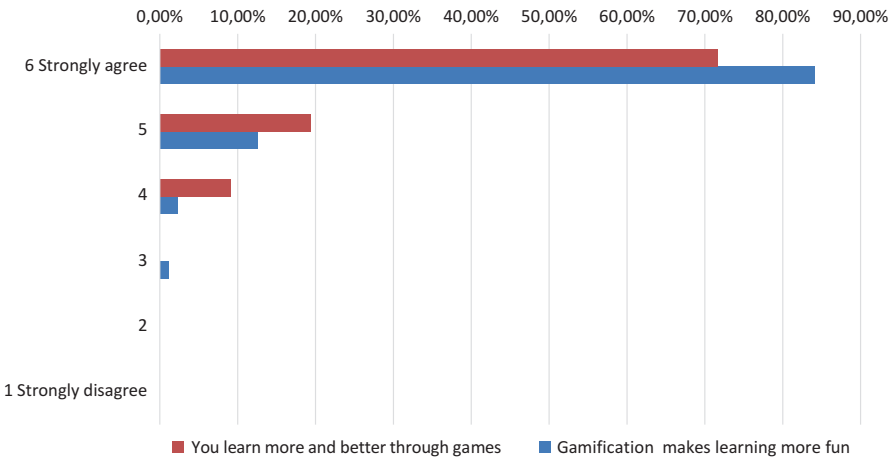

Fig. 7.4 Initial perception of participants

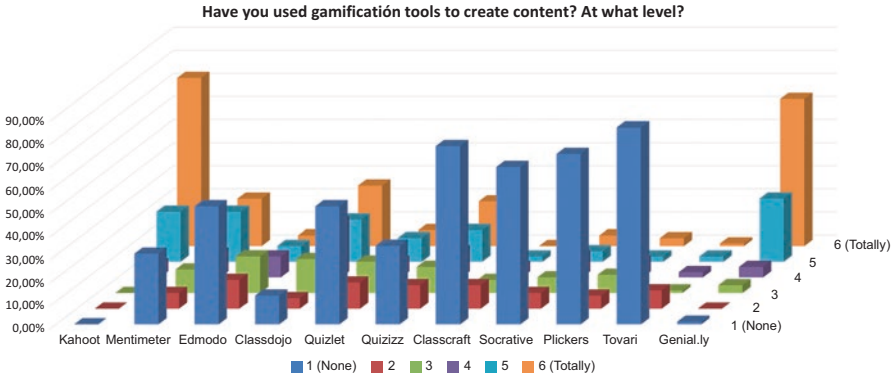

Fig. 7.5 Level of knowledge of tools to create gamified pedagogical activities

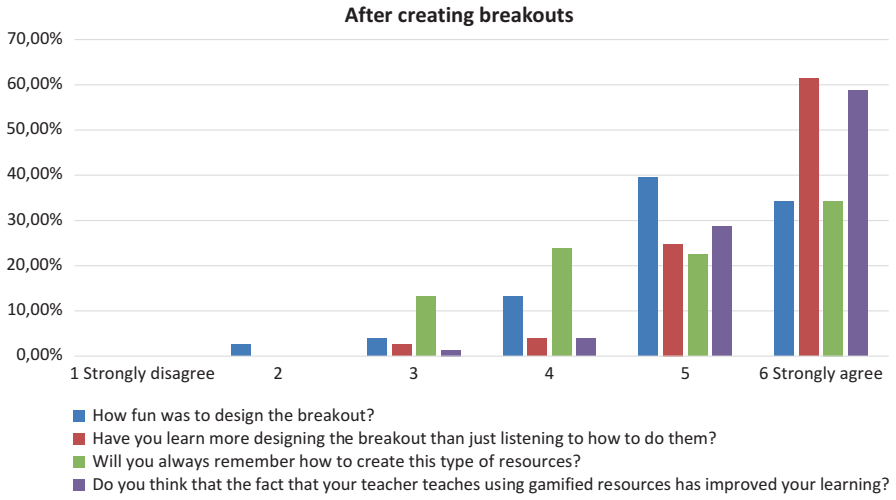

Fig. 7.6 Perception of the process after creating breakouts

Concerning the question of whether they think they have learned more from the teacher's use of gamification, Fig. 7.6 shows that most of them have given an affirmative response.

They also think they have learned more from the process of designing and implementing it than if they had simply attended the teacher's explanation of the process without having to do so. In short, they think that the whole process of designing a digital breakout has been fun and has involved a lot of learning.

The only aspect with which they have a little more doubt is the possibility of always remembering how this activity is carried out with the tools used.

As for the question of what differences they find between traditional and game-based learning, they generally agree with almost all of the options raised. As it can

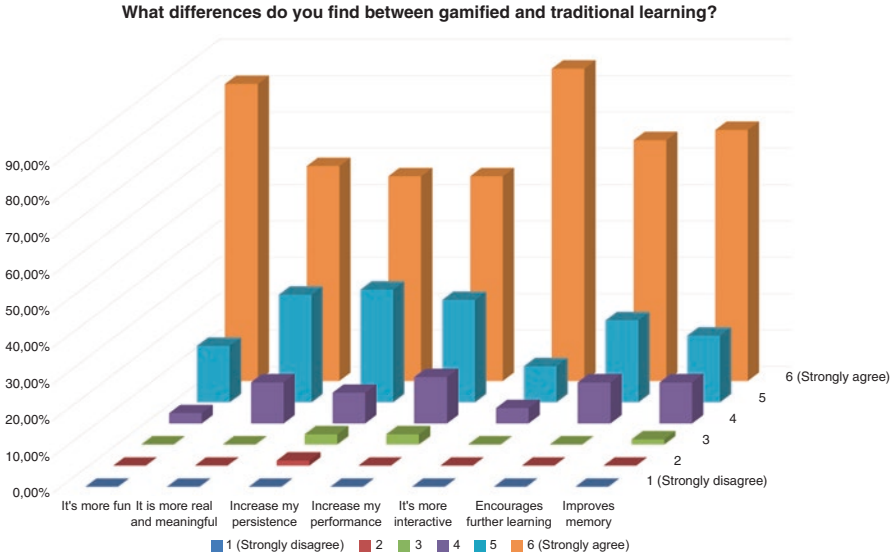

Fig. 7.7 What differences do you find between gamified and traditional learning?

be seen in Fig. 7.7, there are two options that are above 80% in the maximum option (6) which are that learning using gamification is more interactive and more fun.

However, the rest of the options have also a high acceptance, and placing them in order of their average achieved would lead to the following list:

- It's more interactive.
- It's more fun.
- Improves memory.
- Encourages further learning.
- It is more real and meaningful.
- Increase my persistence.
- Increase my performance.

With the latter having an average response of 5.4, this shows how highly students rate this learning activity.

Conclusions

Regarding the conclusions of this experience, it can be said that initially it has been really successful and the students have achieved the objectives of the activity in a more satisfactory and fun way than through the traditional methodologies that were being used until now for these same contents.

It must be taken into account that this experience pursues several objectives, linked not only to learning the tool and the design of the games, but, above all, to learning by doing. As future teachers, it is important to give them tools that allow them to acquire skills they will need in their professional future. Having designed activities through a methodology by which they themselves have learned by playing allows them to learn that through the game they learn more and better than through a traditional methodology, as it can be seen in the obtained results.

As we set out in the objectives, we can say that the goal of learning new tools to create gamified resources, such as Genial.ly, has been achieved. Moreover, as it is shown in the results, they know other tools, but they don't know many of them yet. Perhaps one of the points that we could consider as future options would be to incorporate new tools to gamify the classroom and design content.

In addition, having to design a resource adapted to the Early Childhood Education or Primary Education stage, depending on their level, they have had to analyse the curricular level and adapt the design of their resources to it. Through this work, students develop skills for their professional future. The fact of learning by doing makes them not only learn the content but also the experience of experiencing how to learn by playing.

Most students have stressed the importance of play in learning, with special emphasis on learning more and better than with traditional methodologies. The theories of significant learning highlight the need to build new knowledge into existing knowledge. In this sense, the fact of being able to experience the learning by means of the game implies the need to incorporate playful and motivating methodologies in the acquisition of learnings.

Finally, we have also found that for teachers the game-based learning methodology is very motivating and generates greater satisfaction in their teaching experience.

Appendix 1. Questionnaire Used

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Your Data

Some data about you

* 1. Sex

- ◯ Male
- ◯ Female
- ◯ Rather not answer

* 2. How old are you?

* 3. Profile using gamification

- ◯ Student
- ◯ Teacher

Initial views

Your opinions before using gamification, either as a student or as a creator

* 4. Do you think the play makes learning more fun?

1 Strongly disagree	2	3	4	5	6 Strongly agree
◯	◯	◯	◯	◯	◯

* 5. Do you think you learn more and better through play?

1 Strongly disagree	2	3	4	5	6 Strongly agree
◯	◯	◯	◯	◯	◯

6. Do you know something about breakouts?

1 Nothing	2	3	4	5	6 Everything
◯	◯	◯	◯	◯	◯

* 7. Have you ever created a breakout?

- ☐ My teachers have never used breakouts for their content
- ☐ I have used them as a student
- ☐ I have created breakouts

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* 8. Do you know the following gamification tools because teachers have used them with you as a student? And at which level?

	1 Noting	2	3	4	5	6 Totally
Kahoot	○	○	○	○	○	○
Mentimeter	○	○	○	○	○	○
Edmodo	○	○	○	○	○	○
Classdojo	○	○	○	○	○	○
Quizlet	○	○	○	○	○	○
Quizizz	○	○	○	○	○	○
Classcraft	○	○	○	○	○	○
Socrative	○	○	○	○	○	○
Plickers	○	○	○	○	○	○
Toovari	○	○	○	○	○	○
Genial.ly	○	○	○	○	○	○

* 9. Have you used any of these tools to create content? And how well do you know them? (6 wolud be the maximun level of knowledge, 1 if you do not know them at all)

	1 Nothing	2	3	4	5	6 Totally
Kahoot	○	○	○	○	○	○
Mentimeter	○	○	○	○	○	○
Edmodo	○	○	○	○	○	○
Classdojo	○	○	○	○	○	○
Quizlet	○	○	○	○	○	○
Quizizz	○	○	○	○	○	○
Classcraft	○	○	○	○	○	○
Socrative	○	○	○	○	○	○
Plickers	○	○	○	○	○	○
Toovari	○	○	○	○	○	○
Genial.ly	○	○	○	○	○	○

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After using gamification

And having created a digital breakout

* 10. How much fun was it to design this breakout?

1. Not at all	2	3	4	5	6. Very fun
○	○	○	○	○	○

* 11. Do you think you have learned more by designing it than by listening to how it is made??

1. Strongly disagree	2	3	4	5	6. Strongly agree
○	○	○	○	○	○

* 12. Do you think you will always remember how to create this type of resources?

1. Strongly disagree	2	3	4	5	6. Strongly agree
○	○	○	○	○	○

* 13. Do you think that your learning has improved because your teacher uses gamified resources?

1. Strongly disagree	2	3	4	5	6. Strongly agree
○	○	○	○	○	○

* 14. What differences do you find between learning by playing or by using traditional methods?

	1 Strongly disagree	2	3	4	5	6 Strongly agree
It is more fun	○	○	○	○	○	○
It is more real and meaningful	○	○	○	○	○	○
Increases my persistence	○	○	○	○	○	○
Increases my efficiency	○	○	○	○	○	○
It is more interactive	○	○	○	○	○	○
Encourages greater learning	○	○	○	○	○	○
Improves the memory	○	○	○	○	○	○

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