GAMIFICATION AS AN INSTRUMENT FOR ENHANCING THE ENGAGEMENT ON #TEUFUTURO PROGRAM

A GAMIFICAÇÃO COMO INSTRUMENTO DE AMPLIAÇÃO DO ENGAJAMENTO NO PROGRAMA #TEUFUTURO
LA GAMIFICACIÓN COMO INSTRUMENTO PARA AMPLIAR LA PARTICIPACIÓN EN EL PROGRAMA #TEUFUTURO

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ABSTRACT:
Current generations of students are increasingly influenced by digital culture, technology, and games. However, educational institutions still cannot align this connection that young people have with technology with a teaching method that can engage the student in learning. Thus, gamification emerges as a means of stimulating more active participation of students in classrooms. Therefore, the objective of this study is to verify the effectiveness of gamification in increasing engagement in students participating in the IMED #TeuFuturo program. This is qualitative research carried out through a focus group, collecting data through audio and video recording, with seven 12th grade high school students who were part of the program. The analysis of the obtained data made it possible to observe that gamification had a positive impact on the students' engagement.

KEYWORDS: Gamification; High School; Engagement.

Introduction

The progress of technology has brought changes in the way how young people think and act; however, the teaching method currently used in most schools and universities in Brazil has not evolved accordingly. These changes in the new generation make it necessary a more dynamic education, able to engage and create a transforming educational experience.

Nowadays, there are ways of using the new technologies in favor of a better teaching. Gamification uses games elements that can help the students to engage and work harder in the classroom. Using elements like points, a ranking system and consistent feedback, the students can be aware of the extension in which they are evolving in their learning, thus making the youth more involved in their studies.

Young people spend a lot of time playing video games in front of their TVs and computers. The issue underlying the discussion introduced in this paper is why not using this will to play for enjoyment in something that, besides amusing, help them to learn? There is evidence that games help to focus to learn better. Lepper and Cordova (1992) found that rewriting a lesson with a context of history combined with a challenge to be overcome by the students significantly improves the performance of their learning.

In front of this change of behavior by the current generation, this article introduces a survey of the history of education-aimed games and gamification methods presently used, so that we can have grounds to search how gamification can potentialize the learning of High School students. Based on these data, it will be possible to analyze more properly the results that will be obtained from the use of gamification by High School students who participate on IMED's #TeuFuturo program.

Games in education

Games and plays are quite significant for training and learning in Early Childhood Education. Crawford (1984, p. 16) describes how game is the natural form of education:

> Games are thus the most ancient and time-honored vehicle for education. They are the original educational technology, the natural one, having received the seal of approval of natural selection. We don't see mother lions lecturing cubs at the chalkboard; we don't see senior lions writing their memoirs for posterity. In light of this, the question, 'Can games have educational value?' becomes absurd. It is not games but schools that are the newfangled notion, the untested fad, the violator of tradition. Game-playing is a vital educational function for any creature capable of learning.

Games and toys began to be used in Early Childhood Education around 1840 with Friedrich Froebel. He created the "Froebel Gifts", which were toys used in children education to instigate the imagination and teach basic concepts of geometry.

Games have been used from time to time since then. Rice (2007) says that the interest in paper-based games increased among educators in the 1960s and the 1970s; however, it decreased, returning to K-12 Education. Overall, with the advance of technologies and electronic games, there is a renewed interest for the benefits of these games for education (JUUL, 2001).

In the 1980s, with the increasing use of personal computers, digital educational games like Oregon Trail, Math Blaster and Number Munchers started to become popular. This category of educational games is also called *edutainment*, from the combination of the English words *education* and *entertainment*.

Van Eck (2006) lists three factors that have contributed for the increase of the use of digital games in education. First, the research developed by several authors addressing the contribution of games in education in books like *Digital Game-Based Learning*, by Marc Prensky (2001), and *What Video Games Have to Teach Us about Learning and Literacy*, by James Paul Gee (2003), among others. The second factor described by Van Eck involves the *Digital Natives* who have disengaged from the traditional education. They need multiple flows of information, prefer the inductive reasoning, want quick and frequent interactions with the content, and have exceptional visual literacy abilities. The third factor is the increase in popularity of the games. Digital games comprise an industry of U$ 10 billion per year. In 2004, 248 million games were sold in the United States.

In Brazil, education-aimed games are also developed. An example is the SE•RPG, developed by Univali. The game's goal is to assist with the teaching of software processes and projects management. The student takes the role of processes manager, being accountable for the leading of a team of developers to conclude a project. It is possible to choose the team and the process model, to assign tasks to the employees, and to choose the programming language used. At the end of the project, the player receives a feedback that shows how the student has performed.

Prensky (2001) asks, "Why would we need to develop and use computer and video games for the learning of contents from the 'real world'?" The two answers offered by him are that our learners have changed radically and that they need to be motivated by new ways.

Generation Y, new learners, and new challenges in education

Generation Y, also called *Millennials*, comprises those who were born between the 1980s and 1995, according to world-wide research led by PwC (an auditing and consulting service supplier) in joint with the University of Southern California and the London School of Business.

Generation Y is the connected generation, always in contact with other people through the Internet, by email and cell phone. This connectiveness makes people from this generation to be immediatist for being used to instant messaging and Google search. This immediatism results in Generation Y members experiencing attention deficit. Sheahan (2005, p. 63) refers to them as "addicted to stimulation".

For having grown up amidst technology, Prensky (2001) calls this generation *Digital Natives*, people who, since they were born, adjust their brains to the speed and interactivity of the digital age. Prensky also says that these "cognitive changes" result in these subjects having new desires and preferences, mainly in the education field.

Prensky (2001) also mentions the major features of the *Digital Natives* of this generation:

- They want information quickly, considering the conventional education style quite slow;
- They are able to process many things simultaneously;
- They prefer images rather than texts;
- They are always connected, searching for information, and working in the Internet;
- They are impatient with anything that will not bring the expected reward;
- Technology is considered a friend; they need to have a computer with access to the Internet.

Carlson (2005) quotes Richard T. Sweeney to exemplify which are the necessary changes of the new generation in education:

> Change your teaching style. Make blogs, iPods, and video games part of your pedagogy. [...]. A new generation of students has arrived - and sorry, but they might not want to hear you lecture for an hour.

Sweeney (*apud* Carlson, 2005) explains that colleges need to rethink how they teach, as the youngsters of the new generation expect to be able to choose which form of education they want. Thus, educational institutions need classrooms that incorporate more videos and video games, as well as electronically developed lessons to meet the students schedules, as they choose to learn with each other instead of turning to the teacher. In this way, the didactic material and bookstores would be livened up, based on images and interactivity.

He also claims that these students wish whatever is practical for them, the easiest and fastest way to learn the content. The use of Internet and new technologies makes it possible for these young people to achieve the convenience they need. Sweeney asserts: "They want to learn, but they want to learn only what they need, and they want to learn in the best style for them" (*apud* Carlson, 2005).

The new learners prefer to learn in a way that is natural for them, and technology is natural in this generation. One method that can help to face these challenges in education is gamification, which we will see in the following section.

Gamification

The English word *gamification* means to use games to engage the users, to motivate them to use their critical thinking and creativity to solve problems, either in the managerial or in the educational field. Deterding (2011, p. 2) provides the following definition: "Gamification is the use of game design elements in non-game contexts".

It can be a difficult task to differentiate *regular* electronic games – purely for entertainment – and gamification. For Deterding (2011, p. 4), from the point of view of the designer, what differentiates gamification from *regular* games is the fact that they are programmed with the purpose of a system that includes elements of game design, not a *full game*. From the point of view of the user, such systems that employ elements of game design can, then, be experienced as a *full game*. For the users, what differentiates these systems from *full games* is this instability or flexibility.

Gamified apps use only a few elements of game design. These elements must be implemented in an efficient way for the expected result to be achieved by the app.

Some of the major characteristics of games design used by gamification, according to Zichermann (2011, p. 36-67) are listed next.

- **Points:** it is a system used to reward the user for carrying through tasks and behaviors preestablished by the designer. They are imperative in a gamified system, needed for the developer to be able to evaluate the users actions.
- **Leaderboards:** they show how many points each player earned in the game in a ranking system; this fosters a sense of competitiveness among people, when each user tries to give the best of his/herself to be among the first ones.
- **Badges (medals):** this system is used to demonstrate status in the gamified app. For each goal reached, the player is rewarded with a medal that is displayed in the user's profile.
- **Challenges and Missions:** their purpose is to keep the player's interest. The idea is to assure that the user will always have a challenge to be faced.

It should be noticed that these elements of games design are only tools to reach the desired objective. The challenge of the designers is to create a gamified app that is really able to engage the players, using these tools to motivate and reward users for habit changes and productivity increase, which is the main goal of the system.

Methodology

The research was conducted through a qualitative approach, defined by Minayo as a research that searches for the reasons, the aspirations, the belief, the values and the attitudes, which correspond to a deeper space of the relations, the processes and the phenomena, and cannot be reduced to operationalization of variables (Minayo, 2001). Thus, the goal of this research is to verify whether gamification can help the learning of High School students.

The target group comprised seven 12th grade students who had participated in #TeuFuturo program focused on Computing Science. The program is developed by IMED and was created in 2013, initially aimed to the Computer Science course and later expanded to Civil Engineering and Architecture and Urbanism, with the purpose of bringing High School students closer to Higher Education and the labor market, besides offering scholarships and trainee places in companies of the region. In the 2018 edition, 26 schools in 4 cities of the region were visited to offer to the students the opportunity to participate in the program. In the sixth edition of the project, 36 students enrolled in the course and 26 concluded it. This was the first edition to implement the use of gamification in the lessons.

This paper is focused on the part of the program aimed to Computer Science, which is divided in 4 modules, in a total of 100 class-hours, all assisted by gamification methods, which are described below.

- **Module 1**: games construction – the students develop a game using the Scratch tool, thus learning the basics of programming.
- **Module 2**: apps creation – using the App inventor and the programming of the previous module, the students create apps.
- **Module 3**: robotics – principles of electronics and computing, using Arduino to create robots.
- **Module 4**: entrepreneurship – lessons on the labor market and assistance in interviews and resumes.

Gamification was conducted in the program by means of a spread sheet (Figure 1), developed in Google Docs, using Google scripts, in which each student received points for his/her attendance and for replying to the feedback following each lesson. Attendance is worth 40 points, while feedback, 10. The spread sheet also functions to generate a leaderboard, showing the position of each student according to his/her grading and sending this ranking to each participant's email, so that they can check their ranking and act accordingly.

Figure 1 Gamification spread sheet

Criar	Atualizar	Enviar e-	Dias que os alunos... 5		30/08/2018				06/09/2018				13/09/2018			
Gerar leaderboard	Número de alunos no Leaderboard: 10	Feedback	Trocar o feedb... Feedback#TeuFuturoA		Aula 15				Aula 16				Aula 17			
					Feed back	Pres ença	Badg es	Soma	Feed back	Pre sen ça	Badg es	Soma	Feed back	Pres ença	Badg es	Soma
Num	Nome / Ptos	Ptos	email		10	40		50	10	40		50	10	40		50
Presença	████	214				x		40				0		x		40
x	████	0						0				0				0
Presença	███	459			x	x		50	x	x		50		x		40
Presença	███	174				x		40				0		x		40
Presença	███	265				x		40	x	x		50		x		40
Presença	███	160				x		40				0		x		40
Presença	████	180			x	x		50		x		40				0
Presença	████	200				x		40		x		40		x		40
x	████	236			x	x		50		x		40		x		40
x	████	0						0				0				0
x	████	215				x		40		x		40		x		40
Presença	████	255				x		40		x		40		x		40
Presença	███	396			x	x		50	x	x		50	x	x		50

Source: From the Authors.

Figura 2 Leaderboard

LEADERBOARD				Badges			
1º	459	Larissa	Número	Nome	Link da imagem	Descrição	
2º	396	Luana	1	Pontualidade Ouro	cons2/924/PNG/512/Football_2-20	O participante que obteve 100% de frequência	
3º	390	Joice	2	Pontualidade Prata	cons2/924/PNG/512/Football_2-51	O participante que obteve 90% de frequência	
4º	359	Felipe	3	Agilidade	m/photo/2013/07/13/12/19/hermes	Primeiro grupo que terminar ou primeiro grupo que desenvolver mais coisas	
5º	299	Claudio	4	Criatividade	s/default/files/imagens/lampada.png	Solução mais incomum e/ou mais funcional	
6º	289	William	5	Liderança	AAAAAAiks/dLjel-UEyfg/s1600/con	Lider de cada grupo	
7º	276	Deise	6	6	https://i.imgur.com/D0lwrC4.jpg		
8º	275	Everton					
9º	265	Patrick					
10º	255	João					

Source: From the Authors.

In the leaderboard screen, the participants' cover names are included and it can also be seen the badges that were granted during the final challenges of modules 2 and 3. These medals were delivered to the students or groups that reached some preestablished requirements like punctuality, agility, creativity, and leadership.

The final challenges were used to test the knowledge acquired by the students at the end of each module. In module 2, it was conducted a Hackathon in the shape of a treasure hunting, in which the participants were divided in groups of 4 members, 2 hunters and 2 programmers. QR Codes were spread throughout the institution and each

QR Code pointed to a link with a challenge that the groups needed to solve. The challenges were divided in technical, theoretical, communication, leadership, and networking.

In module 3, the challenge was to automatize a house using Arduino. The groups were chosen by the students and each group needed to find creative ways to automatize a paper model house, like turning the light when it was dark, opening the curtains, opening the doors, etc.

All the challenges used gamification to encourage the students to reveal a stronger effort. Points and badges were assigned to participants who were able to reach the preestablished goals (Figure 2). Besides these objectives, in module 3 it was assigned badges also for the house with the best design, the best final presentation, the best slides developed, and for the teamwork. These medals were printed in the diploma and delivered to the students at the conclusion of the program.

For the evaluation of results of the present research, a focus group was developed with the participant students. This research method is described by Perosa and Pedro (2009) as a form of direct data collection by means of a group's talk, which tells experiences and perceptions concerning a topic. Eight questions were posed to establish the impact that gamification had on the students during the classes. The interview was audio and video recorded so that interactions and answers could be analyzed in an easier way.

Analysis of results

This section addresses the analysis of the results obtained through the focus group. For such, Bardin's analysis of content (2010) was used, and it will be described the major talks of the participants, using cover names to keep their privacy. The goal of this procedure was to establish what the students understood on gamification and considered that helped them along the classes.

Picture 1 presents each participant identification and a synthesis of the talks following each question:

Picture 1 Synthesis of students interactions in the focus group
To be continued

Question 1: In your opinion, which is the purpose of gamification?	
Marcos	"to motivate the students to continue" [...] "not only the experience, the learning, but having some material that makes us to work a little harder"
Vagner	"in my view, it is a meritocratic way of learning" [...]
Question 2: Do you believe that gamification has helped or interfered with #TeuFuturo?	

Marcos	"it helped in the competition, it motivated the students to avoid skipping school" [...] "to be the best" [...] "the ranking that appeared in the end, everybody looked at it to check which was their position"
Luana	*agreeing with Marcos* [...] "oh, I lack this many points to overcome such person*" in the ranking*
Vagner	"in the individual scope" [...] "it helps the individual to always want and search more" [...] "if there were no gamification, they possibly wouldn't dedicate that much" [...] "when it stimulates the competition, it stimulates the knowledge"

Question 3: Did you feel that you have learned more using gamification than in non-gamified instances?	
Luana	*referring to lessons without gamification* "it is more boring" [...] "I think that one doesn't dedicate as much"
Vagner	"I believe that the person dedicates more when there is competition"
Lucas	"like, I'm quite competitive" [...] "this is why, for me, it's better to use gamification"

Question 4 – In a non-gamified class, do you feel that you do not want to learn as much as in a gamified one?	
Marcos	"you learn for the grade" [...] "or if you like the subject matter a lot"
Vagner	"I think that in the collective scope of a group" [...] "in the personal scope, I do not dedicate that much, but if it were in the school collective scope, a group competing with another one, it would be another bias"
Marcos	"it's like in my school when there's a scavenger hunt ["] ..."it completely changes the mood of the group [...] "everybody puts an effort because of the competitiveness"

Question 5: Did you feel more motivated and engaged to participate more actively in the lessons because of the use of gamification? Why?	
Marcos	*referring to the gamification model that was used in the program* "I believe that in gamification, there should be a question like "What did you learn today?" Then the person would pay more attention to the class to reply"
Luana	*agreeing with Marcos* "just like it happened in the final challenge" [...] "there were a few questions that were explained during the lessons" [...] "in the final challenge, there was this question, I think that you pay more attention knowing that you will be demanded and that it will be graded"
Marcos	*agreeing with Luana* "if we had been told, pay attention that it will be posed a question on the class topic and you will be assigned one point in the gamification"

Question 6: Do you believe that a gamified lesson is more entertaining than a "regular" one? Why?	
Vagner	"it's more amusing because of the competition"

Question 7: If all the encounters had a gamification element, do you think that you would be more engaged, and the dropping rate of the program would decrease? Why?	
Luana	"I don't know if the dropping rate would be lower, but everybody would really be more interested"

Conclusion

Marcos	"I think that in #TeuFuturo if you snooze you lose" [...] "if it were necessary to pay attention because there would be a question on the subject matter in the gamification, then the person will pay attention and, in the end, will understand the content; if he understands the content, there is no reason to give up"
Luana	"I believe that it would be cool if we could earn points per activity per lesson for the gamification, because then everybody would try to apply whatever they learned, to pay attention" [...] "to earn one little point" [...] "I think that this way, even those who are ashamed to ask would ask to be able to earn a point"
Marcos	"if there were at least one exercise in each lesson with a content that had been taught in class [...] to resolve at home [...] it would be something that would stimulate the search for knowledge"

Question 8: Did you find the ranking result fair in this model of gamification?	
Marcos	"those who did not miss class, those who answered to the feedback were those who won. I think that it was not those who put more effort in the class itself"
Luana	"this is why I think that there should be a part of exercises in gamification"

Marcos	*agreeing with Luana* "because this would require, those who win must have learned more"

Source: From the Authors.

Next, it will be made an analysis of the major talks from the participants of the focus group. It is worth highlighting that two of the participants did not speak in any question and another one only agreed with the colleagues' talks.

In question 1, there are two distinct views concerning the gamification purpose. Marcos believes that it is a way to stimulate the student to continue studying and to work harder in the learning; in other words, a way to engage the student in the lessons. Vagner said that it is a meritocracy-based system, that is, a system that benefits those who have the highest merit in their efforts; perhaps this is true, however, it is not the real purpose of gamification.

In question 2, all agreed in general that the gamification used in the #TeuFuturo program helped in the engagement of the students, mainly because it stimulated competitiveness among them. Luana commented that she always checked the ranking that was sent to the students and liked to analyze how many points she lacked to overcome the one in the first position. Vagner said that competitiveness stimulates knowledge.

In question 3, Luana commented that a lesson without any gamification element is "more boring" and that people do not dedicate that much. The other students agreed that gamification makes the class more competitive and more interesting than one without it.

In question 4, Marcos said that in a lesson without gamification, everybody learns only to acquire a good grade, not because they really want to learn. Vagner commented that in the personal scope as a student, he did not dedicate himself as much as in a gamified lesson, but if it were in a collective scope as a competition between groups, it would be different. Marcos agreed with Vagner, saying that whenever there is a scavenger hunt in his school, everybody works harder in the learning. Probably what they mean is that when inserting an element of competitiveness in the schools, everybody would feel more engaged in the studies and the competition is one of the principles of gamification.

In question 5, it is observed a criticism to the gamification model that was used in the program. Marcos commented that he considers that he would feel more engaged if there were a question referring to the subject matter taught in class, and that would assign points. Luana agreed saying that everybody would put more effort and pay more

attention if they knew that at each lesson it would be made a question on the subject matter, and that this would count for the final ranking. In question 6, only Vagner commented that the gamified lesson is more amusing because of the competition.

Question 7 aimed to consider question 6 and understand the program dropping that happened during it. Luana said that she is not sure that it would decrease the dropping rates, but she thinks that everybody would be more interested in the lessons. Marcos believes that one of the problems concerning the dropping rate is when the student is not able to understand the subject matter, either because he/she was distracted or lost interest. Thus, he considers that if there were a question at each lesson, they would all have to pay attention in the lessons and would further understand the contents. This student finishes by saying that, if the student understands the subject matter, there is no reason to give up the program. Luana complements this talk when saying that, in this way, even the students who are ashamed or afraid to ask something that they have not understood would do it, so that they could earn the equivalent point in gamification.

In question 8, initially almost all agreed that the result was fair, however, Marcos said that he feels that the method benefited more the assiduity of the students than the effort in class. Luana agreed and said that this is the reason why the exercises solved in class should have been considered.

Analyzing all the talks of the participants, it can be concluded that gamification was beneficial for the engagement of the students in the program, mainly if we consider that they spoke a lot about how much their sense of competitiveness was triggered. Having competitiveness among them been stimulated, most of the students tried to put more effort to improve their performance and overcome their colleagues' in the ranking.

However, the method that was used can be modified to include points for solving exercises, participation in class, and knowledge search out of class, thus making the students to feel even more engaged in the program. Despite the necessary modifications in the program's gamification, it is worth mentioning that #TeuFuturo is already in its sixth edition. Its conclusion rate, which was 30% to 46% in previous editions, increased to 72% of the participants in this edition, in which gamification was included, according to data provided by IMED, showing that the method has been beneficial for the program.

Final remarks

This study tried to better understand the gamification used in education and to establish whether it can be a potentializing agent in students learning. This topic is of utmost importance so that we can find new methods of education for this generation

with which we are living, quite linked to games and electronics, and, also, for the new generations that will come, which might be even more interested in games and technology.

In developing the study, we were able to observe that gamification is already being used in some teaching fields and with good outcomes. We have conducted a research with students from IMED's #TeuFuturo program, which implements gamification elements in its classes; we have noticed that all students understood that the use of the method helped in the engagement when stimulating the instinct of competitiveness among them. There was some criticism concerning the lack of some issues that were not addressed by the gamification model, but, in general, everyone liked the experience.

The study of gamification will be increasingly important for education, as more and more students feel that the old methods are not appropriate for learning in the current days. Thus, it is necessary to carry through new research in this field, mainly in Brazil, a country where gamification is not widely understood or implemented yet, so that we can make new students interested in knowledge and feeling always engaged in learning more.

We believe that the study will be beneficial for the future of the program, as we were able to distinguish positive and negative aspects in the use of gamification in the program. Also, we could establish which elements need to be implemented for the method to further assist in the engagement and learning of the students in the next editions.

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RESUMO:
As gerações atuais de estudantes são cada vez mais influenciadas pela cultura digital, pela tecnologia e por jogos. Porém, as instituições de ensino ainda não conseguem alinhar essa ligação dos jovens com a tecnologia com um método de ensino que consiga engajar o aluno no aprendizado. Assim, surge a gamificação como um meio de estimular uma participação mais ativa dos alunos nas salas de aula. Logo, o objetivo deste estudo é verificar a efetividade da gamificação no aumento de engajamento em estudantes participantes do programa #TeuFuturo da Faculdade Meridional (IMED). Essa é uma pesquisa qualitativa, realizada por meio de um grupo focal, coletando os dados em gravação de áudio e vídeo, com um grupo de 7 alunos do 3º ano do Ensino Médio que fizeram parte do programa. Com a análise dos dados obtidos, foi possível perceber que a gamificação teve um impacto positivo no engajamento dos estudantes.

PALAVRAS-CHAVE: Gamificação; Ensino Médio; Engajamento.

RESUMEN:
Las generaciones actuales de estudiantes están cada vez más influenciadas por la cultura digital, la tecnología y los juegos. Sin embargo, las instituciones educativas aún son incapaces de alinear esta conexión de los jóvenes con la tecnología con un método de enseñanza que pueda involucrar a los estudiantes en el aprendizaje. Así, la gamificación surge como un medio para estimular una participación más activa de los estudiantes en las aulas. Por lo tanto, el objetivo de este estudio es verificar la efectividad de la gamificación para aumentar el compromiso de los estudiantes que participan en el programa #TeuFuturo en la Faculdade Meridional (IMED). Se trata de una investigación cualitativa, realizada a través de un grupo focal, recolectando datos en grabación de audio y video, con un grupo de 7 estudiantes del 3° año de secundaria que formaban parte del programa. Con el análisis de los datos obtenidos, fue posible percibir que la gamificación tuvo un impacto positivo en el compromiso de los estudiantes.

PALABRAS CLAVE: Gamificación; Escuela Secundaria; Compromiso.