



Preferences of Student In-Game Elements for Implementation in Gamified Learning: A Survey Report

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Abstract. Gamified learning environments are used as an aid to traditional teaching methods, with the aim to motivate learners and keep them engaged in making progress. However, the implementation of gamification does not always yield the desired outcomes for several reasons, for example poor implementation and with mixed results among students. Some studies refer the importance of designing personalized or adaptive gamification in order to allow customization and better fit the diverse user preferences. With the objective to implement a customizable gamified system for Maximus project, we interviewed our target students (23 valid responses) to collect their preferences and trends. The survey report provides several answers to students type of preferred games, favorite features for customization in terms of game elements, in-game currency, rewards, among other relevant suggestions. Having students help designing their own gamified learning environment contribute with clear guidelines on the best game components and dynamics to implement in Maximus system and other gamified learning systems or serious games for learning.

Keywords: Gamification · Learning · Survey

1 Introduction

Traditional teaching and learning methods are beginning to seem outdated amid generations of students increasingly captivated by digital technologies and games. The use of gamification in education aims to motivate students for the tedious tasks of learning and keep them engaged in the long term to improve their outcomes [1].

The term “gamification” is commonly defined as *the use of game design elements in non-game contexts* [2], in the specific context of Maximus project it will be used in-schools, with students aged 13–15 years old. Foremost, gamification “is about how to add a bit of fun to laborious and tedious tasks” as said by Hammerschall [3].

The Maximus project aims to maximize student motivation and participation, through an interactive and customizable digital gamified system. The system will include game-like elements to inspire game-like reactions and student engagement. For example, teachers can create classroom activities and reward students with in-game virtual rewards and currency to unlock avatar parts that they can customize. The virtual currency also allows the student to enter an online store to buy further in-game items and featured cards that earn them experience points. The objective is to make the Maximus system available to teachers and students through an application for mobile phones, tablets and PCs.

However, after the implementation of gamified learning systems, student results do not always show improvement, because the use of gamification is not a bullet-proof solution, guarantee of achieving better results. Specifically, poorly designed gamification approaches, limited to the PBL triad (Points, Badges and Leaderboards) or other primary game features, without proper instructional context and fun design will hardly obtain the desired positive results [4].

Some studies refer to the importance of designing personalized gamification systems according to user preferences and profile [5, 6]. Thus, we interviewed a group of students representing the target audience of the Maximus system, to find out what their preferences are regarding game elements, and implement them in the design of Maximus customized gamified system.

The main contribution of this survey report are the students preferences, in terms of game elements, that can be implemented into any gamified learning environment or educational game.

The rest of the paper is organized as follows: in Sect. 2 we describe the state of the art, presenting from the precursors of our work to the most recent research; in Sect. 3 we describe the survey research method; in Sect. 4 we present and explain our data and their results and in Sect. 5 we highlight the conclusions.

2 State of the Art

There are a few methodologies for gamification design, for example the Gamification Model Canvas framework [7] or the 6D framework proposed by Werbach and Hunter [8], the Octalysis framework by Yu-Kai Chou for gamification and behavioral design [9] or the framework for gamified education published by Kapp in 2012 [10]. Despite some commonalities of these and other frameworks, the truth is that there is not a single, standardized approach on how to design successful gamification. Probably because gamification design requires a creative balance between technical and artistic solutions, combined with fun design. Furthermore, Oliveira et al. [5] state that it is not known what are the best design solutions for tailored gamification of educational systems suited to the student’s profile and highlight the need to develop personalized gamification frameworks according to user preferences, needs and goals.

Sundar defines tailoring or personalization of digital media as content that “is tailored by the system to individual tastes” of the user [11]. Adaptability is a behavior where the user can modify their learning path using a predefined set of rules [12].

The main goal of any gamification system is to use game elements to motivate the user to change behavior, and engage it over time to build its loyalty [2, 13]. However, gamification should not be designed as a “one solution fits all” because existing motivation theories propose that each user has a specific profile and is motivated differently [14]. There are a range of theories and models of motivation (Self-determination Theory [15], Theory of Incentives [16], Flow Theory [17], etc.) and frameworks such as 4Keys2 Fun [18] or Marc LeBlanc 8 types of fun [19], to help design engagement for players, they should not be interpreted as divergent but as complementary because they focus on different aspects of human behavior.

Martens et al. [20] and Werbach et al. [8] refer the importance of designing gamification using user-centered approaches adopted from design thinking. Among several principles, the authors refer to the importance of properly knowing the needs of users in order to plan, implement and even test in context and iterate gamification solutions that really meet their expectations.

Michael et al. (2014) [21] tested students results across two courses, one gamified with leaderboards and badges and the same course, non-gamified. Their results found that the gamified course resulted in less motivation, satisfaction and empowerment and negatively affected final exam grades through intrinsic motivation. The authors final remarks are that gamified systems strongly featuring rewards may have negative effects. Probably because “taking the thing that is least essential to games (in this scenario leaderboards and badges) and representing it as the core of the experience” should result in a poor gamified experience, wrote M. Robertson in 2010 [22] and also other authors make similar statements [20].

A few studies evaluated the results of using specific game elements on the learning performance of students, namely Landers et al. (2017) [23] where they corroborate that using leaderboards and setting goals was successful in motivating participants into completing tasks.

Yildirim [24] conducted a research study to determine the impact of gamification on students results and behavior towards learning and claim that gamification had a positive impact. For the gamified curriculum they implemented the game components of points and experience points (XP), levels, badges and leaderboards.

Santos et al. (2018) [25] tested comparatively how a tailored vs. non-tailored gamified education system, according to the students’ gamer archetype using the *BrainHex* (Seeker, Survivor, Daredevil, Mastermind, Conqueror, Achiever and Socializer [26]), could impact their concentration and flow experience following Csikszentmihalyi [17]. Their results, tested with 121 students, stated that the tailored version improved concentration and flow experience for the gamer types of Daredevil and Seeker, however for the gamer types of Mastermind and Survivor the non-tailored system performed better. These authors conducted a second experiment to identify the preferred gamification elements for each gamer type, which they present in a table.

Hammerschall published a gamification framework for educational engagement based on the Self Determination Theory and the Transtheoretical Model of Change

[3]. The author proposes a basic, generic game process, that can be coupled with a game story, to be used within diverse learning scenarios. There is not, however, any testing or validation of the proposed framework.

Rozi et al. [12] conducted a systematic literature review to analyse the components, methods and frameworks predominantly used in adaptive gamification. Their review concluded that the most used components are player/learner profiles, learning style, behavior and skill/knowledge. The top 3 (from 11) most used methods in adaptive gamification are: scoring, the Felder-Silverman Learning Style Model and the Linear Model. The popular frameworks are in first place the one proposed by Hassan et al. [27], following Codish and Ravid Framework [28] and ALEF (Adaptive Learning Framework) by Filipcik and Bielikova [29] among others.

Sailer et al. [30, p.] did a meta-analysis to analyse the effects of gamification on learning results, motivation and cognition. They report positive effects for learning, with less stable results on the motivation and behavioral learning aspects. Sailer et al. propose several game design ideas to improve the behavioral learning results such as including a fictional game world combined with an avatar system that can be customized over time [30]. Also fostering healthy competition with collaboration (instead of mere competition), using teamwork can help improve motivation. The author adds the example of using a badge system to allow students to challenge and reward among themselves.

Klock et al. (2020) [6] did a review of literature for tailored gamification and their findings reveal that most of gamification was designed by implementing game elements according to the user profile (player typologies as proposed by Bartle [31] and Marczewski [32], gender and personality traits), and there is a lack of research of methods on how to customize or personalize gamification. The studied authors mainly applied badges and customization for development of tailored gamification, and evaluated the implementation principally with surveys and questionnaires.

Oliveira et al. (2022) [5] did a systematic literature review to analyse the effects of personalized gamification in students learning. They identified that most systems are personalized using only the gamer types and the results do not demonstrate their effectiveness and lack comparison validation tests between tailored vs. non-tailored systems. The authors research study suggest that gamification should be tailored to the user's needs on two levels: (a) the content that should be adapted to the users; (b) game elements to suit diverse types of player profiles. The authors also reinforce the need to conduct further comparison studies of impact between tailored and non-tailored educational environments.

3 Method

3.1 Procedure

To achieve our research's goals, it was vital to collect information about students' preferences towards two key aspects that scientific literature refer as fundamental for gamification to be effectively used as a tool to make the learning process more interesting, fun and engaging. The first of these dimensions relates to the gamified elements themselves, for example in terms of their design, and the second one pertains to the rewarding system at the base of the gamification.

So, to this end, a questionnaire was designed and applied to a sample of Portuguese 9th grade students (age range typically between 13 and 15 years old), with the objective of collecting information about their preferences about technology use (e.g., “Do you or the school have a technological device that you are allowed to use during class?”), gaming elements (e.g., “Do you like games with personalized avatars?”) and rewards as a motivational tool (e.g., “Would you be willing to help with things beyond the basic curriculum and get something as a reward?”).

The method at the base of the development of the questionnaire was to combine the knowledge and know-how of 9th grade teachers and game developers, to create a pool of questions that would prompt students to manifest their preferences in an effective way. Thus, a brainstorming focus group was performed with a sample of teachers, that contributed with an innovative and student-centered (educational) reward, that could be built into a motivational system. Another similar focus group was performed with game developers, that contributed with key elements of gaming design that are associated with higher (or lower) levels of engagement with gamified activities or elements. The information collected from these focus groups was used to create the first draft of the questionnaire used in this research, which was tested, for content validity purposes, to a small sample of 9th grade students. After analyzing the information gathered from this test trial of the questionnaire, and the necessary corrections done, the final version of the questionnaire was set with 23 questions.

The questionnaire was then made available online, to a population of 9th grade students, whose parents (legal tutors) were contacted through email, to obtain informed consent for their children to participate in the research. The online questionnaire was built so the first page of the questionnaire had a second informed consent form, that students had to agree with, to answer the questionnaire. For sample consistency reasons, as well as for research design reasons, it was decided to exclude from this sample students with special needs, as these students’ profiles have specific characteristics that demand that a posterior and independent study be performed.

Results from the questionnaire were then processed and analyzed through SPSS statistical analysis software, for descriptive analysis, which are the type of analysis more suited for our research’s goals, as we aimed to collect information about students’ preferences, that could be used to support the design of Maximus project’s customizable gamified system.

4 Results

The questionnaire collected 23 valid responses, with the first question asking for which school was the respondent from; all participants are from Instituto Superior da Maia. The second question asked for the student’s age; the average age of respondents was 14 years old ($M = 13,9$), ages interval variation 13–15, from 9th grade in the Portuguese education system.

Question 3: Do you feel more invested in the subject when studying in more interactive way or theoretical?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Interactive	19	82,6	82,6	82,6
	Theoretical	4	17,4	17,4	100,0
	Total	23	100,0	100,0	

Portuguese students answered that they feel more invested in studying when the content is **more interactive (82, 6%)** than theoretical (17, 4%).

Question 4: Would you be interested in a game that would be directly connected to school's curriculum?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	4	17,4	17,4	17,4
	Yes	19	82,6	82,6	100,0
	Total	23	100,0	100,0	

Most of Portuguese students would be interested in a game directly connected to school curriculum (**82, 6%**).

Question 5: How do you feel about using technological devices in the learning process?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	8	34,8	34,8	34,8
	Positive	15	65,2	65,2	100,0
	Total	23	100,0	100,0	

A percentage of **65, 2%** of students feel positive about using technological devices in the learning process. Of note is the fact that none of the respondents answered that they feel negative towards using technological devices in the learning process.

Question 6: Do you feel that healthy competition can increase the potential of the students?

Most of students (**87%**) feel that healthy competition increases the potential of students.

Question 7: What type of mobile device games do you like the most?

Portuguese students gave a wide variety of answers to this question. The main categories of games referred as the most liked by students were (starting by order of preference): Action; Arcade; Adventure; Clash Royal; Call of Duty; Mystery; Strategy; Role Play; Chess; Card Games; Builders; Simulators; Minecraft; Quizz; Roblox; Shoot them up.

Question 8: Do you like games with personalized avatars?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2	8,7	8,7	8,7
	Yes	21	91,3	91,3	100,0
	Total	23	100,0	100,0	

Most students like games with personalized Avatars (**91, 3%**).

Question 9: When playing mobile games, do you care about the content and design of the game as equal?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No, care more about the content	4	17,4	17,4	17,4
	Yes	19	82,6	82,6	100,0
	Total	23	100,0	100,0	

A percentage of **57, 5%** of students answered that they considered equally important the content and the design of the games they play.

Question 10: Order the following types of gaining knowledge (from worst to best): 1. Digital Books; 2. Video; 3. Article; 4. Podcast; 5. Infographic; 6. Practical Games; 7. Digital Posters.

Question 11: Which in-game animations attract you the most when playing (can be based on a game of your choosing). Portuguese students gave a wide array of preferences when answering this question. When we analysed the answers, we were able to group them accordingly with types, from which we identified the following categories: Human-like animations; Colourful animations; High Quality Sims; Fortnite (dances); Animals; Graphs, sounds and animations connected with character development or evolution, or story development (Hogwarts Mystery); Landscapes.

Question 12: What is the basic source of motivation that you would like to include in a motivational system? Portuguese students gave a wide array of potential sources of motivation, when answering this question. When we analysed the answers, we were able to group them accordingly with types, from which we identified the following categories: Animal company; Games, namely games related to school/academic content; Rewards; Rankings (according with mastery); Objective list connected to achievements; Achievements; More video material in class; Interactivity; Music.

Question 13: Do you find the concept of getting rewarded with in-game currency (gold, diamonds, jewels, etc.) as ideal?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	3	13,0	13,0	13,0
	Yes	20	87,0	87,0	100,0
	Total	23	100,0	100,0	

A percentage of **87% of students** think that getting rewarded in a logic of in-game currency is an ideal concept to use in a motivational system.

Question 14: If no, state other rewarding system or other method/s you would consider interesting. From the answers of Portuguese students, we were able to identify the following alternatives of rewarding methods to increase motivation: 1. Getting rewards that could be used in stores, hotels, spas, etc.; 2. Getting access to mini-games.

Question 15: Do you or the school have a technological device that you are allowed to use during class?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	9	39,1	39,1	39,1
	Yes	14	60,9	60,9	100,0
	Total	23	100,0	100,0	

Almost 40% of Portuguese students report that they are not allowed to use technological devices during classes, which is in accordance with the data collected from teachers and reinforce the notion that school regulation might be a relevant barrier to implementation of motivational systems that include, or rely heavily, on the use of technological devices. This is an issue that should definitely be accounted for when preparing schools for program implementation.

Question 16: Would you be interested to see how other students are doing during subjects?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	7	30,4	30,4	30,4
	Yes	16	69,6	69,6	100,0
	Total	23	100,0	100,0	

Much akin with what is one of the main methods associated with gamification, namely in terms of using rankings, **almost 70% of Portuguese students** would like to see how their colleagues are doing. This means that the use of rankings might be an interesting tool to include in the motivational system, as a good percentage of students seem to be comfortable and interested in this kind of strategy.

Question 17: Would you be inclined towards more competitive group work in class?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	7	30,4	30,4	30,4
	Yes	16	69,6	69,6	100,0
	Total	23	100,0	100,0	

Portuguese students seem to be inclined to have more competitive group work in classes (**69, 6%**), which is consistent with a gamification-based approach, proposed by MAXIMUS, and with their answers to other questions.

Question 18: In case of a group work, would you be more interested to be split randomly or to choose the group members by yourself?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	By myself	17	73,9	73,9	73,9
	Randomly	6	26,1	26,1	100,0
	Total	23	100,0	100,0	

Portuguese students prefer to choose their work group members (**73, 9%**).

Question 19: Would you be willing to help with things beyond the basic curriculum and get something as a reward?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	5	21,7	21,7	21,7
	Yes	18	78,3	78,3	100,0
	Total	23	100,0	100,0	

A big percentage of Portuguese students (**78, 3%**) manifested their availability to do extra class work to get rewards, which is a very interesting signal, considering the logic behind MAXIMUS proposals for a motivational system, as well as for teachers to be able to be creative and expand their methods beyond more conventional and class-centered activities.

Question 20: Would you do additional work in school to get exam benefits (more time, help with questions, less questions, option to skip questions, etc.).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	5	21,7	21,7	21,7
	Yes	18	78,3	78,3	100,0
	Total	23	100,0	100,0	

Most students would prefer to additional work in school to get exam benefits (78, 3%).

Question 21: Do you prefer variety of tasks that can be done only couple times over repetitive tasks that can be done infinite number of times?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Repetitive tasks	1	4,3	4,3	4,3
	Variety of tasks	22	95,7	95,7	100,0
	Total	23	100,0	100,0	

Almost all of students that participated in this questionnaire (**95, 7%**) answered that they prefer tasks to be varied instead of repetitive, which is an important cue for a motivational system design. Furthermore, it follows the trend of younger generations of students, which by having access to a wide range of information, activities, means of communicating and learning since a very early stage of their lives, are not motivated and don't identify, in the least, with repetitive tasks.

Question 22: Rate, how interested you are in benefits like this, ranging from 1–5, (one being the worst, five being the best).

The preferences of Portuguese students, concerning the benefits that they find more attractive, from the most liked to the less liked, are as follows: 1. Ignoring questions on an exam; 2. Having an option to ask the teacher for answer; 3. Having longer breaks; 4. Possibility of retaking the exam; 5. Having a free lesson during the day; 6. Possibility of cancelling one grade; 7. Ability to use a phone during the day in school.

Question 23: What other rewards would motivate you to do extra work/ other tasks specified in a motivation system?

Portuguese students gave a wide array of alternative rewards, when answering this question. When we analyzed the answers, we were able to group them accordingly with types, from which we identified the following categories: Don' have to do written tests; Do a paper instead of a test/exam; Extra points on the final score of the test; Material rewards like food, money, interactive boards in classrooms, vouchers; Having more free time; Doing only one test in a week; Public acknowledgement for their work; Doing work or activities that might give us information about careers and jobs.

5 Conclusions

The answers from Portuguese students cover a considerable range of ages, which gives us a broad view of what might work with different students, of different school levels, which, in fact, we were able to see that didn't vary all that much. Although we only collected 23 students, we believe that the answers they give interesting and valid cues for developing the motivational system.

From the data, we believe that gamification and MAXIMUS' motivational system proposals, in their majority, are going to be well accepted by Portuguese students. This belief is based on their preference for more interactive and competitive methods of teaching-learning, as well as for the use of technological devices in school and classrooms. Additionally, they also have a very positive and enthusiastic view about gamification, and it's main elements like avatars, in-game design and animations, reinforced by the large number of suggestions they offered beyond the choices that they had in the questionnaire's items.

Also, their reaction to motivational system's issues and elements makes us believe that they are motivated to try new methods, that could improve their schooling experience. Once again, students gave very interesting and valid alternatives to the rewards suggested by the questionnaire, which we can interpret as not only as motivation to participate but also that they have clear and objective ideas about how to make the teaching-learning process more interesting, motivating, and productive. We find this very encouraging for implementation of different and innovative methods, but also for the usefulness of including students in the design of their schooling system.

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