



# DESIGNING GAMIFICATION SYSTEMS IN THE CLASSROOM

## Abstract

*This handbook provides guidance on designing effective gamification, diversity, systems that motivate and reinforce behaviors leading to learning, considering factors such as motivation strategy, accessibility, and fun.*

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## INTRODUCTION

The '*Designing Gamification Systems in the Classroom*' handbook has been produced for the 'MAXIMUS' project, which aims to improve student engagement and learning through gamified environments. The project involves the design, development and testing of a digital motivational system that can be customised and interactive. The handbook is about designing gamification systems in the classroom, which involves adding game-like elements to non-game activities to increase student motivation and engagement. It aims to motivate and reinforce behaviours that lead to learning and can be effective in different disciplines. The MAXIMUS tool is presented as a means of simplifying mission tracking, scoring and reward management to create an engaging and flexible gamification environment. Designers should consider several factors when designing gamification systems, including intrinsic motivation, attention to diversity, strategy, proportionality, accessibility, fun, goals, context, philosophy, and student personality.

## ABOUT MAXIMUS

### Aims:

- To increase the level of stimulus in classes through technologies in a meaningful and effective way
- To increase learner's motivation and active engagement and at the same time increase learner's transversal skills, critical thinking and creative expression;
- To enable learners to monitor their own progress and reward their progress/success;
- To create an open and accessible environment for the school community
- To help teachers/learners set/meet SMART (achievable) goals in the course
- To provide \*useful tools for teachers \*to motivate and engage learners
- To enable teachers to monitor learners progress in a variety of areas.

### Results:

- Maximus System design & setup
- Maximum Platform Testing & Upgrade to Mobile application
- Maximus audio-visual instructions.

### Target Groups:

- Experts, teachers and trainers
- Students

## WHAT IS GAMIFICATION?

**Gamification** is the process of adding **game-like elements and mechanics to non-game activities**, with the aim of **increasing motivation and engagement**. It can be applied to many areas, but in this context, we will focus on its use in learning.

For **Example**: Encouraging children to do household chores by rewarding them with points that can be exchanged for toys.

### Disambiguation with game-based elements

It is common to confuse gamification with game-based learning (GBL), but they are different things. In GBL, the game itself teaches you, whereas the aim of gamification is to motivate and reinforce behaviours that lead to learning.

- **Examples of GBL to learn addition:** playing a game where students are merchants and must keep track of their purchases and sales.
- **Example of gamification to learn addition:** rewarding students who voluntarily solve a sheet of addition problems.

From the examples, we can conclude that GBL is an effective way to learn addition, but could the same be done for punctuality, learning about cell parts, or writing English compositions? The answer is no. On the other hand, gamification is much more general, and the same system can be used for different disciplines.

### Objectives of gamification

Based on the previous example, it may seem simple. And, in fact, it is simple to make a bad gamification. To design a good gamification, we must understand its main characteristics.

- **Not just extrinsic motivation:** Gamification is directed at the weakest type of motivation, extrinsic “do this and I will give you good things, don’t do it and you will have a punishment”. The intrinsic motivation “Understand that doing this is good for you, look how fun it is to do this” is better and more lasting, and we must not lose sight of it when designing the gamification. To do this, not only must the rewards be seductive, but the tasks must also be (as much as possible).
  - **Example** ✗: Summarise the parts of the cell.
  - **Example** ✓: Design a 3D model of a cell and its parts.
- **Attention to diversity:** Each person has different skills and a different way of learning; we must offer different “tasks” that suit each type of student.
  - **Example** ✗: You can get 3 points for submitting an essay on the Middle Age, for submitting an essay on the Renaissance, or for submitting an essay on the contemporary age.
  - **Example** ✓: You can get 3 points for submitting an essay on the Middle Age, for submitting a timeline of the Middle Age, or for a video made at the Middle Age museums in your city.
- **Strategy:** For each situation and person, the most productive strategy for an exam is different. Rewards should allow for different approaches.
  - **Example** ✓: María knows she is very slow taking exams, so she buys “extended time”. Juan tends to freeze, so he buys “consulting his notebook for 30 seconds”.

- **Proportionality:** Points associated with tasks and rewards must be proportional to the efforts invested or the benefits provided. This ensures that all are used because none will have an “unfair” cost.
  - **Example** ✘: 5 points for asking a yes or no question to the teacher during the exam. 5 points for one exam question not being evaluated.
  - **Example** ✔: 5 points for asking a yes or no question to the teacher during the exam. 15 points for one exam question not being evaluated.
- **Accessibility:** We must invite those who are not motivated to be gradually motivated. To do this, there must be tasks and rewards accessible to different levels of effort (respecting proportionality).
  - **Example** ✘: Juan is not very involved and has only accumulated 6 points before the exam. With 6 points he cannot buy any reward, so he will not participate this time.
  - **Example** ✔: Juan is not very involved and has only accumulated 6 points before the exam. With 6 points he can buy a weak reward, but he is already participating.
- **Fun:** As a different voluntary and playful system, it is also an opportunity to relieve tension in overly academic environments and generate another type of coexistence. For this, gamification should have a game aspect.
  - **Example** ✘: Gamification has a very serious tone, there are no images in the rewards and the teacher gets angry if the class does not participate.
  - **Example** ✔: Gamification has a humorous or adventurous tone, has some attractive aspects and students see it as a more relaxed moment.

## Maximus Contribution

Keeping track of all these processes can be very tedious for teachers:

- Keeping track of what missions each student performs.
- Assigning points.
- Students can buy rewards.
- Keeping track of rewards.
- Deducting invested in rewards from accumulated points.
- Students can consult it
- It should have an attractive image to encourage participation.

MAXIMUS is a tool designed to simplify all these tasks that make teachers waste a lot of energy when organising gamification. In other words, its function is not to establish how gamification should be, but to provide an attractive and flexible environment that can adapt to almost any gamification concept.

## DESIGNING A GAMIFICATION

When designing gamification, we can do it in very different ways depending on our objectives, the context, the philosophy of the centre, the personality of the teacher. What is important is that each gamer has this introspective view and makes conscious choices.

### Examples:

- A centre that applies gamification to all its subjects will likely prefer there to be cross-rewards (related to excursions) or even materials (centre merchandise).
- If gamification is applied to a single subject, the rewards will be local, related to the subject itself and to development in the classroom.
- If the teacher has a light-hearted tone with the students, the gamification can have a more humorous cut, for example, with a style of cartoons, very exaggerated reward names (Temporary *Chew-gumer*: it allows you to extend your exam time by 5 minutes).
- If the teacher has a more serious tone, the gamification could be more dramatic and the rewards more themed (in a history class, for example “Logistical improvement: you can extend your exam time by 5 minutes”).

### Economic System

**Accumulative/depreciative system** indicates whether our gamification allows for saving or not. The choice may depend on the type of subject being gamified. In subject with continuous evaluation, saving does not impact the content, but in those divided by themes, a student can accumulate savings and only must focus on the theme they dislike.

### Examples:

- **Accumulative system:** Juan saves points in the topics of arithmetic, functions, and geometry, so he can spend them on the topic of statistics that he struggles with.
- **Depreciative system:** Each new topic, the value of saved points decreases by 50%, so Juan is inclined to spend the points obtained through assignments on the topics related to those assignments. If he wants to have ease in statistics, he must complete the "missions" for that topic.
- **Shop/fixed rewards:** This aspect sets a specific reward for achieving a goal or, on the other hand, makes the reward a certain number of points or currency of the gamification, which will allow it to be redeemed for what the student prefers (increasing the degree of customization).

### Examples:

- **Fix reward:** Upon completing a form that reflects the formulas for the physics topic, Maria obtains the ability to use it on the exam as a reward.
- **Shop:** Upon completing a form that reflects the formulas for the physics topic, Maria earns a certain number of points that can be redeemed for different rewards (such as more time, access to notes, or consultation with the teacher).

- **Global/Local system:** This aspect distinguishes between a gamification that encompasses several subjects or affects only one. Having several gamification systems simultaneously at the centre doesn't mean they have to be part of a global system. There are also hybrid options, where part of the reward is local and another (for example, experience points) is transversal to all gamifications.

**Examples:**

- **Global system:** With the points earned from doing mathematics work, José can purchase advantages in Language.
- **Local system:** If Jose wants to purchase advantages in language, he can only do so with points earned from doing language work.
- **Hybrid system:** Jose has completed a math work and a language work. With each work, he received specific points for each subject along with a quantity of experience points. With the math points, he buys "using the calculator in the exam", with the language points he buys "using the dictionary in the exam", on the other hand, the experience points from both subjects allow him to level up to 2 and obtain a new avatar.

### Tasks/Achievements/Missions

They must be well defined, pedagogically oriented, and be measurable. The other aspects may vary according to the intention of the game-maker.

- **Example** ✘: Being a good classmate earns between 10 and 20 points.
- **Example** ✔: For each session a student provides support to another student struggling with mathematics, they are awarded 10 gamification points.
- **Individual tasks/collective/team tasks:**
  - **Individual:** They are the most obvious. They are done by an individual student, and they receive personal recognition.
    - **Example:** Clara makes a timeline of the Renaissance topic and earns 10 points to exchange for rewards.
  - **Collective:** Those that must be carried out by the whole class to obtain points. They are designed to foster a sense of commitment to the group and social awareness.
    - **Example:** All the students in 3rd grade have completed the math tasks, so the individual reward of "having the tasks done" is doubled.
  - **Teams:** For certain dynamics, the class-group can be segmented into teams that share rewards.
    - **Example:** A mental calculation speed game is played in math, dividing the class into teams. Team A wins, and all its members earn 15 points.
- **Limited/unlimited achievements:** This aspect talks about the frequency with which achievements can be obtained, to avoid any loopholes that would undermine the game.
  - **Unlimited:** Achievements can be obtained as many times as one wants.
    - **Example:** Doing 4 equations in math for 2 gamification points. Juan does 400 equations and earns 200 points.
  - **Limited:** There is a limited number of times you can obtain an achievement (per course or topic).
    - **Example:** Doing 4 equations in math for 2 gamification points, up to a maximum of 4 times. Juan does 400 equations and earns 8 points.

- **Exclusive/Common achievements:** This feature has to do with the competitive aspect of gamification.
  - **Exclusive achievements:** there is a limited number of times that reward can be granted, so if other students have requested it before and depleted it, the next student who meets the conditions will not receive it.
    - **Example:** The first ten students who earn 50 points receive a school cap. Pedro was the twelfth student to reach 50 points, so he does not receive a cap.
  - **Common achievements:** Each student who meets the conditions for a reward will receive it, regardless of how many classmates have requested it before.
    - **Example:** Pedro has accumulated 50 points, so he gets a cap, regardless of how many students have achieved it before.
- **Academic/Leisure Missions:** This aspect refers to the direct relationship between the mission task and the content being worked on. This classification is less clear than the previous ones, as it is more subjective.
  - **Academic missions:** these are missions in which the task directly affects the subject matter, either through schematics, class activities, summaries, etc.
    - **Example:** The completion of schematics of the Middle Ages topic in history earns 12 points.
  - **Leisure missions:** These missions involve activities that would otherwise be difficult to evaluate in the classroom, but which we believe it is necessary to encourage.
    - **Example:** Watching the movie "The Name of the Rose" and telling the class which medieval elements you have recognized in it earns 15 points.
- Examples of types of achievement:
  - Completing class exercises
  - Having materials ready and waiting for the teacher seated (as a group)
  - Participating in class (contributing value) 3 times in one session
  - Summarising the topic being covered.

## Rewards

Their design should make them **desired** by the participants in gamification. In addition, to promote personalization of learning, they should be **varied** enough to allow for the development of strategies.

It is also worth reflecting on whether we want our system to be:

- **Facilitator/Elitist:** This feature addresses the difficulty that an unengaged student may have in incorporating into the game.
  - **Facilitator:** There are always rewards within reach, even for those who have scored few points, to motivate them to achieve more and make it easier for them to join the game.
  - **Elitist:** Only rewards are accessible from a certain level of effort.

Also, according to the objective of our gamification, we must design prices that allow the game to maintain interest, considering the following factors:

- **Proportionality:** The Price of each reward should be proportional to the effort required and the price of similar rewards.
  - **Example of proportionality:** The reward improves as its cost increases.
    - "Get the outline in 30s" 5 points
    - "Get the book in 30s" 10 points



- “Get the book in 60s” 15 points
- **Example of non-proportionality:** Only the 3rd reward makes sense to the buyer.
  - “Get the outline in 30s” 15 points
  - “Get the book in 30s” 10 points
  - “Get the book in 60s” 5 points
- **Adaptation to reality:** For the game to be interesting, it should be possible to achieve all rewards with a lot of effort and not many, but some, with little effort. If there are not enough opportunities to earn points or if it is too easy to obtain them, the game loses interest. An appropriate strategy can be to calculate the hypothetical points of a student who does everything and delivers it as an upper limit and one who simply attends class and meets their work halfway as a lower limit.

In addition, rewards can have other features to consider:

- **Academic/non-academic:** Referring to whether they affect grades or test performance or not.
  - **Academic:** those that affect the student’s grade or grant advantages in exams.
    - **Example:** “0,1 more grade “take notes for 30s during the exam”
  - **Non-academic:** rewards that benefit the student in a way that is not directly related to the grade.
    - **Example:** “choose your seat in class” “you choose the start music for the day for one week”.
- **Individual/Collective** refers to the number of people who benefit from it or are necessary to obtain it.
  - **Individual:** Only one student with his/her points can acquire it, and it only benefits him/her.
    - **Example:** Juan spends 10 points to extend his exam time by 5 minutes.
  - **Collective:** rewards that must be acquired in a group or affect a group.
    - **Example:** All students in 3rd B spend 3 points to have that day’s math class outside.
- **Scarce/Abundant:** Refers to whether a student acquiring a reward reduces or not the ability of another student to obtain it.
  - **Scarce:** This type of rewards is depleted when consumed by the first buyers. They foster a more competitive game
    - **Example:** Natural scarcity - being the one who chooses the movie on Fridays (2 movies cannot be chosen).
    - **Example:** Imposed scarcity - the first one to buy the reward "+0.5 points on the exam" depletes it (there could be more similar rewards, but it has been decided not to be the case).
  - **Abundant:** The availability of the reward is independent of who has consumed it.
    - **Example:** Each student who spends 10 points can go to recess 5 minutes earlier, regardless of how many have already bought it.
- Examples/suggestions of rewards
  - a. 10 min. meeting with teacher.
  - b. 1 additional hour to hand in an assignment
  - c. Get a hint on a question
  - d. Can work with a partner on an individual assignment
  - e. ...

## Levels/Experience (Recognition)

In parallel to the rewards system, players appreciate having their activity recognized through a parameter such as experience or levels. In this sense, reaching levels does not imply an advantage, but rather a recognition of a good player. The pace at which these progressions are achieved is important for the player's perception.

- Linear: Each level is achieved with the same experience points.
  - Example: To go from level 0 to 1, 40exp is needed. To go from level 1 to 2, 40exp is needed. To go from level 2 to 3, 40exp is needed.
- Incremental: Higher levels are much harder to achieve than the previous ones.
  - Example: To go from level 0 to 1, 40exp is needed. To go from level 1 to 2, 60exp is needed. To go from level 2 to 3, 80exp is needed.

Experience increments usually affect this type of recognition, although they may carry other benefits. One of the most common ways of achieving this recognition is through the avatar.

**An avatar** is an object or character that represents the player and "grows" with them. The more experience the player has, the more unique and personalised the avatar will look.

## Concept

Lore of gamification: what it refers to.

When gamifying, a key fundamental point is the story or lore, as the same task told differently can be very boring and routine, or a super interesting task that helps with student motivation. A simple example would be addition exercises. If we only set these exercises to practice math, the interest it may generate will be low. While with a good story (it is important to adapt it to the students' ages), not only can the student be motivated to do the task, but in some cases, it can also facilitate understanding of the concepts.

## Narrative

Endowing a gamification system with a story is not strictly necessary. In fact, if it is not done correctly, being too childish or too complex, it could turn students away from gamification. On the other hand, if it is done correctly, it helps create an immersive experience and provides students and teachers with common ground. More relaxed, comedic, or even mysterious cliff-hangers moments can help disconnect a bit from the academic aspect and improve social connections within the group.

So, in this article we are going to imagine that yes, we have decided to give our motivation system a narrative. But... how do we do it? This topic is sufficiently extensive to write a couple of books about it. Furthermore, it is already known that in everything related to artistic production the rules can often be broken by a creator who has a well-calibrated intuition and knows what they want to do. In any case, I will try to explain a basic structure that can be useful for almost any subject.

Firstly, the narrative should be an adventure, which is the style in which all our elements inherited from video games comfortably fit. As a guide for this, we can use the monomyth "The Hero's Journey" (written by Joseph Campbell) which shows the basic structure of virtually all of the stories and myths known to humanity.

Basically, initially the hero (or heroine) lives an everyday life in their comfort zone. An unexpected event calls them to adventure, and they reluctantly accept it. They overcome various obstacles to reach their goal, and this transforms them. Then they return home (successful or not) but now they are a different person from the one at the beginning.

This is the recipe for creating a successful adventure.

Being more specific, in adventures created for group gamification, the "hero" should be the entire class. It could be the crew of a spaceship, a research team, or the survivors of an apocalypse. This will allow each student to feel like they are part of the adventure.

The last necessary ingredient is that the teacher believes in it. If it's not your style or you don't feel comfortable with this type of thing, it's better to avoid it. If you do it half-heartedly or "just to fulfil it" it can be even ridiculous. However, if you feel like it... go for it. Your students will be very grateful for your effort and involvement.

Now all that remains is to adapt (with relative ease) the achievements and rewards to the new background you have created, giving the gamifications a new layer of depth.

## ADAPTING GAMIFICATION BY AGE/ENVIRONMENT

The following are general recommendations for adapting gamifications using MAXIMUS in different environments and with different ages:

### Elementary school (Children)

- In this stage, rewards for roles can be interesting, in addition to those subjects:
  - Cleaning the chalkboard
  - Raising and lowering the blinds
  - Preparing the computer and class projector.
  - Etc.
- Many rewards can be focused on moments during the class, not just exams or grades.
  - Choosing where you sit for a day
  - Choosing the next movie to watch in English class (from several options)
  - Choosing a toy to play with at recess
  - Etc.
  - The themes should be gentler, like a cartoon adventure, and special attention should be paid to images, as they will be highly valued.

### Secondary and High School (Adolescents)

- At this stage, various academic approaches to the subject matter can be interesting:
  - Presentation of the topic to classmates
  - Outline the topic
  - Infographics of the topic
  - Digital notes on the topic
  - Etc.
- Rewards should be more focused on written test, which are what they value the most.
  - More exam time
  - Ability to take the form
  - Ability to void a question on the exam
  - Ability to ask the teacher questions
  - Etc.

- The theme can be darker/action with drama, moments of fear, etc; or more oriented towards mischievous humour (within the logical limits of a school). If the students are older than 15, they may see childish stories, so these can be dispensed with.

### University (Young Adults)

- In this stage, the “excellence” of individual and group projects could be valued:
  - Originality
  - Presentation
  - Aesthetics
  - Content depth
  - Etc.
- The rewards should move away from exams (as it is more delicate issue) but focus on projects:
  - Choose Project topic as a priority
  - Choose practice days as a priority
  - Obtain sweatshirts/shirts/hats from the University
  - Etc.
- At this point, the story will matter little.

### Work (Adults)

- Typically, rewards tend to be for productivity/companionship and centre round recognition/free time/economic bonuses.