

UNIVERSITY OF THESSALY

THESIS

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# Gamification in higher education

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# Declaration of Authorship

We, Konstantinos TSEAS, Nikolas KATSIOULAS, Theodosios KALANDARIDIS, declare that this thesis titled, 'Gamification in higher education' and the work presented in it are our own. We confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where we have consulted the published work of others, this is always clearly attributed.
- Where we have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely our own work.
- We have acknowledged all main sources of help.
- Where the thesis is based on work done by ourselves jointly with others, we have made clear exactly what was done by others and what we have contributed ourselves.

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*"We should take computer science majors and have them write codes for Congress. The printouts would be more understandable to the layperson."*

Bauvard

UNIVERSITY OF THESSALY

## *Abstract*

Department of Electrical and Computer Engineering

Electrical engineering and computer engineering

### **Gamification in higher education**

by Konstantinos TSEAS, Nikolas KATSIOULAS, Theodosios KALANDARIDIS

Ο όρος παιχνιδοποίηση αναφέρεται στην ενσωμάτωση διαφόρων μηχανισμών παιχνιδιού σε καταστάσεις που δεν σχετίζονται με το παιχνίδι με στόχο τη λύση προβλημάτων μέσω της αύξησης της διαδραστικότητας και της συμμετοχικότητας των χρηστών. Αυτή η εργασία παρουσιάζει την παιχνιδοποίηση της ιστοσελίδας του τμήματος των ηλεκτρικών και μηχανικών υπολογιστών και την πλατφόρμα ασύγχρονης τηλεκαίδευσης η-Τάξη. Ο στόχος μας με την παιχνιδοποίηση ήταν η βελτίωση του μαθησιακού περιβάλλοντος, της κριτικής σκέψης, των δεξιοτήτων επίλυσης προβλημάτων αλλά και η συμμετοχή στις διαλέξεις και γενικώς η διαδραστικότητα.

Gamification is the concept of applying game mechanics and game design techniques in non-game contexts to engage and motivate people to achieve their goals. When designed correctly, gamification has been found to increase engagement and encourage targeted behaviours among users. This thesis presents the gamification of the website of the department of electrical and computer engineering and the asynchronous teleteaching platform open eClass. Our goal with gamification was to improve learning environment, lecture attendance, critical thinking, problem solving skills and general engagement.

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*Dedicated to my family...*



# Chapter 1

## Introduction

The term "**gamification**" is relatively new and it is used the last four years. Because of this there's a fundamental misunderstanding around what it actually means. So it is essential to understand the exact meaning and realize that there is a difference between "Gamification", "Simulations" and "Serious Games". These are three terms that people usually confuse. Therefore:

**Simulations** are real and immersive games which offer an experiential educational experience. Simulations place people in a risk free environment which supports their engagement in an authentic experience which contextually demonstrates benefits and consequences.

**Serious games** use traditional gamecraft techniques (for example video game technology, Kinect, strategy) around serious concepts such as defence, education, scientific exploration, health care, emergency management, city planning, engineering, politics, business, environmental and social issues.

**Gamification** is all about applying game elements (the 'DNA' of games) to non-game activities. It is about making 'normal', day-to-day activities more compelling. Gamification leverages 'game mechanics' such as points, levels, badges and achievements to create engagement and interest.

### 1.1 Subject of thesis

Gamification is a powerful tool that we can use to increase engagement and motivation of people. After conducting a research in which fields gamification can be used conclude that there was a few attempts to be imported in higher education. So we decided

to implement gamification in different tools of University of Thessaly which are used by students to collect information about lessons, professors, grades, curriculum etc. Consequently our main purpose is to use basic mechanics of gamification such as badges, levels, leaderboards, points and actions in two main structures portal of the department of Electrical and Computer Engineering in University of Thessaly and eClass an online course management system. In addition it is important to identify after a short period of trials whether these techniques can improve student's engagement, learning skills, lessons grades and generally make learning process more enjoyable without students focus only in gamification mechanics.

## 1.2 Organization of text

The rest of this thesis is organized as follows:

- In second chapter we try to describe with details what the meaning to play game is and what exactly the definition of the term game is. Moreover gradually we enter the unfamiliar readers to "what is gamification" and "why we want to use it".
- In third chapter is described how we can advantage gamification in higher education with the right way and previous attempts to apply it in practice.
- In fourth chapter is presented our goals and design for the project. Moreover the tools and the way to gamify the portals of the department of Electrical and Computer Engineering and the on-line course management system of University of Thessaly which called eClass. In addition this chapter contains details how we used some other components for gamification. Last but not least there is an initial evaluation of how useful is this project for the students.
- In fifth chapter there is a brief review and future plans for the development of the project.

## Chapter 2

# Background

### 2.1 What is a game

#### 2.1.1 Definition

"What makes a game?", "What makes a successful game?" are some of the questions in current discourse amongst game designers and theorists. Firstly, a working definition of a game will be established in order to create a reference point for meaningful and valid comparisons. In order to do this, a number of definitions from game designers, academics and philosophers will be juxtaposed. The famous twentieth century philosopher Ludwig Wittgenstein, in his masterpiece philosophical investigations, used games as one of his core examples about the difficulty, in fact the impossibility of using language to define things. The argument that he made, was that it is impossible to define what a game is. The game designer and scholar, Jane McGonigal, states that contemporary games come in more forms, platforms, and genres than at any other time in history. There is huge diversity in the way we play games. We can play them alone or in massively multiplayer environments, on many devices or on an old-fashioned board, we can play mini games or games that go on for months, games with or without a story, games that are physical or mental or both. Despite the variety there is something essential and unique about the way games structure experience. Stripping away the genre differences and technological complexities, McGonigal informs us, "A game has: a goal, rules, a feedback system, and voluntary participation" [1], [2]. In her definition, having a goal keeps players focused because it gives them a sense of purpose. Rules push players into unexplored territory as they remove or limit obvious ways of achieving those goals. Feedback systems motivate, while voluntary participation insures that all accept the rules and goals and thus share common ground, willingly accepting the effort and challenges that may be involved. Graphics, interactivity, narrative, rewards, competition, virtual environments and so on

are only ways of reinforcing and enhancing these core qualities. She goes on to state that in video games, rules are often ambiguous and are discovered as you play, as opposed to being clear instructions understood before commencing, as occurs in more traditional games. The feedback systems are what gamers learn first, as these guide the player towards a goal. Decoding the rules and discovering what is possible are some of the most powerful motivating factors [2]. The next definition to evaluate is found in *Rules of Play* (2003) by Katie Salen and Eric Zimmerman. According to them "A game is a system in which players engage in artificial conflict, defined by rules, that results in a quantifiable outcome"[3]. They reached on this conclusion having these on their minds:

- **System:** The concept of a system is essential to their approach. They describe a system as a set of parts that interconnect to form a complex whole.
- **Players:** A game has players, active participants that interact with the system to experience the play of the game.
- **Artificiality:** Games maintain a boundary from "real life".
- **Conflict:** Conflict, a contest of powers, is central to games. It can take on many forms from competition to cooperation, solo conflict or multi player conflict.
- **Rules:** Rules provide the structure out of which play emerges by delimiting what players can and cannot do.
- **Quantifiable outcome:** Games have a quantifiable goal or outcome. A player wins or loses or has a score. This distinguishes games from less formal activities. According to Salen and Zimmerman this definition can be applied to all kinds of games.[3]

Below are some concentrating definitions, by contemporary game designers, scholars, and authors.

- (a) Jane McGonigal: a game has a goal, rules, a feedback system, and voluntary participation.
- (b) Jesse Schell: a game is a problem-solving activity, approached with a playful attitude.
- (c) Kate Salen and Eric Zimmerman: a game is a system in which players engage in artificial conflict, defined by rules that result in a quantifiable outcome.
- (d) Tracy Fullerton, Chris Swain, and Steven Hoffman: a game is a closed formal system that engages players in a structured conflict, and resolves in an unequal outcome.

Moreover an essential book to understand the theory behind the game is "Theory of Fun for Game Design" by Raph Koster. Here are some highlights of the book:

- At the begging there is an explanatory of the purpose of writing this book. Kids start playing games at a very early age while it is a mystery how they become familiar with them and when exactly they get over them. The same thing with adults. "Why are some games fun and other games boring? Why do some games start getting boring after a while, and other games stay fun for a long time?"
- "How The Brain Works"  
"The human brain is a voracious consumer of patterns" as Koster explains. Faces are probably the most fitting example. Once we have created an image of how a face generally looks like we tend to see faces everywhere including places where there are none. Expanding on the pattern recognition, our brains are great at "routinizing" processes that recur periodically. After a while they are performed in autopilot, which is not really fun. On the other hand when we cannot see a pattern we get frustrated and give up.
- "What Games Are"  
Games are puzzles to solve, just like everything else we encounter in life. they are on the same order of learning to drive a car, or picking up the mandolin, or learning your multiplication tables. We learn the underlying patterns, grok them fully, and file them away so that they can be rerun as needed. The only real difference between games and reality is that the stakes are lower with game. Also the fun factor I might add. Fun is feeling good and one of the moments that this happens at most is when we learn or master something. In other words, with games, learning is the drug.
- "What Games teach us"  
The older we become the more we know and since we absorb knowledge from games we tend to enjoy them more when we are younger. The very phrase "is just a game" implies that playing a game is a form of practice for real-life challenge. Some teach us how to explore, some teach us how to aim, others exercise our sense of timing and reflexes. Mainly though games urge us to master skills that would be really useful when our species was first evolving. After "beating" it you could be asked to do it faster or more thoroughly which admittedly is a task that we could actually be asked to perform for a work project for instance.
- "What Games Are not"  
Games are largely about getting people to see past variations and look instead at the underlying patterns. Because of this gamers are often very good at seeing

past fiction. This is the reason why they are dismissive of the ethical implications of games, they do not see "run pedestrians over with your car" they see a power up. Story, setting, and backplot in games are nothing but a side dish to the brain while it completes its challenges. In some cases even make up for an otherwise unremarkable game. Stories are a powerful teaching tool in their own right, although games are not stories. Of course, learning patterns are not the only thing that is entertaining. Humans enjoy primate dominance games for instance. We also enjoy visceral experiences of various sorts. Last but not least, people often take delight in things that are not challenges. It tends to wear out quickly though. Real fun comes from games that test our ability limits. The perfect balance between the two causes people to zone out.

- "Different Fun For Different Folks"

Not everyone is the same. Some people have musical talent. Others can integrate equations in their heads, and others are intensely charismatic. But as parents usually tell their kids, if you work hard enough, you can overcome deficiencies. Talent does not substitute hard work. Since different brains have different strengths and weaknesses, different people will have different ideal games. People will usually choose to play games they are already good at, that reflect to their strengths. Arguably, they should seek out the games that address their weaknesses instead.

- "The Problem With Learning"

Since games are teaching tools, players seeking to advance in a game will try to optimize what they are doing. If they are clever enough to see an optimal path, an Alexandrine solution to a Gordian problem, they will do that instead of the "intended gameplay". They will try to make the game as predictable as possible which means that it will become boring not fun. In the real world, we call this "security" and "steady jobs" and "sensible shoes" and "routine". Call it a treadmill if you want. Game makers are fighting a losing battle against the human brain, which always fights to optimize, assembly-line, simplify, maximize ROI. In fact, most games are so bottom-line that if an activity does not give a quantifiable reward, they will consider it irrelevant. Most long-lasting games in the past have been competitive because they lead to an endless supply of similar yet slightly varied puzzles. Goes without saying that if your opponent is not an even match, the puzzle will be too easy or too hard. In fact, the desperate hunt for more puzzles to put into a given game has led to something called "kitchen-sink design".

- "The Problem With People"

Game designers talk a lot about emergent gameplay, non-linear storytelling, and

player-entered content. They are all ways of increasing the possibility space, making self-refreshing puzzles. The interesting thing is that people tend to come to a given puzzle and try to apply known solutions. For example, players of online role-playing games tend to play the same character types in game after game after game. And if gamers find themselves in tune with a game, they may play it far longer than they need to in order to master it, because being in the zone feels good. Some games will have broad experience with games, and that lets them see a given game and quickly grok the entire pattern. They end up flitting from game to game like butterflies. Game designers often play a given game for only fifteen minutes or so. It can be hard to play for enjoyment rather than analysis.

- "Games In Context"

Of course, analyzing a game is just another way of playing it, of pinning down the pattern in it. This is no different from any other medium, really, or any other field of human endeavor. This suggests that critiquing games is not only valid, but somehow praiseworthy. It's important that we figure out how to do it correctly. We often discuss the desire for games to be art, for them to be puzzles with more than one right answer, puzzles that lead themselves to interpretation. That may be the best definition of when something ceases to be craft and turns into art, the point at which it becomes subject to interpretation. There puzzles like this in life. Like writing a book. Or composing music. Or understanding your significant other. Or designing games.

- "The Ethics Of Entertainment"

But designing games isn't just about mechanics. Even if players can see through fiction, the art of the game includes that fiction. For example, we don't say that dance is solely choreography, even though that is the formal core of it. Consider a game of mass murder where you throw victims down a well and they stand on each other to try to climb out. The mechanics maybe Tetris, but the experience is very different. The literal lesson being taught is still how to stack blocks, but the artistic statement is different.

- "Where Games Should Go"

It is not the same for our games to portray the human condition and the human condition to exist within our games. A game is like a trellis. A trellis can shape how a plant grows. Often the plants escape the trellis, but that is not credit to the trellis, it's a credit to the plants. For games to reach art, the trellis itself, the mechanics, must be revelatory of the human condition. And that means the puzzles should be a bit more interesting than animalistic concepts like "territory", "aiming" or "timing".

- "Taking Their Rightful Place"

Games deserve to sit on the shelf right next to all other communications media, once the medium is mature. The point at which our game puzzles approach the complexity of the puzzles in other art forms is the point at which the game art form become more mature. The gap between those who want games to entertain and those who want games to be art does not exist because all art entails posing question and puzzles, though ones, ethical ones even. And games will never be mature as long as designers create them with complete answers to their own puzzles in mind. Of course, we all know that most people are too comfortable to want to be challenged in that way. There will always be a class of player who refers the comfort of tackling only puzzles they know how to solve. In the caveman days, the wolves and tigers got them. These days, we're a bit more tolerant, the job market gets them instead.

- Last but not least is the part that explains why fun matters: "Games are powerful tools for good, they rewire people's brains, just like books and movies and music. People get scared of the influence games have over them, fears that they will cause murderous rampages on the streets. That's unlikely. Like story, and music, games and play are fundamental parts of how the human brain works, and it's pretty rare for symphonies to cause riots... This doesn't mean that game designers shouldn't act responsibly, but then, all creators in all media should act responsibly. The challenge game designers face is "how do we create games that do not have one right answer?". This may involve making games with uncomfortable subject matter, because having respect for players implies giving them real challenges, challenges as sophisticated as the best stories give them. It also requires society to have respect for its own games. Someday, if society allows it, games will have their Shakespeare. But if we fail to understand why games matter, and how fun matters, all our games are designed to be like tic-tac-toe. To which I say, NO. Because I'd hate to pass up that look of joy and wonder in my children's eyes."

### 2.1.2 Types of games

Games can be categorized by many different characteristics and are usually classified by game playing environments or the game playing goals. It is common for a game to fit into more than one group (Hogle, 1996). The top six study fields related with game studies are:

- Game ontology (ludology) - the study of games and gaming, especially video games (Oxford Dictionary, 2013).



- Game criticism and history.
- Serious games (learning games, persuasive games, advergaming) – the games used for training, advertising, simulation, or education (Susi, Johannesson, Backlund, 2007).
- Game sociology, economics, and ethnography.
- Game design theory studies the main elements of what a successful game consists of.
- Game computer science (AI, visualization, content management, etc.).

### 2.1.3 Play and game

In game studies, there is distinction between "game" and "play" which is usually tied back to the French intellectual Roger Caillois and his concept of "paidia" and "ludus" as two poles of play activities. On one hand "paidia" (from the Greek word for child) denotes a free, expressive and improvisational form and even more a "tumultuous" recombination of behaviors and meanings. On the other hand "ludus", from the Latin which basically means games, captures playing a structured by rules game and having competitive strife toward goals. Also some classic definitions in game studies state that "gaming" and "game" in contrast to "playing" and toys are characterized by explicit rule systems and the competition or strife of actors in those systems towards discrete goals or outcomes.[4]

Below are some quotes from philosophers and game designers in order to understand what do mean when we talk about play that is different from when we talk about games. Quotes about "play":

- (a) Philosopher Friedrich Schiller talks about play as the expenditure of exuberant energy.
- (b) Santayana, another philosopher, says play is done spontaneously for its own sake.
- (c) Katie Salen and Eric Zimmerman two game designers say play is free movement within a more rigid structure.

Quotes about "game":

- (a) Tracy Fullerton says that a game is a closed, formal system that engages players in a structured conflict and resolves in an unequal outcome.

- (b) Sid Meier, a famous game developer says that a game is a series of meaningful choices.
- (c) Thomas Mallaby, an anthropologist at the University of Wisconsin, talks about games as a domain of contrived contingency that generates interpretable outcomes.

In conclusion we should understand the fact that play is freedom. Play is doing whatever you want but there is loose structure and some limits. Contrariwise, game has explicit rule system which you must follow it and discrete goal to succeed if you want to win the game. Generally we can imagine "play" as the broader, looser category which contains "game", which is a stricter subset. So it is important to keep in mind that gamification relates to "game" and not "play".

## 2.2 What is a gamification

### 2.2.1 Definition

Gamification is the use of game-thinking and game-mechanics in non-game contexts to engage users in solving problems.[5] It is the concept of applying game-design thinking to non-game applications to make them more fun and appealing. But what exactly does this mean. These are rather perplexing definitions so in order to simplify we can say that gamification is about learning from games, not just in a sense of learning about the games themselves but grasping the reason why games are so successful, and to take it one step further by utilizing it to achieve other goals. In the name of making the above easier to comprehend we shall use some quite well known examples. Take for instance Nike+ to understand gamification better. Nike, as we all know, is an athletic apparel manufacturer. They create running shoes, among other products, and therefore, Nike could benefit from people running more. So they developed a device which uses a piece of equipment called an Accelerometer, which fits into the sole of your shoe and tracks every single step you take while running. Consequently, the device knows how far and how fast you are running and it communicates wirelessly with a Smartphone or your PC, which can aggregate together all of that data. Having accomplished that, what Nike did was build a set of applications around it that made the experience of running more game-like. Specifically, the Nike plus Application possesses functions to inform you how far you have run, the fastest or longest run you have ever had and other various kinds of tracking data. Furthermore it enables you to compare yourself to previous times and so forth to track your "running history". The most absorbing fact yet is that you can also establish goals and challenges. And if you are successful in achieving those goals, you

acquire a trophy or a medal. Now that sure seems a lot like a game. Nike has built a variety of other features into this system including the ability to compete against friends, or getting encouragement from friends. Overall what this does is takes the experience of running and makes it feel somehow more like the experience of engaging in some kind of game. Now you are still going out for a run. It does not encourage you to sit down in front of your computer and play a running game to see how fast the avatar, the character in the computer can run. On the contrary, you are actually running outside but the game structures around it make it so that it motivates you and in this regard the whole experience of running feels somehow richer and more rewarding.

Another example, it is the *Zombies Run* and its purpose is the same as the Nike Plus to motivate people to run. The theme here is that it simulates an environment in which you are being chased by an army of bloodthirsty zombies. Pretty common kind of motif, hopefully not something that any of you have experienced, nevertheless it is not a unique setup for games. The concept is the following. While you are running, the *Zombies Run* game is telling you that actually the reason you are running is to avoid been captured by a gang of zombies that wants to kill you and eat your brains. As you keep going the game provides you information on whether or not the zombies are getting closer and it also enables you spot them on a map. Moreover there are virtual power packs for you to acquire to help you get special powers, or go faster. Your friends can get in the mix as well. The game that you are playing is very lightweight; nonetheless it is taking the experience of running and now subtly making it feel like more fun. Subtly, it is supplying another dimension to that involvement in running. Different kind of added dimension to what we saw in Nike Plus thus this is a much more immersive. Both are examples of using game elements and game design techniques with different ways to serve a purpose which itself is outside of the game. In these particular cases this is to stimulate people into exercising and in addition the first one to make profit. Still there is a plethora of objectives to achieve with the application of gamification. Lastly, it is essential to be mentioned that gamification has not always connection with web and apps. So, another bright and simple example to understand this, is the "Piano Stairs". The goal of this project is simple: increase the amount of people who choose stairs over the escalators. In order to accomplish this, the stairs were turned into black and white piano keys, producing a sound when stepping on them. The results was remarkable with an incensement of 66% in stair traffic versus escalator traffic. [4]

### **2.2.2 History**

The term "gamification" is pretty new as a business concept, but as it turns out, the roots of it go way back. 100 years ago, the Cracker Jack Company started putting a

toy surprise in every box. Since then, countless companies have use games and toys and other kinds of fun as a way of selling products. There are many other related examples like the S & H Green Stamps, frequent flyer program and so forth that have some of these components in them. But they are not really gamification in the sense if we talk about today, systematically thinking about how to make things more game like in order to increase business results.

The first example that we can find of the term gamification was from 1980. It involves Richard Bartle, who is a noted game designer and researcher at University of Essex in England, and he was brought into a project called MUD1. Mud1 was the first multi-user domain or multi-user dungeon. Essentially, it was the first massively multiplayer online game. Did not look like much though. It was a text based system on a university computer network. Although MUD1 was the first time people could experience a shared virtual world in this way, and thus was a precursor for things like Second Life and World of Warcraft today. The role of Bartle in this project was to take what was basically a collaboration platform and gamify it. He actually jokes today that gamification then meant taking something that was not a game and making it a game. Whereas now, it involves breaking games down into these constituent elements. So, taking an actual game and turning it into something that really is not a game. The work that Bartle did was called gamification. Still, it really was not the same kind of thing that we see today.

Other developments at the time helped to lay the groundwork for today's gamification. One of them was research by education scholars looking at video games and learning. Tom Malone, who is now at the Sloan School of Business at MIT, started around 1980 performing work on early video games. His work was a very simplistic games on PCs. But he was able to show kids could learn from playing these video games. Since then, a number of researchers have done similar and more sophisticated work. One of them is James Paul Gee, who is at Arizona State University. A number of books about how video games, even off-the-shelf, commercial, entertainment oriented games like the Tomb Raider series have been created by him. Encode powerful knowledge creation and learning mechanisms that relate to all of the deep research that we have on how people learn.

A second stream of work that contributed to gamification nowadays is the Serious Games movement. The Serious Games Initiative was founded in 2002 by Ben Sawyer and David Rejecs, and it brought together the communities in the private sector, academia, and the military that were using games, full-fledged games, for training and simulation various kinds of non-game purposes. The military was very interested in being able to simulate the battlefield and also in being able to use games as training mechanism for the thousands upon thousands of soldiers and others that it has to train every year. And

many companies had similar interests. Assembling serious games is actually building a simulation for a particular purpose. Undoubtedly they are very powerful and there have been tremendous accomplishments using them. The work on serious games informs much of what gamification stands for at the present time but it is distinct for that reason.

The Games for Change movement is a related initiative, or set of initiatives that focuses on using games for social impact. Letting you play a side in the Arab Israeli Conflict in the game called, "Peace Maker", to understand some of the complexities of that incredibly naughty issue is a quite fitting example. Games are great for teaching systems thinking, for showing you that your individual actions fit into a much more complex larger whole, which is valuable for pure education, and is also valuable in trying to promote understanding of major social issues.

Carrying forward, the first time that gamification was used in something like the current sense was 2003. When Nick Pelling, a British developer and a designer, set up a consulting firm called Conundra, which was there to promote the term in consumer products. He wanted to take a hardware product and make it more game-like. Unfortunately it was not really successful, the consultancy did not last all that long, despite that it was an indication of this notion that game mechanics and game concepts could be applied in this way to consumer products and other kinds of situation.

In 2005, a company called Bunchball was founded. In 2007, their first product was launched, which was really the first gamification platform. Actually they did not refer to it like that because again the word was not in common usage, nevertheless it was the first program that incorporated mechanics like points and leaderboards and so forth to serve engagements purposes in companies. Since then, Bunchball has been joined by a number of competitors like Badgeville and Bigdoor and Gigya. Companies like Kiosk, Practically Green and Ryppe (Salesforce) offer gamification services to other firms in specific areas. In addition, many corporations nowadays are building gamification services and systems on their own.

In 2010, gamification really took off. This was partly due to the community reached critical mass and they agreed to use gamification as the common term, but on top of that partly because of a set of presentations that really crystallized the idea of gamification for people. Probably the most prominent was a presentation by Jesse Schell, a well-known game developer who owns the firm called Schell Games and also teaches at Carnegie Mellon University. Jesse Schell spoke at the DICE Conference, a big games industry confab in 2010, and his presentation immediately went viral. The following is a fragment of that speech: "Well, I think it'll be like this. You'll get up in the morning to brush your teeth. And the toothbrush can sense that you're brushing your teeth. And so, hey, good job for you. Ten points for brushing your teeth. And it can measure how

long, and you're supposed to brush them for three minutes, and you did a good job. You brushed your teeth for three minutes. And so, you get a bonus for that. And hey, you brushed your teeth every day this week, another bonus. All right. And who cares? The toothpaste company, the toothbrush company, the more you brush the more toothpaste you use. They have invested financial interest. You go to breakfast, there's the cornflakes. On the back, there's a little web game that you can play. While you eat, instead of reading the back, you play a game while you eat your cornflakes. And you get that. And you get ten points just for eating the cornflakes. And then it turns out you can see your list of friends who also have cornflakes, and the scores that they got, because you're Wi-Fi, and then Facebook connected and everything, and so, you know, you get five bonus points because you just beat out one of your friends at the cornflakes game. So, then you go and get on the bus. The bus? Why am I taking the bus? You're taking the bus because the government has started giving out all kinds of bonus points to people who use public transportation. And you can use these points for, for tax incentives. And while you're sitting on the bus riding to work and you're playing your little Tetris and getting a few points here and there, you suddenly remember, I had this dream last night. I had a dream that my mother was dancing with this giant Pepsi can. And then you realize, oh yeah, the REMertainment system. Right? Which is the thing you put in your ear and it can sense when you enter REM sleep, and then it starts putting little advertisements out there to try and influence your dreams. And, then you can fill out a little form, it's a test to see if those things came through into your dreams. And if they did, then big points for you."<sup>[6]</sup> Definitely it was a little bit sarcastic, still it pushed people to think about just where this could go. And most significantly, it lit a fire in terms of getting everyone to imagine the potential of gamification.

Something else that had that effect the same year was the book, *Reality is Broken*, by Jane McGonigal and a tech talk that she gave at that point. She talked about how games could actually solve major human problems, help us address things like climate change or inequality in the developing world. Jane, herself, is not exactly a fan of the term gamification. To emphasize that she did not make use of the word in the book.

Today gamification is starting to mature. It is still new. We are still developing the ideas. But there are conferences and many companies and different areas of the gamification space. There are market research reports giving big figures about the gamification industry. We would take all their specific numbers with a grain of salt, but clearly something is going on here. And clearly, the industry is reaching a point where it is real and significant. So, we have come a long way, yet we also have a long way to go.<sup>[4]</sup>

### 2.2.3 Game elements

The raw materials of games and gamification are called game elements and it is our toolbox to create gamified systems. So, we will see how to break down a game into its constituent parts and apply them to systems. If you would look to all games you can think of, you will find a vast array of different paths, elements, templates and design patterns that can be applied to other games or gamification. Kevin Werbach is a professor who is teaching people about gamification and also have published great book called "For the win!" K. Werbach have developed a framework for gamification elements. These are base elements that can be found in gamification and some structure around different kinds of those elements. These are not every possible element, nor are these the best elements, nor elements that should be in every example of gamification or game. The best example is not that uses the most elements, it's the one which uses the elements most effectively. This framework should give some sense how different elements and structures can be applied in gamified systems or games.

It is a pyramid structure that have 3 levels:

- (a) Dynamics (top)
- (b) Mechanics (middle)
- (c) Components (bottom)

At the top of the pyramid are the game dynamics. These are the highest level conceptual elements in a game or gamified system. You can think about these as a grammar - the hidden structure.

- (a) Constraints
- (b) Emotions (gamification generally narrower range than real games, but still diversity here)
- (c) Narrative less than in games, but can rely on consistent graphical experience, not just a bunch of abstract stuff, needs sense of coherence and relationship to player's life
- (d) Progression – very important aspect, chance to improve, not necessarily Levels & Points
- (e) Relationships – peeps interacting

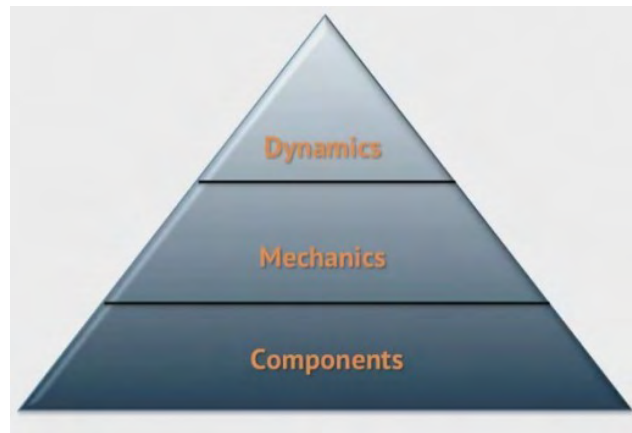


FIGURE 2.1

At the next level of the pyramid are the game's mechanics. These can be understood as verbs of gamification. The elements that moves the action forward. There are more mechanics than dynamics - that's the notion of the pyramid. Game mechanics are tools that can help to figure out how to move the action forward and get the players into the game. The mechanical elements of the game are:

- (a) Challenges
- (b) Chance
- (c) Competition
- (d) Cooperation
- (e) Feedback
- (f) Resource Acquisition
- (g) Rewards



- (h) Transactions
- (i) Turns
- (j) Win states

In the most surface level there are components. Specific examples, specific ways to do the higher level things that dynamics and mechanics represent.

- (a) Achievements
- (b) Avatars
- (c) Badges
- (d) Boss Fights
- (e) Collections
- (f) Combat
- (g) Content Unblocking
- (h) Gifting
- (i) Leader-boards
- (j) Levels
- (k) Points
- (l) Quests
- (m) Social Graph
- (n) Teams
- (o) Virtual goods

All together there are thirty different elements. A great list, which should show you some of the options, that you have to play with while implementing some gamified system. The structure of the pyramid shows that the lower level examples are the way of doing some higher level things. That is how the structure fits together. In a lot of cases the core of gamified system is the **PBL** triad (PBL = Points, Badges, Leaderboard). Generally, there is a fundamental attraction to using these elements in gamification but always we should be careful because these are not everything and gamification should not start

and end with PBL. Thus points are used to keep score, determine win states, connect to rewards, provide feedback, display of progress, data for the game designer and fungibility, which means that points can be used to represent anything because they are a universal currency. Badges can be used for representation of achievements (typically button like graphic on profile page or other place that people can see), flexibility because a badge can represent whatever the game designer wants to motivate, style (graphical style can communicate overall aesthetic), signalling of Importance, credentials, collections such as a "bookcase" which is an invitation to fill it up and social display or status symbols. Finally leaderboard displays ranking although it is challenging to use it right because it can be discouraging and make peeps abandon effort; so a good practice is to use personalized leaderboards to zoom in current user's score. Many people think that just throwing game elements is enough. Elements are a starting point but not the entirety of what you need to do. The elements are not the game. Alone they do not guarantee success. They are at the base of the pyramid, they do not tell you that the experience is engaging. It is important to remember that not all rewards are fun and not all fun is rewarding. [7] [4] [8]

### 2.2.4 Why gamify

There are mainly four reasons that the systematic study of gamification is fruitful. As a matter of fact more and more gamification will be a regular subject to be taught about, both in, training context and in, university educational context. To begin with gamification is a significant emerging business practice. A mass of examples comes up from a variety of companies, as well as in non-business context, where gamification is being applied. An article from Fortune Magazine, from October 2011 talking about gamification as the hot new business concept. Certainly we would not just follow something because it is a hype trend, still the important thing is, and many of the worlds most admired companies are starting to get on board with this. A second article from the Wall Street Journal talking about how growing number of firms are incorporating elements of video games into the workplace. Video games had become a huge and influential industry. Notwithstanding the essential deduction here is that more and more cases of video games being the foundation of performing actions at and around the workplace. Which leads to the conclusion that gamification is something that is happening and it takes place very widely. There is a growing recognition that this set of techniques has value, and it has value in a very broad set of circumstances. The second reason is that games are powerful things. We probably all had experience of really being addicted to a game. Time just seems to fly by. Perhaps it is a video game, or a board or card game, even playing sports. Whatever the case may be games have a real pull on us. There is something that is extremely forceful given that we think of them as events that we participate in just for enjoyment. "So what is it that makes games engaging?", "What is it that allows games to support sophisticated kinds of thinking and learning as you see?", "What is it about games that makes them so engaging?". Important questions to ask as mentioned above. It is worth starting to dig down and say just what is it about games that is so significant?

Over and above that, it teaches us things about other areas of knowledge as well. Gamification is strongly connected to psychology. Games have been around throughout all of human history because they link to some very basic aspects of the way our minds work. In order to understand how to design applications that are effectively gamified, we need to understand about motivation. "What is it that makes someone want to do something?", "What are different kinds of motivation?", "What are different techniques that can be used to help people achieve their goals?". Moreover we ought to learn about design. Gamification is a design practice so realizing how to do it, necessarily gets us into thinking about the very, sophisticated, complex world of design. Last but not least technology. Since games exist from the dawn of civilized community, many of them do

not involve any sophisticated technology. In spite of that, the ability of current network information technology to create rich immersive personalized experiences, to track interactions in real time, aggregate and analyze them, as well as make use of them, is incredibly formidable when applied to gamification. The majority of examples that we will analyze in the following chapter occur in the world of online activities, whether online services or technology startups. Gamification is applied in a digital internet based context. All in all, grasping what it is about that environment that makes gamification successful will provide a window into understanding aspects of technology as well.

In addition, the final reason to motivate the research and utilization of gamification is that it is not that elementary, not that obvious. Turns out that implement gamification properly, ethically even, in a way that fits in with our ultimate long-term business objectives is not trivial. It requires thought, it requires recourse through various different areas of knowledge as mentioned above. It is something that we can just find instructions in a cookbook, and thus, quite challenging.[4]

To conclude, a very educational book on how to gamify and why gamification is effective is "Gamification by Design" by Gabe Zichermann and Christopher Cunningham. So we separate some important parts from the book and we quote them: Gamification by Design sets out by defining three terms – gamification, engagement, and loyalty.

- Gamification is defined as "The process of game-thinking and game mechanics to engage users and solve problems."
- Engagement is defined as "the connection between a consumer and a product or service."
- Loyalty is defined as what "gets users to make incremental choices in your favour when all things are mostly equal."

In the preface and introduction, the book promises to reveal "what drives users to play and the core psychology that makes games so compelling", and already summarizes the answer it gives: "reward structures, positive reinforcement, and subtle feedback loops alongside mechanics like points, badges, levels, challenges, and leaderboards." Thus, gamification represents "a cohesive worldview that's informed by the latest research into behavioral psychology and the success of social games." This cohesive worldview is illustrated with the example of getting children to eat broccoli. Zichermann repeats the latter claim: "Brain scientists the world over agree that games' challenge-achievement-reward loop promotes the production of dopamine in the brain, reinforcing our desire to play." So why is playing games fun, then? The reasons identified by designers and researchers: The aesthetic joys of beauty and pattern, the autonomy in choosing who to

be, what goals to pursue and what strategies to pick in doing so, the creative expression of yourself, novelty and humor, excitement in suspense and its release. Games satisfy one of our three innate psychological needs – namely, the need to experience competence, our ability to control and affect our environment, and to become better at it.

Zichermann seriously underplays the conditions for something to afford meaningful social status: "Status benefits and rewards give players the ability to move ahead of others in a defined ranking system. Importantly, this ranking system need not be based on the real world at all—it works perfectly in a purely constructed environment." For something to convey meaningful, motivating social status, it better be connected to something I already care about, something that people care about whose opinion I care about, and something that represents an actual personal achievement I'd be proud to communicate to said people, in a way that wouldn't count as shameless bragging.

Engaging users with virtual currency conveying social status is a cheap opportunity for businesses to take advantage of. The exploitive nature of this thinking is maybe best illustrated in a statement Zichermann made: "Uniquely, games are able to get people to take actions that they don't always know they want to take, without the use of force, in a predictable way." Zichermann summarizes his thoughts as follows: "no matter what the player thinks, the house will always win a well-designed game. Just as any honest casino manager will tell you, while the illusion of winning is vital to motivating use and play, actually winning is much harder than it seems." Thus "you have a fundamental choice: either be the house, or get played."

Moreover we can learn about the four player types of Multi-User Dungeons or MUDs.

- Achievers are interested in acting on the world that is, achieving game-related goals they set out for themselves, measured in levels reached, loot gathered, experience collected, etc.
- Explorers want to interact with the world, that is, discovering how the virtual world of a game looks and works.
- Socializers are interested in interacting with people; the game is only a pretext that allows them to do so.
- Killers want to act on people; they enjoy imposing themselves on others, causing distress.

The next chapters begin with introducing Marc LeBlanc's Mechanics-Dynamics-Aesthetics framework for game design, to then discuss points, levels, leaderboards, badges, onboarding, challenges, "social engagement loops" and customization as "core game mechanics".

Zichermann claims that mechanics "allow a designer ultimate control over the levers of the game, giving her the ability to guide player actions". Also, points, levels, badges, challenges, onboarding and engagement loops are not game mechanics. They are interface elements used to provide feedback to the user, or components of a game's design, not game mechanics. Finally, what gets discussed there are 'mechanics' (more or less) and things people like about games.

### 2.2.5 Categories and examples

There are three main categories, three main areas, broadly speaking, where gamification adds value. External, internal, and behavior change context. To start with external is actually exactly the obvious. It concerns the external of the firm or organization that is being gamified in the first place. Typically, these are applications of gamification for customers or for potential customers. Commodities like marketing and sales context. Thinking respectively will lead to the interpretation of internal gamification, which is about applications to people inside the company structure. Employees commonly. Fitting the same category is crowdsourcing. Crowdsourcing is a process of reaching out to a large group of people. To elaborate on that, it takes place either for purposes of breaking up a task, into very small pieces or in cases where there is a challenge and anyone who wants to can respond to it. Crowdsourcing is not internal in the sense of employees in a corporation, it is internal within a community. The organization that launches the challenge needs masses of people. Gamification can encourage people to participate when they otherwise might not. The third category is behavior change. Motivation through gamification can potentially change conduct. Mostly in situations where there is some either personal or community benefit in the activity, and the problem is getting people to engage in it, even though they know it is something they want to do, that they could benefit from. With regard to expanding upon the definitions above we will point to an actual example for every category. The first one is an external case and it is called Club Psych. Club Psych was set up by USA Network, a U.S. cable channel. For one of their popular shows called Psych. They have a regular website for the show, but a few years ago, they set up a new gamified website to get people more engaged with the show. It uses many of the game mechanics that we have already seen when we introduced the concept. One of the aspects of Club Psych is make sure to mix what they implement using game mechanics with other aspects of the show. It is not just a generic gamification as it is tied in to motifs so that people feel like it is an extension of the show experience. Results were pretty rewarding. Overall visits to the USA network went up 30%. Online merchandise sales, at a real direct bottom line impact in terms of revenues went up 50%. Page views on the Club Psych site or the, the Psych website overall went up 130%.

They more than doubled the number of views of the site around the show, and they got people to share content on Facebook as part of the challenges in this gamified service. 300,000 times people shared content, which meant 40 million users were able to see that content. The audience for Psych is only about four and a half million. So this was a big marketing bump for them by virtue of these relatively trivial, generic, although well put into action game mechanics. A second example is an internal example and this comes from Microsoft. "Being" Microsoft is pretty challenging. They manufacture software like Windows and Office for millions of people in hundreds of different countries and dozens of different languages. Certainly that is thoroughly demanding. A large group of employees is involved in testing and quality assurance. The tough part of the task is the fact that there are so many people using Microsoft software in so many places. So what Microsoft's test group did on that case in terms of dealing with localization of Windows was ingenious. They gamified it. The test group lead by a guy named Ross Smith in Microsoft developed a game. It is called the Language Quality Game and was used for Microsoft internally to test localization of Windows 7. The concept includes a dialogue box in some language. They would put this out to volunteer Microsoft employees who worked in the country which uses this particular language. It was a chance to do their part for the company and also a chance to compete against other Microsoft offices since there was a leader board focusing on how many bugs people found. If the dialogue box looked correct they would click on "okay", on the contrary if something was wrong, like a term that seemed out of place they would click that there is a problem and that would get recorded. What happened was Microsoft Offices started to compete. That game-like aspect of this process, even though what it involved was very mind-numbing; sitting and reading dialog boxes did in fact led to significant results. Turns out that over 4000 Microsoft employees were willing to sit for free and look at these dialogue boxes. They looked at over half a million dialogue boxes Found close to 7,000 bugs. 7,000 times they found something out of place. And several hundred of those turned out to be actual bugs in localization that Microsoft was able to fix. So gamification was the mechanism that encouraged people to take this action. Obviously this was internal. Definitely it was not on money earning basis, it was not necessarily for individual recognition either. It was part of their corporate citizenship around something outside of their normal job responsibilities. Then again, the game structure made it fun, made it enjoyable. And help to get people to participate. Lastly a behavior change example and maybe not one of the ones you might expect. This concentrates on how the police get drivers not to speed. Traditionally the way to accomplish this is having an officer with a radar gun patrolling. In case a person gets caught speeding gets a ticket and a fine to pay. Not an efficient technique since people will only slow down if they think there is a cop present. Clearly there is no way for a guard on every corner at every time. Therefore the idea was in addition to handing over tickets to drivers that do speed, give the ones that do

not a coupon in a lottery. The reward would come from the fines provided by people who were caught speeding. Some of that money that would otherwise go to the Government, went into a pool. Periodically there would be a raffle, and the winner would get picked out of the individuals who were "caught" not speeding. Volkswagen managed to persuade the city of Stockholm in Sweden to try this. Unavoidably the results were actually pretty dramatic. People slowed down. People slowed down over 20%, over a three day period when they trialed this system. Besides the lottery, the addition of the game, the competition element to this activity changed the behavior of the people.[4]



## Chapter 3

# Gamification in higher education

### 3.1 Gamification in learning process and education

The gamification of learning is an educational approach to motivate students to learn by using game design and game elements in learning environments. The goal is to maximize enjoyment and engagement through capturing the interest of learners and inspiring them to continue learning. The idea to gamified learning start since the 1700's, school has represented opportunities for students to earn marks for handing in assignments, which are like points, and students who achieve certain marks may earn certificates or scholarships. Since the early 1900's, with the advent of psychoanalytic theory, reward management programs were developed.[9][10] Moreover nowadays education already have several game-like elements. Students get points for completing assignments correctly and these points translate to "badges", more commonly known as grades. In addition they are rewarded for desired behaviours and punished for undesired behaviours using this common currency as a reward system. If they perform well, students "level up" at the end of every academic year. Given these features, it would seem that education should already be the ultimate gamified experience. However, something about this environment fails to engage students. That's the spot where a well-designed gamification system should be placed to help players take on meaningful roles that are fruitful for learning. By making the development of a new identity playful, and by rewarding it appropriately, we can help students think differently about their potential in education and what education might mean for them.[11] Also it's important to be mentioned that the last three years after 2011 there is a significant approach to connect and import gamification especially in higher education and measure the results of this change.

## 3.2 Benefits and risks

As mentioned above it's crucial to understand that the gamification can be a powerful tool and the challenge is to use it to make the educational system better. It's obvious that in recent years more and more organizations and institutions try to apply the gamification in education for example Quest to Learn or Khan Academy have made gamification a top priority. President of Khan Academy Shantanu Sinha notes that gamification can be successful because it offers a new incentive for students to engage in class: "Most games encourage you to push your own personal boundaries. They provide users a sense of improving themselves, and they provide challenges perfectly suited for them. Imagine if students (or even adults) were always encouraged to improve themselves incrementally. You aren't done after you secure an 'A,' that's just one phase of a never-ending journey of learning and discovery". On the other hand he agrees that gamification is place in education isn't quite clear: "When we started building the platform behind the Khan Academy, one of the first things we did was bring in the concept of badges and other game mechanics. The reaction has always been interesting. Most people applaud the effort to make learning engaging and rewarding to young users. Others fear it can lead to perverse incentives or can detract from real learning objectives. As with most things, the issue is not nearly that black and white and is far more nuanced."<sup>[12]</sup> What makes gamification so appealing for education is that we can achieve through it the dynamic combination of intrinsic and extrinsic motivators and this can be a powerful force for potential benefits in education such as:

- giving students ownership of their learning
- freedom to fail and try again without negative repercussions
- chances to increase fun and joy
- opportunities for differentiated instruction
- providing a manageable set of subtasks and tasks
- inspiring students to discover intrinsic motivators for learning
- increases student engagement
- increase student motivation
- to give student the opportunity to take initiative
- to make student focusing on meaningful learning tasks
- increase attendance in class

- make easier for learning environments to have specific goals and established procedures
- make easier for learning environments to provide a continual feeling of challenge that is neither so difficult as to create a sense of hopelessness and frustration, nor so easy as to produce boredom
- make easier for learning environments to provide a high intensity of interaction and feedback

[2], [13], [11], [14], [15] Although there is the critic and belief that gamification it's possible to push students to just focus only in extrinsic motivators and this potentially cause the decrease of intrinsic motivation for learning. This idea is based on research which emerged first in the early 1970s and has been recently made popular by Daniel Pink. Some people may criticize gamification for taking a less than serious approach to education. This may be a result of the historical distinction between work and play which perpetuates the notion that the education cannot be a place for games, or a place for fun. Game play has also suffered under misconceptions of being easy, irrelevant to learning, and applicable only to very young children. These negative impressions of play may translate into suspicions regarding the value of game elements which promote fun and a sense of playfulness within a learning context. [16], [17], [18], [19], [20] Always we should keep in our mind that gamification is not a universal panacea. If we are to improve the odds of gamification providing value to education, we must carefully design gamification projects that address the real challenges of education and focus on the areas where gamification can provide the maximum value.[11]

### 3.3 Related studies

Firstly in the Department of Computer Science at the University of Cape Town they decide to investigate if gamification could improve the motivation of students to do coursework and how this could be implemented for one of UCT courses. The surveys that they conducted shows that there is a potential benefit and improvement to use gamification in courses. In addition it is exported the conclusion that the most interesting gamification elements are progress bar, leaderboard, badges, storyline.[21]

Second attempt in the same University they try to apply gamification to an existing course focusing on 2D games design and development. For this purpose, it is used an existing online learning management tool that is called Vula aiming to improve lecture attendance, content understanding, problem solving skills and general engagement.

Prior to designing their gamification product they used the Brainhex survey (it is a survey that described in the above paper), to identifying the target gamer personality type of students. The gamification elements that are used was badges, progress bars and leaderboards, a storyline and a visual. A main mystery-solving storyline with visual appearance (3.1) was used because this is appealing to the seekers. Quizzes and puzzles that could be completed by the student at any time so to raise the autonomy announced every week and also students had more than one attempts to correct their answers. Moreover sporadic group challenges were organized throughout the semester to practice game development concepts learnt in class and during these, students worked together and the best work was rewarded. The reward system consist of experience points (XP) which are earned by students completing quizzes and puzzles, attending lectures, participating in class exercises and for creativity in assignments. Steam points also used as an in-game currency. Progress bar is an important element to identify your progress and instead of using badges to represent certain skills, they used them as a proxy for rank. Finally the leaderboard is designed to display all the in-game statistics and the top 20 students according the XP points. The success of this intervention was measured using course marks, lecturer evaluations, lecture attendance, and a questionnaire; all with strongly positive results.[22]

Another attempt is the Osaka Sangyo University where they had the common problem that some students hesitate to state their opinions or ask questions in front of other students during classroom lectures since they do not want to feel embarrassed or humiliated, or just because they need some practice speaking in front of an audience. So it is decided to develop a gamified, half-anonymized education support system that can be utilized to improve classroom interactions and propose an educational methodology that encourages class members to engage simultaneously in both off-and online communication. The main concept of the methodology is a blended interaction, that is, one consisting of both real-world interaction (Layer 1) and virtual world interaction (Layer 2) (3.2). One of the notable features of the system is that it provides a good opportunity for students to get to know each other's opinions, and to ask questions or broadcast opinions to all participants in the class without notifying them who the sender is. For the development of the system it is used JavaScript with the latest real-time web technology, WebSocket along with Node.js, a framework of server-side JavaScript and that implements WebSocket as a Socket.IO module. The user interfaces (UI) of the system looks like 3.3. Also they report the findings from an experimental implementation of the system in a class and they discovered that more than half of the students felt less burdened exchanging their opinions in the half-anonymized environment than in person, and the majority of students enjoyed being able to communicate in this way, answering the questions via the system, and participating.[23]



FIGURE 3.1

In the Queensland University of Technology, reviews of past orientation surveys, interviews and a focus group with university engagement staff revealed that during the first few weeks of university new students can often feel lost, have trouble meeting new friends and know what services and events are available on campus. To address these issues they try to use of game achievements when applied to a mobile application designed to help new students at university orientation. Orientation Passport is a prototype smart phone application that serves to support activities a student undertakes while at university orientation. Also is primarily a digital orientation schedule that provides a customized list of events for the student depending on their enrolled degree. The schedule is accompanied by a number of helpful additions including an interactive campus map, which lists building names and shows the student's current location; an information page which provides information about university services. Twenty achievements were created that used the user actions above to reward students for application use (e.g. checking in to events, adding friends) and to make static university service information interactive (e.g. finding campus buildings, answering service related questions). Finally the results show that the game elements were generally well received by the students as a welcome

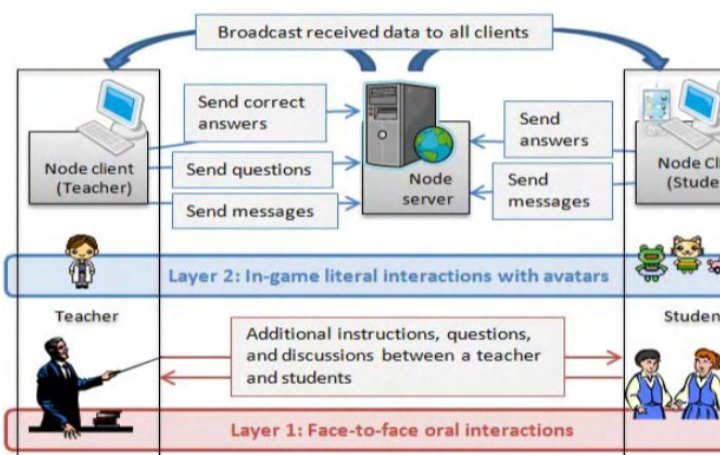


FIGURE 3.2

addition to the application. However there were some observations made from the data that raises potential conflicts that should be considered when designing achievements as a means to engage people with non-game activities. [24]

At the same university, is made a second attempt to improve the previous prototype and develop a better gamified, smart phone application built that offered a number of useful functions for new students attending university orientation. The application was designed using a three-layered framework that connected goals to game elements through various sensing methods available from the smart phone technology being used (3.4). Functions built to include an event scheduler to show students current and future events on campus, a contacts page for adding new friends students make, and a location aware map that showed campus buildings. University information about the campus and services was also provided. Interactions made with the application functions could be recorded with sensor data and used as input for game elements. These recorded contexts included entering a number, scanning an object with a barcode, attending an event, adding a friend or being present at a particular location. A number of game-like challenges were then added to the application using the context triggers to support the

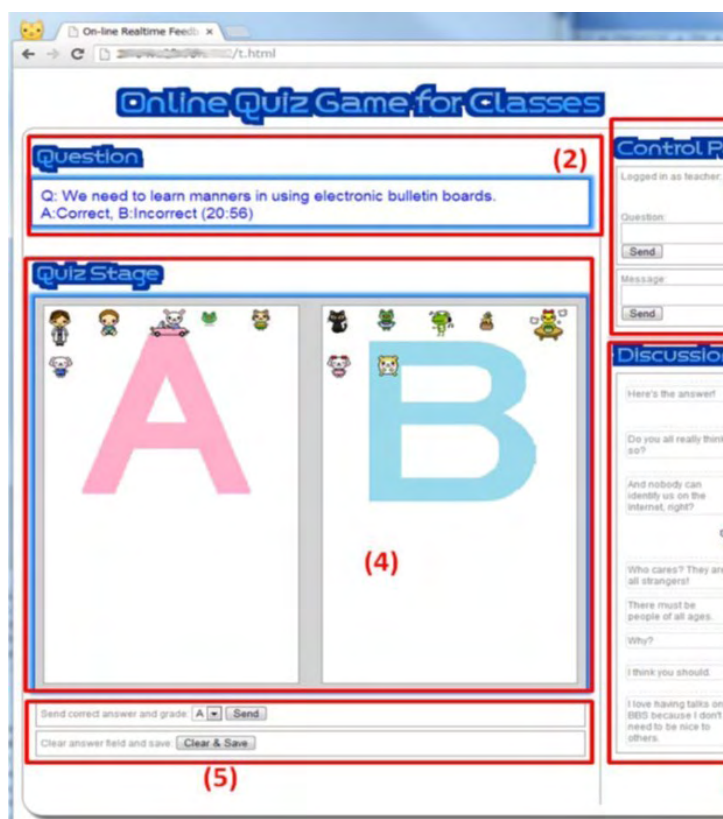


FIGURE 3.3

goals identified. These were based around tasks such as exploring the campus and important buildings (e.g., Library, IT Helpdesk), collecting important university items (e.g., Student Card, Semester Planner) and learning about important services (e.g., Security phone number, Health services). Tasks also included introducing students to functions available in the application, such as using the event list and adding new contacts to the contacts page to engage them with these tasks. Also challenges were extended to run over the first three weeks of university as well orientation week, with new challenges being released weekly. Challenges were grouped into sets with common themes. New sets could be added and released on various days to coincide with important orientation milestones (such as orientation week, lectures starting in week one and tutorials starting in week two). These sets could be retired once each milestone was over. The difficulty of each challenge (easy, medium or hard) was displayed in the challenge description. This provided the user with more information about the challenges they were chose to undertake, and some feedback on how difficult each one may be. A leaderboard was added for each set of challenges in order to encourage friendly competition between students and motivate them further. The ability to enter the draw for rewards was also added



to each set. Furthermore survey responses were collected from thirteen students and usage data was captured from 105 students suggest that the game elements complement the orientation application and experience, encouraging some students to explore the campus more. [25]



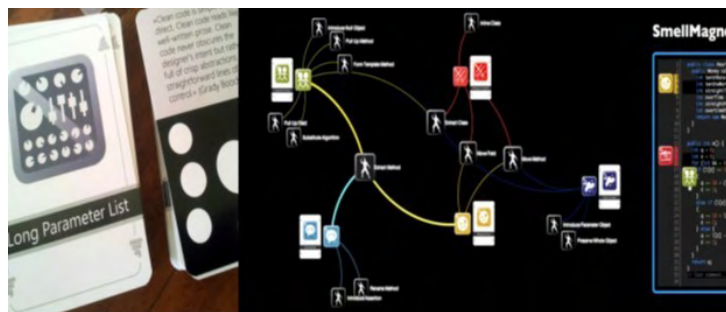
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FIGURE 3.4

A further project is in the Regensburg University in Germany where they develop CodeSmellExplorer an interactive exploration and learning tool for code smells with gamification elements for a University course because is recognized the problem that undergraduate students frequently fail to identify bad coding practices without prior training. First, they designed an icon for each code smell and assigned a custom color. Second, they have created a set of tangible playing cards. The front of the card shows the icon and name of the code smell, the back of the card displays a short description of the smell and a tag. CodeSmellExplorer (3.5) is based on a graph network, consisting of code smell and refactoring nodes. Each code smell is represented by a tangible playing card that is connected to multiple refactoring nodes as soon as the card is put onto the tabletop surface While the code smell nodes remain at fixed position next to the tangible object (that can be freely moved on the surface, however), a force-based layout algorithm



arranges all connected refactoring nodes to maintain a visually pleasing graph. When a code smell is double-tapped, an application is opened, displaying a short description of the challenge, a code example and a list with drag gable icons. Depending on how the challenge was created by the author, one or more visible or invisible placeholders are displayed when a code smell is being dragged by the user. The placeholders mark predefined areas of the source code where the icon has to be dropped. After completion of the challenge, the feedback visualization shows all right and wrong answers.[26]



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FIGURE 3.5

One more attempt at gamification field is GradeCraft a learning management system which developed in the University of Michigan to foreground the affordances of these grading systems, to enhance the "game-like" experience for students, to increase student engagement, and to provide students more personalized learning experiences. GradeCraft allows three types of users: students, teaching assistants, and instructors. At its core GradeCraft is a comprehensive dashboard that allows students to see their course performance in a single view, much like the dashboard of a videogame. Upon logging into GradeCraft, a student sees their current score, a chart of the points they have earned so far, and a chart of the points that are available to earn throughout the entire course.

The dashboard shows students up-to-date grade information for their course. On their dashboard (3.6), students can also see which badges they have earned, their progress towards completing unearned badges, and which badges their classmates have earned. To that end, one goal they have is for GradeCraft to encourage students to be less concerned with grades and more focused on mastering skills by completing assignments and earning badges. To this end, they have chosen not to display course grades on the student dashboard by default. Students can also check how their current score compares to the class average by clicking a button (3.7). This displays a box-and-whisker plot intended to help students gauge their performance against the rest of the class. They opted not to use "leaderboards" because they can be de-motivating to low-ranked students/players. Also the student can page through each assignment type, selecting how many assignments they plan to do, how well they believe they will score on them, and if applicable, how they would like to weight that assignment type. On the other hand Instructors can create assignment types and badges, each one can be tagged with the relevant course objectives. Moreover they can then visualize exactly how their objectives are distributed across the entire course per activity, and in relation to the grading scheme. Instructors can create badges to encourage the development of particular attributes, skills, or actions that they feel are important for their students to have or do. Each badge has a set of criteria that must be accomplished in order for a student to earn it. Instructors can easily view which badges have been earned, how often, and when. They can also see which badges students are working on, which criteria have been marked complete, and which are proving more difficult for students to achieve. Standard access data—login count, page views, resources accessed—provide the basic framework (3.8) within which instructors can first begin to investigate student engagement. Instructors can view an interactive table displaying student and class statistics, on these metrics. While this data is possible to collect in all learning management systems, displaying these metrics for instructors' use is not frequently taken advantage of. Students also need feedback regarding their class performance and guidance as to what else they should be doing. GradeCraft gives students direct access to analytics that can help answer these questions, and also provides instructors with further material to support conversations with students regarding what additional work they can do in the course. Instructors can see each student's dashboard view, visualize how well they have completed the comprehensive learning objectives, and check where the student has ranked in completing each assignment. GradeCraft allows instructors to visualize which assignment types students choose to complete, and how much weight they decide to assign them. Mapping these choices back to students' final grades will help us investigate if students know their own skills and choose to weight them higher, or if students weight things so as to reduce the risk of working on assignment types they are less familiar with.[27]



FIGURE 3.6

In the University of Hawaii they try to use gamification in order to increase student involvement with course concepts and enhance learning and retention. So they decided to create a virtual world as a laboratory that can be used as a virtual classroom, online workspace, communication medium, presentation venue, role-play medium, simulation tool, creativity machine, and more, depending on the ideas and flexibility of instructors. The Web and the virtual world platform Second Life were used in all courses for the purposes of attending pre-announced events or class sessions, making observations of some in world or online activity, working in project teams, finding objects and information for assignments, designing and building interactive exhibits, and presenting results to the class and to specific audiences. The methodology emphasizes learning new online skills for productivity and collaboration. They introduced new types of student interactions including a venue for each student to express an opinion that is reacted to by class members. Their interactions convey a distinct identity and authorship via assigned online discussion of class topics. Students used their own mobile, laptop and netbook wireless technologies as well as campus lab computers and a variety of free software, to participate in and produce assignments. Technology integration included all of the

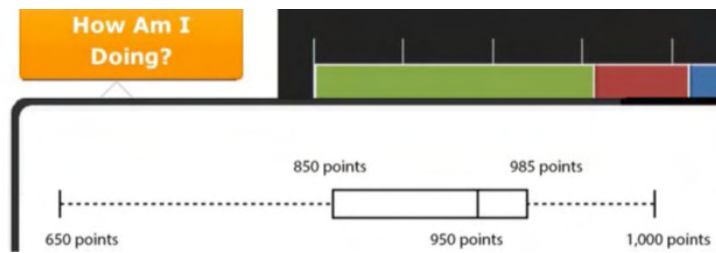


FIGURE 3.7

Name	Score	Badges Earned	Log ins	Page Views	Predictor Views	Last Self-Predicted Grade	Cu Fir Gr
Rita Bennet	52200	18	21	38	21	A+++	A
Kimberly Blake	50070	12	10	15	3	A	A
Irene Hoffman	45870	8	10	18	4	A	B
Scott Ricker	44919	7	14	21	5	B+	B

FIGURE 3.8

software in Table 1 below. Each course included several assignments that incorporated teamwork, choice of activity and team members, role-play, threaded discussion, and live presentations. Undergraduate courses required five types of weekly posts of minimum length including lab reports, replies to lab reports, chapter reviews, replies to chapter reviews, and social networking activity updates. Graduate courses required students to post and reply to chapter reviews, and summarize replies to chapter reviews for synthesis. Many options for voluntary participation are built into instructions to foster autonomy and creativity. Students in all courses produced and presented informative interactive virtual exhibits.[28]

TABLE 3.1: I. Social Immersion Affordances to provide a game environment to stimulate urgent optimism.

Affordances	Functions
Adobe Connect	For synchronous online class meetings and conferences.
Second Life	For synchronous team explorations of specified areas and locations.
Second Life	For avatar-mediated role play events.
Second Life	For avatar-mediated research and building activities.
Second Life	For avatar-mediated conference chat for communication.
Instagram, Flickr, PicPlz	For seeking and allocating social recognition.

TABLE 3.2: II. Task Collaboration Affordances to encourage perseverance and blissful productivity.

Affordances	Functions
Google Documents	For submitting multi-authored student reports of team projects.
Jomag and Keepsy	For team produced online magazine issues to communicate with students.
Google Presentations	For team produced online and oral presentations.

TABLE 3.3: III. Group Chat Interaction Affordances to foster social fabric and solidarity.

Affordances	Functions
Google Groups	For sharing their profiles, weekly chapter reviews and weekly lab reports.
Google+ Hangout	For holding office hours and consultations with instructor.
Skype	For holding office hours and consultations with instructor.

TABLE 3.4: IV. Evidence-based Affordances to support a sense of epic meaning by turning assignments into evidence.

Affordances	Functions
Jing	For capturing and annotating images.
PollEverywhere	For establishing ranges for social comparison.
Google Forms	For individual assessment with online quizzes for grading.
You Tube Channels	For instructor curated interactive content students use to analyze training vid
SlideShare	For instructor curated online course content.

In the Learning Technologies unit at the University of Washington implemented a freeze on salaries paid to state workers in response to the economic crisis and Those who manage student staff recognize that keeping students motivated and engaged is vital to retaining quality employees, especially once the honeymoon phase of a new position has worn off. One way of doing this in the past has been to increase pay dependent on seniority (duration of employment). With that option no longer available, skill-based and responsibility-based changes in job titles were required. In addition to justifying promotion to the university, skill-based promotions allow us to guide and direct our student employee development. This development requires tracking, evidence, and consideration. We began by assigning projects to students pursuing promotion. However, these projects were often time-consuming, uneven, and presented an unclear path to the students toward the skills they were attempting to encourage. Students were understandably discouraged when projects, through no intent of the assigners, could vary from 2 to 10 hours. To attempt to resolve these issues, we have begun to explore digital badges to encourage skill development. So for this purpose it is preferable an Open Source solutions (badg.us, BadgeOS) which should be self-hosted and self-maintained. Especially in the context of a large university with a number of existing tools, developer time will be required to enable authentication through the university's standard. The benefits of these systems include flexibility and lower direct cost.[29]

## Chapter 4

# Gamifying ECE/UTH

### 4.1 General objectives and design

Our first goal was to implement gamification in the most commonly used tools by students of UTH to improve learning environment, lecture attendance, critical thinking, problem solving skills, general engagement and help new students at university. So we decide to move in 3 main axes and gamify:

- \* the portal of Electrical and Computer Engineering of University of Thessaly
- \* the asynchronous teaching platform eClass of University of Thessaly
- \* the electronic secretariat of University of Thessaly

All the above contains information which any student needs for duration of his academic procedure. Also we thought to develop separate check-in system for classrooms in order to reward lecture attendance. Firstly, electronic secretariat is a close system and contains sensitive personal data and to take permission for access we should communicate with the company, however this was not possible. Secondly, we observed that the portal which includes useful information for anything related to the department was a bit dull and monotonous. So, students did not give any attention to some very important data such as the graph of prerequisite courses in which you can see how all courses are connected, what is the structure of the two study parts or what courses are included in each fields of specialization. Thus, we decide to use gamification in order to increase engagement and show the user which information is significant. To succeed all the above we design badges and assign points depending how important is the action that user commits (for more details you can read sub-chapter 4.2). In addition regarding the eClass platform we behold that it has a lot of tools like chat room, forum, etc. that is used in a negligible

extent. So our thinking again was to gamify eClass with aim to increase motivation for users to work these tools (for more details you can read sub-chapter 4.3). Moreover, it is observed that in the most courses the attendance of students descends over time. So our goal is to motivate students to keep pace of attendance high by rewarding them with a boost in grades whether they complete a certain amount of presences. Thus, we create a check-in system for this purpose (for more details you can read sub-chapter 4.4). As regards user experience design the most important think is not to make the user work or think. People have limitations. They do not read, but they scan. All they really want is what they need right now. They cannot multitask and they need guidance. Also they make mistakes. User memory is complicated and fragile. Memories and decisions always change, you have to observe what the user does in action and do not make them remember things from one page to another. The user likes to be social - they use tech to be social, they look to other people for guidance and they need feedback, so as to always know what is happening. Also users create mental models. That means they have specific ideas and expectations about the way things are supposed to work. These experiences come from their experiences with other things they have used in the past. Furthermore, users need visual systems, if there are too many things on the screen they cannot find anything, if they see things that are close together or have the same color they will think they are related. Also, cross-channel expectations are higher. Good user experience design really makes the life of the user easier and also makes things enjoyable. Thus for all principals that are mentioned above and because we added new elements to existing tools with a plethora of senior users; a main goal was to keep aesthetics and look-and-feel of user interface as close as possible to the original form of portal and platform. This is important for these users in order not to disorient and they need to explore again all functions from the beginning to find the new features. So our general design strategy was to put the minimal new data in a prominent place to attract user's attention and all the details are displayed using pop-up windows.

## 4.2 Portal enhancement

### 4.2.1 How is the site originally

The website at the department of Electrical engineering and computer engineering is a WordPress website. WordPress is a free and open source blogging tool and a content management system (CMS) based on PHP and MySQL. Features include a plug-in architecture and a template system. It is probably the easiest and most powerful blogging and website content management system in existence today. WordPress has a web template system using a template processor. Firstly, WordPress users may install and



switch between themes. Themes allow users to change the look and functionality of a WordPress website or installation without altering the information content or structure of the site. Themes may be installed using the WordPress "Appearance" administration tool or theme folders may be uploaded via FTP. The PHP, HTML and CSS code found in themes can be added to or edited for providing advanced features. Thousands of WordPress themes exist, some free, and some paid for templates. WordPress users may also create and develop their own custom themes if they have the knowledge and skill to do so. Also, Wordpress has a variety of plug-in architecture which allows users to extend its features. The plug-ins offers custom functions and features enabling users to tailor their sites to their specific needs. Finally, WordPress also features integrated link management, a search engine-friendly, clean permalink structure, the ability to assign multiple categories to articles and support for tagging of posts and articles. Automatic filters are also included, providing standardized formatting and styling of text in articles (for example, converting regular quotes to smart quotes). WordPress also supports the Trackback and Pingback standards for displaying links to other sites that have themselves linked to a post or an article.

Concerning the website of the department, the theme which is used for the layout is the Office version 1.9. At the main page there are information about the department of electrical engineering and computer engineering, the available courses and all the latest announcements. In order to have full access to the website students of our department can login with the credentials which are given by the secretary's office. There are tabs each one of them provides several information about everything someone needs to know, from a new undergraduate student to a graduate student. Exploring those tabs you can find the full list of the courses, the schedule for the exams and the semester, personal info for all the professors in the department, useful addresses for the location of the buildings, also you can read the theses of graduated students, check your personal status via e-grammateia and many more things. The website is neat, responsive and well dominated. However, we believe that the navigation is a little boring for a student and so we tried to put some elements of gamification to our website to make it more fun.

We searched among many available plug-ins for gamification such as PunchTab, Leaderboarded and Kazooky Loyalty. Nevertheless, we ended up to Captain Up, because it is more customizable to our needs. Captain Up offers game mechanics and social tools to improve engagement, retention, virality and monetization on the web and mobile apps. Quickly and immediately start rewarding users for engaging with the content of the website, using points, levels, badges, and leaderboards, and keep them coming back for more. With 30 levels to keep the game balanced and more than 80 badges to keep players motivated. Also, it is total customizable giving us the possibility to create our

own badges and levels, including how they look and what users have to do to get each one.

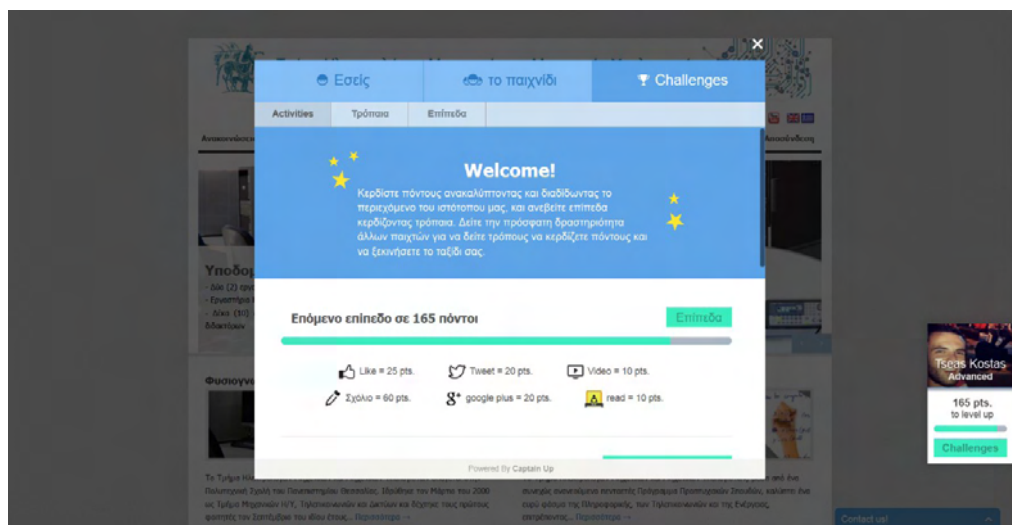


FIGURE 4.1: The welcome page at Captain Up.

The second one was the well-known plugin for Facebook like and share buttons. Using those buttons each user has the possibility to gain badges.



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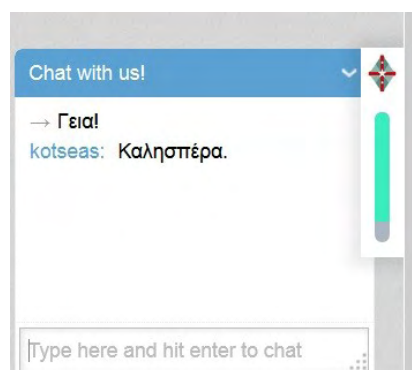
FIGURE 4.2: Like and Share buttons.

And the last one was Olark. Olark is the most beautiful and effective way for the students to ask anything relative to the department and get answers in some seconds via a pop up window.



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FIGURE 4.3: Olark pop-up.



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FIGURE 4.4: Olark chat window.

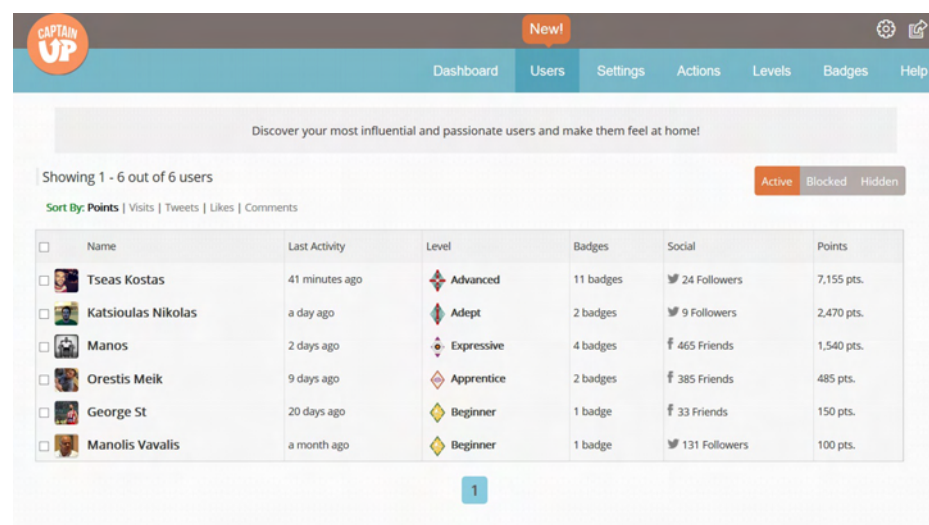
### 4.2.2 Development of gamified site

As it was mentioned above Captain Up offers many mechanics to gamify a website. The installation was through the plugins that the WordPress provides. However, in our case the most actions and badges were not suitable, so we made some of our own. Firstly, we kept the badges for visiting the homepage five times and the signup login badges. Then we created badges for all the courses and we started to make some scenarios based on these badges. First scenario was if a student visits the page of a course thirty times in six months earns the appropriate badge of the course. Through this situation we get feedback if the student is remain active in a semester. Another one was based on the six different knowledge fields which our department provides, so the idea was if a student likes (via like button) the pages of the courses from one particular knowledge field then will earn a badge. It is a way for us to form an opinion about the tendency of the students. Also, if someone reads above five master thesis or other exercises through the website earns a badge. Finally, we added a badge for the schedule of studies. As though if a student visits and likes this page will get the badge.

Navigating through the webpage you will locate a leaderboard which shows the rankings of the registered users. The rankings are based on month, week or day.

In addition, Captain Up provides an administration panel where you can see the overall statistics of the actions in the website. In the dashboard field there is an overview about monthly active users and the actions data by day. Also, you can see the list of the registered users and sort them by points, visits and likes. For each user there is a tab which provides information about when was the last time he was logged in, how many badges does he has and in which level the user is. As an administrator there is the possibility to delete users for unexpected behaviour and increase or decrease the points system. These features give the opportunity to properly manage the gamified website and make changes and additions at any time.



















For the activation of like - share button and the Olark we put the source code in file footer.php. With Olark there is a popup window at every page of the website. Via this window each visitor can ask a question about the department and get a direct answer. Our goal is to engage Captain Up and Olark by getting a badge if a visitor uses regularly the chat window.



Discover your most influential and passionate users and make them feel at home!

Showing 1 - 6 out of 6 users Active Blocked Hidden

Sort By: **Points** | Visits | Tweets | Likes | Comments

<input type="checkbox"/>	Name	Last Activity	Level	Badges	Social	Points
<input type="checkbox"/>	 Tseas Kostas	41 minutes ago	 Advanced	11 badges	 24 Followers	7,155 pts.
<input type="checkbox"/>	 Katsioulas Nikolas	a day ago	 Adept	2 badges	 9 Followers	2,470 pts.
<input type="checkbox"/>	 Manos	2 days ago	 Expressive	4 badges	 465 Friends	1,540 pts.
<input type="checkbox"/>	 Orestis Meik	9 days ago	 Apprentice	2 badges	 385 Friends	485 pts.
<input type="checkbox"/>	 George St	20 days ago	 Beginner	1 badge	 33 Friends	150 pts.
<input type="checkbox"/>	 Manolis Vavalis	a month ago	 Beginner	1 badge	 131 Followers	100 pts.

1

FIGURE 4.5: Captain Up - Users.

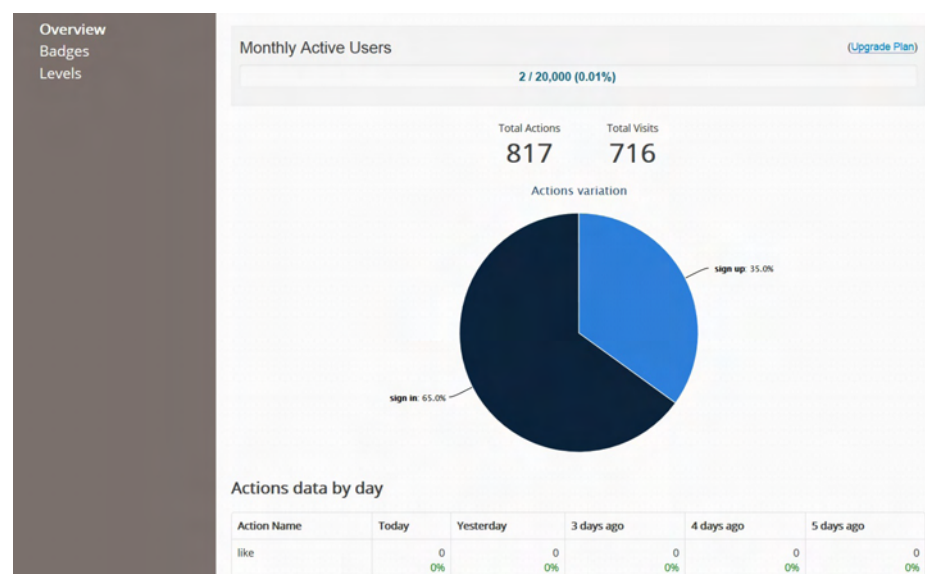


FIGURE 4.6: Captain Up - Dashboard.

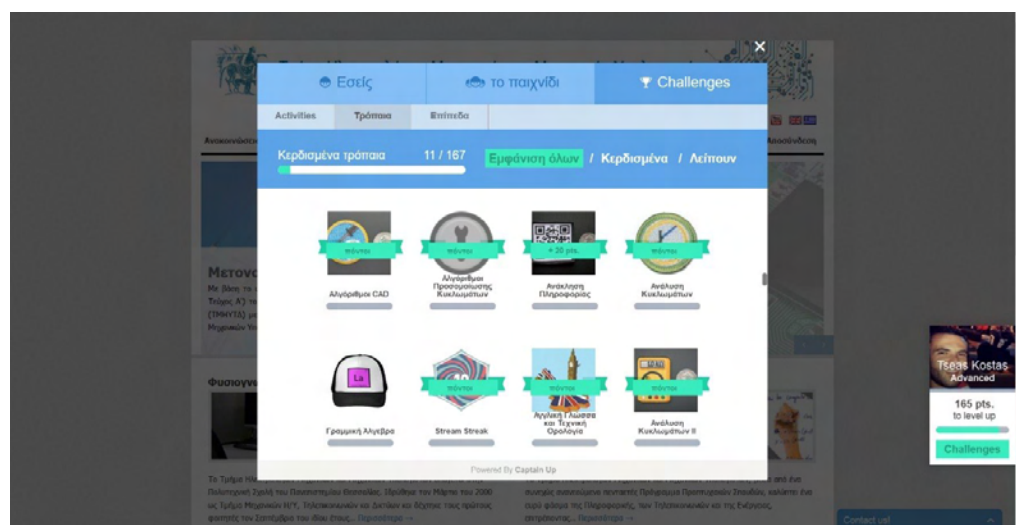


FIGURE 4.7: This image shows some of the badges.



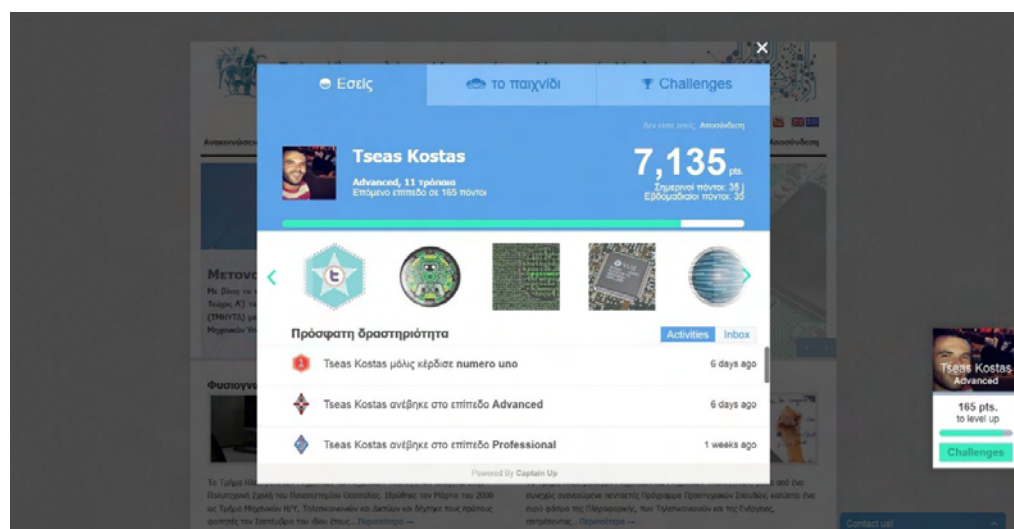


FIGURE 4.8: Status of the registered user

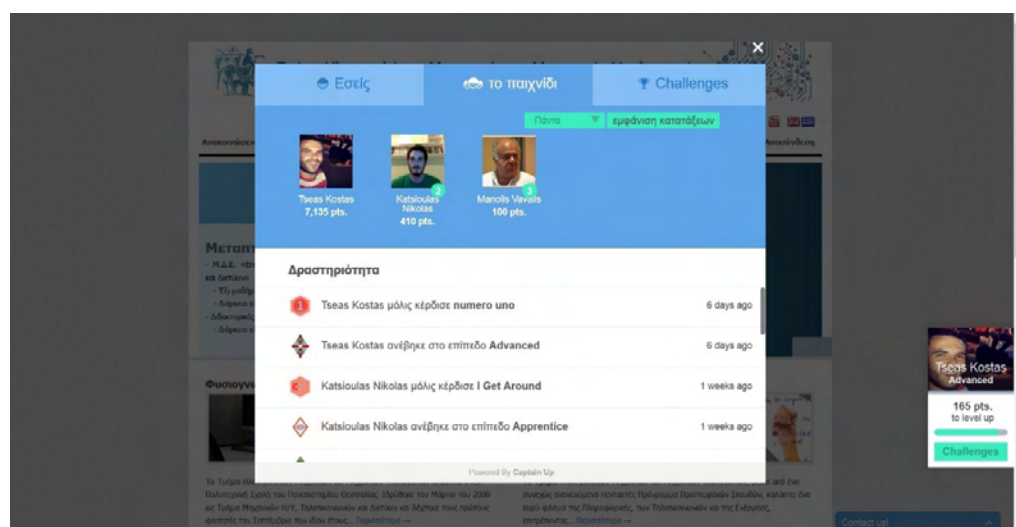


FIGURE 4.9: Classification of registered users

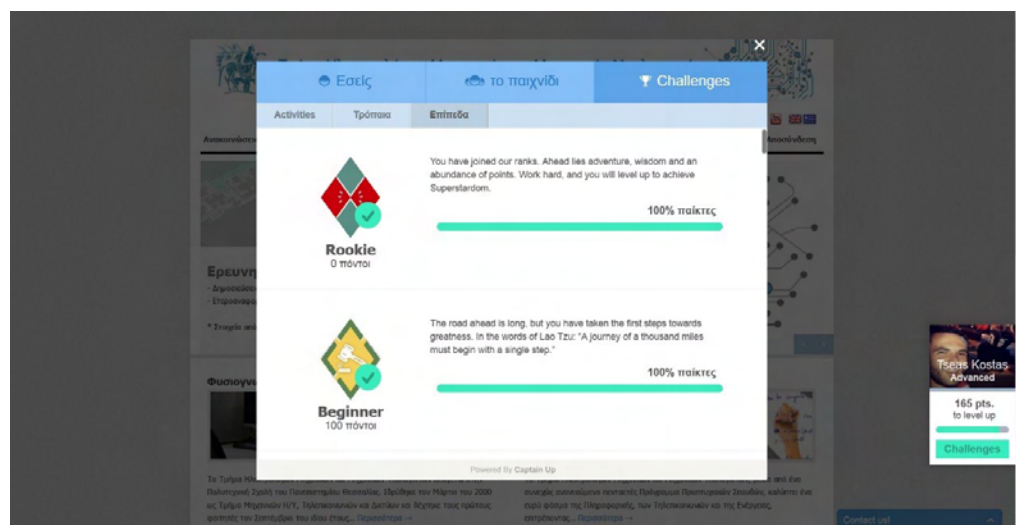


FIGURE 4.10: Levels.

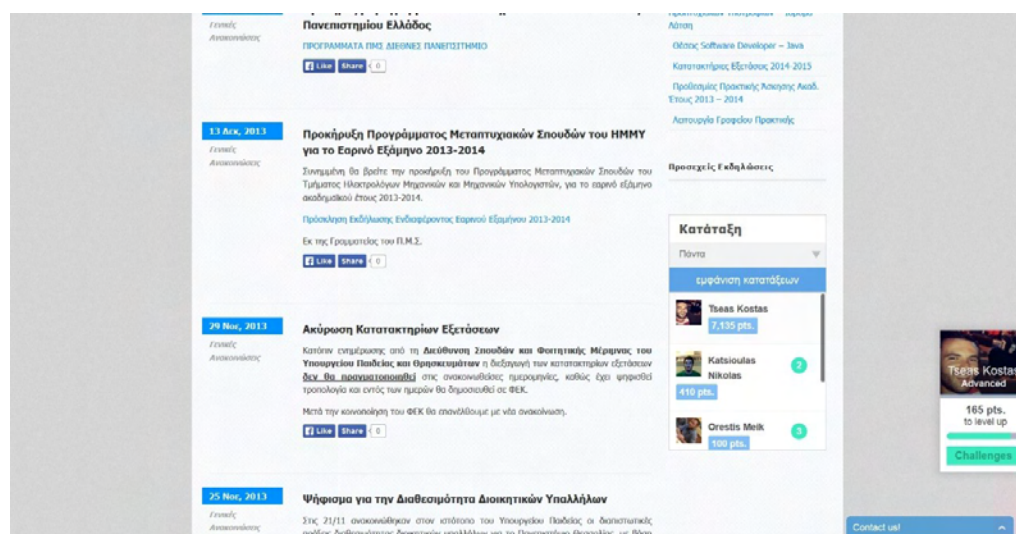


FIGURE 4.11: Leaderboard.

## 4.3 eLearning environment additions

### 4.3.1 About eClass

The Open eClass platform is an integrated Course Management System, used to store and present educational materials. It is the solution offered by the Greek Academic Network (GUnet) to support asynchronous e-learning services. Its goal is the incorporation and constructive use of the Internet and web technologies in the teaching and learning process.

The introduction of e-learning into the traditional teaching process provides new capabilities and allows new means of interaction between students and teachers. At the same time, it supports the electronic management, storage and presentation of teaching materials, transcending limitations of space and time and creating the necessary conditions for a dynamic teaching environment.

The Open eClass platform has been designed to supplement and support the traditional teaching process. Teachers retain the main role, while being able to quickly organize practical on-line courses, making use of existing educational materials: texts, documents, presentations, pictures, video, exercises and so on. Students themselves can access provided materials via an alternative channel. The Open eClass platform is available as open source software. Its design principles include ease of use by end users without specialized technical skills, adaptability to current and future demands, and simple software upgrade and extension. The service is accessible via any web browser. [Open eClass](#)

### 4.3.2 Additions Performed

The main idea was the application of gamification elements, like points, levels, achievements and badges, in order to turn the e-learning platform of UTH into a more engaging and fun environment.

As a first attempt, after a partial research we discovered Moodle. Moodle is another web based learning platform used in quite a few universities, domestic or otherwise. The reason for mentioning this is actually that a gamification plug-in was already implemented for moodle (Education++) and naturally we attempted to apply it to eClass. Still, owing to inequality between the structure of each platform this concept was quickly abandoned.

Furthermore, within the frame of our initial research we experimented with a Joomla plugin. However since both the portal (WordPress) and the eClass (independent) are

The screenshot shows a Moodle course interface. At the top, it says 'moodle' on the left and 'You are logged in as Admin User (Log out)' on the right. The course title is 'Test', with a breadcrumb trail: Home > Courses > Miscellaneous > Test > General > Test. On the left, there are two navigation menus: 'NAVIGATION' and 'ADMINISTRATION'. The 'NAVIGATION' menu includes links for Home, My home, Site pages, My profile, Current course, Test, Participants, Badges, General, News forum, Test, and various date ranges from May to July. The 'ADMINISTRATION' menu includes Education++ Administration, Edit settings, Locally assigned roles, Permissions, Check permissions, Filters, and Logs. The main content area features a large 'e++' logo in yellow and red. Below the logo, there is a 'Welcome to Education++!' message. To the right of the logo, there are several administrative links: 'Administrator', 'Point Earning Scenerio Tools' (with a sub-link 'Manage Scenarios in which Students can Earn Points'), 'Reward Tools' (with sub-links 'Manage Rewards in which Students can Spend Points on' and 'View the Store that Students can Purchase Rewards in'), 'Reporting' (with sub-links 'View A Student's Transactions' and 'Generate a report and track All Reward Purchases'), 'Notifications' (with a sub-link 'Create a New Notification for all Users in this Class'), and 'View the Leaderboard' (with sub-links 'View the Class Leaderboard' and 'View the Schoolwide Leaderboard').

FIGURE 4.12: Moodle.

not Joomla-compatible, due to the same reason mentioned for moodle, this plan was also dismissed.

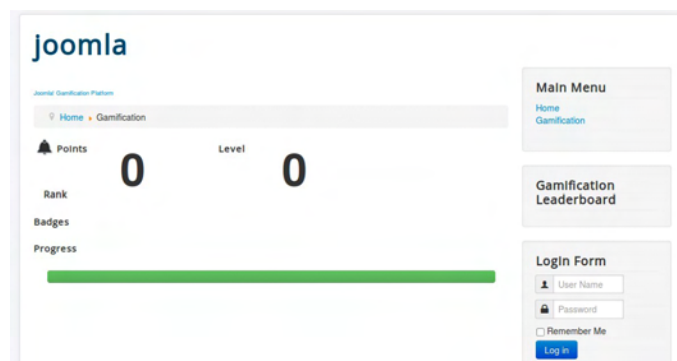


FIGURE 4.13: Joomla.

Subsequently, we focused on creating a plug-in from scratch. Before all else, we ought to study the code organization of Open eClass in order to understand where exactly the changes should be made. Following that came the first significant step, the addition of points. Since eClass extensively uses MySQL databases to store data, to accomplish that we altered certain tables in order to save the points obtained by each user and also check the point-worthy goals that have been achieved. Currently the modified platform provides points for the ensuing actions:

- (a) user logs in to the system once a day
- (b) user signs up for a course
- (c) user correctly answers quizzes

(d) user checks oneself in a classroom or lab

The last two will be described in detail later on.

Having taken care of the inclusion of points we simply put into action a number of achievements, related to the actions above, that once fulfilled a badge would be earned. Right now we have performed the following:

1. user logs in to the system once a day for a week in a row
2. user correctly answers five quizzes in row
3. user correctly answers ten quizzes in total
4. user successfully checks oneself in for the first time

Every time an achievement has been reached the player is being notified by certain pop up windows.

To let the user know the amount of points gathered, along with the foundation of a sense of healthy competition between oneself and the rest of the users, a leaderboard was created. At present, our leaderboard is fairly simple. It provides information about every player's rank and also the ability to search through it for a particular player.

Points on their own though are not quite enough. Probably the most suitable way to display them is a level system. Initially a draft system was utilized, in which its level was reached after the same amount of points but it was finally replaced a more advanced one. For more information check chapter [4.3.2.3](#)

#### **4.3.2.1 Quizzes**

Once the user has logged into the system a new service is now available in the tool section.

Exercises is a function that had already been implemented in Open eClass but it was accessible only through courses. Our concept was to give out exercises regarding the university in general and not just a particular course. Thus we created a new "hidden" course, which provide us with the ability to construct exercises as explained above, that is open to all since they are logged in. The user is not required to register oneself to this course, one just clicks on "Exercises" and all available quizzes will appear.





FIGURE 4.14: New service added.

**Gamification**

Άσκησης ☯


Όνομα Άσκησης	Έναρξη / Λήξη	Χρονικός περιορισμός	Επιτρεπόμενες επαναλήψεις	Αποτελέσματα
» Test	18-07-2014 13:17 / 18-07-2015 13:18	-	-	0/1
» Test1	22-08-2014 12:48 / 22-08-2015 12:48	-	1/1	2/2

FIGURE 4.15: Exercises.

Exercises contain questions that can be either multiple choice with a single correct answer or multiple choice with several correct ones or matching or filling the gaps or true or false.

#### 4.3.2.2 Check-in

This service was implemented in order to reward students for participating in classes. To achieve that we employed an already developed API from Foursquare. Handling this API depends upon the creation of an application, which is pretty basic, that provided us with a preselected url.



The image shows a web form for setting up a Foursquare application. At the top, there is a text input field labeled "Your app name" and a green button labeled "SAVE CHANGES". Below this is a section titled "Web addresses" containing three input fields: "Download / welcome page url" with the value "http://www.yourapp.com/", "Your privacy policy url" with the value "http://www.yourapp.com/privacy", and "Redirect URI(s)" with the value "http://www.yourapp.com/redirect\_uri". A note below the last field says "Enter as many as you'd like, separated by commas. Like: https://www.foursquare.com, https://es.foursquare.com, https://fr.foursquare.com..."

FIGURE 4.16: Setting up Foursquare.

Once the application is set up Foursquare supplied us with security keys needed for verification purposes.

What this application actually does is pushing check-ins from users connected to it. Every user can check in from their phones using Swarm. Swarm is a fairly simple and



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FIGURE 4.17: Security keys.

friendly application, created by Foursquare that allows you to instantly inform your friends of your location. After creating an account (or signing up with Facebook or Twitter) each time you open it, Swarm automatically finds where you are and prompts you to check in.

All the significant classrooms and labs of UTH are registered to foursquare as of now.

From the eClass point of view, we added "Check In" to the tool Section.

Every time a player clicks on "Check In" eClass provokes one to log in to Foursquare and draws all available checkins starting from the last one it checked.

We store the last check-in whenever there is one to our database. Also stored are the checkpoints. Checkpoints are entries into a database table including the name of a place (classroom, lab), the exact time and date the lesson is performed and finally the latitude and longitude. If latitude and longitude of a user's check-in as long as the time and date

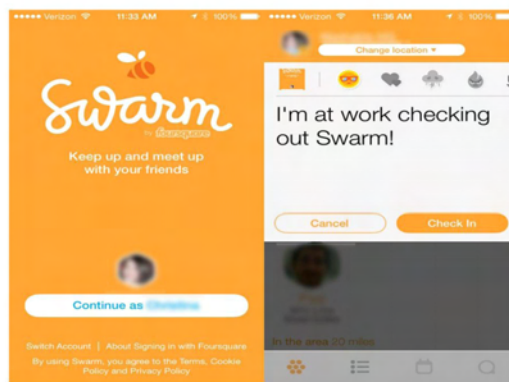
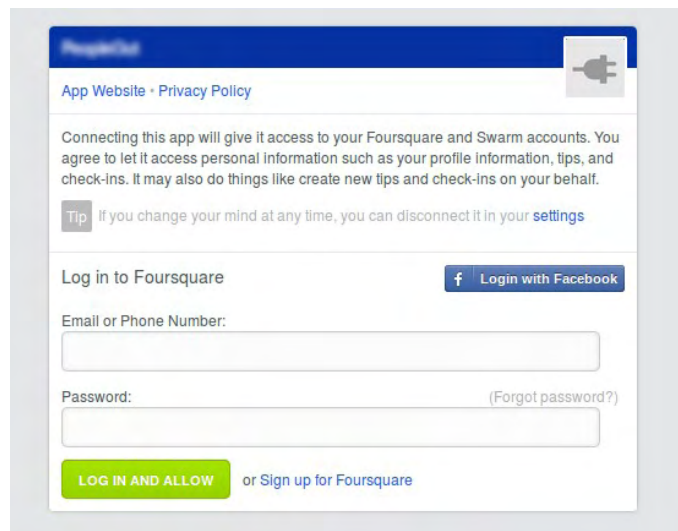


FIGURE 4.18: Swarm.



FIGURE 4.19: Check in tool.



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FIGURE 4.20: Login page Foursquare.

match their counterparts in a checkpoint an amount of points is earned followed by a certain pop up window.

#### 4.3.2.3 Point System

As discussed above, in the beginning the point system was as simple as possible to assist in the debugging process. Each user would reach a new level after accumulating ten more points. Later on we decided to adopt the one from Captain Up, and thus the same as the UTH portal. For doing so, we stored all level information gathered from Captain Up into a table in the existing database.

Furthermore, we came to the conclusion that all of the user's points should be amassed in eClass, both from eClass itself and the UTH portal. The Captain Up API provided us with the ability to draw data about every player (points and level included) but a player id was necessary. To get that id the user must log in to their Captain Up account.

As a result of that, a cookie was generated, and inside that cookie "hid" the player id. So until the id is stashed the Captain Up pop up window appears in the user's portfolio.

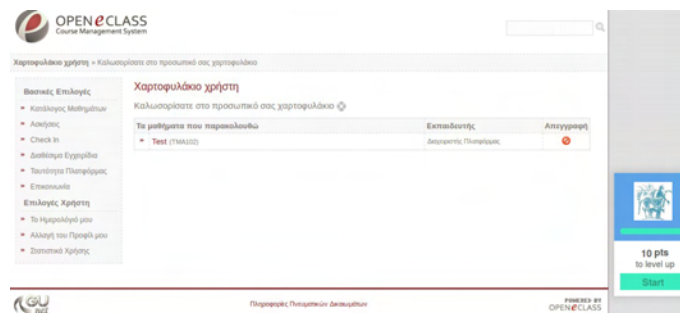


FIGURE 4.21: Captain Up - eClass.

Once one signs in to Captain Up the script is not longer activated. From that moment on, when points are won in either environment they automatically add up.

#### 4.3.2.4 Design

Overall, the concept was to alter the current form of eClass as less as we could. The emergence of the user's level was attained by positioning that information in the header next to their name.

As you can see, on the right of the user's name a progress bar has appear presenting how far along one has come during the ongoing level.

Besides, a "Leaderboard" sign is now visible.



FIGURE 4.22: Gamifying eClass 1.

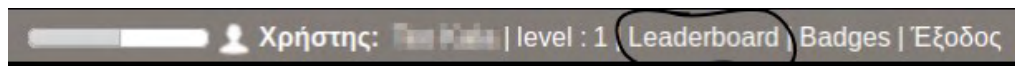


FIGURE 4.23: Gamifying eClass 2.



By clicking on that, a sliding panel appears on the left of the screen displaying the leaderboard.

The screenshot displays the OPENeCLASS Course Management System interface. On the left, a sliding panel shows a leaderboard with the following data:

Rank	Username	Points
1	antonio	536
2	isa	75
3	thodoris	51
4	agorizana	26
5	kikiroly	25

The main interface shows the user's profile (Χρήστης: Ορέστης Δημητρίου | level : 5 | Leaderboard | Badges | Εξόδος) and the 'Χαρτοφυλάκιο χρήστη' (User Portfolio) section. It includes a search bar, a navigation menu with options like 'Κατάλογος Μαθημάτων', 'Ασκήσεις', 'Check In', and 'Επιλογές Χρήστη', and a central area displaying a badge for 'Επιλέξετε «Κατάλογος Μαθημάτων» για να παρακολουθήσετε τα διαθέσιμα ηλεκτρονικά μαθήματα.' The footer contains the logos for GU and Πανεπιστήμιο Θεσσαλίας, and the text 'POWERED BY OPENeCLASS'.

FIGURE 4.24: Gamifying eClass 3.

Exactly in the same manner the user's collected badges are displayed on the right.

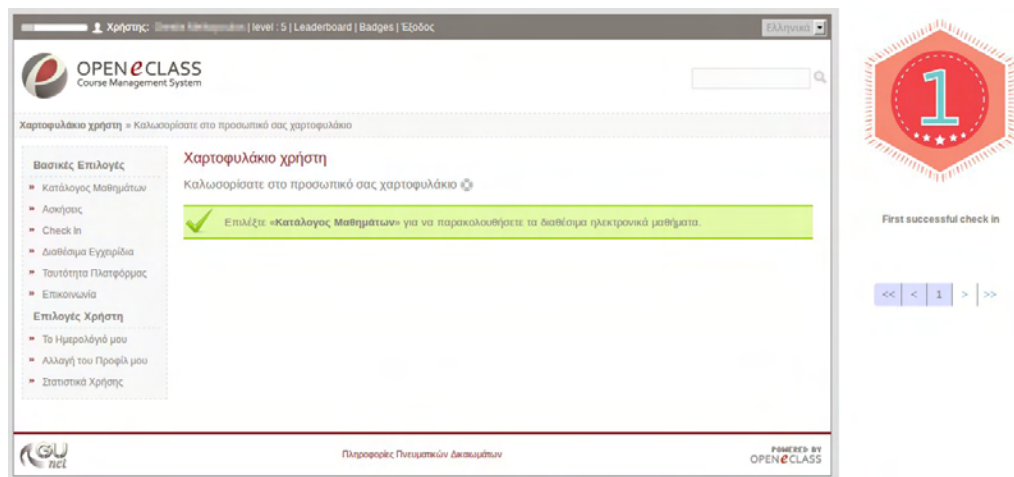


FIGURE 4.25: Gamifying eClass 4.

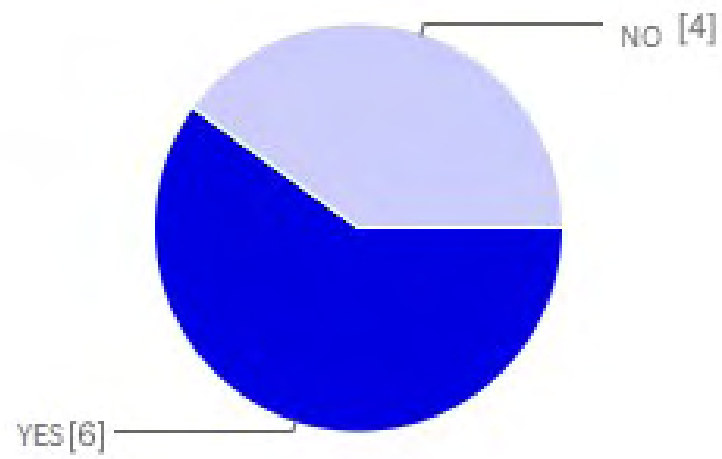
Both the leaderboard and the badge board, as well as the pagination of them and the sliding panels, were developed using jQuery. jQuery is a fast, small and feature-rich JavaScript library. Specifically jQuery UI that provides a curated set of user interface interactions, effects, widgets, and themes built on top of this library.

#### 4.4 Other components and modules

The first thought was to create a separate component in order to identify whether a student is present or not in a course. However the most important problem to use a geolocation system in interior spaces is the accuracy that you can succeed because the GPS sensor's strength is inadequate. So another technique to solve this issue is to use the signal of neighbouring Wi-Fi hotspots for triangulation, but even this has not always the right results. Thus we decided that was a good idea to record MAC addresses as a presence of devices that connect to specific hall at course's time. Although, it is proved that the Wi-Fi system of university is too complicated and also we were needed some special permissions to record these data. Finally, we conclude to modify the previous idea into something simpler so we create a Wi-Fi hotspot at professor's laptop in which students can connect. Then we develop a script which enables the hotspot for 15 minutes after its execution and when this time expires disable the hotspot. During this period of time it records the date, every MAC address that has connected to hotspot and it checks for duplicate in order to have only one register at this time limit. So at the end of semester if a student wants to participate in grade's bonus, he must prove that he is the owner of a certain MAC address and the professor can check the amount of presences.

## 4.5 Initial evaluation

We distributed a questionnaire to some classmates of our department after they have tested the implementation of gamification in the portal and the eClass platform. We received ten responses and although it is a small sample; we use it to make an initial evaluation. Firstly we asked if they have ever heard about the term "gamification" and our results was split: 50% of users answered "yes" and 50% of users answered "no" as shown in 4.26. Then we split questionnaire in two parts the one was for the portal and the other was for the eClass platform. Thus, initially some questions are for the functionality of the portal before we use gamification. Here it is important to clarify that 1 represents "strongly negative" and 5 "strongly positive". First question was how easy is to navigate in the portal and second how easy is to trace the information you are looking for; as shown in 4.27, 50% of users are "neutral" and the rest 50% of users are "easy" and in 4.28 we can deduce that 80% of users are "neutral" and below so there is a difficulty to find useful information. On the other hand when we asked the same questions after they have tested the implementation of gamification in the portal, we observed a significant positive change as shown in 4.29 for the first question that 90% of users are "easy" and above; and as shown in 4.30 for the second question that 90% of users are "easy" and above. Moreover we can see the difference in engagement before gamification as shown in 4.31 there is 70% that make a weekly use of portal less than 3 times and after gamification as shown in 4.32 there is 80% of users that make a weekly use of portal more than three times. In addition we try to rate how pleasing is the user interface of portal and as shown in 4.33 without gamification an 80% of users support that it is "neutral" and under opposite as shown in 4.34 with gamification 90% of users believe that it is "pleasing" and above. Also we asked if the implementation of gamification in portal to a greater extent will have positive impact and as shown in 4.35 100% of users consider that this is possible. Finally there was a question which game elements do you think that it will increase the engagement of users in the portal, our results are shown in 4.36. So while we did not change anything in the main structure of the portal for instance how categorized information or how it is displayed, it seems that gamification encourage and motivate users to realize that the time they spend to navigate and search about information is useful. Moreover engagement is increased and there is a strong feeling that gamification make the browsing in portal more enjoyable.



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FIGURE 4.26

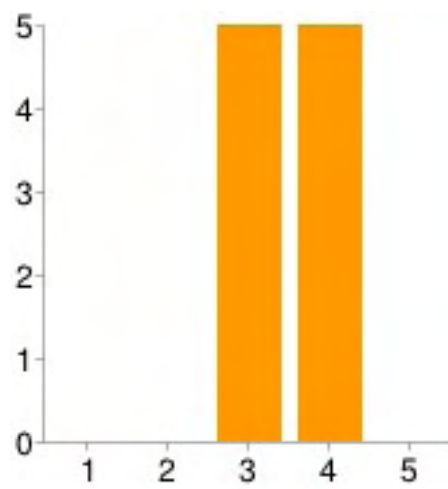


FIGURE 4.27

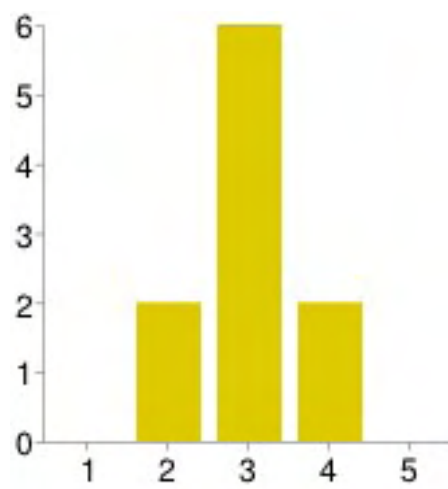


FIGURE 4.28

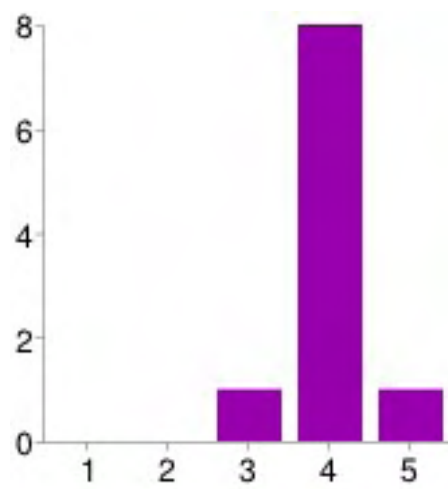
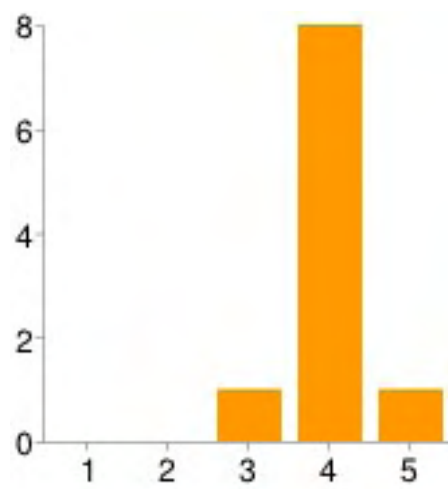


FIGURE 4.29





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FIGURE 4.30

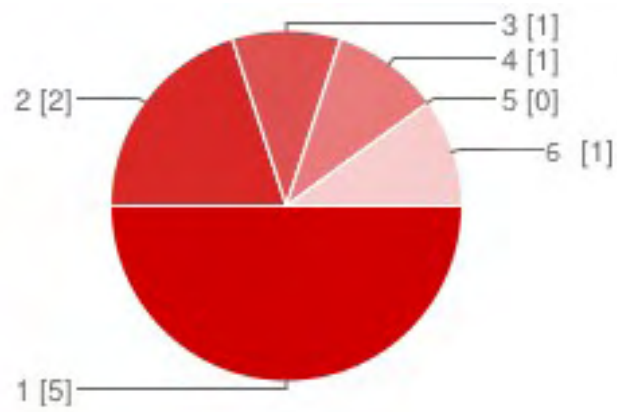


FIGURE 4.31

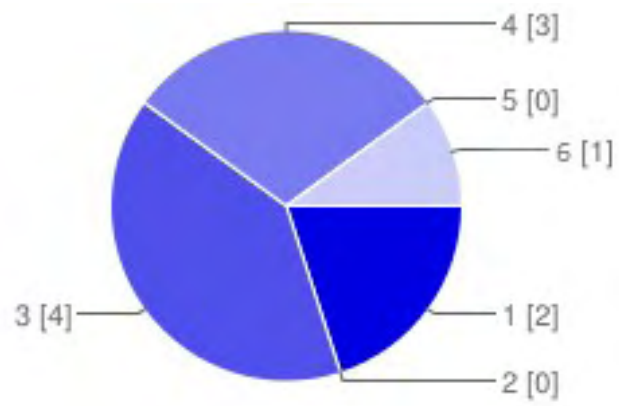
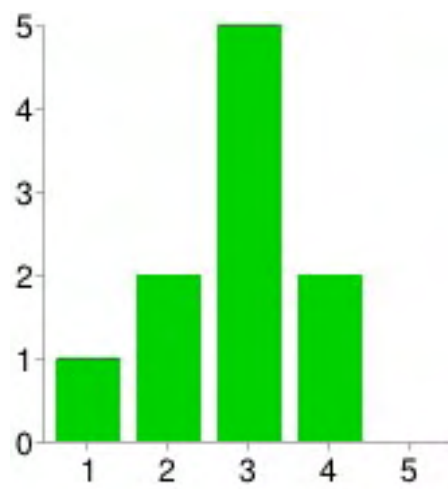
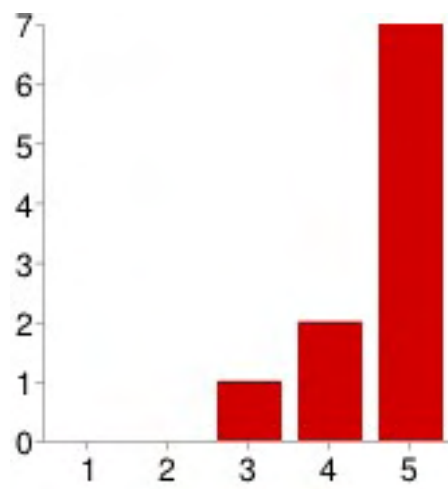


FIGURE 4.32



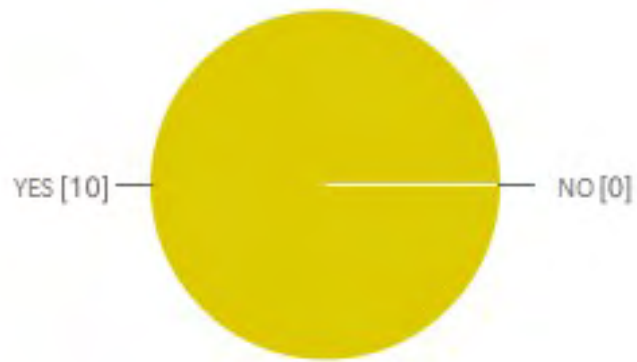
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FIGURE 4.33



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FIGURE 4.34



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FIGURE 4.35

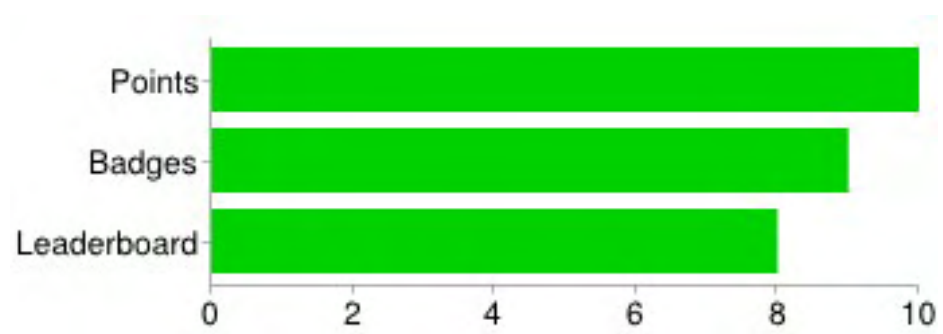


FIGURE 4.36

In the second part which regards the eClass platform we followed the same pattern as above. Firstly we asked two questions about weekly usage of platform and how pleasing is the user interface of platform before we use gamification. As shown in 4.37 and 4.38 respectively the 70% of users make use of eClass less than three times every week and the 100% of users think that user interface is "neutral" and below. On the other hand for the same questions after the implementation of gamification there a significant improvement as shown in 4.39 the 80% of users make use of eClass more than three times every week and as shown in 4.40 the 100% of users think that user interface is "neutral" and above. In addition we wanted to test our feeling that some important tools of eClass have minimum use, so we put a list of these tools with a question which of them have used little or not at all. As shown in 4.41 from 60% up to 90% of users had done minimum use for each of these tools. Moreover we asked whether you think that the use of gamification will affect user's participation in the above tools and as shown in 4.43 90% of users believe that the impact will be "positive" or "strongly positive". Also it is asked the opinion of users if they want gamification to be expand in more aspects of platform and we received "strongly positive" responses in 100% percentage. Finally there was a question which game elements do you think will increase the engagement of users in eClass, our results are shown in 4.44. Thus generally we can conclude that the influence of gamification has positive sign.



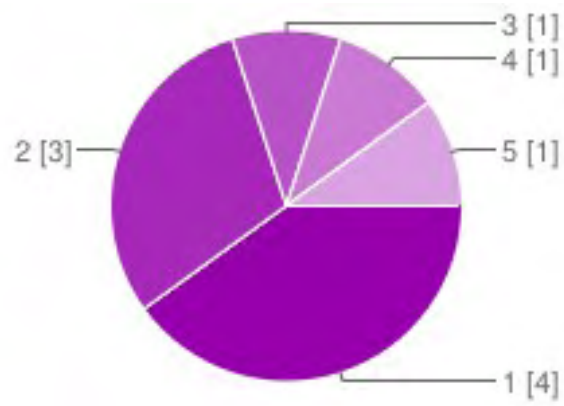


FIGURE 4.37

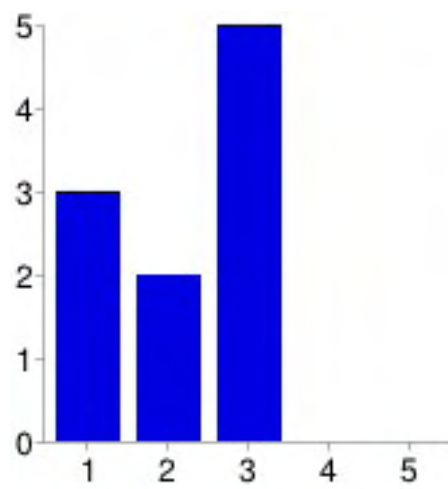


FIGURE 4.38

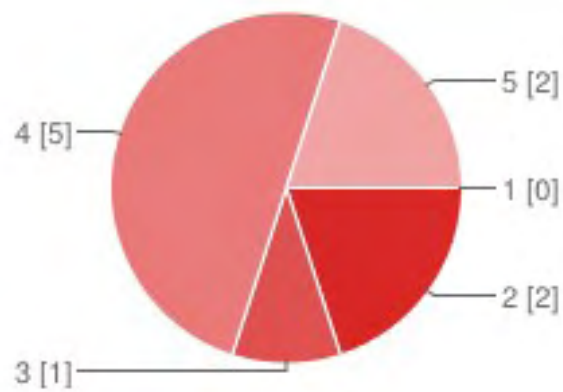
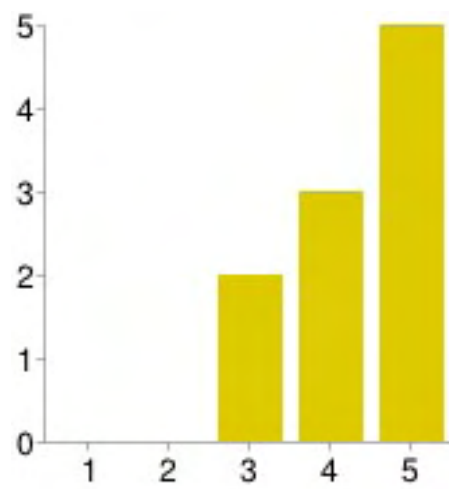


FIGURE 4.39



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FIGURE 4.40

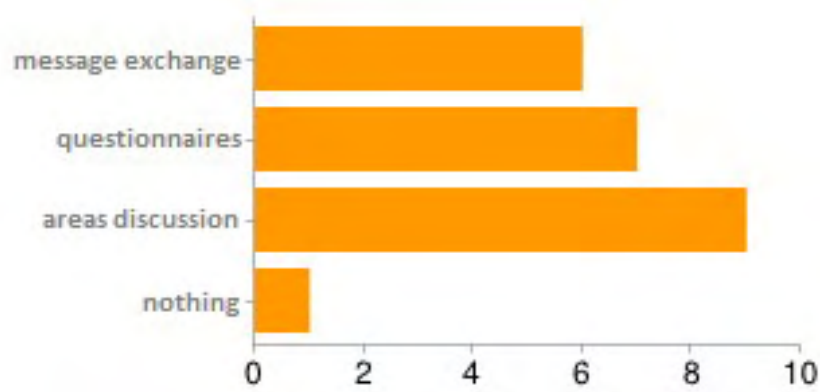


FIGURE 4.41

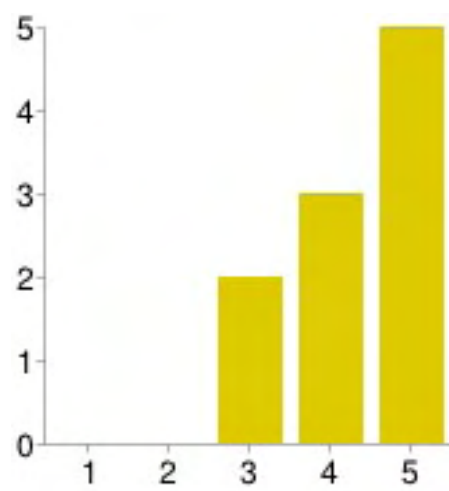
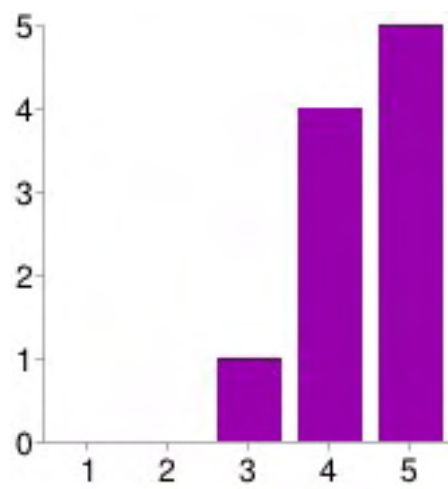
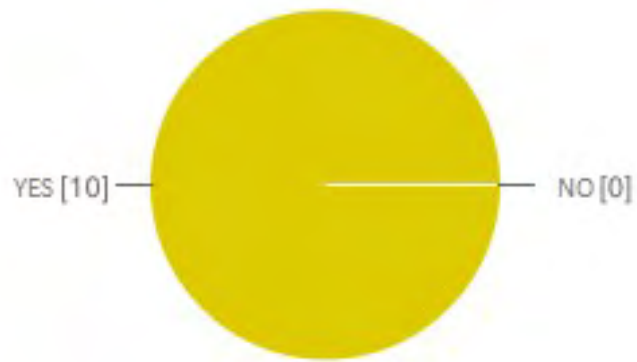


FIGURE 4.42



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FIGURE 4.43



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FIGURE 4.44



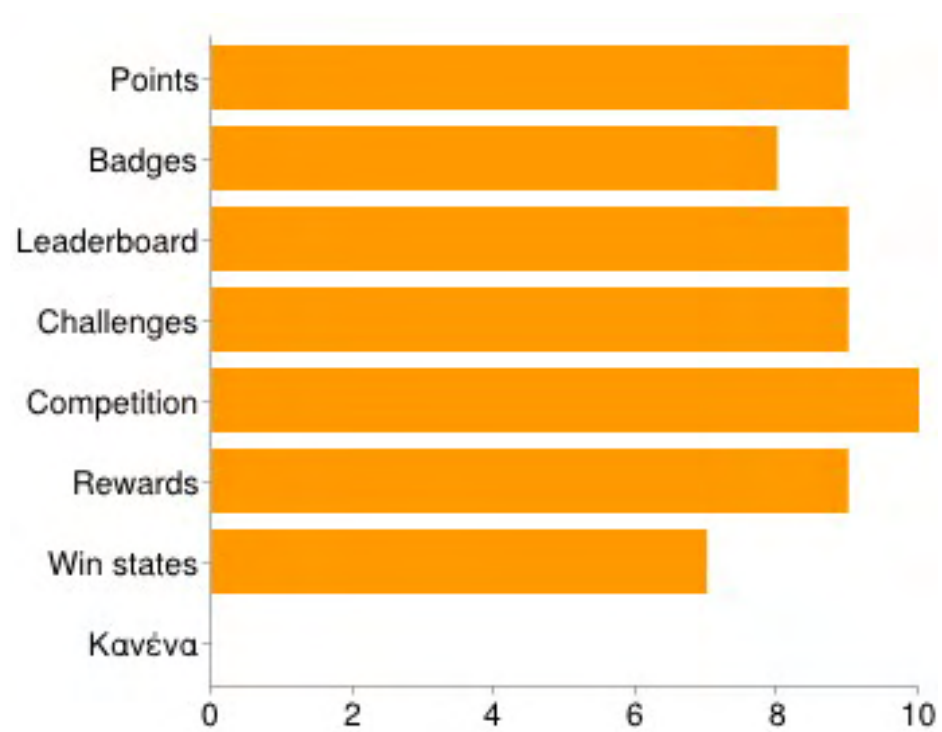


FIGURE 4.45

## Chapter 5

# Synopsis and future perspectives

Initially, we specified the term "game" and "play" in order to understand better what gamification is. Subsequently, we analyse the term "**gamification**", how it evolved in its present form and we quote different categories of examples. Moreover we focused about gamification in higher education and we studied related projects. Finally, we implemented gamification in tools which are used by students of the University of Thessaly.

In our future plans there are possible perspectives for improvement and development of project that described above.

1. Engage the Olark chat plug-in with captain up in order to gain points and badges by using the chat window.
2. Create at e-secretariat a goal-scheduler which provide to students a change to set aims in regarding courses and reward them if succeed their goals.
3. Add in eClass a story-line game which its clue are revealed when user collect certain amount of points.
4. Use a virtual economy for players in order to exchange points for currencies. These can be used to buy more time or attempts for challenges.
5. Improve the synchronization of points between eClass and captain-up plug-in of UTH portal.
6. Add an administration gamification panel for professors so that they can observe gamification data of students, manage points ad libitum or create separate leader-board for a certain course.

7. Implement a communication between eClass and the separate check-in component in order to automatically eClass sync its points according the percentage of attendance in classroom.
8. Users use the same elements for login in both Captain up plug-in and WordPress portal.

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