BIRZEIT UNIVERSITY

Serious Gaming Fundamentals (COMP2331)

By: Dr. Mamoun Nawahdah

2016

Contents

What is Gamification?

What is Game?

Class activity 1: in groups, define what is a game?

*"A game is a **system** in which **player(s)** involve in an **abstract challenge**, defined by **rules**, **interactivity**, and **feedback**, that results in a **quantifiable outcome** often causing an emotional reaction."*

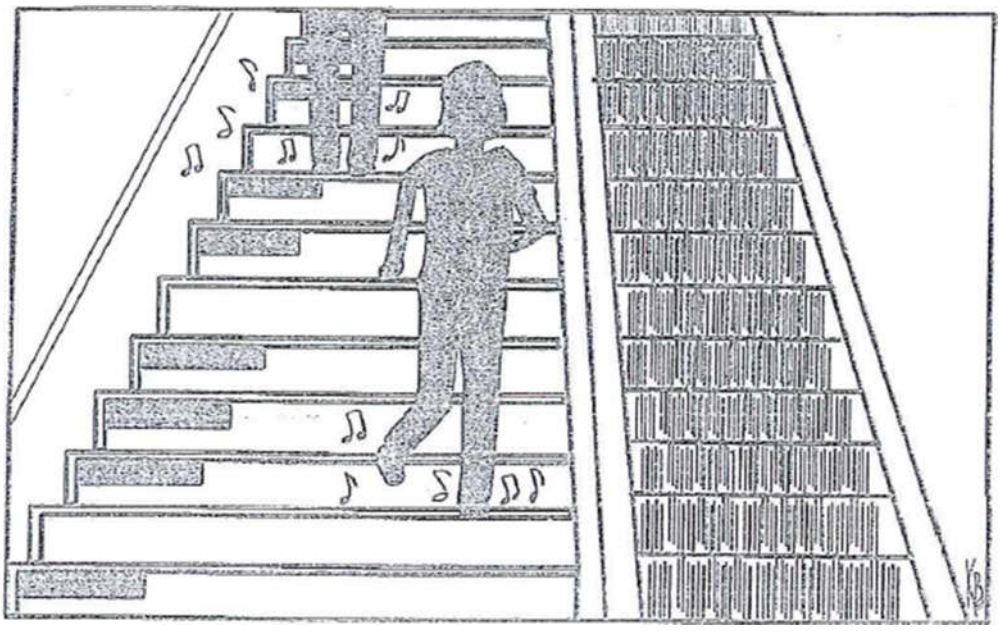
- **System**: a set of interconnected elements occur within the "space" of the game.
- **Players:** games involve a person interacting with game content or with other players. The person playing the game is the player.
- **Abstract**: games typically involve an abstraction of reality and typically take place in a narrowly defined "game space".
- **Challenge**: games challenge players to achieve goals and outcomes that are not simple or straightforward.
- **Rules**: the rules of the game define the game. They define the sequence of play, the winning state, and what is "fair" and what is "not fair" within the boundaries of the game environment.
- **Interactivity**: games involve interaction. Players interact with one another, with the game system, and with the content presented during the game.
- **Feedback**: within a game, feedback is typically instant, direct, and clear.
- **Quantifiable outcome**: games are designed so that the winning state in concrete. There is no ambiguity.
- **Emotional reaction**: games typically involve emotion.

What is Gamification?

Class activity 2: in groups, read the related gamification paragraphs and try to come up with a definition to what is Gamification?

1)

Lack of physical activity is a growing challenge putting millions of people at risk, but it's not due to a lack of information or knowledge. Plenty of people know they should exercise and can recite all the benefits of physical activity when asked. But sadly, this knowledge is not reflected in their behavior. Few people exercise or even elect extra physical activity when given the opportunity. For instance, many people exiting a subway take the escalator to get to street level rather than the stairs, even when the escalator is busy and the stairs empty. But all that changed in one town when they transformed a subway exiting staircase into a set of black and white piano keys, each step producing a different musical note when stepped on, as depicted in Figure 1.1. After the piano-type steps were installed, behavior changed. People started to engage with the keys and elected to take the stairs making music as they entered and exited the subway station. The use of the staircase increased 66 percent.[3]



2)

Running was never a favorite activity of Rachel's; she didn't like to run in the rain or cold, or even if when it was hot or muggy. She couldn't bring herself to jump out of bed in the morning, put on a pair of running shoes, and pound the pavement; she just wasn't that into it. Until she downloaded *Zombies, Run!* The mobile application changed everything.

It wasn't an ordinary application to track running time, number of miles completed, and pacing, Sure, it tracked all that, but it also involved her in an interactive game. As she runs, she plays the role of a character known as Runner 5. Her job is to go out into a zombie-infested post-apocalyptic environment and collect supplies to bring back to her home base.

She puts on her headphones, starts the application and, as she is running, the application periodically indicates when she has collected key items required to support her virtual base. It also warns her when zombie hordes are closing in and she needs to increase her speed. Several times a run, she finds herself chased by zombies and unknowingly doing interval training. All the while, the application records her pace and number of miles; when she returns home, she uploads the information to a website to track her progress. She also tracks the rebuilding of her base using items collects during her run.

Now she can't wait to run. She is actively engaged in the story, and her running miles have increased over the past few months as she finds herself running more so she can rebuild her base faster and find out her next mission as Runner 5.[4]

3)

Sam knows first-hand just how dangerous it can be working on a loading dock. One day, he was unloading product from a delivery truck with his 9,000 pound forklift when he forgot to check behind him as he backed up. What he didn't see was that a co-worker had placed a stack of pallets immediately behind him blocking his right-of-way. As Sam's forklift moved backward, it caught the edge of the pallet and began to tip. Instinctively, Sam tried to jump out of the forklift. Unfortunately, his foot caught, the forklift tipped all the way over on landed on him. He saw himself being killed instantly.

Sam wasn't hurt—not even a scratch. Of course, he did lose one life and 100 life points for his mistake, which made him mad because it dropped his standings in the virtual safety leaderboard. Sam was driving a virtual forklift in a virtual networked simulated environment with an instructor and four other trainees. The entire incident took place online as part of a training activity. After the incident, the instructor used the opportunity to explain to the group several points of forklift and loading dock safety. To this day, Sam has never had a safety incident on an actual loading dock. He contributes that record partly to the training he has received in the loading dock simulator.[5]

4)

Professor Jones, a new faculty member at a large university, teaches large classes. She has over three hundred students per class but, on average, her students have almost 100 percent attendance. Other faculty members marvel at how she is able to accomplish this task because many students use large classes are an excuse to cut class. But to Professor Jones, the process is simple. Each class period she tracks attendance, demands student interactivity, and evaluates the quality of each and every student's answer to questions she poses during her lectures. Students log onto a website and see their progress against themselves and others on a class leader board. Professor Jones uses an audience response system to make the process for three hundred students manageable.

Every student is assigned a response pad at the beginning of the semester containing his or her student identification number. In every class, Professor Jones poses dozens of questions from the reading interspersed into her lecture. Students respond by clicking a button that corresponds to an answer. The results are instantly loaded to the class website, and students track how they are doing in real time.

5)

Elizabeth's organization is the envy of many. Its members never have to actively recruit; people come to them, drawn by their reputation, and the ones who fit well and make a positive contribution end up being welcomed into the group. Elizabeth has learned from other start-ups the importance of good communication and giving everyone a common vision he or she can believe in. She is a good day-to-day manager but is also careful to step aside and allow others the opportunity to lead. She is charismatic by nature, but uses this strength to make everyone on the team feel like part of something special, rather than hogging the spotlight. When there's a disagreement, everyone on the team knows that she can be counted on to be fair and practical.

She credits her abilities with learning from other leaders. Remembering the first person to promote her into a management position, she says, "This guy was amazing. . . . Everyone loved him. No one could argue with him. And I learned it wasn't just because he was a leader. It was his attitude. He was always open to other ideas, but he also knew how to stick firmly to something he knew would work. It's not about being able to force people to do what you want to them to do; it's about getting people to try what you want and seeing how things work, and staying open to new ideas."

By the time Elizabeth was promoted to her first management position at work, she had years of management and leadership experience from leading one of the most successful guilds on her World of Warcraft server.[6]

6)

Emanuel's factory wasn't doing well. The team members were working as quickly as they could, but they never got ahead of their problems. The plastic inventory components were stacked up around the work centers, customer satisfaction rates were low, and product wasn't flowing through the factory in a timely manner. The only consolation was that none of the competitors' factories looked much better. Emanuel's frustration level was beginning to grow and he could feel himself getting angry; he just didn't know how to improve production. It was at this time that the instructor stepped in and explained to the four teams sitting around the lean manufacturing game boards how they could improve.

The instructor from a lean manufacturing consulting firm demonstrated techniques for streamlining the factory floor layout on the game board and provided ideas for moving materials from work cell to work cell based on upstream demand and not simply meeting a quota. After the demonstration by the instructor, Emanuel and his fellow teammates reconfigured their mock factory and moved their plastic inventory pieces based on the new advice. During this process, something became glaringly obvious to Emanuel. Quickly moving inventory from work center to work center wasn't as productive as only moving inventory when the downstream work center need it. Emanuel had read that advice and heard it spoken by instructors, but he never really understood or trusted that idea until he witnessed the dramatic results during the playing of the game. Four weeks later, the product line Emanuel supervised benefited from his new insight by waiting for downstream demand before producing the needed inventory. Production on Emanuel's line increased by 20 percent, while scrap decreased by 15 percent.

All these examples have one thing in common: **they use elements traditionally thought of as game-like or "fun" to promote learning and engagement**.

Gamification: is using **game-based mechanics**, **aesthetics** and **game thinking** to **engage people**, **motivate action**, **promote learning**, and **solve problems**.

- ***Game-Based***: it is a game.
- ***Mechanics*****:** include **levels**, earning **badges**, **point** systems, **scores**, and **time constraints**, etc.
- ***Aesthetics:*** engaging graphics or a well-designed experienced. User interface is an essential element.
- ***Game thinking*****:** most important element. It is the idea of thinking about an everyday experience (e.g. running, teaching, working) and converting it into an activity that has elements of **competition**, **cooperation**, **exploration** and **storytelling.**
- ***Engage*****:** an explicit goal is to gain a person's attention and to involve him/her in the process you have created.
- ***People*****:** the individuals who will be engaged in the created process and who will be motivated to take action.
- ***Motivate action***: is a process that energizes and gives direction, purpose or meaning to behavior and actions.
- ***Promote learning***: many gamification elements are based on educational psychology.
- ***Solve problems*****:** due to **cooperative** and **competitive** nature of games.

What Gamification is Not?

- ***Badges, Points, and Rewards***: the real power of game-based thinking is in the other elements of games: **engagement**, **storytelling**, **visualization** of characters, and **problem solving**.
- ***Trivialization of Learning***: gamified learning can, and is, difficult, challenging, and stressful.
- ***New***: the elements of gamification are not new. e.g. military
- ***Perfect for every learning situation***: many situations for which gamification will not work.
- ***Easy to create***: it is not easy to create a game that is both fun to play and instructional.

Gamification vs. Serious Games

A **serious game** is an experience designed using **game mechanics** and **game thinking** to **educate individuals** in a specific content domain.
Some examples:

1) Stairs vs. escalator.

2) Frequent flyer program.

3) Sales simulation.

- Each activity has an **intrinsic** (جوهري) goal (reach top of steps, fly for free, learn to sell/buy better).
- Each has **extrinsic** (خارجي) elements (music, points, animation).
- Each has a **clear end point** (top of stairs, a free flight, sales game ends).
- Each is designed specifically to **promote a serious outcome** (taking stairs for health, sell more airline tickets, sell more product).

The creation of a serious game falls under the process of gamification.

Who is Using Gamification?

- **Cisco** developed a game it called "**The binary game**". The idea is to teach people the basic idea of binary numbers. http://forums.cisco.com/CertCom/game/binary_game_page.htm
- **IBM**: The INNOV8 simulation game brings IT and business together for process model innovation. http://www-01.ibm.com/software/solutions/soa/innov8/index.html
- **Military**: **M**assive **m**ultiplayer **o**nline **w**ar **g**ame **l**everaging the **i**nternet (**MMOWGLI**). https://portal.mmowgli.nps.edu/game-wiki/-/wiki/10773/About+MMOWGLI
- **UK**: **Idea Street** is an online ideas-management platform that encourages employees to share their innovative ideas for change with a community of likeminded colleagues, and work with those colleagues to help make their ideas a reality. http://www.sparkcentral.co.uk/showcase/show/idea-street
- **Marriott hotel social game**: https://www.youtube.com/watch?v=ULOwlkiRM18
- **SGI Flight(1983):** Fighting jets simulator like F-16, F-15, F-14D (military purpose).

- **ARMA(2006-present):** Simulation for modern war combats (Military purpose).

- **Portal (2007-2012):** Puzzle game Using interactive tools like the Puzzle Maker to draw students in makes physics, math, logic, spatial reasoning, probability, and problem-solving (Education purpose).

- **SimCity(1998-Present):** Government/Political simulation.

- **Microsoft Flight Simulator(1982-Present):** Flight Simulator

- **PARAMEDIC SIMULATOR:** First aid simulator.

- **Areeb's World:** Areeb's World is a **MMORPG** (Massively Multiplayer Online Role-Playing Game) game, that based on math and science curriculum in Saudi Arabia. http://areebworld.com/

Understanding Game Elements?

Abstraction of Concepts and Reality

Imagine trying to duplicate all the complexity of running a major city!!!

Game based on this complex subject matter work, not because they include all the complexities, but precisely because they reduce the complexity and use broad generalizations to represent reality.

Games are based on models of the real world. This is known as "**Operating model**".

Abstracted reality has a number of advantages over reality:

- It helps the player manage the conceptual space being experienced. It minimizes the complexity.
- Cause and effect can be more clearly identified.
- Abstracting reality removes unimportant factors.
- It reduces the time required to grasp the concepts.

Class activity 3: in groups, read a related text (in *Game_elements_1.pdf* file) to game elements and summarize it.

Goals

- The difference between a **game** and **play** is the introduction of a **goal**. (e.g. running)
- The introduction of a goal adds **purpose**, **focus**, and **measurable outcomes**.
- In many games, goals are **clear** and **visible**.
- Visually understanding how far you are from a goal provides **incentive**, **feedback**, and an indication of **progress** as well as a **measurement** against others.
- A goal gives the player the freedom and autonomy to follow it using different approaches and methods.
- Goals have to be well structured and sequenced to have sustained meaning and to motivate players to achieve those goals.
    - **Once a player accomplishes the goal of the game, the game is over**. So a number of smaller goals leading to a larger goal are important in providing continuous play.
    - Goal can be difficult to achieve without building prerequisite skills necessary to achieve the goal.

Rules

- **A game is just a set of defined rules**. Without rules, games would not exist.
- There are different types of rules that apply to games:
    - **Operational rules**: these are the rule that describe how the game is played. (E.g. you can't open door until you collect the right key).

- **Constitutive rules or Foundational rules**: these are the underlying formal structures dictating game functionality. (E.g. the mathematical formulas used to calculate how many times the number 6 will appear on a die).
- **Implicit rules or Behavior rules**: these are the rules that govern the social contract between two or more players, in other words, game etiquette.
- **Instructional rules**: these are the rules that you want the learner to know and adopt after the game is played.

Conflict, Competition, or Cooperation

- A **conflict** is a challenge provided by a meaningful opponent.
  - To win a challenge, the player must defeat an opponent. (e.g. football game)
  - This is typically accomplished by causing damage on the opponent, by scoring more points against the opponent, or by delaying the progress of the opponent.
- **Competition** is where opponents are constrained from impeding each other and instead give the entirety of their attentions to optimizing their own performance. (e.g. racing)
  - Winning is accomplished by being faster, cleverer, or more skilled than opponents.
- **Cooperating** is the act of working with others to achieve a mutually desirable and beneficial outcome.
  - This is the social aspect of games that many players enjoy. (e.g. FarmVille)
- While it is helpful to consider the elements of conflict, competition, and cooperation separately, often **good game design includes elements of all three**. (e.g. World of Warcraft)

Time

- Time used as a motivator for player activity and action.
- Time can also be a resource that needs to be allocated during a game.
- Without the convention of compressed time, games would be difficult and boring.

Rewards Structures

- **Badges**, **points**, and **rewards** are not all bad; it's just that they are not the only component to gamification.
- While it's fun to obtain a high score, it is just as fun to let others know you are the one who received it.
- The **leaderboard** is a list of the top scores in the game.
- Games provide players with **instant** reward in the form of **points**.
- Many games have extra abilities or prizes that can be earned for accomplishing certain tasks.
- Make them as easy to get as possible early in a game so the players are hooked.

- It is better to link activities within the game to reward than to have random rewards.

Feedback

- One of the game key features is the **frequency** and **intensity** of **real-time** feedback.
- Some games provide **immediate** informational feedback to indicate the degree of "rightness" or "wrongness" of a response, action, or activity.
- Other games provide feedbacks to the learner to guide him/her toward the correct outcome.
- **Juicy feedback**:
  - ***Tactile***: the player can almost feel the feedback as it is occurring on screen.
  - ***Inviting***: it's something the player desires to achieve.
  - ***Repeatable***: can be received again and again if some events are met.
  - ***Coherent***: within the context of the game.
  - ***Continuous***: occurs as a natural result on interacting within the context of the game environment.
  - ***Emergent***: it flows naturally from the game.
  - ***Balanced***: not overwhelmed.
  - ***Fresh***: a little surprising contains some unexpected twists and is interesting and inviting.

Class activity 4: in groups, read a related text (in *Game_elements_2.pdf* file) to game elements and summarize it.

Levels

- Games have different types of levels:
  - Level –or **mission**- based structure.
  - Level is the **degree of difficulty**.
  - Level of **experience** and **skills**.
- **Game Levels**: (mission-based) one purpose is to keep the game space manageable.
  - In each level the player accomplish a small set of goals and, when completed, moves on to the next level.
  - The skills are built and reinforced at each level.
  - At the earliest level of the game, players are taught basic skills.
  - As the player progress and the levels become more difficult, players are required to recall and use skills learned in previous levels to advance.
  - Levels serve as motivation.
  - The different levels provide small, achievable goals that lead the player to engage in more and more activities to move to next level.
- **Playing Levels**:
  - Playing a game that is too difficult is not fun.

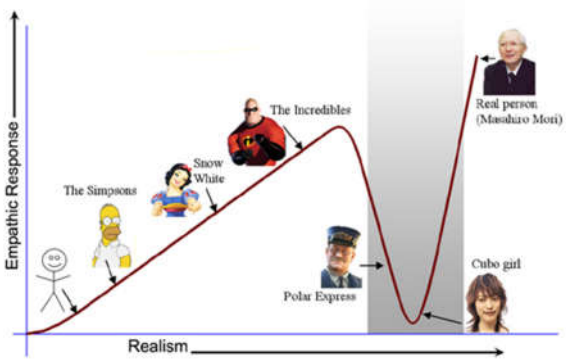
  - Playing a game that is too easy is not fun either.
  - Therefore, create a game that is either too hard nor too easy.
- **Player Levels**:
  - Easy, intermediate, and hard.
  - Novice, normal, and experienced players.

Storytelling

- Storytelling is an essential part of gamification.
- The element of "story" provides relevance and meaning to the experience.
- It provides context for application of tasks.
  - Tic-Tac-Toe are not guided by a story.
  - Chess evoke a back story of two warring factions.
  - Angry birds story.
- Early video games added a thin story layer to make them more **interesting** and **engaging**.
- Elements of storytelling:
  - Characters
  - Plot (something happened)
  - Tension
  - Resolution
- Adding these elements together creates an effective story to accompany the elements of the game.

Aesthetics

- Art, beauty, and visual elements.
- Aesthetics play an important role. Ignoring them will reduces the overall experience of the players. (e.g. chess)
- However, don't confuse aesthetics with realism. A game doesn't need to have photorealistic images to be visually appealing. (e.g. FarmVille)
- Avoid **uncanny valley phenomenon**. When a robot or other animated figure becomes more humanlike in its movements and appearance, the emotional response to the figure becomes more favorable, but only up until a certain point.



Replay or Do Over

- The replay button or do over gives the player permission to fail.
- In games, failure is an option. And it is a good one.
- People expect to fail, and look forward to the lessons learned during the failure process.
- Allowing a player to fail with minimal consequences encourages exploration, curiosity, and discovery-based learning.
- Failure adds an additional level of content because it makes the player reconsider his approach to a game.
- Winning a game without failure or a do over is often a dissatisfying experience for the player. The act of failing multiple times makes the act of wining more pleasurable.

Class Activity 5: in groups, chose one of the following topics, and discuss with your group the game elements that apply to this topic.

- Life
- Study (university)
- Work
- Marriage
- Family
- Friendship

Theories behind Gamification of Learning and Instruction

Motivation

- When it comes to game play, **motivation** is a key concept.
- Motivation consists of two parts: **Internal** and **external.**

- **Intrinsic motivation:**
  - Mainly driven from within the learner/player.
  - When player replay an activity from a game by himself, because of the enjoyment the game provides, the learning it permits, or when the player want to re-feel the great experience the game evokes when accomplishment.
  - Intrinsic motivation is when the rewards come from carrying out an activity rather than from the result of the activity. (e.g. teaching, reading a book)

- **Extrinsic motivation:**
  - Comes from external factors.
  - The motivation comes externally when players seek to earn something that is not directly related to the activity (or avoid punishment), it doesn't come from the person. (e.g. study, washing a car)
  - External motivation can be a high grade, a certificate, badge, rewards, money prizes or appreciation from others.
  - When the player only want to play the game to gain the rewards not for enjoyment, then the player is called **extrinsically motivated.**

Class Activity 6: in groups, think of one activity in life, and then discuss the **intrinsic** and **extrinsic** motivations that might include. Which one is more important?

Motivation Models

1- ARCS Model

- The ARCS model examines the motivations of games through four factors: (**Attention**, **Relevance**, **Confidence**, and **Satisfaction**).
- **Attention**: aims to gain the attention of the players, so they are more interested in the contents. This can be achieved through:
  - **Perceptual (الإدراك الحسي) arousal (إثارة):** through the means of specific, relatable examples, the use of strangeness or conflict, or element of surprise.
  - **Inquiry arousal:** presenting a question or problem (the learner interested in solving).
  - **Variability:** varying the delivery method periodically.
- **Relevance:** of the material to be learned.
  - **Goal orientation:** Tell the player that reaching the goal will help him/her in the future.
  - **Match** the player motivations with the teaching motivations**.**
  - **Familiarity:** Showing the player that his/her knowledge is familiar with (or base to) the new knowledge to be learned.
- **Confidence:** The player's expectation that they will achieve success.
  - One way to help a learner be confident is to clearly state the learning requirements and expectations in the beginning (ILOs).
  - Learners like to be successful and success builds on success.
  - Provide feedback and personal support to help learner feel in control.
- **Satisfaction:** To give the players the feeling that the learning has value and is worth the continued efforts.
  - Try to tap into the intrinsic motivation of the learners.

2- Malone's Theory of Intrinsically Motivating Instructions (1980s)

- Investigated what make the game fun to play and motivating, and this model consists of three key elements: **Challenge**, **Fantasy**, and **Curiosity**.
- **Challenge:**
  - The game environment is challenging when the players are not certain to reach the goal.
  - Ways of making outcomes uncertain include variable difficulty level, multiple level goals, hidden information, and randomness.
- **Fantasy: (خيال, نزوة)**
  - A game environment is called fantasy when it evokes mental images that are not in the current game scene.

- **Curiosity: (فضول)**
  - Game environments evoke players' curiosity by providing an optimal informational complexity.
  - **Sensory curiosity**: involves the attention-attracting value of changes in the light, sound, or other sensory stimuli of an environment.
  - **Cognitive curiosity**: make learner believe their knowledge are incomplete, or inconsistent.

3- Lepper's Instructional Design Principles for Intrinsic Motivation

- **Control:** give the learners the control over the learning activity.
  - Let them have some say into when to initiate and when to terminate an activity.
- **Challenge:** create environments that are continually challenging the learners.
- **Curiosity:** can be achieved by making the learners feel that there is incomplete in their knowledge.
- **Contextualization:** present the activities in a functional simulations or fantasy context.

4- The Taxonomy of Intrinsic Motivation (Lepper and Malone)

- Consists of two parts, the first focused on the **internal motivation** which includes:
  - **Challenge** in terms of goals, uncertain outcomes, performance feedback, and self-esteem.
  - **Curiosity** in terms of sensory and cognitive.
  - **Control** in terms of possibility, power and choice.
  - **Fantasy** in terms of emotional and cognitive aspects.
- The second focused on the **interpersonal motivation** which includes:
  - **Cooperation** in terms of players working together.
  - **Competition** in terms of competing against other players.
  - **Recognition** in terms of making achievements available to others.

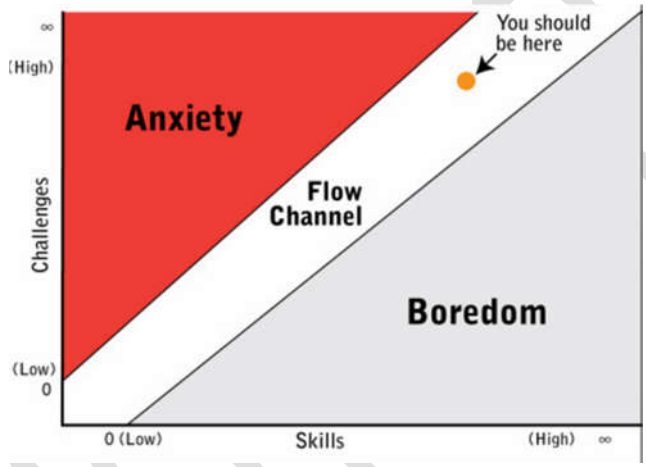
5- Distributed Practice

- Is the space between the times the game is played.
- This achieved in teaching by distributing study or learning efforts over multiple short sessions, with each session focused on the subject matter to be learned.
- This helps learners retain access to memorized information over long periods of time.

- The problem with the **mass practice** the learner can become tired and less efficient.
- Games are designed so that players play them again and again.
- Well-designed game means the player is not having the same experience twice.

6- Flow

- Flow is a mental state of operation in which a person is fully immersed (occupied) and focused in what he/she is doing.
- Flow is experienced when the challenge facing a person is in almost perfect balance with the person's level of skills and abilities.



- Flow is elusive and cannot always or easily be designed into a game.
- Components that make flow possible:
  - **Achievable task**: the person must believe that he/she can accomplish the task with some degree of effort.
  - **Concentration**: the player must apply mental and physical energies with intense focus.
  - **Clear goals**: the person knows exactly what he needs to do.
  - **Feedback**: as the person is engaged in the activity, feedback is provided immediately.
  - **Control over action**: the person feels in complete control over what he/she is doing.
  - **Loss of sense of time**: when in flow state, time doesn't matter.

Player Types and Games Patterns

- Not everyone plays a game the same way.
  - Some are ultracompetitive- they play to win. They don't like losing and become emotionally upset when they lose.
  - Others play games because of the challenge; they want to achieve the goal, whatever it may entail.
  - Others play for the social aspect.
  - Still others want to explore the elements of the game and determine what they all mean.
- Not all games have the same type on interactions, goals, or playing styles.

Types of Play

Class Activity 7: in groups, watch sample games and then discuss the type of plays in each one.

- When thinking about player types, consider what players of games like to do.

1. **Competitive play**: players compete against the game or others to achieve goals.
   - First-person shooters: A player working against non-player characters created by A.I. within the game. (e.g. **DOOM**)
   - First-person thinker: involves moving around an environment encountering obstacles, but not using violence. (e.g. **SUDOKU**)
   - Player vs. Player: where two or more players compete against one another until one player lose. (e.g. **Chess**)
2. **Cooperative play**: players work together to help each other and share resources to achieve mutually desirable goals (referred as co-op mode).
   - Players may work alone to accomplish some goal but cannot reach the final stage of the game without working with others (e.g. **Toontown**, **FarmVille**, **CityVille**)
3. **Self-expression/creative play**: these games are played simply to provide players a chance to express themselves and exercise their creativity. (e.g. **Minecraft**)

- Most often gamification involves a combination of these three elements where one will be the dominate form.

Player skill levels

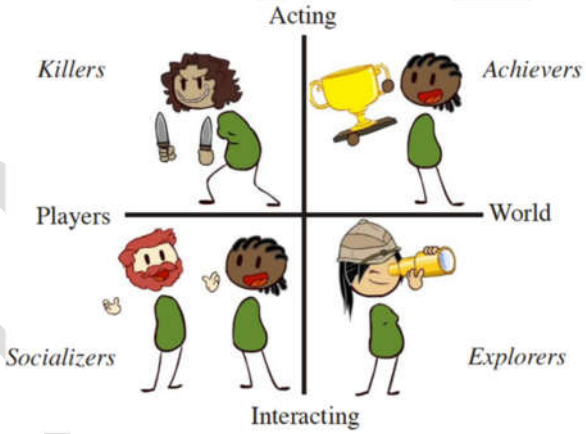
- **Novice player**:
  - Requires some approaches to motivate and attract them different than those used to hold onto players who consider themselves masters of the game.
  - An important first step is to guide them into the game gently but with a great deal of attraction and interest.
  - Most of the time the first task, quest, or mission is nothing more than walking over to a particular area. Once the player reaches the area, he receives a reward or token- **immediate reinforcement**. This will teaches basic navigation and interface control.
  - Next step might be to manipulating objects within the environment.
- **Expert player:**

  - Players have all the skills they need to competently/expertly engage at a high level of game play.
  - In this level, player wants to gain access to rewards, items, and levels that are not accessible to novice players.
- **Master player:**
  - Player has accomplished every task in the game and has a high level of knowledge about the game play, sequence, and mechanics of the game.
  - At this level, players look after status, exclusivity/uniqueness, and special benefits to keep them interested in staying with the game.

Player Types

- Determined by how they interact with and within a game environment.
- Richard Bartle (a game research from England) was able to identify that people mostly liked the same types of things within the game.
- Based on his research, he named and classified game players into four groups: Achiever, Explorer, Socializer, and Killer.
- Every person tends to exhibit behaviors from all the four types when playing games, but many people tend to lean more heavily toward one of the types.

Player Types Diagram



The Achiever

- Seeking the achievement within the game context, and wants to be at the top of the leaderboard.
- Always want know how they can gain status and then to show everyone the status they have achieved.
- The primary enjoyment for this type of players is to challenge other players' status, score, and achievements.
- Achievers goal is to gain rewards, score, and moving from lower levels to higher levels.
- They only engage in activities that can be used to move them to their goals of achieving victory.
- They find exploration necessary only to find new sources of rewards or points.
- They socialize with others only to learn new ways to gain more levels or earn more points.

- When opponents become obstacles in the way to achieving more, they are aggressive and kill till they achieve what they want.
- The social capital of achievers is that they have accumulated a large number of points and are good at the game.

The Explorer

- They try to discover the game environment as much as they can, to learn all the nooks and understand the breadth of the game.
- They try to find all the hidden elements within the game.
- They enjoy the discovery of learning new things other players don't know.
- They care of scoring points, as it could be necessary to explore new locations or open new levels or unlock mini-games.
    - They try to interact with all the aspects of the game to see what will happen (the results of their actions).
- They socialize with others when it can be a source of interesting information, or when they want to share their knowledge.
- They love to share information with others.
- Their social capital is based on knowing the ins and outs of the game.

The Socializers

- Their main interests are in relationships with other players and in organizing players.
- They enjoy connecting with other players through the game environment, and they enjoy the company of others.
- They like to greet and help new players; also they create subgroups within the game, and try to use all the communication tools provided by the game to communicate with others.
- In **Multiplayer**:
    - Those players are the first to send you friend request.
    - They love to open conversations with others.
    - They love to help other players to achieve success.
- They explore the environment to learn new places to discuss and socialize with others.
- Gaining points in their perspective is required to facilitate socialization with others.
- When it comes to killing, they rarely do, but when their friends are killed or attacked, they tend to be aggressive to seek revenge.
- Their social capital is that they know a lot of people within the game.

The Killer

- His/her enjoyment is to defeat other players by killing them in all the possible ways.
- Winning is not important, but to kill as many players as possible, and cause the larger possible amount of trouble.
- They try to impose themselves and their ideas on other players.
- Their social capital is that they are very powerful within the game and others fear them.

Class Activity 8: in groups, consider a life activity, and then discuss the player types in it

User-Centered Development (UCD)

- HCI Definition: "*Human Computer Interaction is a discipline concerned with the **design, evaluation**, and **implementation** of **interactive** computing systems for human use and with the study of major phenomena surrounding them*" (ACM SIGCHI, 1992)
- HCI Science combines knowledge, techniques and methods from domains like:
  - Psychologists (علم نفس): Experimental, Educational, Social and Industrial Psychology.
  - Computer Science
  - Instructional and Graphic Design
  - Technical Writing
  - Human Factors and Ergonomics (بيئة العمل)
  - Anthropology (علم الانسان) and Sociology (علم الاجتماع)

Usability

- Most accepted definition for usability is: *"**The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use**"* (ISO 9241-11)
- Other definitions of usability: "***Usability is concerned that humans who use the product can do so quickly and easily to accomplish their own tasks***"(Redish & Dumas, A Practical Guide to Usability Testing, 1999)

Usability Requirements:

- **Every designer wants to build a high quality user interface.**
- Careful planning and process is needed.
- System goal is always: to be easy to use, accessible, comprehensible, intelligible, idiot proof, available and ready.
- This requires a systematic process.
- **Goal**: develop usable systems, taking into account the specific users in their specific context.

Goals for Requirements Analysis:

Ways taken to assure the **user needs**:

- Determine the tasks and subtasks that must be carried out.

- Cover tasks that are only performed occasionally: Common tasks are easy to identify.
- Functionality must match the user need or else users will reject or underutilize the product.

Deliver with reliability:

- Actions must function as specified in needs / requirements.
- Data displayed on screen must match the actual database records.
- Ease the user sense of distrust.
- The system should be available as often as possible.
- The system must not introduce errors.
- User privacy and data security should be assured, by protecting against unwarranted access, destruction of data, and bad usage.

Usability Measures:

- ISO 9241 definition of usability: focuses on the goals of **effectiveness**, **efficiency** and **satisfaction**.
- Target user community and classification of associated tasks related to the interface need to be identified.
- Communities evolve overtime.
- Needs and models of use change.

Shneiderman and Nielsen added the usefulness factors:

- **Time to learn:** How long does it take for typical members of the community to learn relevant task?
- **Speed of performance:** How long does it take to perform relevant benchmarks?
- **Rate of errors by users:** How many and what kinds of errors are made during benchmark tasks?
- **Retention over time:** Frequency of use and ease of learning help make for better user retention.
- **Subjective satisfaction:** Allow for user feedback via interviews, free-form comments and satisfaction scales.

Design options have always trade-offs:

Changes to the interface in a new version may create **consistency** problems with the previous version.

However, the new changes may **improve the interface** in other ways or introduce **new needed functionality**.

Design alternatives can be evaluated in several ways like by designers and users via mockups or high-fidelity prototypes.

Getting feedback early enough is:

- The basic tradeoff.
- Perhaps less expensively in the development process versus having a more authentic evaluated interface.

Usability Motivations:

Lots of interfaces are poorly designed; this is true across domains.

- Example 1: **Life-critical systems**: In an air traffic control, nuclear reactors, power utilities, police & fire dispatch systems, medical equipment.
  - High costs, reliability and effectiveness are expected.
  - Length training periods are acceptable despite the financial cost to provide error-free performance and avoid the low frequency but high cost errors.
  - User satisfaction is less an issue due to well-motivated users.
- Example 2: **Office, home, and entertainment applications**: Word processing, electronic mail, computer conferencing, and video game systems, educational packages, search engines, mobile device, etc.
  - Ease of learning, low error rates, and subjective satisfaction are very important.
  - Infrequent use of some applications means interfaces must be intuitive and easy to use.
  - Choosing functionality is difficult, the population has a wide range of both novice and expert users.
  - Competition cause the need for low cost.

Usability Testing:

Usability testing may put the user in a separate controlled environments and asking them to perform tasks on their own without any offered help and measure their **quantitative performance**.

The goal of usability testing:

Find errors in a particular interface(s), with a small or large number of user in a structured or unstructured style.

Not to generalize the results but improve interface of an application.

Not stating a statistical significance.

Laboratory or non-laboratory research methods are available.

Methods include:

- Observations

- Field studies
- Focus groups
- Expert reviews
- Surveys
- Interviews
- Controlled experiments

Usability and Games:

Playing games that are frustrating because of usability problems or interface faults is not acceptable.
Usability should be taken into account in all phases of game development.
User experience (UX) MUST be high in serious games.

Know the User (Player):

- Age, gender, physical and cognitive abilities, education, cultural or ethnic background, training, motivation, goals and personality.
- Design goals based on skill level:
- Novice or first-time players.
- Knowledgeable intermediate players.
- Expert players.

Collecting Information about the User!

- Collect data from target players of games, only the player knows how it should behave and the enjoyable interaction.
- NEVER from developers but from players themselves in their contexts.
- Observation.
- Metaphors.

Participatory Design

Definition: "A design approach used in user centered development, where representatives from **stakeholder**s are actively involved in the processes and procedures of the design."

In this approach the users/players and the wider public are also recognized as stakeholders and are involved into the process as well.

Controversial (debatable)

In one side, more user involvement brings:

- More accurate information about tasks.
- More opportunity for players to influence design decisions.
- A sense of participation that builds players' ego investment in successful implementation.
- Potential for increased player acceptance of final game.

On the other side, extensive player involvement may:

- Be more costly.
- Lengthen the implementation period.
- Force designers to compromise their design to satisfy incompetent (useless) participants.
- Build opposition to some game concepts.
- Players have no expertise in the game systems nor the serious topic; subject of the game?

Scenario of Use (Use Case)

- Scenarios about the daily life activities/actions.
- Describe how play in typical games.
- Provide examples of play as input to design.
- Best to be done in a walkthrough (task based) approach.
- Tools of good help:
    - Table classifying player types and their ways of interaction.
    - Table of gameplay sequences.

- May make use of **personas** (prototypical players)
  - Based on hypothetical player.
  - Ask questions: “how would Abass react if. . . ?”
  - Non-essential details help things appear real.
  - Avoid designers.
  - Don’t make it for yourself but the player.

Persona example

Prototypes

- Paper
- Wireframes and Script (PowerPoint, flash, Lucid Charts, etc.)
- Animated Prototypes, Visual Programming
- Functional Prototypes

Managing the Gamification Design Process

Based on the research, theory, and practice presented early in this book, this chapter brings together the various elements into one design process, combining the best practices to create the best possible outcome. We'll start by providing a high-level overview of the process and then looking at each step in more detail. This chapter will examine project management structure options, who should be on the design team, how the instruction goal should be developed, developing ideas for the game, prototyping those ideas, the development process, testing the game, and ultimately deploying it within an educational, corporate, or other setting. Finally, we'll discuss evaluation.

Serious Game Team

who should be on the game design team? What role does each person fill.

Class Activity: in groups, discuss who should be on the game design team? What role does each person fill.

The following team members typically are involved with a project for the gamification of learning and instruction:

(Note: not all of these individuals will be involved every time. It depends on the size and scope of the project.)

Project Manager

The project manger is responsible for coordinating the activities of the other members of the group. This is a critical role. Again, on some teams a project manager is replaced by the scrum master and a product owner is involved in the process as well. Regardless of the configuration, someone needs to lead the project and all the interconnected and dependant activities. Someone on the team must ensure that the different individuals on the team are speaking the same language and working toward the same instructional goals.

Instructional Game Designer

2 Right now there are not too many of these people in existence. More likely, you'll need to hire an instructional designer, but look for one who plays games. An instructional designer is responsible for developing the instructional framework and the pedagogy to make the learning effective within the game. This is the person who is responsible for thinking through the entire learning experience and linking instructional objectives with game play. As mentioned previously, this person is often missing from instructional game development teams. Over time, as more instructional designers gain experience creating games, more instructional game designers will exist. For now, look for someone who likes to play games.

Subject-Matter Expert

3 This is the person who knows the subject matter to be learned within the game. This person has to supply the content knowledge and information necessary for the learning to occur. However, many subject-matter experts are not familiar with games and want to present in a linear method and add all kinds of conventional "checks" just in case. Try to find a subject-matter expert who really understands games.

Artist

4 This is the person responsible for creating the look and feel of the game. Artists create the characters, the setting, and the screen interfaces. This might be more than one person, depending on the complexity of the project. Sometimes there is a lead artist and then a shader who either works on the lighting in 3D renderings or who "colors" images and maintains style of art throughout project. Sometimes there is separate concept artist, who creates the drawings up-front but is not involved later. The point is that aesthetics are important in a gamification project and an artist must be part of the team.

Programmer

5 This person is responsible for writing code that makes the game function as desired. This can be one person or may involve an entire group. More typically, it is one or two people who are creating a way to keep the score and pass it to a learning management system, and performing other types of programming tasks.

Information Technology Representative

6 When implementing game-based instruction, a representative from the information technology department must be included to ensure it will run on the organization's computer infrastructure. This person knows the technical requirements necessary to run a robust and effective game.

Representative of Learner Population

7 One often overlooked team member is someone who represents the typical learner, someone from the target population who can help to inform the team of the mindset of the learners. This person can help make suggestions and contribute ideas that will shape the gamification experience and make it more comfortable for the learners.

Music/Sound Technician

8 This person is responsible for how the game sounds, from special sounds to any music or sound effects. Sounds and music play a key role in games. Sounds can provide feedback, set the tone of an environment, and even help the learner know what to do next.

Animator

9 If the game involves a great deal of character animation, an animator is needed to create character walks, animate jumping sequences, and any other type of animation you desire within the game.

Level Designer

10 This is the person who creates the challenges and sets parameters for the game play on each level. Smaller games do not involve level designers, and typically instructional games do not have the budget for multiple, complex levels.

Serious Game Design Document

A gamification design document can help establish the foundation for development. The document is a place to collect thoughts, ideas, and approaches to creating the game. It is not meant to be an exact step-by-step roadmap.

Overview of Concept

In this section of the document provide information about your overall concept and what you are trying to accomplish. Describe the goal and intended audience, and provide a high-level overview of the game theme and what type of game you are designing.

Academic Concept Example

The concept is to create a multi-player online game for middle school students that provides engaging, relevant, and personalized learning while reinforcing educational standards in an interdisciplinary environment. Topics covered in the game are tied to the Pennsylvania academic standards in mathematics and English. The game is a time-traveling game where the learners will travel back in time and try to work out mathematical formula and craft great works of literature before they actually happen in a first-person thinker-type game. The more the player can solve before the NPCs, the more rewards will be provided.

Corporate Concept Example

The concept is to create a web-based single-player online game for pharmaceutical sales representatives that provides engaging, relevant, and personalized learning on the topic of opening and closing a conversation with a physician. Topics covered in the game are tied to our ABC engagement model. The game is set in a realistic setting, a physician's office. The game will happen from a third-person perspective and the learners will be evaluated on credibility, affability, and the ability to become an information source for the physician.

Outcome

2 What do you want to have happen as the result of the game. This is not specific, like an objective, but a general goal you have for the learners after they have played the game. Ask yourself: "If this instructional gamification project is successful, what will a learner who successfully completed it be able to do? What will be different because he or she has played the game."

Academic Outcome Example

Students will be able to correctly answer questions pertaining to English and mathematical standards and will perform well on standardized tests assessing those standards.

Corporate Outcome Example

Pharmaceutical sales representatives will properly use the ABC model to gain more time with the physician and become valuable resources to the physician.

Instructional Objectives

3 The instructional objective needs to be up-front because you are creating games for learning and instruction; be sure your objectives are front and center. Most good instructional design books tell you to place the objectives in a behavioral format to ensure measurement, but writing measurable objectives for higher-order thinking skills can be difficult for a game environment. However, it is a critical step to ensure that learners are actually learning within the context of the game. One way to address the issue is to have learners make a decision based on a higher-order skill like synthesizing information or making a prediction on the outcome of an event. Another is to include objectives for which the learner has to apply the knowledge.

If you are including any affective domain objectives within the game, this is the place to include them as well. For example, in the game for middle school students, the affective domain goal is aimed at helping kids to learn to positively respond to requests for help: The game designers will have to consider how that can be accomplished through the game story, mechanics, and reward structure.

This section should also contain information about how you plan to measure the outcomes of the objectives. The goal of an instructional game is to help the learners acquire new knowledge, so you need a method to assess whether or not new knowledge has been obtained.

Academic Instructional Objectives Example

At the end of the game, the learners will be able to:

Math

- Describe how a change in the value of one variable in a formula that utilizes linear variables affects the value of the measurement.
- Predict how a change in the value of one variable in a formula affects other variables.

English

- Analyze the ways in which a text's organizational structure supports or confounds its meaning or purpose.
- Apply knowledge of genre styles to correctly identify the genre from a one-page passage.

Affective

- Positively respond to requests for help.

Corporate Instructional Objectives Example

At the end of the game, the learners will be able to:

- Properly apply the three steps of an ABC opening.
- Properly apply the two steps of the ABC closing.
- Appropriately prepare for a call on a physician.

Affective

- Behave in a warm, friendly, professional manner toward the physician.

Description of Character or Characters

Not all games have an underlying story, so for some game designs you may not need to consider characters at all. However, in a game that does involve characters, you are going to want to give some thought to each character. You might want to consider questions such as: Are the characters customizable? Do the characters accurately reflect the diversity of our organization? What do the characters represent within the game? and How do the characters interact with the player or players?

Academic Character Description Example

The students will be able to choose a basic character type and then customize the eyes, skin, hair, and clothing in terms of color. The characters the students interact with represent diversity around the world. In the multi-player game students will interact with each other and NPCs who provide instructions and problems; students will need to partner on some tasks to achieve the desired goals.

Corporate Character Description Example

The learners will be able to customize an avatar in terms of eyes, skin, and hair and be able to select different styles of clothing. The learners will interact with six NPCs, three female and three male, each representing ethnic and personality diversity. The NPC physicians will each have different amounts of time they are able to spend with the sales representative.

Description of the Game Environment

5

This section describes the environment in which the game takes place. It provides an overview description and a listing of the key locations within the game. The artist can use this to create concept art. It also helps the team think through the type of environment that needs to be created to support the activities within the game.

Academic Game Environment Description Example

There will be four locations. The first will be the main headquarters, which will look a little like a situation room with large monitors and screens and people sitting in rows observing the monitors with smaller computer screens in front of them. There will be a transporter room to the right, which will be used for moving the students from one time period to the next. There will be three time periods in which they interact. One is the Old West in the United States in the 1800s, one is London in 1960s, and the third is in the future, 2055.

Old West—Typical Western town, two rows of buildings with a dirt road in between. Places to tie horses, dusty with a slight wind.

London 1960s . . .

Corporate Game Environment Description Example

Home office for the learner and then six different offices. Learner will walk their characters to a car that has a map on the passenger's seat. The map has images, each representing a different physician's office location. The learner will click on the map to arrive at the front door of that location. Six physician offices need to be created.

Office one: Rural small family practice. Older filing cabinets, small waiting room space with six chairs.

Office two:. . . .

Description of the Game Play

6 In this section, describe the play of the game. What happens in the game? This can be done in a series of vignettes describing first how a person enters the game, then what he or she does when in the game and what interactions he or she will have within the game. This can be a lengthy description if it is a large game. This is the description of the flow of the game outlining how the players are on-boarded into the game, how they perform actions in the game, and what the anticipated outcomes of the game are.

Academic Game Play Example

Upon typing in a pre-assigned username and password, students enter into headquarters and are met by an NPC who asks them to step over to the customizer space so they can customize the look of the avatar for time travel. The first activity will be for the students to customize their characters. Once that occurs, the students will be directed over to the mission director, who will provide the students with information about a randomly chosen mission occurring in the future, Old West, or London. The characters will be given folders, which go into their inventory, which can be viewed at any time. Next. . . .

Corporate Game Play Example

Upon entering into the learning management system and launching the game, the learner is placed into an office where customization can occur. After the learner customizes an avatar, he or she hears an audio of a phone ringing. The learner must click on the phone to answer it. At that time, the voice provides instructions on how to navigate through the game. At the end of the call, instructions are given as to the next step. When the call is over, the learner must click on the computer to view a list of physicians. Each image and name is clickable to receive more information. The learner must then prioritize the list to decide in what order to visit the physicians. Next. . . .

Reward Structure

7. Determining how to reward the player is a critical task. Do you want to create rewards (points, currency, badges) for completion of activities or for performance. Chapter Ten, written by game researcher Lucas Blair, describes the many considerations and best practices for creating reward structures within the game. Careful consideration needs to be given to ensure that the reward system does not undermine the learners' intrinsic motivation to participate within the game.

Academic Reward Structure Example

The reward structure will consist of both badges for achievements and currency that the students can spend on purchasing upgrades for their avatar characters. The idea is to use measurement achievements instead of completion achievements to increase intrinsic motivation through feedback.

Corporate Reward Structure Example

The points in this game will be based on three variables: credibility, affability, and the ability to become an information source for the physician. Each will be scored separately and then an overall score will be provided (the "engagement score"). Within the game, a focus will be on mastery of the goal. This means each learner works to master the content in the game and his or her overall score is not related to any other learner's scores. Feedback will be provided immediately with an unobtrusive pop-up accompanied by a longer explanation available after play.

Look and Feel of the Game

This section of the game design document describes the aesthetics of the game. Does the game rely on high-fidelity, photo-realistic environmental settings and characters, or are they a little more comic or cartoon-like? What color palette will be used for the game? How "clean" is the interface? What does the heads-up display (HUD) look like? Is a map of the environment available? Is there a player inventory and how is it accessed? How many things do you want to display at once to the player? These elements influence the learners' experiences with the game.

Audio considerations should also be documented in this section. Is there any music that accompanies the game? What sound effects are needed? Do NPCs talk? Do players talk to one another? Careful use of audio can enhance the game play experience. Poor audio becomes highly distracting.

Academic Look and Feel Example

A stylized approach will be used for the characters, with minimal details. The environment will be bright primary colors and provide a somewhat crowded aspect within the game. No music will be used, but students will be able to communicate with each other through voice over IP protocol if that is enabled by the school; otherwise, they can use text chats. The interface will be divided into quadrants. In the first will be the map of the immediate area. The map will be a light brown with darker circles indicating positions of key elements. Next. . . .

Corporate Look and Feel Example

The goal is to provide a realistic-looking avatar in three dimensions. The player will be able to see both the front and back of the avatar through a spinning function. The environment will contain 3D objects that are typical colors: black phone, gray computer terminal, brown briefcase. The heads-up display will contain six elements. The first is. . . .

Technical Description

9 This section describes the technical aspects of the game. Will the game require the player to download software to play or will it be entirely web-based? Does the software reside on a server or is it distributed via portable technology like a jump drive? What types of software will be required to create the game: 3D modeling software, game development software, server-side software? Any potential compatibility issues? Does the game need to interface with an LMS? These are the types of considerations that should be documented in the technical description of the document.

Academic Technical Description Example

The game will be distributed via the web and housed on a server outside of the school. The students will access the game via Internet Explorer with a plug-in specific to the game software. The graphics programs required to create the textures for the game include. . . .

Corporate Technical Description Example

This game will be developed using Caspian's ThinkingWorlds software to provide the 3D environment required. The game will be accessed via the corporate intranet and will not require any client downloads. The results need to flow into our learning management system when the player completes the game in a compatible format. Additionally, . . .

Project Timeline

10 This is the projected development schedule for the project, providing start dates, end dates, and dates for key milestones. It provides an estimate of how long each phase of the project will take. It is used for planning purposes and to allocate resources as necessary.

Development Process: ADDIE vs. Scrum

Introduction

Your boss is playing Angry Birds on her iPhone and it looks simple. It has basic graphics, an easy-to-use, intuitive interface, and she thinks, "Hey, we need to do a simple learning game." She pulls everyone together and tells them she wants to gamify the content for completing an expense report and she'd like the finished game in a few weeks. She puts you and one other person on the job. The last thing she says is "Keep it simple and uncomplicated like Angry Birds; that was a basic game probably done in somebody's garage, and look where it is today."

Your boss is wrong and you are in trouble. You don't have enough people or time to build a game like Angry Birds. What your boss doesn't know is that building even a "simple" game like Angry Birds is not a casual or haphazard undertaking.

To put it in perspective, the Angry Birds development project was a purposeful project created by a game development company with lots of experience. Rovio, a game company located in Finland, had previously published fifty-two other games and created sixteen original games. The success of Angry Birds was not a accident. The twelve-person team spent eight months carefully studying the iPhone application ecosystem and developing the game.[1]

They wanted to make sure they knew what would work and what would not work. As part of the process, they refined the game many times before it was released. It took a great deal of research, engineering, and prototyping to make it a success. It wasn't random that Angry Birds was successful.

The gamification of learning cannot be a random afterthought. It needs to be carefully planned, well designed, and undertaken with a careful balance of game, pedagogy, and simulation.[2] The design process must consider creating extrinsic reward structures that do not negate intrinsic rewards, instructional objectives, and playability.

ADDIE

ADDIE is a process model for creating instruction based on five individual and semi-discrete steps. The five steps are analysis, design, development, implementation, and evaluation. Occasionally, it will be referred to as the MADDIE model with the inclusion of project management. ADDIE is usually associated with the creation of instructor-led classroom materials or e-learning modules. It is used by many instructional design and e-learning development firms.

In the analysis phase, the type of problem to be solved by the instruction is analyzed to ensure that the problem is indeed a lack of knowledge requiring instruction and not a problem due to another issue like a poorly designed process. Analysis also takes into account the type of content to be learned, determining, for example, whether it is declarative knowledge or problem-solving knowledge. The analysis also looks at the learners to see their prerequisite skills and dispositions, as well as the technology available for the delivery of the learning solution.

Once the analysis is completed, the next step is design. In the design phase, the instructional objectives are written, typically using behaviorally measurable language (that is, "the learner will be able to identify. . . ."). The appropriate instructional strategies are selected, such as using examples and non-examples. Assessment items are created to match the behavioral objectives. One outcome of this process is typically a fairly robust design document with a content outline, details on instructional strategies, a list of embedded and summative assessment items, and storyboards. Usually, a client signs off on the design document so that the developers can begin and not have to worry about any unexpected changes.

The development stage is where the programming and creation of the instruction occurs. This involves adding any necessary links, creating interface items for the instruction, or using a preexisting template. It also involves creating and loading images and sound files that may be used to accompany the instruction. At points throughout this phase, a formative evaluation process takes place whereby the instruction is viewed by learners and stakeholders. If changes need to be made, the process might go back to the design phase or the changes incorporated directly into the development phase.

Once development is completed, the next step is implementation. This is the actually rollout of the instruction to the learners. It usually involves making sure the instruction can run on any required computer systems or that instructors using the materials understand how they are to be utilized.

Evaluation actually runs throughout the module and is divided into two types. With formative evaluation that occurs during the design and development, materials are reviewed, feedback is presented to the team, and changes are made as needed. Summative evaluation occurs at the end when an assessment is made of the utility of the instruction.

Management or project management is sometimes listed as an element of the model. This typically means that a project manger oversee a team of an instructional designer, graphic artist, programmer or developer, and a subject-matter expert who provides input on the content.

SCRUM (Agile)

A scrum is agile development methodology for working with complex, unpredictable projects using an iterative approach. Scrum is usually associated with large scale software development projects and is used by many large massively multiplayer online game development companies to update and maintain their products. Scrum is not an acronym; the word comes from the sport of Rugby, where the ball is handed from one person to another as the entire team moves down the field.

The scrum process starts when a stakeholder, a product owner or developer, is handed a vision or idea for a new product or update. The product owner represents the business or the client as the voice of the customer.

From that vision or idea, a list of requirements is created, known as a product backlog. The list of product backlog items is incomplete due to emergent requirements that will appear during the lifecycle of the project. However, rather than try to define all possible requirements in a design document up-front, as with ADDIE, the process accounts for the emergent requirements by allowing them to enter the project in one of the many iterative cycles called sprints. The product owner is responsible for the prioritization of the product backlog items. He or she decides in what order the items should be addressed based on estimates provided by the scrum team who are going to be working on the product.

To start a project, the team meets with the product owner and picks items from the backlog list and places those items on the sprint backlog list. The team only works from the sprint backlog list. The sprint can range from two to five weeks or longer but should be kept short, with one day at the beginning of the sprint for planning and one day at the end for review. The goal of each sprint is to develop finished functionality that can be reviewed by the product owner and outside stakeholders. During the sprint, no changes or modification can be made to the sprint backlog.

Often upon reviewing the results of the sprint, outside stakeholders or the product owner provide feedback and typically additional emergent requirements, which are then placed on the product backlog and reprioritized. This is the part of the process that allows for changes and modifications; in the next sprint the modifications can be made if they are of a high enough priority. The process allows for software to be developed quickly and changes to be easily incorporated into the process, which improves the quality of the final product, reducing risk and increasing return on investment. One tenet of scrum is to prioritize the product backlog and subsequent sprint backlog according to likely return on investment.

To keep the team focused during the sprints, daily meetings called scrums are planned. Daily scrums bring the entire team together and address three questions from each team member to keep the scrum short and focused. The questions are

- What have I done since the last meeting?
- What do I still need to do?
- What obstacles have I encountered?

To make sure the daily meetings run smoothly, to ensure that the scrum team is not pulled in different directions by others in the organization, and to oversee the entire project, scrum employs a scrum master.

The scrum master is not the team leader; he or she acts as a gatekeeper to make sure the scrum team works without impediment and provides guidance and mentoring throughout the process. The scrum master also helps team members think through problems that might be causing delay or issues. Progress of the entire project is tracked with a tool called a burn down chart, which visually shows how much work is left to do versus how much time remains and usually is posted in a visible place so all team members can view it. Typically, there is a burn down chart for each sprint and a burn down chart for the entire project.