Chapter 8
Gamification Strategy

Quest
Let's find out how to identify learning objectives, learner characteristics, and motivators.
Let's understand a gamification process for our classrooms.
Let's figure out how to embed principles of games in our classrooms.

8.1 Manpower Planning and Development Process

Manpower planning is one of the important functions for almost every organization. It might be more significant for teams developing specific products and services than other types of teams because the development teams usually have limited time to launch the product and service. Also, each of the team members must be an expert in each field.

8.1.1 Manpower Planning

Gamification requires experts from a variety of fields. Kapp (2012) suggests a manpower planning model for gamification. The model consists of ten groups: project manager, instructional game designer, subject matter expert, artist, music and sound technician, animator, level designer, programmer, information technology representative, and representative of learner population. The following are the roles and responsibilities of each group:

- Project manager
  - Responsible for the management of all phases of a gamification project
  - Assigns responsibilities to each member
  - Facilitates communication
  - Responsible for the quality of the final products

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- Instructional game designer
  - Provides expertise in the field of instructional systems design
  - Designs instructional systems and learning materials based on associated learning theories
- Subject matter expert
  - Provides expertise in the field related to the content
  - Provides content for gamification
- Artist
  - Develops game aesthetics
  - Aligns aesthetics to game characteristics
- Music/sound technician
  - Creates background music and sound effects, which provide gamers feedback and messages informing them of what they can/need to do
- Animator
  - Designs the mechanisms that allow game characters and other game elements to move
- Level designer
  - Designs missions and challenges for each game level
- Programmer
  - Writes codes to make games work as designed
- Information technology representative
  - Provides expertise on the technical requirements to run a game
  - Ensures new game-based learning will run on the organization's existing system and other infrastructures
- Representative of learner population
  - Provides input representing the target learner
  - Provides feedback on game effectiveness and learner comfort

Purdue University (2007) suggested a somewhat simplified manpower planning model for an educational game development team.

- Subject matter expert (SME)
  - Provides the instructional content for the game
  - Identifies the learning objectives
  - Supplies assessment metrics

- Instructional designer
  - Designs instructional strategies that achieve the objectives
- Game designer
  - Creates game elements, such as rules and rewards, at the pre-production stages
  - Provides the production team with a detailed roadmap
  - Plays the role of a writer or director in a film
- Programmer
  - Writes the programming codes to make the game function as desired
  - Programming duties vary depending on the detail programming field
- Artist
  - Produces the models, textures, user interfaces, and animations
- Technical director
  - Expertise in the art production pipeline as well as programming
  - Writes custom tools for the artists
  - Serves as technical liaison between the programmers and artists

Manpower planning suggested by Kapp (2012) and Purdue University (2007) assumes that gamification for education can be implemented in the form of software and requires hardware and network systems. So, the gamification exists in a web or mobile app game, not a board game or war game. Due to this assumption, the manpower planning of Kapp (2012) and Purdue University (2007) does not include some roles that are necessary for gamification development projects when interpreting the definition of gamification in a broad sense. If the game is a type of board game, the manpower plan should include a tool developer. Also, if the development project needs a large budget, budget and cost management should be one of the roles in the development project. If the scope of development project includes an improvement phase, performance evaluation can be included in the project as one of the roles. Table 8.1 describes roles and responsibilities for the gamification development project. A project member can be in charge of multiple roles.

8.1.2 Development Process

There are various models and processes that can be used for gamification development projects (Mora, Riera, González, & Arnedo-Moreno, 2017). The ADDIE model, one of the most representative instructional design models, can be considered to develop games for educational settings. Branson et al. (1975) created the

Table 8.1 Manpower planning for gamification development projects

Roles	Responsibilities	Notes
Project manager	Manages project scope, schedule, cost, quality, manpower planning, communication, risk management, and resource provision Communicates with clients	
Subject matter expert	Provides content Reviews final outcome	
Instructional designer	Designs instructional strategies and learning processes Determines if game dynamics and mechanics are in accord with the instructional strategies	
Story designer	Creates stories for gamification	
Game designer	Designs game dynamics and mechanics Determines if implemented games and tools are in accord with the game mechanics	
Programmer	Develops game software Integrates game software with existing systems	Mostly for game software development projects
Graphic designer	Creates 2D and 3D graphics Creates avatars, characters, and background images	
Music/sound technician	Composes background music Produces sound effects	Mostly for game software development projects
Tool developer	Develops tools for gamification in the form of board games or war games Makes printed materials, dice, game boards, and other types of tools	Limited roles in game software development projects
Quality manager	Manages the quality of the work in process and the final product Manages each test phase (alpha, beta, and pilot)	
Information technology representative	Knows existing IT systems and integrates new game software with the existing systems Solves information security issues	Mostly for game software development projects
Representative of target learner population	Participates in all development phases and suggests opinions from the user perspective	More representatives can provide more various opinions

ADDIE model, consisting of analysis, design, development, implementation, and evaluation phases, for the US Army. The model has evolved over the years. Each phase is explained as follows:

- Analysis phase: The analysis phase is a front-end analysis which includes analyzing business needs, performance, performance requirements/gaps, training/instruction needs, learner characteristics, learners' existing knowledge, learning environments, and preference of learning methods.
- Design phase: The design phase involves identifying the learning objectives, evaluation criteria, entry behaviors, and details of the learning process. An instructional designer can design an instruction based on the results of the analysis phase. The design phase provides the development phase with the detailed basis.

- Development phase: An instructional design becomes operationalized at the development phase. The development phase produces learning materials, such as instructional media and performance aids. Also, an instructional designer develops evaluation tools.
- Implementation phase: Instruction is delivered to the learners at the implementation phase. The instruction delivery method can vary depending on the characteristics of learners and learning contexts. It can be a classroom instruction, an e-learning module, or simulation software.
- Evaluation phase: An instructional designer or a design team evaluates the instruction with the goal of identifying opportunities to improve it. Trainers and instructors who delivered the instruction can participate in this phase and share their experience with those who designed or will re-design the instruction to improve the performance of the instruction and achieve its objectives.

Some gamification development projects may develop a game software to meet their clients' needs. The projects can direct more focus on the game software development process. Purdue University (2007) suggested a game development process. This process includes Pre-Production phase, Production phase, and Post-Production phase.

Game designers, subject matter experts, and instructional designers are involved in the Pre-Production phase to establish the game concepts and components and design an instruction using the game. At the Production phase, artists, programmers, and technical directors implement the game. Professional and beta testers and educational specialists assess the fun aspects and effectiveness of the game at the Post-Production phase. After the tests, the game can be deployed for the target audiences.

A gamification development process in this book integrates the ADDIE model (Branson et al., 1975) and Game Development Process of Purdue University (2007). The gamification development process consists of five phases: Gamification Target Analysis, Gamification Element Design, Development, Deployment and Implementation, and Evaluation and Improvement (see Fig. 8.1).

8.2 Gamification Target Analysis

8.2.1 Instructional Objective Identification

Instructions should have specific objectives based on instructional needs and/or performance gaps. Thus, it is necessary to understand what the instructional needs are and/or how performance meets the needs as a first step for a gamification development project.

For identifying instructional needs and/or performance gaps, instructional designers frequently use the records and data regarding the expected or planned level of performance and the actual level of performance (Morschheuser, Werder, Hamari, & Abe, 2017). In other words, they evaluate current performance trends compared to desired performance trends. The gap between the two is where they will direct their attention in their objective identification. In some situations, they measure and evaluate performance themselves to use more accurate data.

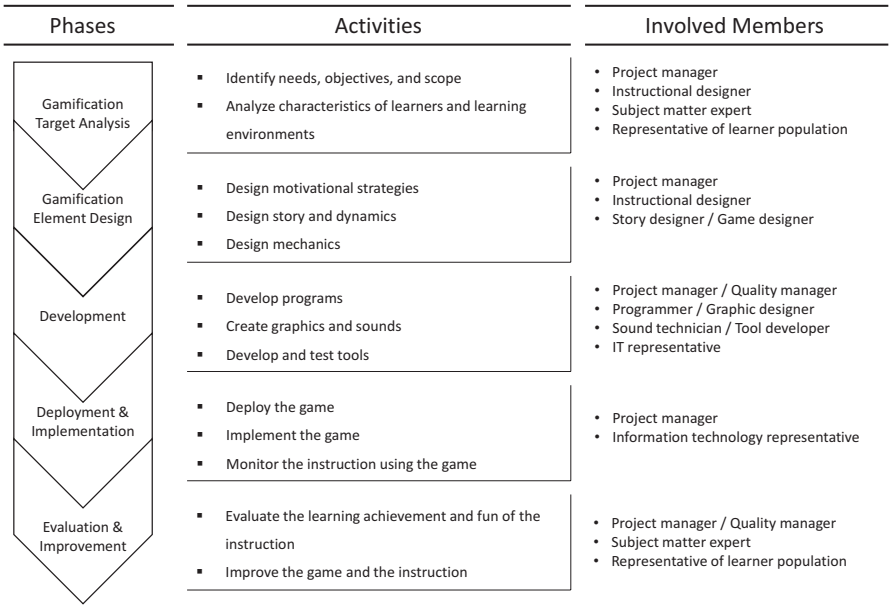

Fig. 8.1 Gamification development process

The instructional objective is a description of expected results and performance of instruction and learning. The instructional objective can be articulated based on the instructional needs and performance gap analyses. The instructional objectives should include the information on the audience, behavior, conditions, and degree. The audience describes who will learn and perform. The behavior specifies what the learners will be able to do. The behaviors in the instructional objective must be observable. The instructional objective also contains the conditions under which the learners will perform a specific task. Lastly, the degree of the behavioral mastery should be included in the instructional objective to define the expected performance level.

8.2.2 Definition of Gamification Scope

The target and scope of gamification should be defined at this step. The project members involved in this step should consider the following:

- What topics or subjects interest students the least?
- What topics or subjects are students struggling to maintain in their long-term memory?
- What can be learned more effectively by interactions with other learners?

Depending on the answers to the above questions, the scope of the gamification project can vary. Some projects may only need to focus on one item, but others may require applying the gamification to all activities in the instruction which will expand the gamification scope substantially.

8.2.3 Analysis of Learner Characteristics

Instructional designers analyze the characteristics of the learner population. They investigate the game experience and game player types. While investigating the game experience of the learners, the instructional designers can see the preferred fun perspectives of games. In the previous chapters, the studies by Apter (1991), Bartle (2003), Caillois (2001), Costello and Edmonds (2007), Csikszentmihalyi (1975), Hunicke, LeBlanc, and Zubek. (2004), Kubovy (1999), Poels, De Kort, and Ijsselsteijn (2007), Sweetser and Wyeth (2005), and Yee (2002) have described the details of and the ways to identify the preferred fun perspectives of games. Instructional designers can use those studies or the PLEX model by Korhonen, Montola, and Arrasvunori (2009). The PLEX model (Korhonen et al., 2009) consists of 20 fun perspectives of games: Captivation, Challenge, Completion, Competition, Control, Discovery, Eroticism, Exploration, Expression, Fantasy, Fellowship, Nurture, Sadism, Sensation, Simulation, Submission, Subversion, Suffering, Sympathy, and Thrill.

For identifying game player types, eight types categorized by Bartle (2005) can be used. The eight player types include Griefer, Opportunist, Networker, Scientist, Politician, Planner, Friend, and Hacker Bartle (2005). The information gained from the learner characteristic analysis can be used for designing gamification elements and story.

8.3 Gamification Element Design

8.3.1 Motivational Strategy

The motivational strategy plays an important role in learner engagement with the instruction. Instructional designers can consider the intrinsic and extrinsic motivation (Deci & Ryan, 2000; Taylor et al., 2014), Self-Determination theory (Deci & Ryan, 2008), Achievement Goal Theory (Dweck & Leggett, 1988; Elliott & Dweck, 1988), Social Learning Theory (Bandura, 1977), Situated Learning Theory (Lave, 1988), and feedback to design the motivational strategies.

For instance, if the learners have strong esteem and belonging needs, the instructional designers should embed the device to meet the esteem and belonging needs in the motivational strategy.

8.3.2 Story and Dynamics Design

Before starting to design story and dynamics for the gamification, it can be useful to review the 12 stage Hero's Journey model described by Vogler and Montez (2007) to draw the backbone of the story and dynamics. The information on the preferred fun perspectives of games and the game player types can be used for determining the structure of the story.

It is not necessary for the game and story designer to cover all of the game player types and the preferred fun perspectives of games. It is important, however, to prioritize the game player types and preferred fun perspectives of games found in the learner population.

8.3.3 Mechanics Design

The goal of mechanics design is to create a more detailed story and dynamics and to provide project members involved in the development phase with the story and dynamics in a usable format. Table 8.2 describes the elements for gamification mechanics. The game designer can use some or all of the listed elements for the game mechanics (Chang & Wei, 2016).

For the projects developing tools rather than game software, the game designer can use the principles for the game design suggested by Tinsman (2008).

- Playing Time: The players must have an appropriate period of time for the play. If they don't have enough time to play the game, they can't experience the game enough. On the contrary, if they have too much time to play the game, the learning effect will be reduced.
- Critical Decision Making Factors: It is important to clarify what critical decision making is in the game design. For example, trading real estate is critical decision making in the Monopoly game.

Table 8.2 Elements for gamification mechanics

Categories	Elements
Rewards	Points, levels, progression, badge, authority, virtual items, physical goods, severance, gifting, free items, virtual money
Reward schedules	Fixed interval reward schedules, fixed ratio reward schedules, variable interval reward schedules, variable ratio reward schedules
Avoidance	Disincentives, leaky bucket
Leader board	Macro leaderboard, micro leaderboard, indirect competition, direct competition
Status	Avatar, social graph
Quests	Content unlocking, countdown, lottery, communal discovery, scaffolding

- Documentation of Rules: The rules of the game should be easy to understand without additional explanation.
- Stakes, Risks, and Rewards: The game players can receive rewards and a feeling of satisfaction for their efforts and investment in learning and playing the game.
- Luck Versus Strategy: Embedding luck to the game can relieve the mental pressure of the player, but if luck influences the game too much, the player will lose the fun that can be gained by making strategic decisions.
- Feedback: The information on the progress and game results of each player should be shared within the game arena to keep dramatic tension.
- Catch-up Features: There should be chances to catch up by luck, magic, or making strategic decisions. If there is no chance to catch up, the player may feel bored.
- Meeting General Anticipation and Expectation: It is too risky making the structure and elements of the game strange.

A virtual economy can be constructed within the game that is based on principles of economy systems as the size of the game grows. The virtual economy often includes a barter system, gifting, or even virtual money. The game designer can consider the virtual money for the following situations (Radoff, 2011).

- Reward: Virtual money can be awarded to the game player who successfully completes specific missions and quests. Figure 8.2 illustrates a mission in

Fig. 8.2 Building a Parisian building as a mission in SimCity BuildIt (Reproduced from SimCity BuildIt, Copyright 2013 by Electronic Arts Inc)

SimCity BuildIt (Electronic Arts Inc., 2013), which is to build a Parisian building. Players who complete this mission receive rewards, such as increasing population, virtual currency, and level point.

- Salary: The game player can get paid for logging-in the game or playing the game for a specific period of time.
- Reselling: When the game player sells virtual goods through a store in the game, the player can receive virtual money. In SimCity BuildIt (Electronic Arts Inc., 2013) game, each player can resell virtual goods through Global Trade HQ and Trade Depot (see Figs. 8.3 and 8.4).

SimCity BuildIt (Electronic Arts Inc., 2013) provides game players with Global Trade HQ and Trade Depot to promote a virtual economy system, and the players can buy virtual goods they want or sell surplus goods via this system. Some players make profits by selling goods at a higher price than the purchase price. This type of economy system is designed and implemented in a way similar to the real-world system.

- Purchase: The game player can purchase virtual money for the game with real money. In SimCity BuildIt, the player can buy SimCash with real money (see Fig. 8.5).

Fig. 8.3 Global Trade HQ in SimCity BuildIt (Reproduced from SimCity BuildIt, Copyright 2013 by Electronic Arts Inc.)

Fig. 8.4 Trade Depot in SimCity BuildIt (Reproduced from SimCity BuildIt, Copyright 2013 by Electronic Arts Inc)

The virtual economy system can reflect similar problems that can occur in real-world economy systems. Radoff (2011) pointed out that kind of problems (see Table 8.3).

As a virtual economy system, virtual money will be explained later in this chapter.

TIP. An attempt by Coca Cola to apply the principles of market forces
In 1999, Coca Cola had an interesting idea which is to sell its soda at a higher price on hot days by embedding a temperature sensor to vending machine. It seemed quite reasonable in terms of an economic law, the law of demand and supply.

Unlike the anticipation of Coca Cola, customers blamed the new attempt of Coca Cola since they perceived the change as a sort of the exploitation of customers.

This is a case that price fairness perception worked. When customers determine the price propriety of a good, they consider their past experience and current conditions.

8.4 Development

This phase is to develop working games based on the design. The first step of this phase is to decide the game type: game software or a physical game. The development process can vary depending on the game type (see Fig. 8.6).

Fig. 8.5 SimCash purchase in SimCity BuildIt (Reproduced from SimCity BuildIt, Copyright 2013 by Electronic Arts Inc)

Table 8.3 Problems in virtual economy systems

Problems	Description	Solutions
Hyperinflation	Game players don't perceive the value of virtual goods and lose interest in playing the game	Reduce the virtual money supply or make players spend more money
Depression	Game players can't make money enough to purchase virtual goods. Continuous depression can make players discouraged	Increase the virtual money supply or diversify economy systems by adding new virtual goods
Inequality	Due to the structural defect of the game, economic inequality exists. If there is no chance to overcome this inequality, players will feel angry	Make various paths to take economic dominance or add alternative options to catch up with other players
Black market	Black market is an unplanned place to trade goods. It is outside the control of the game manager	Provide more various markets that can meet players' needs

If the gamification project develops game software, it is necessary to integrate the game software with the existing systems of the client in many cases. For example, the newly developed game for educating accountants in a particular state may need to be integrated into an existing learning management system of that state. In a case such as this, the information technology representative

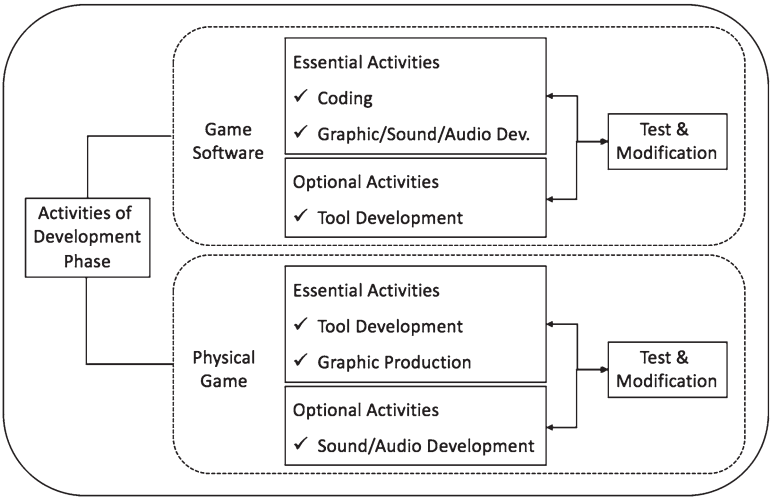

Fig. 8.6 A development process for a gamification project

at the client organization should support the development process by providing following:

- Classify accessible data
- Authorize data access
- Manage security and risks
- Provide APIs for migration and integration
- Solve problems caused by system failure

After developing a game, it is necessary to have them alpha and beta tested in order to find problems and improve the game (Fraser, 2017). In gamification development projects for education, project members can be testers for the alpha test and representatives of the learner population can be beta testers.

Tinsman (2008) suggested a test process for physical games like board games.

- Prototype development: Prepare a prototype that can support a game or a game level.
- Unit balancing: Game designers try to play the game themselves and adjust measures of characters, items, and cards (ability, money, possibility).
- Usability test: Gamers play the game and game designers observe gamers and their behaviors to find opportunities to improve the game. This is similar to beta tests.

Tinsman (2008) proposed self-diagnostic questions to be considered when checking the quality of the developed game. The questions are:

- Who is this game for?
- Does this game have the appropriate level of difficulty for the target game players?
- Are the game rules clear?
- Do the game players need to prepare anything before beginning the game?
- Can people play the game with your prototype?

- What factors make people to choose the game?
- Are there similar games?
- Is the game fun?

8.5 Deployment and Implementation

The developed game should be deployed to classrooms or other types of target educational settings. The information technology representative of the client organization should be involved in this phase to carry out the final check and make sure that there will be no problems in running the game software within the existing systems.

After the deployment, the instruction that includes the use of the game may be implemented. Instructors and learners will participate in the implementation phase. The project manager observes the instruction via video recording to review for improvement opportunities. Using a video recording can reduce the pressure that the learners may feel by having an observer present. Sometimes, the project manager participates in the instruction as a learner or observer.

8.6 Evaluation and Improvement

8.6.1 Learning Achievement and Fun

The evaluation phase is to measure, analyze, and interpret learners' behaviors and performance. Though many people think that the development project is complete after implementing the new game, the evaluation and improvement phase is important since there are chances to improve the quality of the game and the instruction that is using it (Heilbrunn, Herzig, & Schill, 2017). Also, the results from the evaluation phase can provide the project team or the client with reasonable evidence of the success of the project.

In game software development projects, the following can be measured, analyzed, and interpreted as part of the evaluation process (Duggan & Shoup, 2013).

- Number of gamers playing the game
- Number of gamers playing the game at specific date and time
- Number of gamers completed given quests
- Distribution of gained points by gamers
- Ratio of gained points by time periods
- Number and distribution of gained rewards by gamers
- Frequency of access to the game
- Rate of increase in playing time
- Number of visits

These evaluation criteria suggested by Duggan and Shoup (2013) can be a part of the analysis feature that gamification platforms provide. Instructors and facilitators can see when, how frequently, and how long learners participate in the instruction. Also, they can find out how many level goals or missions each learner completed. With the answers to the above criteria, however, it is still hard to assess learning achievements. Educators can use survey, interview, test, portfolios, demonstration, or observation for evaluating learning performance.

Measuring the fun that learners felt is simpler than measuring learning performance. Surveys using a Likert-type scale are frequently used for measuring fun. Sometimes, teachers and observers measure fun by observing learners' behaviors.

8.6.2 Improvement

The result of the instruction using gamification can be one of the four results (see Fig. 8.7).

The goal of the gamification development project is to make the instruction "fun and worth learning." If the instruction was neither fun nor worth learning (relevant to the learner), the learners will be less motivated and lose interest in the next lesson (Faghihi et al., 2017). The gamification development project team must review all the phases of the development project and decide if each activity and decisions made were appropriate. If needed, the project should be revised.

If the instruction was worth learning, but not fun, the learners cannot recognize any differences between the instruction using the gamification and traditional instruction. In this case, the project team should check the game dynamics and mechanics of the

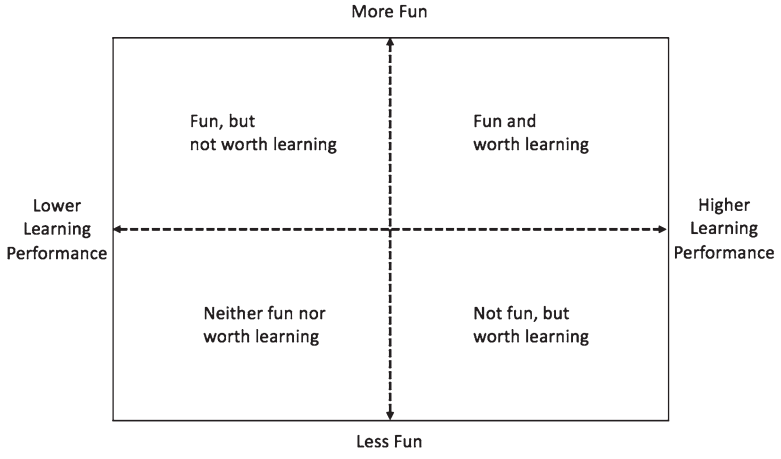

Fig. 8.7 Four results of the instruction using gamification

instruction. If the instruction was fun, but not worth learning, the instructional design embedding the game dynamics and mechanics must be reviewed. In many cases, poor integration of the instructional design and the game dynamics and mechanics can create that type of problem.

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