PTD: Player Type Design to foster Engaging and Playful Learning Experiences

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Abstract. In this paper we present a design model, *PTD (Player Type Design)*, to create engaging gaming and non-gaming experiences for attracting different types of players to learning settings. Based on Bartle's four player types, elements grounded on game design theory are introduced to design collaborative, competitive, explorative, and rewarding learning experiences. We illustrate the use of the framework on two different experiences. The main contribution of this paper is the design model "PTD", which can be used to create and also analyse engaging experiences in different contexts (gaming and non-gaming) based on different player types as known from game design theory. The model is evaluated with two different experiences: (1) a blended learning experience, (2) a mobile game with purpose.

Keywords: game-based learning, design guidelines, engagement, player types, education, computer games

1 Introduction

Designing engaging experiences, in particular in a non-gaming context is a challenging task. Strategies based on game design theory introduce ways to make this task easier. In recent years, the use of video games, game design theory, or single game elements has attracted interest as a powerful tool to make different non-gaming tasks and experiences more engaging and "fun" [11,14,18]. One form of incorporating game elements in a non-gaming context is *gamification*. Gamification strategies describe the use of game design elements, which can be used to engage users in non-gaming contexts [8]. These game design elements can be used to make different non-gaming tasks more attractive and engaging. The gamification of domains such as learning, training, fitness, business applications, or health in particular has become increasingly popular in recent years. Gamification strategies, however, are also often criticized as being used to design experiences which are not meaningful (e.g. giving points for meaningless actions, using external rewards to control behavior) [16]. One of the reasons for this issue is that many designers do not consider that not all players are engaged for the same reasons and by the same engagement elements. All players do not have the same playing behavior, the same reason for playing, nor are they attracted by the same game design elements [1,9], such as various forms of points, badges, and achievements. Bartle described in [2] four main player types (in multi-user-dungeons),

each of which is engaged by different interactions with the environment or other avatars. While different forms of achievement, such as points, badges, and awards, engage some players, others are more engaged by interacting with other users, or exploring the game environments. Also in the non-gaming context, simply adding points to reward specific actions is not engaging for every user. Some users would rather enjoy taking their time to explore the experience (e.g. website), or enjoy the experience shared with others and are engaged and rewarded by interactions of these kinds with the environment or other users. Gamification elements are used in the educational applications to increase the learners' engagement and interest in the learning content by adding game-based elements such as points, rewards, or badges. When looking closer at pedagogical theory, however, it is apparent that all learners do not learn in the same way: learners have different methods and styles of learning [10,15]. This also applies in the issue of how to integrate game elements to engage learners: for example it is not every learner in game-based or gamified scenarios who can be engaged by winning points and badges for completing assignments, or seeing leaderboards and ranking information. Competitive elements in particular can even be stressful and frustrating for some learners, while by contrast, cooperative strategies very often achieve better learning outcomes [13,23].

In this article we intend to introduce a model for designing and evaluating non-gaming experiences and add game-based elements to these strategies in order to attract and engage learners. The remainder of this paper is organized as follows: we will first take a closer look at various game-based learning design strategies and then discuss player types as they are known from game design theory. This is followed by the introduction of the Player Type Design (PTD) model and followed by investigated this model by two case studies in a learning, but also non-learning context.

2 Background

2.1 Game-based and Gamification Strategies for Designing Experiences with a Purpose

While educational games or games with a purpose are usually designed in a process similar to that in the design of traditional games, gamification is the process of integrating game elements in non-gaming environments [8]. Different frameworks and design guidelines have been provided to design educational games or educational experiences based on gamification strategies.

Zichermann and Cunningham [29] describe different game mechanics to support gamification processes. These include elements for scoring (e.g. points), illustrating progress (e.g. levels, progress bars), indicating competition and rankings (e.g. leaderboards, high scores), or badges (to allow collecting and surprise elements). Additionally, they describe the importance of designing minor activities with clear goals, such as challenges, missions, or quests and also activities supporting social engagement as well as different onboarding strategies (helping user learning of how to play the game/interact with the system). Linehan, Kirman, and Lawson [18] introduce guidelines for designing educational games. They propose 'Applied Behavioral

Analysis' as an educational framework, which can be aligned with the principles of the game design and the pedagogical strategies and goals: first, the target behavior students ought to improve is defined; second, the performance is measured; third, the performance is analyzed; fourth, feedback is presented. Following on from this the learner is located in a loop where performance is measured again or the learner is rewarded. Learning takes place in iteration cycles and learners are awarded based on these cycles. Kotini and Tzelepi [16] introduce a framework based on Kumar's player-centered design [17]. This supports the design of educational experiences based on gamification strategies and focuses on three categories of elements: behavior (elements focusing on human behaviors such as open-type problems, freedom of choice, imaginary, creating emotions, team cooperation), feedback (elements giving feedback, if possible immediate if the goals have been accomplished), and progression (progression elements give a sense of structure and advancement). Annetta [1] describes a framework for serious educational game design. The author presents six (nested) main elements for educational game design: identity (identification with the environment), immersion (feeling of presence and engagement with the content, success in achieving goals, feeling of flow), interactivity (social interactions and communication), increasing complexity (level, increasing difficulty), informed teaching (feedback and assessment), and being instructional (learning as goal).

While these frameworks use different elements, general design principles can be observed in all of these frameworks: clear goals, fast feedback, and a sense of control. These characteristics and design goals are also used by Csikszentmihalyi [5,6] in describing the experience of flow. This is a state where people are fully immersed in and concentrated on a task. This state is very typical for immersive video games. The optimal goal of different game design strategies is to achieve this state also in the non-gaming tasks (e.g. learning) to fully immerse and engage users in activities. Csikszentmihalyi describes three main elements of flow: (1) clear goals and sense of progress, (2) clear and immediate feedback, and (3) balance between skill-level and perceived challenge of the task.

Based on these observations we define three principles for successful game design and gamification in learning experiences: (I) clear goals, (II) clear feedback and reward description, and (III) interaction possibilities and freedom of choice.

2.2 Player Types

Based on observations of different aspects of player engagements in MUDs (Multi-User Dungeons), the game designer Richard Bartle [2, 3] identified four main player types. In his '*Taxonomy of Player Types'* the following types are introduced based on their interactions with the environment or other players: (1) *achievers*, who are engaged by achieving goals in the game (e.g. rising levels, getting points), (2) *explorers*, who like to discover the game and try out different things in the environment (e.g. discover treasures, explore the maps), (3) *socializers*, who are interested in interacting with others players and building relationships (e.g. joking, chatting), and (4) *killers*, who are engaged by beating others or showing their 'higher in-game status' to others (e.g. rankings, helping others as reputation booster). While these player types represent Bartle's observation of players in MUDs, these or similar types can be observed in all

sort of environments and situations, where several people interact, such as in learning situations [13,23]. Different authors have explored and discussed Bartle's player types. Yee [28] explored the four player types and found three main principles summarizing the activities and preferences of the types: (1) achievement: advancement, mechanics, competition, (2) social: socializing, relationship, teamwork, (3) immersion: discovery, role-playing, customization [9]. While different models cover a more general version of engagement, Bartle's model is one of the earliest and simplest models and well known in the game design theory [20,27].

Since Bartle's player types model is one of the best known and most widely recognized models, we have also adopted it as a basis for the player type design strategy in the context of learning experiences.

3 Player Types Design (PTD)

People are engaged by different elements. Bartle's taxonomy of player types [2, 3] helps us to identify game design elements suitable for different types of players. However, this taxonomy was originally designed especially for MUDs (multi-user-dungeons) and hence needs to be used with care. Using the different player types as design strategy gives designers the possibility to include different forms of engagements in an experience, in the context of this paper in a learning experience. In the following, we propose *Player Type Design (PTD)*, a design strategy based on the four player types. PTD incorporated the four player types and engagement elements, which the different player types might be likely to enjoy. Additionally, various typical game elements inspired by gamification literature are identified, which can help attracting and engaging different player types.

3.1 Engagement Activities and Elements

We identify four broader categories of engaging activities and design elements based on the four player types and their interactions with the environment or other users (see Fig. 1). When designing activities in non-gaming context, such as in learning settings, designers should think of specific tasks and engagement elements in the form of verbs. More specifically, designers can think of tasks in line with the following action verbs:

A: Achieving, Gaining, and Producing. To please the player type *achiever*, it is essential to design elements, which suggest the user/learner that something has been achieved. Typical game elements here include elements suggesting performance (points, progress bars, levels, etc.) or special visible rewards (badges, achievements). Achievers need clear goals and objectives to be completed, and also feedback on their current progress towards this goal.

E: Exploring, Researching, and Testing. The main goal for *explorers* is a depth exploratory experience featuring lots of freedom through discovery, experimentation, finding secrets, and surprise elements. Furthermore it is important to reward this

behavior in a visible way. The real reward here is the possibility provided for interacting in an explorative way with the environment.

S: Socializing, Collaborating, and Joining. Interactions with other users, collaborations, discussions, and building relationships and friendships are the most important reward factors for *socializers*. Sharing information, completing tasks together, or working together towards a goal are activities to attract and engage them.

K: Competing, Challenging, and Bragging. The gamer type *killer* seeks ways to compete with others. Typical elements supporting this group of users are special rewards, leadership information, or rankings. However, the activities are not only limited to obvious competitions. Killers can also be engaged by activities, which might be helpful, such as sharing information or gift, just to make others aware of their higher status or simply bragging (demonstration of superiority over fellows). The personal reputation and the recognition of skills and levels are important to this gamer type.

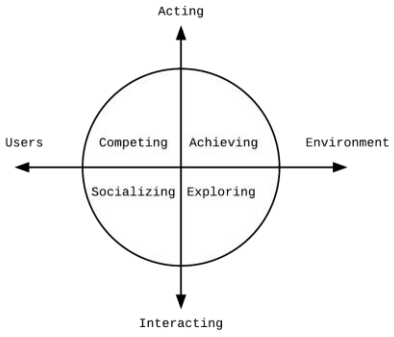

Fig. 1. Engagement activities and elements based on Bartle's player types.

3.2 Design Goals

As outlined in section 2.1, we can define three main design principles to create an engaging playful experience, which can even create a flow experience: (I) clear goals, (II) informative and immediate feedbacks such as reward descriptions, and (III) possibilities to interact with the environments and other users and giving a freedom of choice.

Based on the type of feedback and interaction possibilities different player types can be engaged. This framework should help to design and analyze learning activities and engagement elements in learning platforms to understand what types of players are already motivated by the platform.

The core of the framework is built by engagement elements. An engagement element is an interaction with the system (e.g. finishing an assignment to get points) or an element provided by the system to engage (e.g. leaderboard).

Every engagement element should have a clear goal, an optional reward, and some extend of freedom. For the design of every engagement element the goal and the rewards should be clearly described. Additionally, different design strategies/elements should give players a sense of control and of their interaction possibilities. Since not every player type is attracted by every engagement element, some elements should be identified and designed as optional element (e.g. only showing ranking information on request instead of making it a part of the main site).

3.3 How to use it

Table 1 illustrates a design framework for PTD. Game-based activities are listed and mapped to the engaged player type. A clear goal and feedback description should be added for each engagement element. Freedom refers to other choices as part of this engagement element. Additionally, the designer can indicate if an activity is optional.

An important point to mention is that Bartle's player types were originally described only for MUDs (Multi-User Dungeons). This framework adopts the player types in non-gaming contexts. It thus merely provides design inspirations on how to attract and engage different kind of users (in the specific context learners), but it is definitely not a complete and definitive guideline. PTD provides designers with a new method for designing game-based and gamified experiences that will engage different users. It can be also used to evaluate existing systems.

Table 1. PTD design framework: engagement elements are mapped to player types; goal, rewards and the possibility of freedom and interactions are described for each activity; additionally activities, which are optional, are marked

Engagement Elements	A	E	S	K	Goal Description	Feedback / Reward	Freedom / Interaction	O
1. ..								
2. ..								
…								
…								

The following sections describe and discuss two case studies as a means of evaluating applicability in learning settings.

4 Case Studies and Discussion

4.1 Case 1: Designing a playful blended learning environment

Motivational Active Learning (MAL) is a pedagogical model designed as a hybrid of the interactive learning model TEAL (Technology-Enabled Active Learning) and gamification strategies [23, 24]. TEAL uses mainly interactive engagement strategies

including constant interactions with the students, collaborative assignments, and hands-on experiences (e.g. hands-on physics experiments). To make it more engaging for students, we combined this approach with game elements. The following main features of MAL were introduced:

- Small learning units (typically lectures are split in several activities in, before and after class, and the current learning progress of the students is steadily assessed), alternative task can be chosen
- Collaborative learning (many assignments, such as calculation problems, research activities, or discussions are designed as collaborative activities)
- Constant interactions (between the theoretical learning units given by the teacher, students' are asked to complete assignments, discuss the content with peers, or have some other form of interaction with the learning content as well as with other students or the instructor)
- Immediate feedback (for many interactions students receive immediate feedback on their performance through the lecturer, or the e-learning systems)
- Motivational feedback (the feedback is also enhanced by different forms of engaging feedback types such as points, ranking information, or badges; these feedback types are also designed to engage different player types)
- Flexible and adaptive class design (through the constant assessment in form of interactions between the small learning units, the current learning progress of the students can be assessed through the e-learning system)
- Errors are allowed (students can repeat assignments, quizzes, or other interaction types to improve, gain more points, step up in the ranking)

Table 2. Examples of PTD framework for MAL

Engaging Elements	**A**	**E**	**S**	**K**	**Goal Description**	**Feedback / Reward**	**Freedom**	**O**
1. Small learning tasks in e-learning system	X				Complete learning unit	Feedback in form of progress-bar	Different/alternative task can be chosen	
2. Finishing research assignments in groups		X	X		Find answers to specific questions in a team	Get to know solutions from other groups and discuss different aspects	The extend of collaboration can differ	

3. Answering concept questions about learning progress with visible feedback and overall in-class statistics	X			X	Answer a question	Get feedback and see statistics what the rest of the class answered		
4. Work on clearly defined assignments	X			X	Finish an assignment;	Points, Leaderboard for points		
5. Working on clearly structured and defined assignment series	X			X	Finish an assignment series	Badge	Due to bonus assignments this activity is voluntary and the series can be chosen	**X**
6. Points are used for leaderboard information	X			X	Points influence the in-class ranking	Good ranking	The leaderboard is hidden on a subpage and must not be looked at; students can constantly improve assignments to get more points to enhance the ranking	**X**

4.2 Case 2: Designing an engaging mobile application

In a second project we developed a playful and educational mobile app with the goal of engaging and motivating the user to walk and run more and learn about concepts of the city environment. The main idea was to develop an android application or game, which rewards the users for every active "own" movement. As current implementations of location aware games (e.g. Ingress, Resources, etc.) very often do not take into account the mode of transportation was used and also travelling e.g. by car is a legitimate action when playing the game and we needed to find a way to prevent this. Another common problem with current games is the fact that it sometimes suffices to stay still on one point to achieve certain game goals. These applications are focused on being games, without the addition of extrinsic motivation for getting people to be more fit and more on the move. We wanted to make movement the core element of our application. We tried to achieve this with carefully chosen game elements and making use of the smartphone sensors data (e.g. activity recognition with the help of the acceleration sensor). When designing the game we did not initially think of a story or the whole game it would be when complete. Instead of this our approach was to start designing the game with our focus on the player types. On the one hand we wanted to reach as many users as possible with this approach. On the other hand we did not want to be constrained in the possibilities by the rigidity of an initial fixed concept about what the completed game would need to be. Instead we approached the problem bottom up by adding game elements targeted to the player types, the limitations and possibilities of smartphones and the broadgoal of achieving fitter users. Not until when this task was completed did we plan further on what to implement to make this a single unified

application that would add up to a game, instead of a collection of random game elements that do not fit together.

In the resulting game the players are separated into two opposing teams and the world is the playground. We separated the globe into trapezoids serving as areas, which can either be conquered for the own team or taken from the opposing team. Furthermore these areas can be leveled and thereby strengthened against being taken by going to the area more often. Furthermore those trapezoids are hidden for each individual player from the beginning. The players need to go to these areas to reveal what is happening there. We took this element from strategy video games where this "fog of war" is a very common. As the players use this core element of the areas, which is solely done by moving, points are earned and energy acquired. As in many games these points are an instant indicator of progress and lead to a level-up of the players. Energy is a consumable resource and as such leads to more possibilities in the game. Currently three options are available how to use this energy: *Plant a bacteria on an enemy area, Cure a bacteria on an friendly area, Reveal an area (which potentially may not be reachable e.g. restricted property).* Those areas affected by bacteria will spread to neighborhood areas every 4 hours and as a result downgrade the area by one level or make it neutral ground again. This serves two purposes: on the one hand players are given another challenge; on the other hand this behavior should balance the problem of non-equal team sizes. Furthermore, we implemented elements, which are expected in nearly every multiplayer game. The game contains badges, a leaderboard to compare with other individual players, and a team rating. It also includes a world log which shows some of the actions of other players and in which area the actions happened. Independent from the game, the application also contains most of the functionality of classic sports tracking applications such as current speed, the distance run during the current session, duration of the current session, or average speed. It also implements a variety of statistics of past sessions to help the users keep track of their fitness development. Those statistics and the feedback of the current performance could also be interpreted as gamification elements targeted at achievers.

Fig 2 shows the elements we introduced in the game correlated with the player types we tried to address with the specific elements

Fig. 2. Screenshots of the fitness app "Sportinate" (a) Fog of war, (b) Item: reveal areas, (c) Item: destroy enemy elements and statistics, (d) team ranking and player ranking.

Table 3. Examples of PTD framework for Sportinate.

Engaging Elements	A	E	S	K	Goal Description	Feedback / Reward	Freedom	O
1. Discovering areas	X				Player should discover new areas	Area gets marked as discovered	Area can be chosen	
2. Uncovering fog of war		X			Area is uncovered and the fog disappears	Area is visible and usable now also from distance	Area can be chosen	

3. Infecting areas with bacteria				X	Area levels can be changed	Area loses enemy-levels	Area can be chose, activity is on choice	**X**
4. Seeing other player activities in World Log			X	X	See interactions with others early to help or intervene	Interactions with others	Player can decide to interact with the others	**X**
5. Getting a badge when completing specific challenges	X	X		X	Finish specific tasks	Badge		**X**
6. Seeing leaderboard information	X			X	Points influence the personal ranking	Good ranking		**X**
7. Seeing team scoring information	X		X	X	Points influence the group ranking	Good ranking, "better than others"		

5 Conclusions and Future Work

In this article we have proposed PTD (player type design), a design strategy to design experiences and activities in gaming, but also a in non-gaming context, such as educational environments to engage different player styles. As a means of making design activities aimed at different player types easier we presented each of the four following activity descriptions for each player type: (1) Achievers: Achieving, Gaining, and Producing, (2) Explorers: Exploring, Researching, and Testing, (3) Socializers: Socializing, Collaborating, and Joining, and (4) Killers: Competing, Challenging, and Bragging.

The crucial issues in the creation of an engaging experience are to design clear goals, think of direct or indirect rewards, and leave players (users or learners) interaction possibilities and freedom to interact with the system. This strategy cannot only be used to design new experiences, but also to evaluate existing experiences. The first usage of the design strategy reveals that the model is helpful in analyzing and designing applications and pedagogical models with a specific focus on different engagement types. As a follow-up project we are planning a user study to evaluate the effectiveness of the model as design tool with stakeholders in the context of learning applications.

References

1. Annetta, L. A.: The "I's" Have It: A Framework for Serious Educational Game Design. In *Review of General Psychology*, 14 (2), 105-112 (2010)
2. Bartle, R.: Hearts, clubs, diamonds, spades: Players who suit MUDs.*Journal of MUD research*, *1*(1), 19 (1996)
3. Bartle, R.: *Designing virtual worlds*. New Riders (2004)

4. Canossa, A., Drachen, A.: Patterns of play: Play-personas in user-centred game development. In *Breaking New Ground: Innovation in Games, Play, Practice and Theory: Proceedings of the 2009 DiGRA Conference, London, Brunel University,* p. 11 (2009)
5. Csikszentmihalyi, M.: *Beyond boredom and anxiety: Experiencing flow in work and play*. San Fransisco, CA: Jossey-Bass (1975)
6. Csikiszentmihalyi, M.: *Flow: the psychology of optimal experience.* New York, NY: Harper & Row (1990)
7. De-Marcos, L., Domínguez, A., Saenz-de-Navarrete, J., Pagés, C.: An empirical study comparing gamification and social networking on e-learning. *Computers & Education*, *75*, 82-91 (2014)
8. Deterding, S., Dixon, D., Khaled, R., Nacke, L.: From game design elements to gamefulness: defining gamification. In *Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments* (pp. 9-15). ACM (2011)
9. Dixon, D.: Player types and gamification. In *Proceedings of the CHI 2011 Workshop on Gamification* (2011)
10. Felder, R. M., Silverman, L. K.: Learning and teaching styles in engineering education. *Engineering education*, *78*(7), 674-681 (1988)
11. Gee, J.P.: *What Video Games Have to Teach Us About Learning and Literacy*. New York, NY: Palgrave Macmillan (2007)
12. Hanus, M. D., Fox, J.: Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, *80*, 152-161 (2015)
13. Johnson, R.T., Johnson, D. W., Stanne, M. B.: Comparison Of Computer-Assisted Cooperative, Competitive, And Individualistic Learning. In American Education Research Journal, Vol. 23, No 3. 382-392 (1986)
14. Kapp, K. M.: *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons (2012)
15. Kolb, D. A.: *Learning styles inventory*. Boston (1976)
16. Kotini, I., Tzelepi, S.: A gamification-based framework for developing learning activities of computational thinking. In *Gamification in Education and Business* (pp. 219-252). Springer International Publishing (2015)
17. Kumar, J.: Gamification at work: Designing engaging business software. In *International Conference of Design, User Experience, and Usability*(pp. 528-537). Springer Berlin Heidelberg (2013)
18. Linehan, C., Kirman, B., Lawson, S., Chan, G.: Practical, appropriate, empirically-validated guidelines for designing educational games. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1979-1988). (2011)
19. Nah, F. F. H., Zeng, Q., Telaprolu, V. R., Ayyappa, A. P., Eschenbrenner, B.: Gamification of education: a review of literature. In *International Conference on HCI in Business* (pp. 401-409). Springer International Publishing (2014)
20. Pirker, J., Gütl, C.: Educational gamified science simulations. In *Gamification in Education and Business* (pp. 253-275). Springer International Publishing (2015)
21. Pirker, J., Gütl, C., Belcher, J. W., Bailey, P. H.: Design and evaluation of a learner-centric immersive virtual learning environment for physics education. In *Human factors in computing and informatics* (pp. 551-561). Springer Berlin Heidelberg (2013)
22. Pirker, J., Gütl, C., Weiner, P., Garcia-Barrios, V. M., Tomintz, M.: Location-based Mobile Application Creator creating educational mobile scavenger hunts. In *Interactive Mobile Communication Technologies and Learning (IMCL), 2014 International Conference on* (pp. 160-164). IEEE (2014)
23. Pirker, J., Riffnaller-Schiefer, M., Gütl, C.: Motivational active learning: Engaging university students in computer science education. In *Proceedings of the 2014 conference on Innovation & technology in computer science education* (pp. 297-302). ACM (2014)

24. Pirker, J., Riffnaller-Schiefer, M., Tomes, L. M., Gütl, C.: Motivational Active Learning in Blended and Virtual Learning Scenarios: Engaging Students in Digital Learning. *Handbook of Research on Engaging Digital Natives in Higher Education Settings*, 416 (2016)
25. Pürcher, P., Höfler, M., Pirker, J., Tomes, L., Ischebeck, A., Gütl, C.: Individual versus collaborative learning in a virtual world (2016)
26. Schell, J.: *The Art of Game Design: A book of lenses*. CRC Press (2014)
27. Stewart, B.: Personality and play styles: A unified model. *Gamasutra http://www.gamasutra.com/view/feature/6474/personality_and_play_styles_a_.php, September*, *1* (2011)
28. Yee, N.: Motivations of Play in MMORPGs. *In Proc. DiGRA* (2005)
29. Zichermann, G., Cunningham, C.: Gamification by design: Implementing game mechanics in web and mobile apps. O'Reilly Media, Inc. (2011)