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Experimenting on how to create a sustainable gamified learning design that supports adult students when learning through designing learning games

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Abstract: This paper presents and discusses the first iteration of a design-based research experiment focusing on how to create an overall gamified learning design (big Game) facilitating the learning process for adult students by letting them be their own learning designers through designing their own digital learning games (small games) in cross-disciplinary subject matters. The experiment has focused on creating a game-based learning design that enables the students to implement the learning goals into their games, and on making the game design process motivating and engaging. Another focus of the study has been to create a sustainable learning design that supports the learning game design process and gives teachers the ability to evaluate whether the students have been successful in learning their subject matter through this learning game design process. The findings are that this initial experiment with the learning design comes part of the way toward making the experience engaging and facilitating learning, but there is room for improvement and suggestions for tweaking the big Game — the gamified learning design.

Keywords: Learning game design, gamifying education in upper-secondary class, game design models, students as learning designers, design process, co-design.

1. Introduction

The potential of learning games in education as a means for learning has been supported in many studies (Gee 2007; Barab, Gresalfi and Ingram-Goble 2010; Tobias and Fletcher 2011). James Paul Gee (2005) advocates building principles of learning into good games to empower learners, teach them problem solving and enable understanding of the subject matter. Many learning games has designed game-worlds that help learners identify with the non-human actor's roles in the game and engage in story lines that change by means of their individual choices in the game. Identifying with roles and choosing their own learning trajectories can provide a deeper learning process. If the games are properly designed, they might be able to provide the problems, tools, experiences, perspectives and consequences that ensure that the learners/players develop rich content understanding (Barab, Gresalfi and Ingram-Goble 2010). In this experiment, the students build their own learning games. The goal is to enable a deeper and more conscious learning process by letting them build learning games for fellow-students. The hypotheses is that this will demand that the students become very familiar with the curriculum they teach through the games.

Today young people are choosing how and what they want to learn, and what is essential to them is that the task in front of them is meaningful. A task has to seem worth the investment of time and energy (Illeris 2007; Tanggaard 2013). The student's motivation to learn helps establish interest in the subject matter and is therefore an important contributing factor to the learning process (Illeris 2007; Koster 2005). The question is how to spark the student's motivation, helping them to find meaning and reach the learning goals in the curriculum at the same time. Research shows that students "do not want learning made easy, they want it to mean something. They want to feel something, to be moved by what they learn; they want to connect deeply with things that matter to the world and matter to them; and they want the chance to make a difference" (Willms, Friesen and Milton 2009,p.5). This may demand that the teachers are creative when making learning designs. It may also demand that the teachers are willing to do more than "teach to the test", since doing so can make teachers less creative and less likely to teach something that the test does not measure (Tanggaard 2013). This said it should still be considered that the students would always learn most when being familiar with the learning goals of the current lesson (Hattie 2012).

Within a gamified process, this project experiments with letting the students make games for learning and aims at embedding the learning goals in the games. The aim is not only to work with the creative game design processes, but also, in a dedicated way, to scaffold and evaluate the learning process for the student game designers. The purpose is also to facilitate the learning process for the other players/fellow-students who will later play the games. Some schools have already been working with "gamifying" (Deterding 2011) the curriculum for different age groups and in different lengths of time.

For example, Quest to Learn, a public school in New York, has a pedagogical strategy aiming at translating the learning experience by using the underlying form of games (Salen 2011). This paper examines how the learning design can be “gamified” for making the learning experience motivating and engaging as a variation from more traditional teaching approaches.

2. Case

The case organization VUC Storstrøm, an adult learning centre in Denmark, is applying the Global Classroom (GC) concept — a hybrid synchronous virtual and campus-based videoconference concept — to an upper-secondary general education program, a full-time education lasting two years. The aim of this flexible class, breaking down the walls of the classroom, is to offer a learning environment that responds to the need of the young adult learners (20–30 years old) to complete an education while fitting it into family and working life. Though the teachers can ask the students to attend in person on specific days, generally the teachers prepare their daily learning design without knowing how many students will be in class and how many will be attending online. The previous part of the research-project has experimented with continuous competence development. This competence development practice aimed at enabling the teacher-team to reflect, innovate and create new solutions for the constantly occurring IT-pedagogical issues on a theoretical and practical level. This should happen in a way that empowers, engages and motivates the teachers in their daily working life (Weitze 2014b&c). Since the students are the end-users, it is now the aim to focus on experimenting and examining how to create innovative and motivational learning for the students (Hutters et al. 2013).

The teachers in GC strive to create a motivating learning environment for the students. The course group at VUC is diverse — students have different academic levels and different reasons for being in adult education, as well as different ages, life situations and experiences. Recent reports found that the adult students enjoy activities with playful elements, and that this engages and motivates the students (EVA 2014). Though the current experiment has been designed for GC (this hybrid synchronous class) the first workshop takes place solely on campus, and the second and third workshops are designed for the hybrid environment. This is new research regarding the combination of the target group, the setting and the gamified learning game design.

3. Research objective and methodology

This study is experimenting with creating innovative and engaging learning designs for the students. The research is conducted as a combined Design-Based Research (DBR) and Action Research (AR) study, using the best and most meaningful approaches from both (Majgaard, Misfeldt and Nielsen 2011, Susman and Evered 1978). After the diagnosing and action-planning phases (Weitze and Ørngaard 2014a), the research has proceeded to steps four and five in AR: taking action and evaluating (Susman and Evered 1978). Qualitative methods are used to investigate how the DBR learning game design experiments are answering the research question. The data (Table 1) includes field notes, audio- and videotaped utterances and observations from the described workshops, informal meetings, documents written by the students, questionnaires, playtest assessments from the students, and the students' videos of the playtest of the games. The analysis is made from the coding of the data in the qualitative research software NVivo, carried out as concept-driven (using concepts from the theory and previous empirical data to find themes in the data), as well as data-driven coding (reading the data and searching for new phenomena which are not known from previous preconceptions of the subject) (Kvale 2009). The questions for the research process become: 1) Which elements, practices and processes are essential when creating sustainable, innovative and motivating learning designs for teachers and adult students? 2) How does the learning design contribute to enable a motivating learning process?

Table 1: Material from the research process – Spring 2014

1) Observations of teaching in Global Classroom
2) Questionnaire surveys of students and teachers from Global Classroom
3) Four meetings: continuous interviews with teacher team, briefing and debriefing
4) Three four-hour learning game design workshops with students
5) Material from student workshops, game concepts, playtest videos, game-homepage, playtest questionnaires and learning-design documentation

3.1 Research design

In the spring of 2014, three teachers and 17 students from GC participated in an experiment on designing learning games that implemented specific subjects (History, Religion and Social Studies). The goal was to facilitate a motivating learning experience by making the whole learning design into a game. The research was initiated by an earlier game experiment in the IT-pedagogical Think Tank for teachers in GC (Weitze 2014b&c), where a teacher team experimented with creating a DNA learning game for GC students.

The learning game design process was embedded in an overall class game (referred to as the big Game in the following). Gamifying the learning process has been done before; for example, Lee Sheldon describes it in his book, *The Multiplayer Classroom: Designing Coursework as a Game* (2011). It is also taking place at the previously-mentioned Quest to Learn school (Salen 2011). In the current experiment the overall game continued over the course of three four-hour-long workshops. Though this was a long time to spend on an experiment, curriculum-wise, for the upper-secondary students, it is very little time when both teachers and students are novices in game-design. The time was granted by combining the lessons from History, Religion and Social Studies. The aim of gamifying the overall learning design concept is to make it a motivating and engaging learning experience for the students. The purpose of leading the students through the game-levels was also to be able to scaffold and strictly guide the novices through the learning design. This gamified learning design should facilitate a deep learning process within the subject matters during the creation of the learning games. The experiment is the first iteration of a sustainable gamified learning design. The learning design should also be able to support teachers who are unfamiliar with using the creation of learning games as a new kind of vehicle for learning subject matters in upper-secondary classes.

4. Theoretical and grounded analysis of the empirical data

4.1 The big Game and the little game

James Paul Gee, literary and learning game theorist, talks about the little “g” game and the big “G” Game. These terms are used to distinguish between what happens inside the software game and “outside” — in all the interactions between the players/learners as they discuss and negotiate the meanings in the game, while learning during the process (Gee 2011). The gamification of the learning game design process is a way to structure and qualify the big Game around the students’ creation of the little game. The aim of the learning project is thus that the students will be discussing, negotiating and finally mastering the intended learning goals while building and implementing these learning goals into the little game. In other words: the student-game-designers are *learning inside the big Game while the designing the little game*. Their fellow students should afterwards learn from playing the games and thus gain knowledge, skills and competence while playing. This is an ambitious goal, since a good learning-game-play is difficult to achieve even for trained learning game designers and instructors (Flanagan et al, 2010). Since it might become difficult for the students to build good learning games, the focus of the overall learning design is on the learning that happens in the big Game.

4.2 The Smiley Model as frame

To ensure that the learning was embedded in the learning games, the *Smiley Model* (Figure 1), a learning game design model for building engaging learning games (Weitze and Ørngreen 2012), was used to scaffold the learning game design process. This inspired the gamification of the overall learning design in the big Game and structured the learning design in a way that both ensured that learning from the curriculum was implemented in the little game in a qualified way and helped the students with guidelines on how to make a motivating game. The description, discussion and lessons learned regarding the students’ success in implementing learning into the little game in this experiment is explained in another article (Weitze 2014d).

The Smiley Model addresses how to design the learning and how to implement the learning elements into the game while at the same time considering how to make the game motivating and engaging. The Smiley Model uses the Hiim and Hippes (1997) learning design framework for the learning design (Figure 1) (Weitze and Ørngreen 2012). In the Smiley Model, the six game elements you can use when you want to “set the learning design into play” are: 1) goals, 2) action space, 3) rules, 4) choices, 5) challenges, and 5) feedback. All the game elements are intertwined.

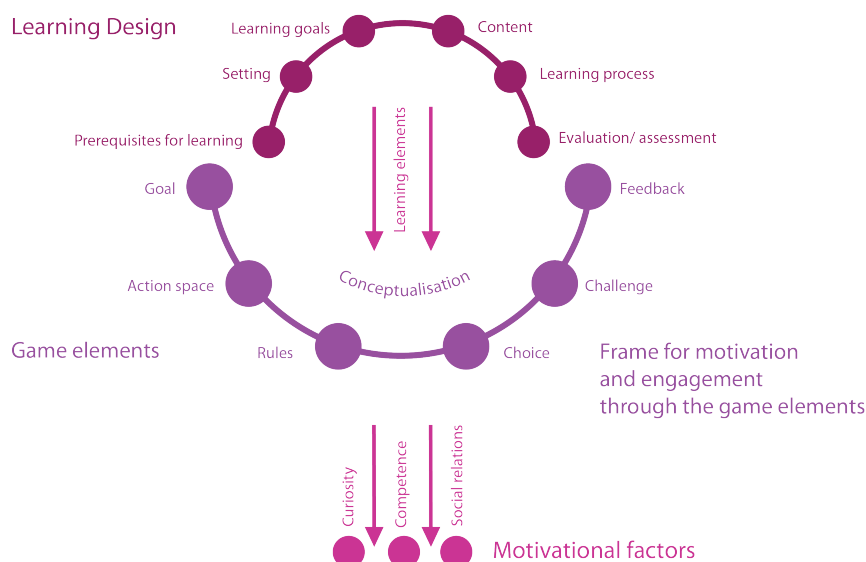


Figure 1: The Smiley Model (Weitze and Ørngreen 2012)

4.3 Plan for the workshops

Three workshops of four hours each were divided into three themes: 1) Concept development of the learning games, 2) Introduction and experiments with the digital game design software, and 3) Building the learning games on the digital platform. This was an ambitious plan and did not turn out exactly as planned, but the article describes the lessons learned.

4.4 Structure of the big Game

Since the art of game design is complicated, the whole learning design was gamified as a big Game. This was, as mentioned, a way to structure and scaffold the learning design, making it easier for the students (and the teachers) to follow, as well as making it a fun and engaging experience for the students in the target group.

In the beginning of the first workshop, the teachers introduced the learning goals to the students. Afterward, the students were briefly introduced to small, meaningful game concepts (e.g. The Oregon trail, Fitter Critter, Free Rice, Carmen Santiago, Darfur is Dying, Hush and September 12th) to give ideas and set the stage for the learning game. The concept of gamifying the workshops as a big Game was also introduced, using examples from Lee Sheldon's *Multiplayer Classroom* (Sheldon 2012), as well as an example from Rochester Institute of Technology's *Just Press Play* (<https://play.rit.edu>), which adds a game layer to the undergraduates' daily life by gamifying real-life experiences.

Table 2 (below) briefly shows the 23 levels in the big Game. Each level was further deepened with 3–15 questions that the students could choose to answer. Some answers were mandatory if they wanted to progress in the game.

Table 2: The 23 levels in the big Game, a brief overview

Level in the big Game	Assignments on the current level
Level 1:	Your Team (4 min) – name it, choose point master and project master
Level 2:	Learning in the games (10 min)
Level 3:	Ideas for games (45 min). Brainstorm.
Level 4:	Learning objectives in the team's game. What are they?
Level 5:	Assessment in the team's game – How?
Level 6:	Build paper prototype that can be played by another team (20 min)
Level 7:	Playtest of games with another team (20 min) and video documentation.
Level 8:	Global Classroom teamwork – contracts. Arrangements about participating from different locations and what tools to use (Google docs, breakout rooms, Screencasting Teamviewer, etc.)

Level 9:	Try software: GameSalad!! Use instructional videos on homepage.
Level 10:	Preparation before next workshop. Make a list of your tasks and agree how to allocate the tasks. Maybe it will make sense to assign each other "roles", e.g. project master (coordinator), code-master, learning master, image/graphic master, handyman/woman. The idea is to continually help each other in the team.
Level 11:	Summary: Read the tasks at the next levels and make decisions for your game concept. Time to concretise. Game design: make a concept map of your game design "learning elements"; Talk about how you might manage to code your game, or part of your game, into GameSalad (5 min). Describe your game concept: ½ A4 page.
Level 12:	Throughout all levels, all the time: Playtesting / discussion: Every time you've moved on in your game, discuss or playtest with one of the other teams – it provides points every time. Remember to document all play tests. (Write these points into each level where you test the game.)
Level 13:	Game design: Game-mechanics - what your characters may do in the game Start with this right now! Then start to code!
Level 14:	Implementation of learning in the game (teacher involvement): Does the game still have the same learning goals, and can they be evaluated in the (little) game?
Level 15:	Game goals, action scene, narrative and "actors" in the game – check the game elements from the Smiley Model
Level 16:	Rules, challenges, choices and feedback in the game; write down the details.
Level 17:	More game design tasks: Make a list of the things that must happen in the game and what you need to do when you start coding. Make the list in as small units as possible, so it's easy to get an overview of each task. Think about what some of the tasks could look like.
Level 18:	Now actually design the "learning elements": the small things /tasks /challenges /quests the player must learn and be able to do in the game start to draw them so they are very specific and you can explain them to each other.
Level 19:	Screenplay and storyboard: Draw a mind-map describing scenes; create storyboard.
Level 20:	Pictures/Graphics: Create backgrounds, actors, etc.
Level 21:	Motivation and engagement in the game: measuring the player's sense of curiosity, competence and community/competition.
Level 22:	The coding of the game, has been going on since level 9, and should be going into the final stages here.
Level 23:	Finish the game and celebrate!

The levels in the big Game were designed progressively. The assignments or quests in the big Game were inspired by the Smiley Model that was used as a theoretical learning game frame (Weitze 2012). The levels also encompassed project management assignments, point master assignments, playtest assignments and cooperation assignments. As the second and third workshops took place in the hybrid synchronous GC setting, some of the tasks focused on how to coordinate the team work, since some of the students on the team chose to participate from home via videoconference.

The iterative working process in the game development phases was inspired by the *iterative interaction design model* (Sharp, Roger and Preece 2011) as well as working methods from *design thinking* (<http://dschool.stanford.edu/redesigningtheater/the-design-thinking-process/>) originally introduced by David Kelly from www.ideo.com.

A website was created for the big Game that included a "score page" for the winning team of the week, videos of the student's different prototype games, a list of all the levels, progressively-ordered tutorials for the game design platform, a toolbox with links to tutorials on how to handle graphics for the game, and a page for the big Game rules. The students were divided into five teams, and in this relatively low-tech version, every group had a Google document with all the levels and assignments as well as a table in which to write up the goals. This enabled all of the students to write in the document, no matter their location. The goal was to create a sustainable learning design that could be used by student and teacher novices in learning game design.

In the first workshop, the student teams moved effortlessly through levels 1–8, not that it was not hard work, but they seemed very engaged and motivated as they competed against each other. All the teams worked through different ideation phases, making “drawing brainstorms”, sketching, prototyping, debating, implementing the learning goals from the curriculum in the small games and developing their own learning game concepts (see Figure 2 for an example).

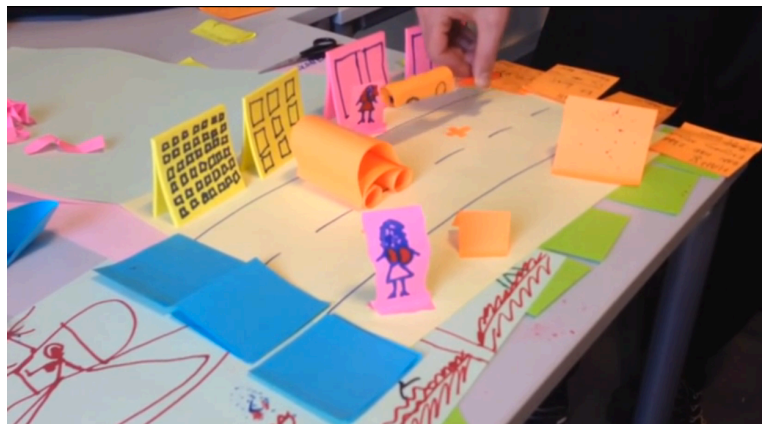


Figure 2: Racing game with “cultural objects” and quiz

As this was new ground for the teachers, they mostly chose to observe and be open for questions from the students. At the end of the first workshop, one of the participating teachers said, “It seems as if we can just use this frame [the learning design for the big Game] and put other learning goals into it, and then they [the students] will develop games”, giving the impression, that this part of the learning design would be possible to re-use. The teachers also discussed and agreed on the motivating elements of the learning design. The experience of the teachers in the first workshop indicates that part of the learning design for developing learning games had successful and engaging elements. Of course, the use of any model or frame (here, the gamification of the learning design in the big Game) will depend entirely on the intentions and the interpretations of the people using the models and the context in which they are used. In the current learning situation, the final aim was to facilitate a deep learning process.

4.5 Motivation and learning

To investigate one of the inquiry points in the study, focusing on how to create motivating and qualified learning design for the students a Danish learning theorist, Knud Illeris’ theory of learning is used. Illeris (2007) argues that the following three dimensions are involved in every learning process: 1) The inner psychological process of acquisition (content dimension); 2) The interpersonal interaction dimension; and 3) The willingness and desire to deal with what should be learned (the incentive-driven dimension) (Illeris 2007). Whereas the first two dimensions involve the cognitive (content) learning and collaborative learning domains, respectively, and are important in teaching and learning, the third motivational dimension is equally worth focusing on in this case, since the target group in VUC’s Global Classroom often lacked the motivation to learn (Pless and Hansen 2010). Motivation can influence when we choose to learn, as well as what and how we learn. When we are motivated, we are more likely to undertake challenging activities and be actively engaged. We enjoy and adopt a deep approach to learning and, to a greater extent, exhibit enhanced performance, persistence and creativity (Schunk, according to Hartnett, George and Dron 2011, p.21). Jerome Bruner, educational psychologist, believes that our intrinsic motivation to learn consists of three main underlying driving forces (Bruner 1966): 1) Curiosity: the desire and freedom to explore things and decide for yourself – being in a playful and investigative mood; 2) Achieving competence: the desire to show that we can do things and therefore are independent individuals. The idea is that mastering something creates joy and pride and is thus motivating; and 3) Reciprocity: the desire to be an indispensable part of the community. People like to achieve goals together with others, being part of a “learning community” - a community of practice (Wenger 2004). The argument about these underlying forces is this: if the learning is planned in a way that enables the student to achieve one or more of the three motives above, it will help the student feel an inner motivation to learn (Bruner 1966). Clearly, it is worth paying attention to motivational factors when creating learning designs. However, motivation is an individual experience. It is also complex, multifaceted and influenced by both persons and context. Neither the effect of the learning design nor the characteristics of the learner can fully explain

motivation. Therefore, it is important to consider the motivational factors in the learning design but also consider the individual learners interest and background. (Hartnett, George and Dron 2011). This was emphasised by the teachers, as it was their experience that several of the students did not have a deep interest in learning about the subject matters; they just wanted to pass their exam.

4.6 Motivation and learning in the experiment

In the first workshop, the students seemed very motivated. They laughed frequently, they worked hard and they joked about competing against the other teams. In traditional classroom learning, students often sit quietly and listen, taking turns answering the teachers' questions. By comparison, most of the students in this first workshop were very active and engaged. One of the things the students had a lot of fun doing was playtesting—that is, trying and evaluating each other's games. This is promising for the overall learning design, since these meetings between teams, if well-facilitated, can be a place for discussing, negotiating and qualifying 1) how the learning is implemented in the little game, as well as 2) how the team has succeeded in making the little game engaging and motivating. The discussions should thus enable learning in the big Game. These playtest meetings will extend each team's *community of practices* (Wenger 2004) to encompass the other teams from class, providing each other with ongoing formative evaluations. Another specific phenomenon in the first workshop was the quirky sense of humor several of the games had. This was a fun, engaging aspect of some of the games. This fun aspect could be divided into two categories: 1) in some of the games it was due to the content; that is, the questions in the quizzes that were funny, but, unfortunately, these quizzes did not always provide deep learning, since there was no demand for critical thinking (Weitze 2014d); 2) in other cases, it was just the fun of playing the game that engaged the students. In the first workshop, all three driving motivational forces to learn were present (Bruner 1966): 1) Curiosity, as the students explored the learning game design process and the freedom to create the games as they wanted; 2) Achieving Competence, as they built their game concepts, mastered the assignments and rose through the levels in the big Game; and 3) Reciprocity: the feeling of belonging to a team, working together toward a goal and, at the same time, competing with other teams. By these parameters, the first workshop was very motivating for the students.

In the second workshop, the atmosphere changed completely for some of the students. The process of learning how to master the game development software was scaffolded through progressively-ordered instructional videos, made available on a homepage with the option of asking for help. Though the students were offered a group walk-through of the basics of the game development software in class, they preferred learning on their own with their team. At this point they were asked to start considering how to create their game concept in a digital version. These tasks were overwhelming and off-putting for some of the students to such a degree that they almost refused to continue. This was a big change in their motivation to continue in the big Game and thereby the students learning process was hindered as well.

Vygotsky describes the student's *zone of proximal development* (ZPD) as the zone between the student's actual level of development in individual problem solving and the potential development when being guided by a teacher or collaborating with more skilled peers. To learn and move to the next level, the student must be scaffolded in the learning process, with the scaffold removed slowly until the student can work on her own at the new level of competence. (Vygotsky, acc. to Santrock 2008). It was obvious that some of the students did not feel sufficiently scaffolded in this learning process; furthermore, the software on the some of the students' computers malfunctioned. The concept of "flow", first described by Csikszentmihalyi (2008), has similarities with the zone of proximal development; both deal with the potential area of learning in which the student is challenged to learn and where it is neither too difficult nor too easy to learn, taking the student's competencies into account. However, Vygotsky speaks more about the zone of proximal development as the state or place where learning actually can take place, whereas the flow state is more a matter of framing the place where the student subsequently has learned the most, since he was kept in a state with maximum attention. When you experience flow, it happens because a balance has been created between your individual abilities, interests and the challenges in the game or learning process. Boredom or anxiety is avoided. We should try to design for the students' experience of flow, deepening learning by creating harmony between challenges and abilities in the big Game. Therefore, in order to have or to create good learning conditions in the game, it is important to create an appropriate balance between learning challenges and the student's abilities in such a way that the student is neither bored, anxious nor subject to feelings of inadequacy. "Pleasurable frustration" is the point where the challenge is exciting but difficult; this is the point where students learn a lot and find it

fun as well. Within games, "pleasurable frustration" is considered to be the point where deep learning and "good gaming" meet (Gee 2005). To reach this point it is important to try out and iterate the learning design with the target group.

At VUC many students (60%) attending the upper-secondary class has at least one other discontinued education in their past. This is often due to lack of motivation (Pless and Hansen, 2010). The students' reaction to the challenges in the second workshop should therefore also be seen on this background that might make them particularly challenged if experiencing a steep learning curve, causing the students to give up more easily when reaching their limits in the ZPD. The findings of the students' positive and motivating experiences in the first workshop in this learning design concept are therefore essential. However, the experience from the current experiment calls for a rethinking of the learning design for the second workshop, when the students worked with the digital game design tool. New experiments should better scaffold the learning experience and aim at keeping the balance of pleasurable frustration, being neither too easy or too difficult.

4.7 Scoring in the big Game

The score system for the big Game was created in a way that attempted to give a sense of progress and competence by moving through the levels. The team gained *EXP*, *Experience Points*, every time a task was carried out. The system also aimed at creating collaboration in the team and also between the teams and it was possible to get *SP*, *Social Points*, if the team helped another team. The team also earned points if they asked for help, in order to encourage cooperation. Finally, they could earn *XSCOP*, *Experience/Social/Coolness/Surplus/Points*. This was also for the quirky fun of it, but the aim here was *enhance the quality of the learning game*. Here the other teams judged how much they learned in the game, how well-functioning it was, how fun it was, how attractive it was, if the rules were clear and easy to understand, how far the team had come in their game design, and if the team members were friendly. In every workshop, a winning team was elected, and the adult students continued to find it engaging to keep score and compete. They even asked for it to continue when we had to change part of the learning design in the third workshop.

The students were engaged and motivated by this way of gamifying the learning design, and they cooperated and competed in a friendly way. However, in the co-design process, when evaluating and discussing the gamified learning design with the students, there were important findings.

One of the teams felt that they had rushed through the levels and the learning assignments in order to win in the first workshop. Their experience and conclusion was that this had led to superficial learning process, since their focus was on finishing, not on facilitating a deep learning experience in the small game or in the big Game. Though the *XSCOP* points were designed to enable this qualifying and deepening of both the learning process and the game design process, in the current version of the learning design, the points did not have the desired effect. The students' own suggestion was to carry out even more mandatory playtests with the other teams — peer assessments — and to mutually assess whether the other team has fulfilled the assignments in a deep and meaningful way. The playtest would also be qualified by the teacher's active, guiding participation in these formative assessments. These extensions and deepening processes would be a good way to "tweak" the learning design for the big Game in the future to avoid *cheating*, since this will enable a qualifying cooperation and assessment between the teams and also hinder the *worst case scenario*, where the conscientious, diligent and hardworking team is beaten by the "cheating" team, rushing superficially through the process to win.

One of the students complained about the way points were awarded at some of the early levels. Specific levels of the big Game were designed so that teams had to complete all of the assignments to continue on to the next level, ensuring a deep learning process. This was off-putting for the kind of competitor this student was. With a smile, he said that he liked to work hard at being the best, but if he could only compete by means of the speed at which he passed through the levels, then he would become superficial in his learning process. He did not approve of this, because he wanted to learn something. He suggested making part of the assignments at each level optional, formulated in a way that made the students work hard to create and qualify a deep learning process and a good learning game. This would give the teams the opportunity to work hard at winning and at the same time create a good learning experience since the assignments would further support the focus on the learning goals.

5. Conclusion

For this first experiment in creating a motivating and engaging gamified learning design (big Game) for adult students, where they create digital learning games (small games) in an iterative process while implementing the learning goals from specific school subjects, there are several findings. The learning design was framed as a big Game, guiding and scaffolding the students through the learning-game-design phases with the help of the Smiley Model, a game-design model for creating engaging and motivating learning games, which encompasses the learning design as well as the game elements. The overall learning design was also guided by interaction design methods, design thinking methods and project management methods. Though there is still room for improvement in the learning design, parts of the process functioned well, giving the teachers, who were novices in game design, experience with a sustainable learning design that they could easily reuse for other learning goals.

The students were motivated, and they cooperated and had fun in the first ideation phases and the conceptual part of the learning-game-design process. Bruner's (1966) three motivational forces—curiosity, competence, and reciprocity, which promotes our will to learn—were all present among the students during the first workshop. This part of the learning design thus facilitated the three motivational forces making it a motivating experience. Motivation is traditionally an important contributing factor for what and how we learn. As the current target group for this upper-secondary adult class has often lacked the motivation to learn, the fact that this part of the learning design was a more engaging and vivid experience than traditional classes is an important finding.

When the students had to learn and experiment with the digital game tool, the learning process turned out to be too steep, moving beyond the students' zone of proximal development. This part of the learning design needs to be re-scaffolded in future iterations to keep the students in the zone of *pleasurable frustration*, which will enable deep and meaningful learning experiences for the students within a learning process that is neither too easy nor too difficult.

Though the students had fun when playtesting each other's game concepts, it is unfortunate that the current design for this process often failed to lead to deep learning, which therefore means that it should be qualified in future iterations of the learning design. In the co-design processes with the students, it was suggested that one way to enable a deeper learning process would be to add additional mandatory peer assessments/ playtests. This would enable the other teams, or the community of practices (Wenger 2004), to be fellow discussants and negotiators, providing formative assessment on whether learning is being facilitated and whether engaging game play is taking place in the small games, which would thus enable deep learning to take place in the big Game. The teachers would, of course, also have a central role in these assessments.

As the students moved through the levels in the big Game, the scoring system made it possible to earn different types of points. This system was designed to create a sense of progress and competence for the students, and it also aimed to create collaboration within and between teams. The students accepted the challenge, played along and had fun participating in the big Game, competing with the other teams in a friendly way. However, in order to avoid a superficial learning process, it is important that each level, besides the mandatory assignments, also provides optional academic challenges as a part of the assignments. This will make it possible to compete by working harder and going deeper in the learning process. By qualifying the learning design in this way, it will be possible to reward the hardworking teams at each level for creating learning games of high quality while also preventing teams from winning by racing superficially through the games. The adult students emphasized the importance of this change to create a balance in the big Game—play, as this would increase both the fun of competition and collaboration as well as the quality and depth of the learning process. The experiments thus showed that the big Game should be playtested and tweaked, just as traditionally done when designing small digital learning games.

6. References

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