USING UNIVERSAL DESIGN GAME AS AN EDUCATIONAL TOOL – CASE RUFFPROTO

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Abstract

Design games are tools for collaborative design that provide play qualities such as a playful mindset and structure, supported by game materials and rules. In a pedagogical context, the aim of these design games is usually to support collaborative explorations of future opportunities in an inspiring way.

The general aim of the design games is to help facilitate a User-centered design process for design groups early in the design process. Framing collaborative design activities in a game format arguably improves idea generation and communication between students or other participants. Also, by shifting focus to the game, power relations and other factors that might harm learning and idea generation are downplayed.

The RuffProto design game was created as a universal innovation tool for developing new digital products and services for creative teams. Universality in this context means that the design game in question can be applied to the design process of almost any type of digital service. Its potential in pedagogical use was studied in several Service Design, User-centered Design and Digital Prototyping courses in Laurea University of Applied Sciences and Haaga-Helia University of Applied Sciences. Workshops were organized as part of courses for both bachelor and master-level students. The RuffProto design game was used and evaluated in 10 workshops involving more than 200 students. In addition to course observations and student interviews, a total of 60 students took part in an evaluation survey.

The results of the study gave evidence to the RuffProto design game serving as a practical introduction to all course projects and offering a new type of learning experience via gamification, strengthening also group formation. The results highlight also that a universal design game can help student groups form coherent digital service concepts in a relatively short time in various types of digital projects.

As a Universal Design Game, the RuffProto innovation game is also transferable to targets, such as digital service innovation, outside the classroom and school projects. Implementing the design game as part of a course provided students with an understanding of a fast and collaborative innovation process and skills to use design games in future real-life projects.

Keywords: design games, collaborative design, digital service, higher education

1 INTRODUCTION

Today, gamification has especially been addressed and implemented in the realm of education, where supporting and retaining engagement is a constant challenge. Gamification in education and learning most commonly utilizes affordances signaling achievement and progression, while social and immersion-oriented affordances are much less common [8].

However, in the realm of educational games, design games contribute to stakeholders with different interests, leading to a more constructive dialogue. The development of conceptual design games seems to be a promising approach for supporting collaboration between different stakeholders in collaborative design [4].

Design games can also be seen as a tool for ensuring more effective team performance. Despite the complexity of group dynamics in today's world that are not easily represented in a simple model, the classical 'forming, storming, norming, performing and adjourning' of the Tuckman's model has been a valuable model for scholars and practitioners for decades [1]. In this study, Tuckman´s model was used as a practical tool for understanding team dynamics at the fuzzy beginning of a design project: how students felt about forming and developing a collaborative design team by playing a design game, how

they felt about collaboration during the process and how they evaluated the use of a design game as an educational tool.

Another aim for this study was to evaluate the RuffProto game´s usefulness as an educational tool in general, as familiarizing higher education students with new complex concepts requires creative and effective pedagogical methods and tools [7].

2 DESIGN GAMES IN LEARNING BY DEVELOPING BASED USER-CENTERED DESIGN STUDIES

Design games can be used in User-centered design, e.g. as tools for ideation and data collection. As a collaborative learning tools, use design games are useful in study units following the pedagogical model of Learning by Developing (LbD). To provide conceptual understanding, the subject, other key concepts, models and methodologies playing a part in the study, are explained in this chapter.

2.1 User-centered Design

The User-centered design process is based on ISO 9241-210:2019, Ergonomics of human-system interaction. Part 210: Human-centred design for interactive systems -standard.

Human-centred design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance. [6].

The main activities of achieving these design goals are understanding and specifying the context of use, specifying requirements, producing design solutions to meet the requirements and evaluating the designs against the requirements with users and other stakeholders.

This study was carried out in courses where learning content was based either on the entire process of the User-centered design process or a part of it. In a typical workshop, the RuffProto design game was used as a tool in the ideation phase for specifying and understanding the context of use and user groups and for creating a common understanding of the design goal for the student teams.

2.2 Design games

There is no generally accepted definition of “Design Games”, but Brandt [2] has characterized design games as collaborative tools instead of games with competitive aims. Players’ skills and expertise are jointly used to explore various design possibilities within a game setting. Typically, design games are used to achieve some game-specific design purpose. Referring to the examples given by Brandt, design games have historically been used in many different fields of design: art, architecture, engineering, human-computer interaction, social studies, etc. As a collaborative tool, design games are mostly used in projects that involve participatory design methods.

In Brandt´s view, design games are a valuable framework for organizing participation. First, exploratory design games can be designed in many ways, making them suitable for different type of projects. Second, the design game framework proposes certain ingredients and frames in relation to how to stage participation and, third, an exploratory design game framework supports participants in exploring aspects relevant to the projects collaboratively, in order to gain new insights and establish a common understanding of where further design work should be heading [2].

Another characterization of design games comes from Vaajakallio [12]. She defines three common attributes of design games in a co-design process: First, design games create a common design game language. Second, they promote a creative and explorative attitude by tangible material and generative, sensitive, visual and playful tools aiming to sensitize the imagination and facilitate

exploration in a co-design setting. Third, design games help participants envision and enact hypothetical cases. The focus is on finding new design opportunities.

The RuffProto game used in this study, follows these general characterizations of design games. But as examples point out, design games are often created for a specific need [2,3,4]. The RuffProto design game expands its use from a one-time game made for a special purpose, to a *universal, re-usable game for the development of digital services* without limiting its purpose of use in that field.

2.3 Learning by Developing (LbD)

Since the beginning of this century, the pedagogical model in Laurea (Laurea University of Applied Sciences) has been Learning by Developing (LbD). In the LBD model, teachers, students and partners representing different organizations work together in a course or study unit to achieve the desired learning goals and skills. The typical characteristics of LbD include authenticity, partnership, experiential nature, creativity and a research-oriented approach [10,11].

In the LbD context, authenticity refers to a real-life development project that forms the learning environment. Partnership refers to collaboration, competence-sharing and learning together, including agreement on different roles, i.e., the roles of the researcher, the developer and the facilitator when using the tools. Creativity is seen in the LbD context as a resource for the development project and “one of the destinations”. Investigative approach refers to a research-based and critical way of working and the application of research-based information and scientific studies. [9].

Forming teams of students with different educational backgrounds and familiarizing them with new complex concepts requires creative and effective pedagogical methods and tools. In this study, we have used the RuffProto design game in the classroom also as a tool for innovation, creating shared understanding, group learning and forming as part of a LbD project.

3 METHODOLOGY

The RuffProto design game was used and evaluated in 2018 - 2020 in 10 workshops involving more than 200 students in Laurea University of Applied Sciences and Haaga-Helia University of Applied Sciences. Workshops were organized for both Bachelor and Master-level students as part of several different User-centered design related study units.

This study used a direct questionnaire as a main data-gathering method. The survey was sent by email to students who participated in RuffProto workshops. 60 answers were received in total.

Course curricula were constructed following the LbD pedagogical model, involving student teams, a customer or another project setter and a teacher as a facilitator. In these course projects, 8 separate learning events with minor variations could be identified as follows:

1. Assignments
2. RuffProto workshop
3. User study
4. Prototype and/or concept iteration round 1
5. Prototyping and/or other concept visualizations
6. User testing and/or other type of user feedback gathering
7. Prototype and/or concept iteration round 2
8. Prototype and/or concept presentations

At the beginning of RuffProto workshops 3 to 6, student teams with 2 to 5 students were created. The lecturer acting as a facilitator explained the rules and helped students throughout the workshop.

Table 1. The game events of the RuffProto workshop

Game events	Innovation board	Business board
1	Defining the challenge	Describing the customer needs
2	Selecting the user groups	Defining the customer groups
3	Creating the main use cases	Creating the value proposition
4	Identifying the parts and gadgets related to the service	Finding the solution
5	Identifying the context of use	Identifying the distribution channels
6	Creating the customer journey	Calculating the cost structure
7	Commentary	Identifying the revenue streams
8		Monitoring the performance
9		Identifying the competitive advantage
10		Commentary

Figure 1. RuffProto game materials

The Ruffproto game has two different playing boards: Innovation board and Business board (Fig 1). The game events with each board lasted between 5 to 20 minutes. With breaks, a typical workshop lasted 3 to 4 hours.

After the workshops, the students were interviewed about their experiences. In addition to observations and student interviews, the students were asked to participate in a survey to evaluate their learning experiences.

4 EVALUATING DESIGN GAME AND WORKSHOPS: RESULTS

As total of 60 students took part in an evaluation survey after the course, 55 of them answered all questions. 37 students studied at bachelor-level, 22 students were master-level students, and 1 student did not define her/his educational level.

The survey consisted of four main themes and open comment fields inside the themes.

1. Theme: Game in general
2. Theme: Teamwork
3. Theme: Benefits to learning
4. Theme: Benefits to the LbD project

Table 2. Theme 1 - General statements about RuffProto Design game

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	No Opinion	Weighted average n=56
The content and instructions of the game were easy to understand	0	1	7	19	27	2	4,5/5
Facilitation was easy to understand and follow	0	2	13	20	18	3	4,59/5
The game was easy to play	0	2	6	25	22	1	4,62/5
The game result and the goal were in line	0	3	1	18	31	2	4,33/5
With the help of the game, we were able to generate new ideas	0	3	13	20	16	4	4,27/5
The idea generated by the game was a usable starting point for the project	0	0	2	23	30	1	4,41/5

The idea generated by the game was easy to develop during the course	0	0	2	23	30	1	4,0/5
The game is suitable for the development of various ideas, services and products	0	0	2	23	30	1	4,13/5

Based on the open field answers related to the theme, the majority of students felt that playing the game was an easy and meaningful way to promote project work, especially at a stage where the design challenge and the project had not yet been fully clarified within the team. Also, the game was generally felt to be suitable for the development of a wide range of digital services.

Table 3. Theme 2 - Statements about teamwork

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	No Opinion	Weighted average n=56
With the help of the game, we were able to increase common understanding of the subject	0	1	7	19	27	2	4,33/5
The game enabled more goal-oriented design work in the team	0	2	13	20	18	3	4,02/5
The game helped form a common vision	0	2	6	25	22	1	4,22/5
The game guided the activity so that all team members could participate in teamwork	0	3	1	18	31	2	4,39/5
The game brought out the tacit knowledge of the team members	0	3	13	20	16	4	3,94/5
The game supported dialogic	0	0	2	23	30	1	4,51/5

(conversational) learning							

Based on the student answers and comments, the Ruffproto game seems to support dialogic learning in particular, where the game and its artifacts act as a tool for discussion. Brandt has presented similar findings in her studies [2,3]. In addition, the game experience was affected by the type of project assignment, i.e., how the teams were able to get started with their design challenge.

In the open field answers, the game was considered a functional innovation technique. Students also presented various development proposals for the game and game equipment.

Figure 1. RuffProto Game Workshop at Haaga-Helia University of Applied Sciences 2019

Table 4. Theme 3 - Statements about benefits in learning

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	No Opinion	Weighted average n=56
Playing the game was useful part of course	0	1	2	25	25	2	4,4/5
Playing the game helped in achieving the goals of the course	1	1	5	21	24	3	4,17/5

Playing the game helped to accomplish project assignment	1	1	5	21	24	3	4,27/5

In the open field answers of this theme, some students pointed out that the game structure helped them clarify the design challenge and the clear steps of the game guided the ideation process. The game was seen as a good learning tool especially at the fuzzy beginning of the project. In general, playing the game as a team helped students reach the course objectives and clarify the goals of the later stages of the project.

Table 5. Theme 4 - Statements about benefits in project work

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	No Opinion	Weighted average n=55
Playing the game was useful for the project assignment	0	1	8	20	22	4	4,24/5
Playing the game helped in achieving the goals of the project	0	2	6	19	23	5	4,26/5

As pointed out, the RuffProto design game was generally perceived as an effective use of time during project planning and as a good tool to start the project. There were also a few critical comments; some students felt, as the project progressed and the design goals changed, that the original idea produced by the game changed too radically to another at the later stages of the course. In this case, the link to the benefits produced by the design game was felt to be thinner than for other respondents. However, the radical refinement of concepts, based on later-collected user data and iterations, are typical steps of innovation, especially in projects that follow the process of User-centered design, where generally the goal of the process is to produce solutions that meet both user and customer requirements [6]. In response to students' comments, the game played at the initial stages of projects should be seen more as an effective starter for a project rather than the end result of the whole project.

5 CONCLUSIONS

In this paper, I have presented that the RuffProto design game provided a practical introduction to all course projects and offered a new type of learning experience via gamification, strengthening also group formation. Design games are typically seen as collaborative tools instead of games with competitive aims. RuffProto as a design game lacks most of the typical educational game characteristics such as points, badges, levels and game winners. Instead, it offers a tool that supports dialectical learning with clear rules, playing materials and objectives for student teams. The collaborative nature of the game also seems to help get rid of power structures often present in teamwork. This also helps develop better group dynamics.

The RuffProto design game worked as an effective aid in various digitalization related student projects, especially at the fuzzy beginning of a new project. Referring to the survey results, the RuffProto design game is clearly suitable as a learning tool for project ideation and innovation in different kinds of digital projects.

Participatory design workshops in general are categorized as an innovative method of user research [5]. In this sense, RuffProto design game may be used in the data collection phase with users as well as for ideation by the design team.

In this study, the use of the RuffProto game was part of the ideation phase. However, some students also expressed interest in using RuffProto to gather user data, by organizing their own game workshops for members of their own design project. This provides an opportunity for further research on the subject.

The results highlight also that a re-usable, universal design game can help student groups form coherent digital service concepts in a relatively short time for various types of digital projects. As a universal design game, the RuffProto innovation game is also transferable to targets outside the classroom and school projects. Implementing the design game as part of a course provided students with an understanding of a fast and collaborative innovation process and skills to use design games in future real-life projects.

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