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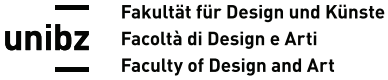
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A cad-based game for inclusive design

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Abstract

The paper presents methods and results of a co-design process aimed at structuring a game intended to train undergraduate students on inclusive design. The process is accomplished in the framework of the wider project PudCad, Practicing Universal Design Principles in Design Education through a CAD-Based Game, supported by the UE program Erasmus+ involving HEIs and Research Centres. It's aim is to create a gaming platform based on CAD software supporting interior architecture and design students to conceive accessible environments regardless of age, physical ability and/or user social condition. Essential for the implementation of EU social integration and non-discrimination goals, Universal Design is often marginal in students' training. PudCad intends to fill this gap by developing a digital video game (a game for change), enriched with story and CAD features. Through playful dynamics, future designers will be able to assimilate inclusion principles and create concepts based on human diversity. The project develops itself through 4 students workshops and three international conferences on Universal Design, Ergonomics, Game and Education.

In this paper we focus on the process and results of the third workshop. Building empathy and awareness for the Universal Design principles was decided to be the main drive of the game. Besides research and analysis on literature and use cases, tools like game engines, platforms and technologies (i.e. virtual reality and augmented reality) were checked out and tested. Before starting the production stage, the idea of having analog prototypes came up to support robust design decisions. To develop game concepts and produce paper prototypes, we execute a game jam workshop with the participation of interior architecture and design students as well as game design students leading the teams. The workshops is thus a breaking point to take solid decisions about the game design and production

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KEYWORDS:

| *Universal Design*
| *Game Design*
| *Social Integration*
| *Paper Prototype*
| *Virtual Learning Environment*

Introduction

The approach experimented by the authors of the paper to develop future designers skills and awareness regarding Universal Design is based on the involvement of users (e.g. beachelor students) in the game development.

The 7 Principles of Universal Design were developed in 1997 by Ronald Mace[1] in the North Carolina State University. The purpose was to evaluate existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments. A complete discussion about the principles isn't the purpose of this paper, what is relevant it's that designing for social inclusion means considering human diversity, creating environments, objects and systems capable to meet the needs of all possible users regardless of age, psychophysical abilities and social status. In this regards, the issue of accessibility cannot and should not be limited to just "compliance with the rules", but rather to the best adoptable solutions. An inclusive project goes beyond the concept of "Barriers free design", replacing the use of equipment dedicated to individual user profiles (Disability aids, Elderly Furniture,…) efficient solutions suited to the widest possible range of population. Considering that today in Europe people with disabilities are around 16% of the working age population (http://www.edf-feph.org/) and that the number is growing

due to the demographic trend, with a clear correlation between disability and ageing, design has to combine the different needs, declined in a real context of products, environments and services capable of responding to social and demographic changes. Each project should be based on the observation of human diversity, on evolution of needs and changes that occur throughout life: different abilities due to different psychophysical or cultural conditions, are the variables that come into play in the user interaction with the environment and products. The different human characteristics have to be assumed by designers in a conscious way, as a central element in relationship between user and built environment and verified in terms of compatibility.

PudCad project aims to spread these concepts through a gamification process. Gamification[2] is a term coming from digital media industry that does not present a univocal definition yet, but a concepts stratification. The most accepted definition by academic world means by gamification the transfer of play dynamics to non-game activities (Ceriani, 2014). A large number of authors also tend to the definition "Serious Game" or "Applied Games" (Desmet et al., 2014) if the primary purpose is not pure entertainment, but an educational goal. Regardless of nomenclature, these systems' general aim is to transfer information promoting the active interest of users so that to increase knowledge, skills or change their behavior. Although the term gamification has a wider meaning than videogame, it is through videogame that the link between learning and technology becomes explicit. In fact, digitization offers the advantage of collecting data from the actions performed within the game, measuring user behavior and allowing profiling and categorization. Moreover the involvement of students as informants and testers is intended to ensure that the prototype design will adapt to the interests and knowledge of the learners who will use it (Rui Leitão, Maguire and Turner, 2019). The outcome is a more efficient active participation, because it's personalized in the message transmission and because through the implementation of dynamic behaviors meanings connect to an action, supporting experiential learning. Experiential learning has been theorized by David Kolb starting from theories of precursors such as, John Dewey, Kurt Lewin and Jean Piaget (Kolb, 1984). According to the experiential model, learning process starts in performing a particular action, and seeing its effect in the contingent situation. This makes it possible to understand the effects of a particular case and anticipate its consequences, thus generalizing the principle. The user manipulates objects and controls actions, but above all is engaged in an empirical process that leads to learning by doing. This methodology (Dewey, 1949) places learners at the center of the learning process and values their interests and choices within experiential processes. In this specific case, the gamification experiences thus promote the direct experimentation of ideas followed by instantaneous feedback, capable of evolving into innovative practices and theories. The possibility to immerse yourself in correct consolidation activities via real projects simulation, while avoiding mistakes that in real life could have catastrophic effects in economic and constructive terms, provides the user with the freedom to experiment and design innovative approaches.

Background

The co-design of the game has been developed in the framework of a wider project called PudCad, Practicing Universal Design Principles in Design Education through a CAD-Based Game. The project supported by the European program Erasmus+ is coordinated by Istanbul Technical University, Department of Interior Architecture and involves five academic partners: Lahti Institute of Design and Fine Arts, Finland; Detmolder School of Architecture and Interior Architecture, Technische Hochschule Ostwestfalen-Lippe, Germany; Architecture Department, Università degli Studi di Firenze, Italy; Department of Design, Politecnico di Milano, Italy; Bahcesehir University Foundation, Turkey; and the Turkish non-governmental organizations SERÇEV (Association for Well-being of Children with Cerebral Palsy) and Occupational Therapy Association of Turkey.

The project is part of European Union cooperation actions for innovation and sharing of good practices which provide, at systemic level, for the modernization and activation of education pathways through participatory ICT-based approaches.

PudCAD's aim is to create a gaming platform that allows university students in design disciplines (designers, engineers and architects) to learn and apply the prin-

ciples of Universal Design, a methodology that allows the use of environments and products regardless of age, physical ability and/or user social condition. Essential for the implementation of EU social inclusion and non-discrimination goals, Universal Design is often considered marginal in future designers' training. PudCad intends to fill this gap by developing a digital video game (a game for change), enriched with story and limited CAD features. Through playful dynamics, future designers will be able to assimilate inclusion principles and create concepts that appreciate human diversity. The project develops itself through 4 workshops involving second and third year interior architecture and design Bachelor students and three international conferences on Universal Design, Ergonomics, Game and Education.

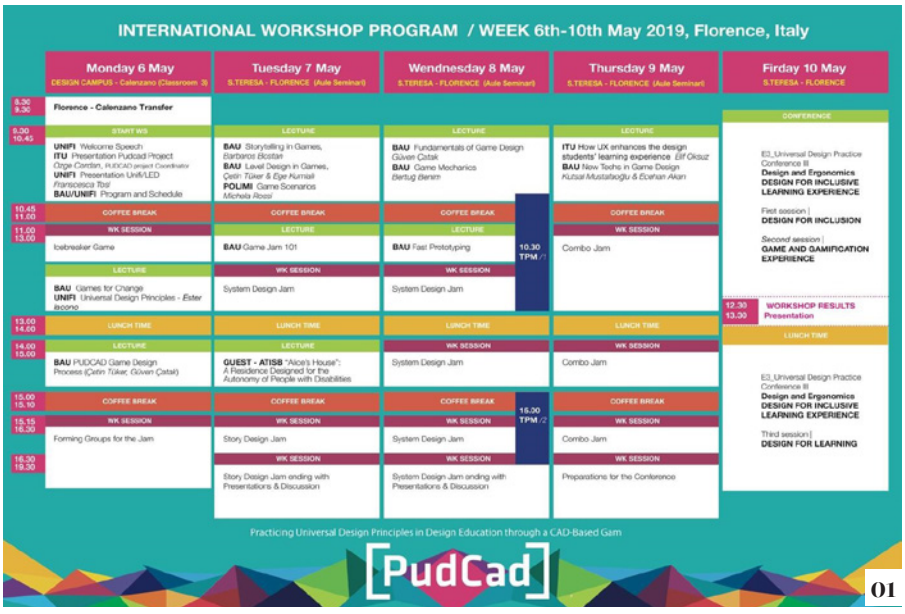
The students' activity in the first workshop was based on a previous work done locally by the partner HEIs analyzing identified schools according to universal design principles. The second Workshop 'Universal Playground' aimed to discuss new approaches towards Universal Design by the exploration of the Parameter of Inclusive Design for Spaces of Learning and students began addressing design criteria. The third workshop, on which the paper focuses, aimed at structuring the game, building empathy and awareness for the universal design principles was the main drive of the game. In the last workshop game software, solutions and e-learning activities will be applied and tested with design students and other stakeholders.

Game co-design

The game co-design workshop has been preceded by research and analysis on literature and use cases and a preparation meeting involving all partners. Before starting the production stage, the idea of having analog prototypes came up to decrease the risks of losing time with wrong design decisions. So using the workshop in Florence (May 6-10, 2019) as an opportunity to test the game ideas and produce paper prototypes, a game jam workshop has been executed with the participation of 35 students from partner universities as well as BAU game design experts.

Possible tools like game engines (Unity and Unreal) and platforms and technologies like immersive virtual reality (IVR) and augmented reality (AR) were also checked out and tested to use in production.

The workshops' structure (Figure 1) comprehends lectures on topics such as game for change, universal dsign principles, game design process, storytelling and level design in games, game scenarios and mechanisms, fast prototyping, user experience and new technologies in game design; giving theoretical and practical inputs to the students for the related jam sessions. The contributions on game design were integrated by a lecture on Universal Design, necessary to give all students basic knowledge of this design approach and concrete examples of application.



01
Game design workshop program .

Students were initially involved in an icebreaker game finalized also to build 7 teams and then invited to choose a plot theme from a given list, design their own Campus story and game levels based on daily inclusion issues they or their friends face every day. They were asked to start with creating characters on paper, whose disability profiles and skills will affect the level design throughout the story.

02
Students at work in the different phases of the game development

Requested outputs were:

- project credits: name of the game, name the team, slogan (if any);
- intro/synopsis: describe how you use the plot theme and turn it into a story and bring levels out of it; and also tell about how you relate your story and levels with inclusion issues;
- board/card game prototype;
- story/level board;
- rule book, including: number of players, average playtime, components of the game, setup of the game, goal of the game, player actions, example game turn description;
- gameplay video: fun-short video showing game component, gameplay and team;
- documentation photos of the game itself, process, and team;
- further thoughts: comments about how new technologies like virtual reality (VR) and augmented reality (AR) can be implemented into the digital game version of the board/card games.

At the side of research and analysis on literature and use cases, the both ideas (i) to adopt a modular system with lattice/grid as game board, rooms as cards, and elements of rooms as tiles; (ii) to apply avatars as play character (Buratti, Costa and Rossi, 2019); proposed by Politecnico and Detmold teams during previous workshops and the preparatory meetings, were shared throughout the partners.

The proposed games were developed on the given themes and named as follows:

Escape From the Campus (Theme: Quake!) is a two player grid based board game which is about two characters trying to escape from the school campus that just had an earthquake. The two has to cooperate with each other by trading cards each turn and making a strategy due to their differences in skills and speed as quick as possible. Its replayability, cooperation mechanics and the idea of creating design solutions to preventing disaster has a high potential of contribution to the digital game.

Match (Theme: What If?) is a card game that is played with four people. Players choose a card set that about different themes such as animals plants which are drawn black and white, then each player chooses a color, finally the cards are put on the board and first one who collects six of the cards that are connected with their color wins. Contrast recognition, alternative pictogram ideas and symbol recognitions for colorblind people can be listed as a contribution to the game.

Fire Alarm (Theme: Fire Alarm) is a four player competitive game that is about scientists trying to escape from a science lab where an explosion occurred which caused temporary blindness and fire around them. Players have oxygen and carbon monoxide as their health resource and they have to maintain a balance between them in order not to get poisoned and eliminated. Each player starts with a perk and a turn

consists of moving and drawing a card if the player has ended their turn on a question mark tile. A Short Daydream (Theme: Daydream) is a four player grid-based roll and move type of board game which players are trying to reach a destination from start to beginning to remove their curse from them. As the story goes players are used to be bullies at school to a certain person, which turns out to be a witch, and now they are cursed by her. Main mechanics consist of grid based board game and roll and move.

Tsialidybi (Theme: Alien Invasion) is about four people trying to escape from an alien ship where they are abducted. Players need to cooperate in order to win the game with dice rolling and point to point mechanics. Room unlocking, fantasy atmosphere, asynchronous character cooperation are interesting mechanics that can be adapted to the video game.

Campus Challenge (Theme: First Day) is about students that are on their first day on campus and who are trying to reach to their destination first. Players are started by having different types of disabilities such as hearing aid, blindness and walking disability. Players draw an event card and they can put a certain obstacle on the board to block a player that has a specific disability. PvP ideas such as preventing other players' bad designs and random destination mechanics can be applied to the video game.

Crazy Granny (Theme: Holiday) is about a granny trying to find his husband in a cruise travel. Players are travelling in the board game with a start to finish and roll and move mechanics. Players are also encouraged to think like old people while making their turn decisions not only to make empathy but also create a meaningful strategy. Design problems for old people can be adapted to the video game.

Six of the proposed games are based on ad hoc boards (grids or paths), the seventh is a card game. Many of them involve dices and tiles representing rooms, architectonic elements or pieces of furniture (doors, stairs, shelves,…). Characters are defined considering perceptive impairments (blindness, mono-chromatism…), specific anthropometric features (i.e. small person), physical temporary or permanent disabilities, specific characteristics like old age or skin disease. A detailed comparison of the games is reported in Table 1 and a choice of samples in Fugure 3.

03
Games comparison

Game Name	Mechanics	Win Condition	Inclusion	Pros	Cons	Contribution to the Digital Game
Escape From The Campus	Grid based Trading Dice rolling	Special conditions	Limb Disabilities	High replayability	Lack of challenge	Replayability by procedural generation ideas. Cooperation mechanics. `Prevent disaster by good design solutions` mechanics.
Crazy Granny	Roll and move	First to finish	Being Old	Old people empathy	No movement choice	Design problems for the elderly
Match	Card game Take that	First to finish	Color blindness	Basic, fun for children, teach for inclusion	Ambiguous color cards	Colorblind peoples' symbol recognitions Alternative pictograms Contrast recognitions
Campus Challenge	Point to point Take that	Destination	Language barrier Blindness □h eelchair	Take that mechanic □ith the □bad design□	Repetitive gameplay □nbalanced card deck	PvP □deas. Such as prevent other players by bad designs Random destinations mechanics
Fire □larm	Grid based Trading Co□operative play	Special conditions	None	O□ygen management as health	No □nclusion	None
□ □hort Daydream	Grid based Roll and move	First to finish	□idget	None	□ap is too big	None
Tsialidybi	Dice rolling Point to point movement Co□operative Play Time track	Special conditions	Skin disease □h eelchair Blindness Amputee	□nteresting theme Risky shortcuts	Real Time boardgame □□□ real minutes to finish the game□	Fantasy atmosphere Asynchronous character co□ operations Room unlock mechanics Shortcuts

03

04
Sample results

Conclusion and future steps

Participants of the workshop had widely varied backgrounds (e.g., different nationalities, cultures, professional experience, teachers, and students). That made the interaction initially complex, but in the same time has been a fruitful occasion to share knowledge and experiences between partners and students, making it possible to produce a wide range of game alternatives all useful to build empathy and awareness on Universal Design principles and practice.

The workshops has been applied as a breaking point to give solid decisions about the needs and design of the game. Although the designed games in this game jam are not for a digital platform, the pre-production stage of the Game Software will be completed based on the feedback from the students and teachers involved integrating and developing stories, scenarios and mechanism emerged during the workshop.

The game development part of the project will be targeting a first-person perspective digital game which will run on a digital platform. The game workshop, instead, focused on board games playable by 4-5 players. Thinking of the game experience and presence perceived by the gamer, designing a board game for 4-5 players and translating the findings to a first-person perspective digital game for next step may cause some loss because not every game mechanic and case, even the feeling of the overal game, designed for the board game will work in the digital game. This kind of translation issues of games when games migrate to other platforms from the native platforms, are already mentioned in the literature (Fang, Chen, and Huang, 2016; Tuker, 2018). This can be considered as a limitation of the study.

Additionally, most of the participants had little to no experience on neither digital game design nor digital game design tools. So, for a very intensive 5-day workshop, instructors preferred to minimize the cognitive load of the participants, which can be arisen while trying to operate digital tools, by designing a collaborative workshop which focuses on brainstorming and paper prototyping in which any participant can accomplish easily. Another reason why the workshop was not focused on the digital game design was the so-called digital game design tools are actually development tools which require a somewhat finished game design with a complete game design

document. In a brainstorming workshop, focusing on the digital game itself with no preliminary design study would shift the emphasis from thinking on the design parameters to the tools. So, the workshop was focused on board games in which any participant can focus and can be produced from the paper quickly.

For future steps, development team will start creating a digital prototype of the game enriched by CAD features and the cases discussed and studied in the workshop. Evaluations from both the student-designer-perspective and game-user perspective are foreseen in the final PudCad workshop that will take place in November 2019.

Notes

1. Ronald Lawrence Mace, (1941 – June 29, 1998) was an American architect, product designer, educator, and consultant. At the age of nine, he contracted polio, which led to use a wheelchair for the rest of his life. He is best known for coining the term universal design and for his work advocating for people with disabilities.
2. The term "gamification" was proposed by the English game programmer Nick Pelling in 2002 and has acquired a relative autonomy since 2010.

References

1. Buratti, G., Costa, F., Rossi, M. (2019). Gamification meets. PudCAD: Advances In Development Of a Games To Teach Universal Design Principles.
2. Ceriani A. (2014). Gamification: Simulazioni per Crescere nella Complessità, Unconventional raining, Milano, Italy: KKIEN Publishing International.
3. Dewey, J. (1949). Education and the social order. League for Industrial Democracy.
4. Desmet, A. et al. (2014). A meta-analysis of serious digital games. Prev. Med. 69, 95–107.
5. Kolb, A. (1984). Experiential Learning: experience as the source of Learning and Development. Englewood Cliffs, NJ: Prentice Hall.
6. Leitão, R., Maguire, M., Turner, S. (2019). Student's participation in the design process: a study on user experience of an educational game-like application. In 11th annual International Conference on Education and New Learning Technologies. Palma de Mallorca, Spain.
7. Fang, Y.-M., Chen, K.-M., & Huang, Y.-J. (2016). Emotional reactions of different interface formats: Comparing digital and traditional board games. Advances in Mechanical Engineering. https://doi.org/10.1177/1687814016641902
8. Tuker C. (2018) Redesigning Games for New Interfaces and Platforms. In: Lee N. (eds) Encyclopedia of Computer Graphics and Games. Springer, Cham. https://doi.org/10.1007/978-3-319-08234-9_145-1