ParticiPécs – a cooperative game fostering learning about the built environment and urban planning

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Abstract

The research presented in this paper is conducted as a PhD research at the HafenCity University Hamburg. It focuses on the question whether cooperative games can be effective tools for developing children's and young people's understanding about urban planning, public participation, and the urban environment. The research is situated within the theory of socio constructivist learning theory and the theory of cooperative learning, which is recognized as a pedagogical practice that promotes learning and prosocial behaviour. Findings on the implementation of games in education and urban planning are considered. We developed a cooperative game for youth participation called ParticiPécs in a set of workshops with local youth of the city Pécs/Hungary and young experts. This paper explains the main concept of the game and concludes with our further research on this topic.
Keywords: educational game, co-operative learning, socio-constructivist theory, urban planning, playful public participation, children and youth

1 Introduction

Since the late 90s we experience an increasing demand for the integration of disadvantaged social groups in participatory urban planning. These groups include also children and youth, whose different needs, skills and interests need to be taken into account in the design of the urban planning process. We are faced with the following questions: How can children and young people get educated for an active participation in urban planning? How can they be involved in the co-creation of the built environment? What kind of knowledge, skills and competences are needed for it? How can children and young people obtain those skills and knowledge?

Our research deals with these questions and focuses on the possibilities offered by games and game play. We focus on games and their use to stimulate children to participate and learn about urban planning and their cities. We investigate whether children and youth can gain an awareness of important concepts and relations regarding the urban space through games. Games also can have a reinforcing effect in learning processes, as they can increase motivation through the experience of flow [6] and can promote sustainable learning [10]. Games can allow simple visualization and simulation of very complex data and can be used for implementations in the context of urban planning [9]. Specific game mechanics can enable the mediation of very complex information about urban issues, urban structure and infrastructure, power relations and important concepts regarding the urban space, as well as about the mechanisms of changing urban space.

In this paper we argue that a cooperative gameplay can provide a suitable instrument for children to gain understanding of complex relationships in an urban space. In order to test our hypothesis we developed the cooperative game ParticiPécs. The main goal of ParticiPécs is to foster learning about urban issues linked with the immediate living environment of the players. The game can serve as an age-appropriate method for young people between 14 and 18 years. It's goal is to promote learning about the complexity of the built environment, urban structures, the planning and participation process. It aims to raise the awareness of children and young people about urban issues and to empower them to be active participants in shaping the built environment. This paper summarizes the current stage of development of ParticiPécs, a collaborative game that aims to foster learning about the built environment with its focus on children and youth. We conclude our paper with directions for future research.

2 Theoretical Framework

2.1 Game-based learning

Although usually people associate games with fun, pleasure and free-time, their impact goes far beyond pure enjoyment. The act of playing and learning is connected in human development from the early years of a childhood [14]. Through playing games we can improve social behaviour, perception and enhance our performance. Games can provide information and knowledge, and can promote personal development. In particular, the acquisition of social skills and social behaviour can be supported by play [5].

Games are increasingly designed specifically for educational or social purposes due to the growing number of empirical research which demonstrates the positive effects of games on achievements and attitudes [4]. Such games are often referred to as "games which have a purpose beyond play" [12]. Edutainment or Entertainment education "is the process of purposely designing and implementing a media

message to both entertain and educate" [22:5]. Digital Game-Based Learning is considered as „any marriage of educational content and computer games" [20:145]. The so-called Serious Games have a "carefully thought-out educational purpose and are not intended to be played primarily for amusement" [1:9]. Epistemic games are "designed to give learners the rich experience of professional practica within a discipline" [21]. Social Impact Games foster change in society [7]. Those „games with a purpose" [24: 324] have already found their way to urban planning, in order to support public participation or learning about the built environment or the planning process [13, 17, 18, 19] .

2.2 Cooperative learning

Our research is based on the social constructivist learning theory that emphasizes the social context of learning, as well as the social interaction between learners, as central element to the learning process [23]. In social constructivist theory, learning is embedded in the social context of the learner therefore it is linked to simulated or real-life situations and the learners' real-life experiences. The immediate living environment of the learner, thus, perceiving, analysing, understanding, and living the urban space can be the central element of education embedded in the theoretical framework of social constructivism. Vygotsky and his followers understand learning as a problem-based, investigative and collaborative process.

As defined by Johnson and Johnson (1999), cooperative learning is interpreted as a process of peer interaction that is mediated and structured by the teacher. Students work with their peers to accomplish a shared or common goal. It follows that positive interdependence among learners is one of the main principles of cooperative learning. Working together in order to achieve a common goal is beneficial for all the learners and the success depends on the participation of all the members. Therefore, another crucial element of cooperative learning process is individual, as well as group accountability. The fundament of effective cooperation and collaborative learning is promotive interaction amongst learners. This refers to an encouraging face-to-face interaction amongst students, who are expected to help each other and to share resources. Cooperative learning environment fosters social skills (e.g. effective communication, interpersonal and group skills) and enhances reflective group processing [11]. Cooperative learning is recognized as an effective learning strategy that promotes complex thinking and prosocial behaviour [3]. Prosocial behaviour is actions or patterns of behaviour that tend to help others or the society as a whole. It emphasizes actions such as helping, sharing, donating, co-operating.

2.3 Cooperative games

In a cooperative game environment players work together in order to achieve a shared goal. The achievement of the shared goal requires coordinated efforts of two or more individuals; all the participants are involved in a successful outcome. Cooperative games can create interest in encouraging and assisting others and can foster communication and interaction amongst players. There is a number of research findings which highlight the positive impact of cooperative games on the improvement of social skills and prosocial behaviour [2, 15, 16]. This research aims to link cooperative game concepts in the context of urban planning. We developed the cooperative game ParticiPécs in order to foster learning about the urban environment, urban structures and planning in Pécs, Hungary.

3 The Game ParticiPécs

3.1 Game development

The game ParticiPécs is being developed by a young game developer team, which consists of six pupils between 13 and 16 years, and six young experts. The experts included one urban planner, one architect, one sociologist, one engineer, one researcher, and one coach. The coach is facilitating the learning process and personal development, as well as helping with the documentation by making observations, taking notes, photos, etc. The game developer team has been meeting monthly on a two-day workshop since September 2013. Figures 1 and 2 show one of the workshop settings and the experts involved in the development of the game.

In our case, the game development process can also be considered as a learning process for the participants of the team. Each of the workshops is designed as a learning process by planning and reflecting constantly the process of development and frequent self-evaluation. The whole process is documented via videotapes, photos, notes, reports, drawings, posters, prototypes and other material prepared by the participants.

Fig. 1. Game developer workshop in Pécs

Fig. 2. Game developer workshop in Pécs

3.2 Aim of the game

The aim of the game is to make the city more attractive for the inhabitants by means of small interventions. Interventions are changes in the game environment suggested by the inhabitants, the players of the game. Players can go to the chosen development areas and place a building block, symbolizing an action or intervention. Each of the interventions is rewarded with points. The common aim of the players is to obtain collectively as many points as possible, in order to improve their city.

3.3 Format

The ParticiPécs game consists of a 30,25 m² large playing area. Figures 3-4 show the playing field which represents the extended downtown of the Hungarian city Pécs. The players can move on it and change its appearance by placing building blocks on the playing field. The main traffic routes and nodes, as well as the areas where players can make small interventions are marked on the playing field. The fields on which interventions are possible are called development areas. They are symbolized by black squares, each of them marked by a number. The numbers written on the black squares determine how many players have to cooperate to fulfil the intervention (Fig 3.). There are development areas for 1-, 2-, 3-, and 4-men interventions. 1-man intervention means, that the intervention is fulfilled when one player places a building block on the given development area. In the case of a 2-men intervention, two players have to cooperate and place two building blocks on the given development area, etc.

The interventions are symbolized by the building blocks. There are two kinds of building blocks: one can be placed to development areas for 1-, and 3-men interventions, and the other one can be implemented in 2-, and 4-men interventions. There are twelve colored squares on the playing field, each of them illustrated with a building. These squares mark the different starting points of the players.

Fig.3 The playing field of the game ParticiPécs (designed by Dóri Sirály)

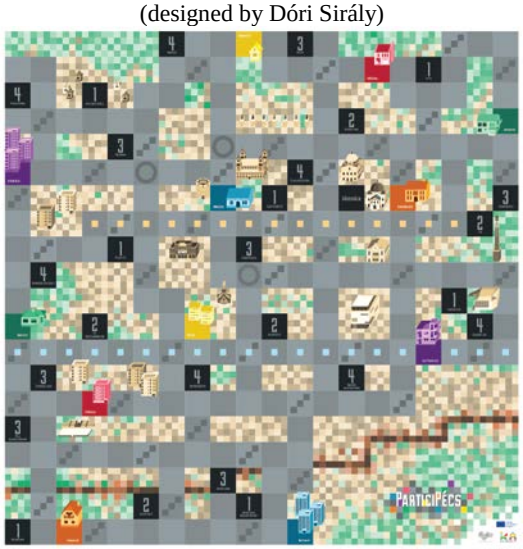


Fig.4. Playtesting of ParticiPécs

3.4 Gameplay

ParticiPécs is a cooperative game, meaning all players play together as a team. Most of the interventions can be fulfilled solely by cooperating with other players, who also accede to the action by placing a building block on the same development area. The more players contribute to the development, the more points they can score. Players have only a limited number of building blocks and limited time to implement actions. They have to develop a strategy together, find common goals and cooperate with each other in order to be able to achieve their goals. They are in a constant flow of communication and agreement, since they can only score together. Fig. 4 shows one of the playtesting sessions in Pécs, Hungary.

At the beginning of the game, each of the players takes a character card (Fig 5.). There are 12 different characters in ParticiPécs, as twelve is the maximum number of players. The character card determines the profile of the players (age, school, hobbies, pets, etc.) and where they live, i.e. at which starting field they begin the game. It describes how the players can place their building block and how many points they can score with the interventions.

Fig. 5. Character card

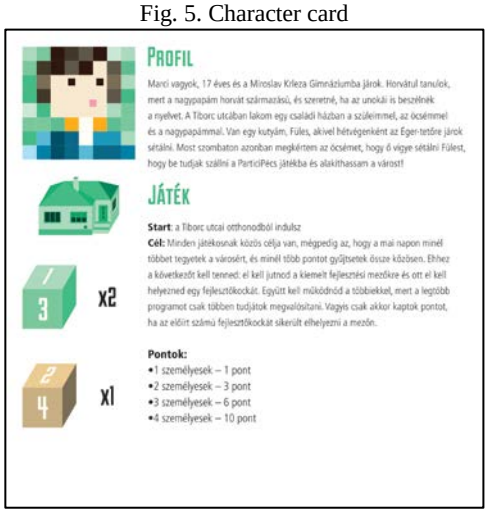
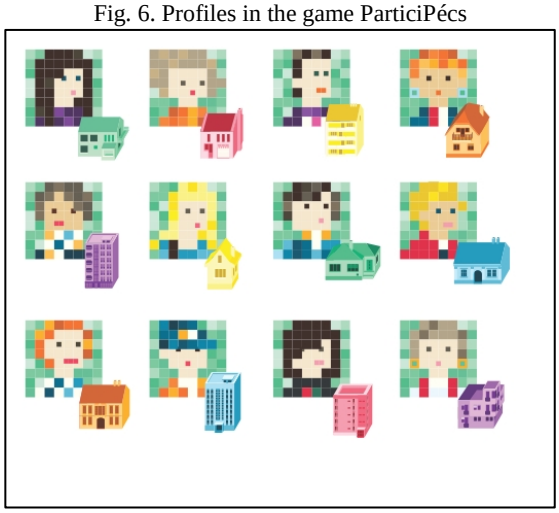


Fig. 6. Profiles in the game ParticiPécs



Players can implement several actions:

1. Move forward

Players can advance by rolling the dice. In each round, only one player is rolling the dice and every player advances the corresponding number of squares on the playing field in the chosen direction.

2. Make an intervention

Reaching a development area, players can make an intervention by placing a building block on the playing field. The player can decide which function of the building block he or she wants to use. By using a lower number, that means to collaborate with less co-players, the intervention can be fulfilled easier and faster. By using a higher number and collaborating with more players, they can achieve exponentially more points.

3. Take a Chance Card

Players can take a Chance card at certain fields. These cards include a short story that relates to the city, to urban transformation and interventions. Example of a story 1: "After the elections a new mayor moved to the office and he does not want to support the developments which have been supported by his predecessor. Every building block received at the Town Hall has to be given back." Example of a story 2: "You signed a petition for preserving the trees in Balokány park. Advance three squares." Each of the cards has a positive or negative consequence on the game, and players often have to accommodate their strategies to the new situation.

4. Lobby for a development of the Town Hall

The Town Hall is a special field where players can lobby decision makers in order to get support for their ideas. After having reached the field "Town Hall", players can roll a dice and depending on the results, they can earn a certain building block or a Chance card.

The game has 11 rounds; at the end of the last round the collected points are counted. The result of the game is evaluated according to a special rating scale. Ratings are measured according to the points achieved by the players. Examples of ratings are: if the result is lower than 30 points then players did not succeed in changing their city. Results between 30-45 points show that players have taken some very nice bottom-up initiatives, but they still have to improve in collaborating with each other. 70 points or a higher score means that players succeeded in creating a very strong proactive community which can foster the co-creation of the urban environment.

The rating scale was developed according to the achievements during the playtestings. It helps players to measure their results comparing their final scores to the maximum achievable score, as well as the score of other groups.

The number of the rounds, as well as the ranking scale were developed during a game balancing workshop. The workshop enabled the game developer team to adjust certain game elements such as:

- fairness: to make our game symmetrical in different aspects, e.g. distances on the playing field, distances from other players;
- challenge: to keep players in the challenge flow, e.g. limited number of building blocks and limited possibilities to obtain new building blocks;
- time: limit the number of rounds;
- meaningful decisions; to extend the freedom of the players to take meaningful decisions that can have an influence on the game;
- chance: to balance the role of chance in the game, e.g. Chance Card, dice…

3.5 Concept of learning in ParticiPécs

The game ParticiPécs can foster knowledge acquisition about the immediate living environment of the players, about urban structure and infrastructure, power relations and important concepts regarding the urban space, as well as about the mechanisms of changing urban space. Knowledge acquisition is embedded in different levels of the game. The first level is represented by the overall, unifying theme of the game, the idea of active participation and proactive citizenship, which is

reinforced by all the other elements of the game. On the second level, players can become acquainted with different options for actions and interventions in urban space. Examples of actions: building a bicycle stand, organizing a parkeur competition, renting a parcel in a community garden, painting a legal graffiti, etc. These interventions are represented by the building blocks that have to be placed on the playing field. The third level of the learning content is imparted through the Chance cards. These cards contain concrete information about the city regarding existing or possible interventions, make clear mechanisms and power relations through short stories or fictitious situations and explain basic concepts regarding the urban space. These different levels of knowledge transfer allow the implementation of differentiated learning, which facilitates the involvement of players from different age-groups or with a variety of previous knowledge.

Through the implementations of the methods of cooperative learning, ParticiPécs aims to foster the acquisition of skills and competences for active participation of children in urban development. Main principles of cooperative learning provide fundamental elements of the gameplay. The common goal players have to achieve ensures both individual and group accountability. Each of the players has to fulfil their individual task considering the collective strategy, which was developed by the group. Most of the interventions can be accomplished via cooperation amongst several players and players get scores for those interventions only if each of them contributes. Hence, there is a strong positive interdependence which motivates players and fosters attention to teammates. Positive interdependence also results in promotive interaction and constant communication where players encourage and facilitate the teammates' efforts to complete the interventions and develop common strategies. Another principle, group processing is also crucial in order to ensure comprehension as well as the long term retention of what is learned. However, during intense gameplay there is a lack of time and possibility for reflection, so much more important it is to integrate a common discussion and evaluation at the end of the game.

4 Conclusions and Future Research

The paper presented builds on the game ParticiPécs which engages pupils in a playful learning environment. We explain the main concept of the game, its elements, and the game mechanics. In the future we plan to test the developed game. Implementing an experimental research design, we aim to study causal relations between the cooperative game ParticiPécs and the learning outcome of the players. Did participants develop an understanding of the domain of urban issues and participation through playing cooperative games? The sample will be taken of pupils in 9th and 12th grades from a secondary school in Pécs, Hungary. In a traditional pre-test and post-test measurement a variety of methods will be applied, as well as observations during the gaming process. We aim to test and explore the mechanisms of learning and gameplay, and reveal their interdependences.

Written and oral tests, interviews, concept maps will be used to collect data regarding the content dimension of learning, respectively the acquisition of knowledge and skills. Videotapes of the gaming and field notes will be taken to document the interactive dimension of learning. In order to be able to analyze the whole field of learning, we will measure changes regarding the motivation and attitudes of participants towards the topic of urban environment and participation. The expected results of these experiments will provide an improved understanding about the learning effect of cooperative games in the context of urban planning. They will provide a basis for the design of playful children and youth participation in urban planning and with this contribute to methods which can involve children in urban planning and creation of cities which are pleasant places to live in for children.

In our future research we aim to develop a digital version of the game ParticiPécs to make it accessible for a wider audience, obtain more diverse data for the study of the game and build on Computer Supported Collaborative Learning (CSCL) in order to improve learning, communication and cooperation within the game. Our research interests are in the enhancement of the learning effect, reinforcement of interaction between the players, and the different communication channels and methods that can support cooperation amongst players.

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References

[1] C. C. Abt. *Serious Games*. Viking Compass, New York 1975.

[2] A. K. Bay-Hinriz, R. F. Peterson, H. R. Quilitch: Cooperative Games: A Way to Modify Aggressive and Cooperative Behaviors in Young Children. *Journal of Applied Behavior Analysis* 27 (3): 435–446. 1994.

[3] A. Ashman, R. Gillies. *Cooperative Learning: The Social and Intellectual Outcomes of Learning in Groups*. RoutledgeFalmer, London, New York 2003.

[4] J. Breuer. *Spielend lernen? Eine Bestandsaufnahme zum (Digital) Game-Based Learning*. Edited by Landesanstalt für Medien Nordrhein-Westfalen (LfM) (LfM-Dokumentation, Band 41). 2010. Available online at http://www.lfm-nrw.de/fileadmin/lfm-nrw/Publikationen-Download/Doku41-Spielend-Lernen.pdf, accessed on 3/14/2013.

[5] J.S. Bruner. The Nature and Uses of Immaturity. *American Psychologist*, 27(8): 687-708. 1972.

[6] M. Csíkszentmihályi. *Flow: The psychology of optimal experience*. Harper Perennial, New York 1990.

[7] A. Czauderna. *From serious games to games for impact*. G4CE Magazine, Insight, 2012. Available online at: http://www.g4ceurope.eu/from-serious-games-to-games-for-impact/ accessed on 05.04.2014

[8] A. Flitner. *Spielen - Lernen. Praxis und Deutung des Kinderspiels*. Beltz J., München 1972/2002.

[9] K. Friedrich (Ed.). *Stadt spielt Stadt. Experimente computer- und webgestützter Bürgerbeteiligung und Planung*. Thelem, Dresden 2005.

[10] J.P. Gee. *What Video Games Have to Teach Us About Learning and Literacy*. Palgrave Macmillan, New York 2003.

[11] D. W. Johnson, R. Johnson. *Learning together and alone: Cooperative, competitive, and individualistic learning* (5th Ed.). Allyn & Bacon, Boston 1999.

[12] E. Klopfer, S. Osterweil, K. Salen,. *Moving Learning Games Forward. Obstacles, Opportunities & Openness*. 2009. Available online at http://education.mit.edu/papers/MovingLearningGames-Forward_EdArcade.pdf; accessed on 13.03.2013

[13] A. Krek, 2008. Games in Urban Planning: The Power of a Playful Public Participation, in: Mobility Nodes as Innovation Hubs. In M. Schenk editor *Proceedings of 13th International Conference on Urban Planning, Regional Development and Information Society*. pages 663-69. Schwechat-Rannersdorf, 2008.

[14] D. Müller-Schwarze. *The Evolution of Play Behaviour*. Dowden, Hutchinson & Ross, New York 1978.

[15] T. Orlick. Cooperative play socialization among preschool children. *Journal of Individual Psychology*, 37:54-63, 1981.

[16] T. Orlick. Positive socialization via cooperative games. *Developmental Psychology*, 17:426-429, 1981.

[17] A. Poplin. Games and Serious Games in Urban Planning: Study Cases, Lecture Notes in Computer Science. In *Springer LNCS, ICCSA 2011 proceedings*, presented at: Cities, Technologies and Planning 2011. Santander, Spain June 20th-23rd, 2011.

[18] A. Poplin. Playful public participation in urban planning: A case study for online serious games. In *Computers, Environment and Urban Systems*, Elsevier, Volume 36(3): 195-206. 2012.

[19] A. Poplin. Digital serious game for urban planning: B3 – Design your Marketplace! *Environment and Planning B: Planning and Design*, Volume 40(3), 2013. doi:10.1068/b39032.

[20] M. Prensky. *Digital game-based learning*. Paragon House, St. Paul, MN 2007.

[21] D. W. Shaffer. Epistemic frames for epistemic games. *Computers & Education*. 46 (3):223 – 234, 2006

[22] A. Singhal, M. Cody, E. M., Rogers, M. Sabido (ed.). Entertainment-education and social change. *History, research and practice*. Lawrence Erlbaum Associates, Mahwah, NJ. 2004.

[23] L. S. Vygotsky. *Mind in society: The development of higher psychological processes*. Harvard University Press, Cambridge, Mass. 1978.

[24] J. H. Watt. Improving Methodology in Serious Games Research with Elaborated Theory. In U. Ritterfeld, M. Cody & P. Vorderer (ed.). *Serious Games: Mechanisms and Effects* pages 374-388. Routledge, New York/London 2009.