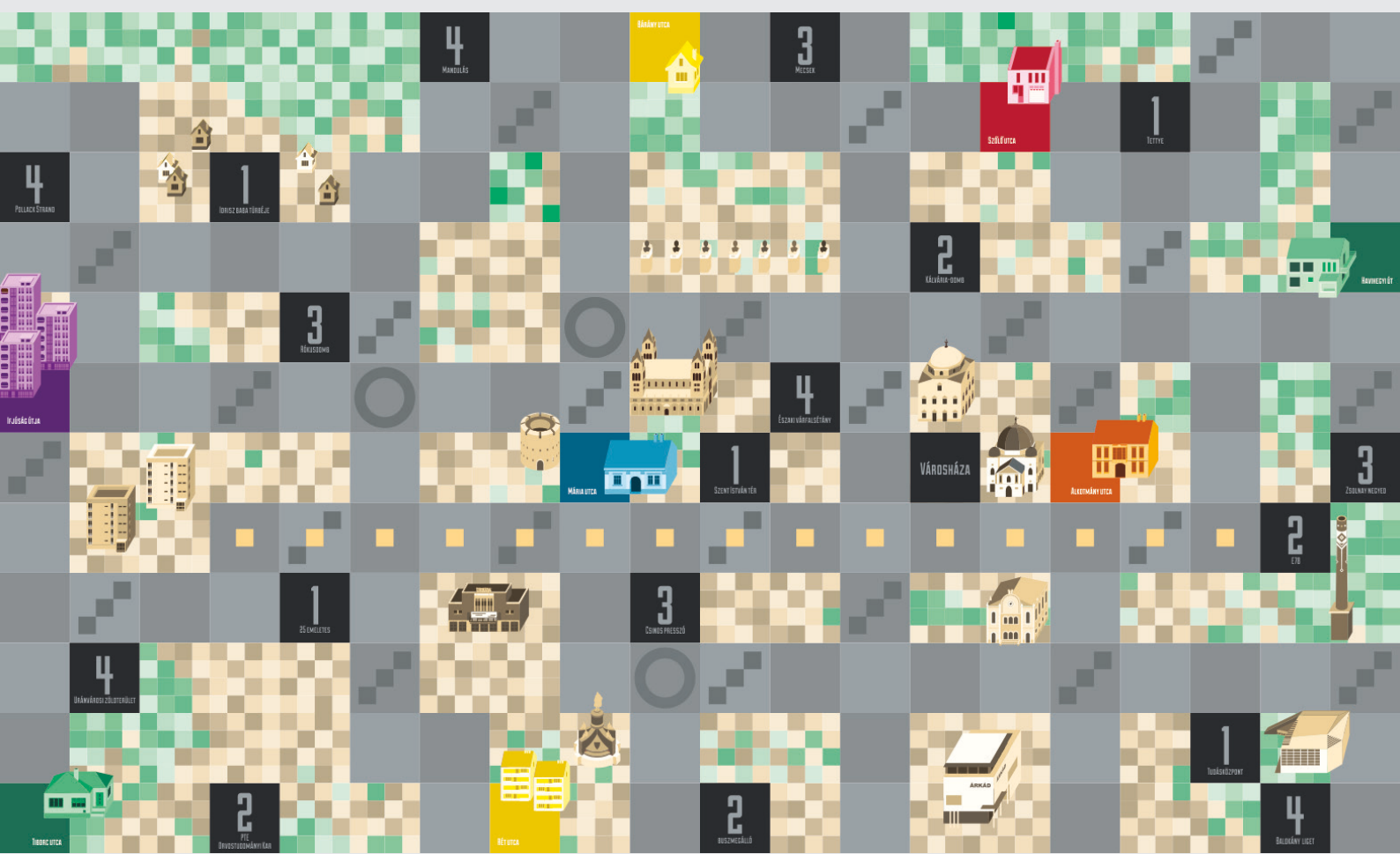


ESZTER TÓTH

TRANSFORMATIVE GAME DESIGN

PERSPECTIVES
ON THE INTERPLAY OF SPACE,
LEARNING, AND GAMES



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Dissertation submitted to the HafenCity University Hamburg in fulfillment
of the requirements for the degree of Doctor rerum politicarum (Dr. rer. pol.)

Research area: Urban planning

Date of submission: 29th July 2024

Date of defense: 18th November 2024

Date of publication: 6th June 2025

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Imprint

HafenCity University Hamburg
Henning-Voscherau-Platz 1 20457
Hamburg © 2025, Eszter Tóth
DOI: 10.34712/142.67

Cover image: ParticiPécs game board by Dóri Sirály

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Acknowledgement

This research has been a journey of reflection and action, characterized by many iterations and shaped by the contributions of numerous individuals who joined me along the way. Without their involvement, the journey and the learning outcomes would have been vastly different.

I owe special thanks to my supervisor, Prof. Ingrid Breckner, for her unwavering support in helping me make sense of my research experience and translating it into a coherent written work. Her encouragement to introduce additional iterations into my writing process greatly improved the clarity and comprehensibility of my findings.

I am also deeply grateful to my co-supervisors, Prof. Angela Million and Gabriella Pataky, who have followed my work from the beginning and provided invaluable feedback that strengthened the disciplinary perspectives of urban planning and education. Their guidance helped me find a balance and integrate these perspectives into my research.

A heartfelt thank you to Prof. Alenka Poplin, my initial supervisor, who encouraged me to embark on this journey and focus on the serious potential of games in participatory urban planning. Her belief in my topic and in me was instrumental in the early stages of this project.

A significant part of my research involved developing and testing game prototypes in Budapest and Pécs. This would not have been possible without the support of the kultúrAktív team, who were actively involved in discussions, implementation, and reflection, providing a solid foundation for the research in Hungary. Special thanks to Anna Szilágyi-Nagy for our engaging discussions on transformative games.

I am especially thankful to the design team members, children, and experts who participated as co-designers over the years. Their collaboration was crucial in co-constructing knowledge on transformative game design, bringing their unique perspectives into the design research process. This diversity of viewpoints contributed significantly to making meaning out of the process and to the development of the games *Pop-up Pest* and *ParticiPécs*. My deepest gratitude goes to Réka Katona, Laura Bahtovic, Zsófia Szolga, Zsuzsanna Lavicska, János Gyergyák, Anikó Plutzer, Róbert Garamvölgyi, Anett Mózer, Bence Gál, Renáta Borbás, Réka Borbás, Dávid, Lili, Laura, Csilla, Réka, Dávid, whose insights and creative input were invaluable. A special mention to Dóri Sirály for creating the compelling visual design of the prototypes.

The practical design phases were always followed by reflective cycles, greatly enriched by the Urban Metamorphoses Research Group at HafenCity University Hamburg. I am particularly grateful for the valuable conversations with Hendrik Weiner, Judith Lehner, Anna Kokalanova, and Renée Tribble.

For practical support in completing this work, I thank Eszter Kapitány for the graphic design and layout, and Caroline de Vries for the proofreading.

I also acknowledge the financial support provided by the research grant from the DAAD, and scholarships from the Sutor Stiftung and the Toepfer Stiftung. Their generous funding allowed me to focus intensively on my research during the critical phases of game development. Without their support, it would have been challenging to dedicate the necessary time and resources to this project, ensuring its thoroughness and depth.

I am profoundly grateful to Éva Tóthné Pfaff, who played multiple roles throughout this journey. As the financial lead of kultúrAktív, her meticulous management of finances and administrative tasks was invaluable in ensuring the smooth progress of the project. Beyond her professional contributions, she provided unwavering personal support as my mother, stepping in as a game master assistant and offering babysitting help when needed. Her multifaceted support was essential to the success of this research.

Finally, I thank my husband, Martin, for believing in me, offering wise advice, and especially for his patience throughout these years. I also thank my daughters, Magdalena and Elisabeth, for helping me take breaks from writing and immerse myself in play.

Abstract

Transformative game design.

Perspectives on the interplay of space, learning, and games

Over the past decades, there has been increasing attention toward the intersection of spatial practice and education. At this intersection, the emerging interdisciplinary field of built environment education has a growing demand for methods and theories that support learning to understand and shape spaces. Due to their engaging and immersive nature, games are increasingly used for this purpose. However, there remains both a theoretical and practical gap in understanding how games can effectively support learning about and transforming spaces.

This research aimed to address this gap by focusing on transformative game design within the context of built environment education. The purpose was to explore how games should be designed, developed, and implemented to support learning to understand and actively shape the spatial environment. To develop comprehensive knowledge on transformative game design, the study adopted an educational design research methodology. This approach was selected for its capacity to uncover the complex interrelations of learning, space, and games through open, iterative processes. It also enabled the development of empirically grounded design principles for transformative games and the evaluation of their impact on children's understanding and engagement with space.

In the first part of my research, I developed a relational approach to the core elements of games, learning, and space. This approach enabled me to explore their interconnectedness in transformative play. Framing games as interconnected systems of rules, play, and culture, enabled to investigate how transformative play can foster the development of players and their broader social and spatial contexts. Understanding learning as emergent from a continuous transaction between individuals and their environment allowed for a natural connection between learning and transforming spaces, and framing both as experience-based, social, and situated processes.

The next level of synthesis involved integrating these perspectives, bringing together games, space, and learning to create situated and social play experiences of learning. Through this integration, I identified initial design principles and key research gaps. The first principle is that transformative games must be grounded in children's spatial worlds to ensure the continuity of experience and facilitate the transfer of learnings from the game to their real-world environments. The second principle states that transformative games should provide situated experiences of spatial practices, helping children understand how they can actively contribute to shaping their living environments. The third principle emphasizes that transformative games should foster social participation, encouraging children to believe that through collective action, they can be active agents in shaping their environments. These principles guided my empirical research, aiming to understand how they can be translated into practical game

design. This, in turn, led to a profound understanding of how transformative game design can support learning to understand and actively shape the spatial environment.

The evolution of game design principles was achieved through an extensive design research process, resulting in three successive game prototypes. The collaborative design process spanned five years in Budapest and Pécs, Hungary, integrating theory and practice, heuristics, and analyses to inform design and research decisions.

The practical outcome of this process was the game *ParticiPécs*, which was implemented in nine school classes ranging from 8th to 14th grade during the final evaluation phase. The theoretical outcomes included a set of design principles for creating transformative games that foster learning to understand and actively shape the spatial environment. The research demonstrated that transformative game design, based on these principles, has significant potential in helping children comprehend the dynamic nature of spaces, recognize their agency in transforming their environments, and believe in their capacity to develop ideas for change.

These insights contribute to built environment education by offering both practical guidelines and theoretical foundations for creating learning environments that enhance spatial understanding and active engagement in spatial transformation.

Abstrakt

Transformatives Spieldesign.

Perspektiven zum Zusammenspiel von Raum, Lernen und Spiel

In den letzten Jahrzehnten wurde dem Zusammenspiel von räumlicher Praxis und Bildung immer mehr Aufmerksamkeit geschenkt. An dieser Schnittstelle entwickelt sich das interdisziplinäre Feld der baukulturellen Bildung, das eine wachsende Nachfrage nach Methoden und Theorien zur Unterstützung des Lernens über Räume und deren Gestaltung aufweist. Aufgrund ihrer fesselnden und immersiven Natur werden Spiele zunehmend für diesen Zweck genutzt. Dennoch besteht sowohl in theoretischer als auch in praktischer Hinsicht eine Lücke im Verständnis darüber, wie Spiele effektiv das Lernen über Räume und deren Transformation unterstützen können.

Diese Forschung zielte darauf ab, diese Lücke zu schließen, indem sie sich auf das transformative Spieldesign im Kontext der baukulturellen Bildung konzentrierte. Ziel war es, zu untersuchen, wie Spiele gestaltet, entwickelt und implementiert werden sollten, um das Lernen über und die aktive Gestaltung der räumlichen Umwelt zu unterstützen. Um umfassendes Wissen über das transformative Spieldesign zu entwickeln, habe ich Designforschung als methodologischer Ansatz gewählt. Dieser Ansatz wurde aufgrund seiner Fähigkeit ausgewählt, die komplexen Wechselwirkungen von Lernen, Raum und Spiel durch offene, iterative Prozesse aufzudecken. Darüber hinaus ermöglichte er die Entwicklung empirisch fundierter Gestaltungsprinzipien für transformative Spiele und die Bewertung ihrer Auswirkungen auf das Verständnis und Engagement von Kindern in Bezug auf ihre räumliche Umwelt.

Im ersten Teil meiner Forschung entwickelte ich einen relationalen Ansatz zu den Kernelementen Spiel, Lernen und Raum. Dieser Ansatz ermöglichte es mir, ihre Interdependenz im transformativen Spiel zu untersuchen. Indem Spiele als miteinander verbundene Systeme von Regeln, Spiel und Kultur betrachtet wurden, konnte untersucht werden, wie transformatives Spielen die Entwicklung der Spieler und ihres breiteren sozialen und räumlichen Kontexts fördern können. Das Verständnis von Lernen als Ergebnis einer kontinuierlichen Transaktion zwischen Individuen und ihrer Umwelt ermöglichte eine natürliche Verbindung zwischen Lernen und Raumkonstitution und rahmte beide als erfahrungsbasierte, soziale und situierte Prozesse ein.

Die nächste Syntheseebene bestand darin, diese Perspektiven zu integrieren, um Spiele, Raum und Lernen im transformativen Spielen zusammenzubringen. Durch diese Integration konnte ich erste Gestaltungsprinzipien und zentrale Forschungslücken identifizieren. Das erste Prinzip besagt, dass transformative Spiele in den räumlichen Welten von Kindern verankert sein müssen, um die Kontinuität der Erfahrungen zu gewährleisten und den Transfer von Lernerfahrungen aus dem Spiel in ihre realen Umgebungen zu erleichtern. Das zweite Prinzip besagt, dass transformative Spiele situierte Erfahrungen räumlicher Praktiken bieten sollten, die den Kindern helfen zu verstehen, wie sie aktiv zur Gestaltung ihrer Lebensumgebungen

beitragen können. Das dritte Prinzip betont, dass transformative Spiele die soziale Teilhabe fördern sollten, um Kindern zu vermitteln, dass sie durch kollektives Handeln aktive Akteure bei der Gestaltung ihrer Umgebungen sein können. Diese Prinzipien leiteten meine empirische Forschung und zielten darauf ab, zu verstehen, wie sie in praktisches Spieldesign übersetzt werden können. Dies führte zu einem tiefen Verständnis darüber, wie transformative Spiele das Lernen über und die aktive Gestaltung der räumlichen Umwelt unterstützen können.

Die Entwicklung der Spielgestaltungsprinzipien erfolgte durch einen umfangreichen Designforschungsprozess, der in drei aufeinanderfolgenden Spielprototypen resultierte. Der kollaborative Designprozess erstreckte sich über fünf Jahre in Budapest und Pécs, Ungarn, und integrierte Theorie und Praxis, Heuristiken und Analysen zur Informierung von Design- und Forschungsentscheidungen.

Das praktische Ergebnis dieses Prozesses war das Spiel *ParticiPécs*, das während der abschließenden Evaluationsphase in neun Schulklassen von der 8. bis zur 14. Klasse implementiert wurde. Die theoretischen Ergebnisse umfassten eine Reihe von Gestaltungsprinzipien für die Schaffung transformativer Spiele, die das Lernen über und die aktive Gestaltung der räumlichen Umwelt fördern. Die Forschung zeigte, dass das transformative Spieldesign, basierend auf diesen Prinzipien, ein erhebliches Potenzial hat, Kindern zu helfen, die dynamische Natur von Räumen zu verstehen, ihre Handlungsfähigkeit bei der Transformation ihrer Umgebungen zu erkennen und an ihre Fähigkeit zu glauben, Ideen für Veränderungen zu entwickeln.

Diese Erkenntnisse tragen zur baukulturellen Bildung bei, indem sie praktische Richtlinien und theoretische Grundlagen für die Gestaltung von Lernumgebungen liefern, die das Verständnis für Raum fördern und das aktive Engagement in der Gestaltung von Räumen verbessern.

Absztrakt

Transzformatív játékdizájn.

A játékok, tanulás és tér kölcsönhatásának új megközelítése

Az elmúlt évtizedekben egyre nagyobb figyelem irányult arra, hogyan kapcsolódik össze a városfejlesztés, az építészet és az oktatás. Ezen a találkozási ponton született meg az épített környezeti nevelés interdiszciplináris területe, amely egyre nagyobb igényt mutat azokra a módszerekre és elméletekre, amelyek segítenek a tér megértésében és formálásában. Motiváló és immerzív jellegük miatt egyre gyakrabban alkalmaznak játékokat erre a célra. Azonban továbbra is sok a nyitott kérdés azzal kapcsolatban, hogy a játékok miként segíthetik hatékonyan a terek megismerését és alakítását. Kutatásomban ezekre a kérdésekre kerestem választ, hogy jobban megérthessük és kihasználhassuk a játékokban rejlő lehetőségeket az épített környezeti nevelés számára.

A kutatásom célja az volt, hogy megértsem, hogyan lehet játékokat úgy tervezni, fejleszteni és alkalmazni, hogy azok segítsék az épített környezet megértését és aktív alakítását célzó tanulást. Ehhez a pedagógiai dizájn kutatás módszertanát választottam, mert ez a megközelítés alkalmas arra, hogy nyitott és iteratív folyamatokon keresztül feltárja a tanulás, a tér és a játékok közötti összetett kapcsolatokat. Ez a módszer nemcsak az empirikusan megalapozott tervezési elvek kidolgozását tette lehetővé, hanem azt is, hogy értékeljem, milyen hatással vannak ezek a gyermekek tanulására a térbeli környezetükről és annak alakításáról.

Az első fázisban kidolgoztam a kutatásom alapvető elemeinek – a játékoknak, a tanulásnak és a térnek – a relációs megközelítését, amely lehetővé tette, hogy feltárjam a transzformatív játék során fennálló összefüggéseiket. A játékokat a szabályok, a játék élmény és a kultúra összekapcsolt rendszereként értelmezve vizsgálhatóvá vált, hogyan segítheti a transzformatív játék a játékosok és szélesebb társadalmi és térbeli kontextusuk fejlődését. A tanulást az egyének és környezetük közötti folyamatos kölcsönhatásként értelmezve természetes kapcsolatot teremtettem a tanulás és a téralkotás folyamatai között.

Ebben a megközelítésben mind a tanulás, mind a téralkotás tapasztalatalapú, társas és szituatív folyamatként értelmezhető. Ezek a szempontok jelentették a következő lépésben a szintézis alapját, amelyben összekapcsoltam a játékokat, a teret és a tanulást, hogy olyan játékelményeket hozzak létre, amelyek során a térhez kapcsolódó, társas és szituált tanulás jöhet létre. Ezen integráció révén azonosítottam három dizájn elvet és az ezekhez kapcsolódó kutatási hiányosságokat.

Az első elv az, hogy a transzformatív játékoknak a gyermekek térbeli világához kell kapcsolódniuk, hogy biztosítsák a tapasztalatok folytonosságát és elősegítsék a játékból szerzett tanulságok átültetését a valós környezetükbe. A második elv szerint a transzformatív játékoknak helyspecifikus téralakítási tapasztalatokat kell nyújtaniuk, segítve a gyermekeket abban, hogy

megértsék, hogyan járulhatnak aktívan hozzá lakókörnyezetük alakításához. A harmadik elv hangsúlyozza, hogy a transzformatív játékoknak elő kell segíteniük, hogy kollektív cselekvés révén aktív alakítói lehessenek környezetüknek. Ezek az elvek irányították az empirikus kutatásomat, amelynek célja az volt, hogy megértssem, hogyan lehet ezeket az elveket gyakorlati játéktervezésbe átültetni.

A játéktervezési elvek evolúcióját egy átfogó dizájn kutatási folyamat során értem el, amely három egymást követő játékprototípust eredményezett. Ez a folyamat mélyreható megértést hozott arról, hogyan segítheti a transzformatív játéktervezés a tér megértését és aktív formálását célzó tanulást. Az öt éven át tartó kollaboratív tervezési folyamat Budapesten és Pécsen zajlott, ahol az elméletet és gyakorlatot, heurisztikát és elemzéseket ötvöztem a tervezési és kutatási döntések megalapozása érdekében. Ennek a folyamatnak a gyakorlati eredménye a *ParticiPécs* játék lett, amelyet a végső értékelési szakaszban kilenc iskolai osztályban játszottunk 14 és 18 év közötti diákokkal. Az elméleti eredmény egy sor játéktervezési elv, amelyek segítségével olyan transzformatív játékok hozhatók létre, amelyek elősegítik a tér megértését és aktív formálását célzó tanulást. A kutatás kimutatta, hogy ezekre az elvekre épülő transzformatív játék jelentős potenciállal rendelkezik az épített környezetről való tanulásban: segít, hogy a gyerekek megértsék a terek dinamikus természetét, felismerjék a környezetük átalakításában rejlő lehetőségeiket, és képesek legyenek ötleteket kidolgozni a lakókörnyezetük pozitív alakítására.

Ezek az ismeretek hozzájárulnak az épített környezeti nevelés területéhez, gyakorlati iránymutatásokat és szilárd elméleti alapokat kínálva olyan tanulási környezetek megteremtéséhez, amelyek nemcsak az épített környezet megértést segítik elő, hanem az aktív részvételt is ösztönzik annak alakításában.

Table of contents

1.	INTRODUCTION	1
1.1.	On the Emergent Research Field at the Intersection of Pedagogy, Architecture and Urban Planning	2
1.2.	Personal Roots and Inspirations	5
1.3.	Transformative Game Design – The Research Object	8
1.4.	From Transaction to Design – The Scientific Approach	11
1.5.	The Aim of the Dissertation	13
1.6.	The Outline of the Dissertation	14
2.	SETTING THE GROUND FOR THE INTERPLAY OF SPACE, LEARNING, AND GAMES	15
2.1.	Toward an Understanding of Learning	18
2.1.1.	Continuity and Reflective Experience	19
2.1.2.	The Situated Nature of Learning	21
2.1.3.	Learning as a Social Process	23
2.2.	Toward an Understanding of Space	26
2.2.1.	Providing Multiple Perspectives on Space	27
2.2.2.	Putting Action at the Heart of the Concept of Space	31
2.3.	Bridging the Gap: Concluding Thoughts on Space and Learning	35
2.4.	The Interplay of Games and Learning	37
2.5.	The Interplay of Games and Space	41
3.	TRIADIC PERSPECTIVE ON THE INTERPLAY OF GAMES, LEARNING, AND SPACE IN TRANSFORMATIVE GAME DESIGN	46
3.1.	Games, Learning, and Space Meet in the Continuity of Experience	48
3.2.	Games, Learning, and Space Meet in the Situatedness of Activity	51
3.3.	Games, Learning, and Space Meet in Social Participation	53
3.4.	Conclusion: Research Questions and Initial Design Principles	55
4.	THE WAY OF ACHIEVING NEW KNOWLEDGE – THE METHODOLOGICAL APPROACH	58
4.1.	Methodological Implications for the Research Design	60
4.1.1.	Linking Theory and Practice in Research	61
4.1.2.	Following an Iterative Route of Design and Research	62
4.1.3.	Keeping a Holistic Perspective	62
4.1.4.	Research as Collaborative Action	63
4.1.5.	Doing Research for Transforming Society	64
4.2.	Research Design	65
4.2.1.	Available Resources for the Implementation of the Research	66

4.3.	Research Methods	68
4.3.1.	Data Collection	68
4.3.2.	Sampling	74
4.3.3.	Data Analysis	76
4.4.	Reflecting the Role of the Researcher	78
4.5.	Ethical Considerations	80
5.	AN ITERATIVE JOURNEY – ADVANCING TRANSFORMATIVE GAME DESIGN	83
5.1.	Framing the Design Research Process	86
5.1.1.	The Spatial Context of the Research	87
5.1.2.	Target Groups and Participants	88
5.1.3.	Composition of the Design Team	90
5.1.4.	Iterative Design Process	92
5.1.5.	Educational Aims and Objectives	97
5.2.	Advancing Design Principles on Spatial Representation in Transformative Games	100
5.2.1.	Understanding Children’s Spatial Worlds	100
5.2.2.	Integrating the Spatial Context into the Game Design	103
5.2.3.	Crafting the Visual Representation of the Game World	106
5.2.4.	Key Insights from Evaluating the First Prototype	107
5.2.5.	Co-designing the Game World	109
5.2.6.	Aligning the Spatial Logic of the Game with the Logic of the Real-world Spatial Environment	113
5.2.7.	Crafting the Visual Representation of the Game World	115
5.2.8.	Key Insights from Evaluating the Second Prototype	116
5.2.9.	Integrating Players' Individual Spaces into the Game World	117
5.2.10.	Insights from the Final Evaluation	117
5.2.11.	Concluding Design Principles on Spatial Representation in Transformative Games	122
5.3.	Advancing Design Principles on Situated Action upon Space	124
5.3.1.	Conceptualizing Spatial Practices for the Gam	124
5.3.2.	Integrating Spatial Practices into the Game Design	125
5.3.3.	Crafting Contextualized Spatial Practices	126
5.3.4.	Key Insights from the Evaluation of the First Prototype	127
5.3.5.	Redesign: Integrating Spatial Practices into the Game Design	131
5.3.6.	Redesign: Crafting Contextualized Spatial Practices	136
5.3.7.	Key Insights from the Evaluation of the Second Prototype	139
5.3.8.	Designing a Game Environment for Personalized Actions on Space	140
5.3.9.	Insights from the Final Evaluation	141
5.3.10.	Concluding Design Principles on Situated Actions upon Space	146
5.4.	Advancing Design Principles on Social Participation	149
5.4.1.	Integrating Social Participation into the Core Game Content	149

5.4.2.	Translating Social Learning into Game Mechanics	150
5.4.3.	Key Insights from the Evaluation of the First Prototype	153
5.4.4.	Redesign: Collaborative Game Mechanics	155
5.4.5.	Key Insights from the Evaluation of the Second Prototype	158
5.4.6.	Redesign: Collaboration on Transforming Spaces	159
5.4.7.	Insights from the Final Evaluation	160
5.4.8.	Concluding Design Principles on Social Participation in Transformative Games	163
6.	LEARNING FROM TRANSFORMATIVE GAMES	166
6.1.	Understanding the Dynamic Nature of Space	168
6.2.	Understanding the Own Agency in Shaping the Spatial Environment	171
6.3.	Developing Ideas for Action	176
6.4.	Transforming Views on Children's Role in Urban Development	181
7.	THEORETICAL REFLECTIONS ON TRANSFORMATIVE GAME DESIGN PRINCIPLES FROM THE TRIADIC PERSPECTIVE OF GAMES, LEARNING, AND SPACE	183
7.1.	Designing Game Worlds for Transformative Play	185
7.2.	Designing Transformative Gameplay	189
7.3.	Designing Transformative Social Play	192
7.4.	Learning from Transformative Games – Potentials and Limitations	195
7.5.	Reflection on the Learning Process of the Researcher	198
7.6.	Reflection on the Transferability of the Transformative Game Design Principles	200
7.7.	Future Directions for Research on Transformative Game Design in Built Environment Education	202
	REFERENCES	204
	LIST OF FIGURES AND TABLES	216
	APPENDICES	219
A	Description of Research Actions	220
B	Overview of Research Methods and Techniques Applied in each Research Action	238
C	Questionnaires Used for Formative Evaluation of the Prototype	240
D	Final Evaluation Interview Guideline	244
E	Overview of Research Participants	247
F	Description of the Pop-up Pest Game	249
H	Description of the <i>ParticiPécs</i> Game	253
I	Description of a Sample Game Session	258
J	Situation Cards in the Pop-up Pest Game	262

1. INTRODUCTION

Games, in the twenty-first century, will be a primary platform for enabling the future. (McGonigal, 2011, p. 13)

1.1.

On the Emergent Research Field at the Intersection of Pedagogy, Architecture, and Urban Planning

Over the past decades, there has been growing attention toward the intersection of spatial practice and education (Million et al., 2019). As a result, the growing demand for methods and theories that support learning about space and place outlines a gap for both research and practice within this emerging interdisciplinary field.

The recent interest in the interconnection of space and pedagogy is grounded in the co-occurrence of significant shifts in various fields of relevance: on the one hand, in children's life experiences and the interest for understanding their spatial relationships, and on the other hand, in the changing understanding of childhood, architecture, design, and space.

Nowadays, it is unquestionable that the physical environment has a significant impact on the quality of our life, behavior, identity, and social relationships; thus, in our personal development, while we are actively and continuously transforming space through our daily activities and spatial practices (Freeman & Tranter, 2011). Environmental psychology has significantly contributed to a deeper understanding of the interaction between humans and the environment (Dúll, 2009) and set the ground for the discussion of how learning about space might be fostered and how these interactions might be consciously integrated into the educational practice. These aspects gain relevance, particularly against the background of a dynamically changing and increasingly urbanized environment (Freeman & Tranter, 2011). Meanwhile, more than half of the world's population lives in urban areas (United Nations, 2015), and even where rural conditions are maintained or re-established, the references to urban civilization are ubiquitous (Eckardt, 2014). This means that tackling heterogeneous social structures and complex infrastructures, as well as complex and rapidly changing physical spaces, are a current challenge for the modern day. Education should thus consider the living environment and address the awareness and understanding of urban experience (Dobson, 2006).

In parallel to these developments, a paradigm shift occurred in the architecture and planning practice. Participatory urban planning has been gaining ground since the 1960s. This participatory reform was reinforced by *Agenda 21* (United Nations, 1992), the action plan for sustainable development adopted at the *Earth Summit* in Rio in 1992, as well as the *Habitat Agenda* from 1996 (United Nations, 1996), which have specifically highlighted children and youth as a major group to be included in participatory processes to improve the environment. Civic consciousness and engagement, thus, have had an increasing impact on the dynamics of space and public participation has become an essential part of planning practices. A growing number of bottom-up initiatives are reshaping spaces by design interventions. Public space is

becoming reclaimed and reconquered by the people (Rauterberg, 2016), and the making of places compounds into increasingly multifaceted contexts (Silberberg, 2013). According to Silberberg, the processual approach towards placemaking – whether large-scale or small-scale – spreads in both academy and practice, and it does not consider the final product anymore as an end but rather the process of making itself. The collective action transforms not only the physical environment but also the people involved, and it empowers the community by building social capital (Derr et al., 2018). This approach understands education as an integral part of the planning process (Million & Heinrich, 2014; Stange, Meinhold-Henschel, & Schack, 2012; Uttke, 2012) and promotes the responsibility of architects to raise awareness of the built environment among the wider society (International Union of Architects [UIA], 2019).

Education gains particular relevance when it comes to the involvement of children and youth. Due to the results of social science research, today we consider childhood an independent life span with specific needs and rights, as passed by *The United Nations Convention on the Rights of the Child* (1989). The Convention recognizes children's right to participate in the discussions on social issues that affect them. Urban development, like the construction of streets, playgrounds, and schools, is indisputably their concern as well. And there is a growing body of literature that considers "children as competent social actors who not only react to social and environmental circumstances, but also use their own agency and autonomy to shape them" (Freeman & Tranter, 2011, p. 8). However, in order to enable meaningful participation, children and youth have to understand the complexities of spatial transformation processes (Hart, 1992). This entails new tasks for educational practice, as children need to be prepared for drawing and expressing opinions meaningfully. It needs to address the development of civic skills and the acquisition of contextual knowledge, which enable participation in collective actions and decision-making processes and finally lead to social and spatial change.

These key shifts in our understanding of education and the built environment have laid the foundation for the emerging interdisciplinary field known as built environment education, and is the primary field of my dissertation. The discourses around built environment education arouse especially in the 2000s (Uttke, 2012) as a reaction to the neglected spatial issues and spatial theorization in education. Appeals for the development and practice of this field emerged from pedagogues and psychologists, as well as from planners, architects, and designers. Those claims, though sharing fundamental assertions, differ from each other in motivations and conceptions regarding space and its role in education. Thus, despite growing practice and increasingly intense academic debate, both in education and in spatial sciences, there is no common understanding of the field, but rather a diversity of approaches (Million et al., 2019).

The purpose of built environment education, in my understanding, is to reflect and enhance the relationship between people and their living environment by promoting the understanding and conscious engagement with space. It enhances identification and engagement with spaces and places to promote active and responsible citizenship. Acknowledging that the term "built environment education" does not prescribe a specific pedagogical stance or approach to space, I elaborate and refine my perspective throughout the study.

My interest in research stems from my practical work in the field of built environment education. In sensitizing children and young people to the built environment, I realized that there was a need to develop methods and tools to prepare children to become aware of, understand and act on their built environment in a complex way. These practical experiences have helped me to develop my knowledge and have had a great impact on my pedagogical approach and research attitude. Below, I outline the key experiences and theoretical reflections that led to the development of my practice and the narrowing of the dissertation topic.

1.2.

Personal Roots and Inspirations

My experimental journey at the intersection of education and the built environment started with a children's book back in 2009, when my hometown Pécs, in Hungary, was preparing for the year of the European Capital of Culture (ECoC). Together with a couple of like-minded colleagues, we felt the need to contribute to the ECoC year by addressing local children who were largely neglected in the conceptualization of the official programming. Our motivation was to trigger positive change in the city from a long-term perspective by strengthening civic consciousness and engagement amongst the youngest inhabitants. We wanted to fill a critical gap, as there was a lack of materials and activities that would encourage children to engage with their everyday environment. Systematic thinking about the built environment was not part of formal education, nor was it addressed in non-formal education programs. In addition, there was a general indifference to issues related to the built environment and, consequently a lack of public debate and weak citizen engagement. Together with my colleague, Ágnes Sebestyén, we developed the idea of *Pécs for kids* (Sebestyén & Tóth, 2010), which encourages children to explore their city and engage with their everyday environment, while discovering the multiple dimensions of physical and social structures and their transformation in space and time.

Hence, my initial focus was on discovering methods to heighten children's awareness of urban spaces, as I recognized a significant gap in educational and cultural offerings. Formulating effective concepts for built environment education, and understanding the needs, interests, and spatial perspectives of children became imperative. Consequently, I organized an experimental summer camp for primary school children, intending to collaboratively delve into the city using our book as a foundation. The insights gained from this experience profoundly influenced my perspective on built environment education and significantly shaped my professional approach.

On the first day, immediately after the presentation and distribution of the books, the children seemed very disappointed. They claimed that they did not want to study during the summer holidays, let alone read books. But when we started exploring the city, their attitude changed radically. They explored the history behind the ancient Roman ruins, the historic buildings and the prefabricated neighborhoods, visited the different religious and ethnic communities that shaped the city, discussed government structures with city hall representatives, observed the urban flora and fauna and immediately understood that it was all affecting them, influencing their daily lives, and ultimately shaping who they are. The children became enthusiastic about learning more and understanding their environment. They complained about skipping chapters, demanded homework, and in the evenings, they took their parents to the places we visited and explained to them all they had learned. They clearly recognized the importance of examining and critically reflecting on their spatial environment. What I have learned from this experience is, on the one hand, the intrinsic motivation that drives children to explore and understand the spaces in which they live and experience on a daily basis. On the other hand,

this experience has influenced my pedagogical approach, as I have observed how powerful and effective learning is when it takes place on the ground, embedded in authentic contexts and experiences, and when the curriculum is not delivered by an authoritative person, but is shaped by learners and educators through their individual knowledge and interactions. This experience sparked my interest in social and situated theories of learning, which situate the learning process in social co-participation and consider knowledge as co-constructed by members of a community (Lave & Wenger, 1991; Wenger, 2008).

Due to the support of the ECoC program, the book *Pécs for kids* was distributed in every primary school in the city. This provided the opportunity for teachers to embed place-based content into their educational programs and for me to explore the relevance of these content in a formal educational context. At the end of the school year, I interviewed teachers and principals from eighteen different primary schools. I wanted to find out about their experiences, whether they used the book in lessons or extra-curricular activities, and how they linked the spatial content to different subjects. The result was astonishing: the book served as a catalyst for introducing spatial contents into the classroom. The city suddenly became present in history, physics, natural sciences, art class, excursions, and several extracurricular activities (Tóth, 2011). The teachers interviewed were negative about the lack of spatial topics in formal education and expressed an urgent need for more tools and materials to facilitate the integration of this content into the curriculum.

Inspired by these experiences, I co-founded the association kultúrAktív, which became an experimental laboratory for built environment education in Hungary, and started prototyping methods and tools for learning about, exploring and transforming spaces and places. In the course of my work, I soon realized the importance of designing engaging and motivating learning environments when working with young people. I observed that the children, and even myself, were deeply focused, fully immersed, and engaged in play and playful exploration of the city. At the same time, I deepened my understanding of motivational theories (Csikszentmihályi, 1990) and the links between play and learning (Dewey, 1916/1980; Malone & Lepper, 1987; Piaget, 1952). I therefore shifted the focus to creating positive experiences, using playful tools and learning environments.

In 2012, I experienced a turning point when I was invited to facilitate a course in Pécs for secondary school students who were planning to study architecture-related subjects at the university. The course with the focus on the basics of architecture and design was led by a local architect. My task was to facilitate the learning process with appropriate teaching methods. We were soon faced with a challenging situation when the architect gave the participants the complex task of rethinking and redesigning an abandoned park near the city center. Traditional methods of participatory planning processes implemented by the architect have failed, and inviting debate and the development of improvement ideas has led to uncertainty and frustration among students. They did not consider themselves competent and skilled enough to formulate an opinion about a particular place and refused to develop ideas for the park. Thus, I had to find a way to overcome this obstacle and find an approach that would make the complex processes of planning and designing places understandable, while motivating young people to think and

develop ideas about their environment. I immediately created a paper prototype of a board game: a sketch of the park layout served as the playing field, and a few simple rules structured the thinking and design process. Although initially skeptical, the students soon revealed their suggestions and gradually became immersed in a playful discussion about the park. This was one of the key experiences that encouraged me to understand more deeply how play can contribute to the understanding of space and the shaping of places. I had experienced the extraordinary potential of games to harness the motivation and tacit knowledge of players and wanted to explore how this could be used to facilitate learning about space.

1.3.

Transformative Game Design – The Research Object

To think of games as a means of built environment education is not obvious, as play as a source of fun and enjoyment has long been separated from serious and productive activities such as work, learning, or research. In the dualism of work and leisure, play and games are associated with the latter and are thus generally seen as the opposite of work. Philosopher John Dewey (1916/1980) strived for dismantling the division between play and work by stressing that they are both activities with an end and therefore they are both meaningful and active occupations.² The play theorist Sutton-Smith (1997) also argued that play is a positive experience that evokes positive feelings. Therefore, he states, “the opposite of games isn’t work. It’s depression” (p. 198). Consequently, playing itself does not have to be not serious or without any other purpose beyond play.

Indeed, games are becoming an emergent field both in the practice of education and spatial disciplines. Games and play have long been employed as a means of education (Breuer, 2010). Especially in the last decades, due to the maturing of the fields of games and learning, more and more cognitive, emotional, and social reasons were discovered to use games for educational purposes (Ramirez & Squire, 2014). And games are increasingly used as easy-to-understand instruments for fostering the understanding of spaces and places in order to make people more conscious about their environment, engage them in active co-creation, enable them to formulate opinions for decision-making, or involve them in participatory planning processes (Dodig & Groat, 2020a). Urbanist Ekim Tan even envisions that “gaming as a method would become a permanent part of city-making cycles for collaborative actions from decision-making, to participatory budgeting, to crowd-building and maintaining cities” (2014, p. 131).

However, as Ramirez and Squire remark, “the translation from these methods from theory to practice, [...] is not a straightforward process” (2014, p. 629). Taking advantage of games’ potential requires careful design, which means that the complex interrelations of the game system, the learning contents and contexts, and players’ learning processes need to be arranged in a meaningful way. As my goal is to advance knowledge in the design of games for built environment education, this dissertation centers on unraveling the connections among games, space, and learning. The aim is to integrate these relationships into a transformative game design.

This requires, first of all, a theoretical framework that sees games not only as a closed system but also as an artifact in interaction with both the players and their broader spatial context. Game researchers Katie Salen and Eric Zimmerman (2003) provide a robust conceptual framework for game design which covers the demand for a holistic, multiperspective approach to games. The authors emphasize that the different aspects of games, such as the interactive, representational, social, and cultural aspects simultaneously contribute to the play experience. Consequently, when designing games, it is fundamental to understand the phenomena

from multiple perspectives. Therefore, Salen and Zimmerman developed a systemic framework providing multiple views by framing games as formal, experiential, and cultural systems.

The formal system refers to internal logical and mathematical structures, that is, the rules of a game. This is a useful way to look at games when designing and analyzing game mechanics as this perspective allows to examine how information is processed, decisions are made, or feedback emerges. The experiential system foregrounds players' experiences and interactions with the game and with other players, and thus, encompasses experiential, social, and representational perspectives. They allow to examine what players perceive, feel, experience while playing, their social interactions, and how they make meaning out of the game elements, contents, and actions. The cultural system perspective integrates the larger cultural, social, and physical context within which games are designed and played. This perspective allows us to explore how the environment affects game contents and play experience, and the other way around, how games transform the broader structures within which they exist. Considering all these aspects collectively is essential in my research. This comprehensive approach is essential for understanding how learning and spatial perception converge in game design, capturing the interplay between young people's experiences and their environment.

Salen and Zimmerman's systemic framework is fundamentally different from the traditional approach to games, which builds upon Huizinga's (2014) concept of the "magic circle". Magic circle refers to the specific time-space condition of games, which separates them from the real world. According to Huizinga, when people start to play, they enter an enclosed, artificial reality, which has no connections to the outside world. He states that entering a game means "stepping out of 'real' life into a sphere of activity with a disposition all of its own" (2014, p. 26). He considers play activities, like many other cultural activities, "temporary worlds within the ordinary world" (2014, p. 12), where we struggle in artificial conflicts through the experience of play. The idea of the magic circle influenced the way games were conceived and theorized for decades. However, if we want to explore and use the transformative potential of games, the mutual influence between games, players, and their broader social, cultural, and physical contexts, then it is necessary to disrupt the borders of the magic circle.

An important milestone in this respect was Gary Alan Fine's (1983) ethnographic study on youth gaming culture, in which he identified three distinctive discursive frames that emerged in role-play gamers' verbal interactions. He could distinguish between 1) communication within the magic circle, when players acted according to their role within the game, 2) a level of metacommunication, when players talked about game issues, for example explaining or negotiating rules, and 3) communication about game external matters, which disrupted the magic circle for a while. Although Fine's study aimed to provide an ethnographic exploration of a gamer subculture, it also presented a compelling description of how the ludic and the real space mingle and merge in the structuring process of a game. Fine's description of the disruptions of the magic circle expands the classical understanding of game worlds as enclosed and disconnected from reality.

The interest in exploring the dynamic shifting between the ludic and the real world grew with the increasing technological development in the gaming arena, especially with the appearance

of massively multiplayer online role-playing games at the end of the 1990s (Taylor, 2006). These games are building real communities and creating lasting game worlds, while spilling over into the real world and becoming more and more a part of everyday life. These games “pervade, bend, and blur the traditional boundaries of game, bleeding from the domain of the game to the domain of the ordinary” by expanding the magic circle “spatially, temporally or socially” (Montola et al., 2009, p. 12).³

This research is based on the premise that the magic circle is not enclosed but rather a permeable boundary, where games and the real world can interfere and exert mutual influence. The boundaries can be transcended, depending on whether we frame games as a structure of rules, an experience of play, or an artifact of a certain socio-cultural environment. This permeability allows us to apply what we have learned and experienced in the game to real life situations, or to bring our knowledge and attitudes back into the game. This makes it possible to grasp how the social, cultural, or physical environment impacts games and play experience, and on the other way around, how playing games might change their envionring societies, cultures, and spaces. In other words, this permeability of the magic circle makes transformative play possible (see Figure 1).

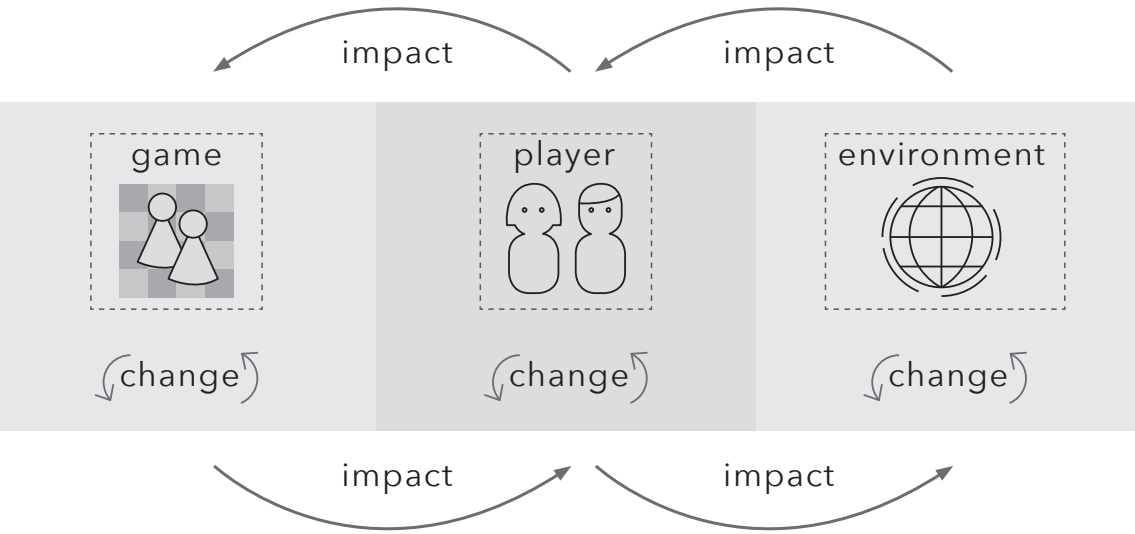


Figure 1
The process of transformative play

This research focuses on transformative play and explores how play should be designed, developed and implemented to help children learn to understand and act upon their spatial environment. Despite the thriving interest in the practice of the application of games in educational and spatial contexts, there is a lack of empirical evidence and theoretical reflections that could guide the creation of powerful game designs (Dodig & Groat, 2020a, p. 6). This research aims to contribute to filling this gap by developing empirically grounded theories on transformative game design that supports learning about spaces and places and the engagement in shaping the spatial environment.

1.4.

From Transaction to Design – The Scientific Approach

The foundation of my research interest in transformative game design is deeply rooted in my educational practice, which lends itself to a practice-oriented nature. Dewey's (1938/1986; 1949/1989) transactional theory provides a philosophical underpinning for my research approach. In contrast to the philosophical dualism of thought and action – which led to the dichotomy between research and practice, as well as between science and common sense – Dewey's philosophy treats doing and knowing⁴ as inseparable. Humans come to know the world through their practice. Action is where knowledge emerges, and the circularity of doing and knowing is involved in both common sense and science. The only difference consists, according to Dewey, of the following proposition: whereas in the concerns of common sense, knowing is necessary to deal with everyday life affairs and in science, “doing and making are carried on for the sake of advancing the system of knowings and knowns” (Dewey & Bentley, 1949/1989, p. 252). In this sense, Dewey's thinking can be viewed as a general theory of practice (Brinkmann, 2013), which is aligned with the practice turn in present social and scientific philosophy (Schatzki et al., 2001). Seeing science and everyday life in a transaction is fundamental for this research, as its initial problem emerged in practice, and its purpose is to improve the practice of built environment education with its outcome. According to Dewey, the scientific inquiry needs to grow out and return to common sense (Dewey & Bentley, 1949/1989), and thus, this research proceeds.

Theories and insights from practice will be continuously interwoven within the methodological framework of educational design research, which allows a gradual, iterative, and systemic development and evaluation of educational interventions as solutions for complex educational problems (Plomp, 2009). My empirical research thus encompassed the entire design and implementation process of a transformative game, beginning from the initial exploration of the problem until the final evaluation and the retrospective analysis of the prototype (Gravemeijer & Cobb, 2006). The educational design research incorporated interwoven cycles of analyses, development, and evaluation, and concluded in the outcome of the game *ParticiPécs*. *ParticiPécs* aims to foster learning, enhance awareness, and transform youth's attitudes regarding the co-creation of the spatial environment by small-scale interventions in public spaces. The outcome of the research includes a series of generative design principles, which can serve as a guideline for future practice and research. The dissertation explains this iterative journey as a dialogue of educational practice and theoretical reflections.

Along this journey, I, as a researcher, have been part of the situation. I shaped, selected, and interpreted thus actively transformed what is actually the subject matter of this research by “thinking and doing” (Schön, 1992, p. 125). The other way around, being in transaction with the situation, the research contributed to my personal and professional growth and development. Dewey and Bentley recognized “that as observers we are human organisms, limit-

ed to the positions on the globe from which we make our observations, and we accept this not as being a hindrance, but instead as a situation from which great gain may be secured” (1949/1989, p. 75). In the earlier sections, my goal was to clarify my personal background, motivation, and philosophical stance. The aim of this section is to make my position as a researcher clear, and thus unveiling the perspectives guiding my exploration of the research subject. However, educational design researchers face challenges not only due to their active involvement in the inquiry, but also because of the evolving roles they may assume throughout the research process (Kelly, Baek, & Lesh, 2008). Consequently, the interventionist roles I played as a researcher were thoughtfully considered throughout my entire research and are explicitly disclosed in this dissertation.

1.5.

The Aim of the Dissertation

The process of deliberate practice set the ground for my dissertation by awakening a keen interest in exploring the potential of play and games within the context of built environment education. Thus, the aim of my dissertation is to explore how games should be designed, developed, and implemented to be effective tools for learning to understand space and to take action on its behalf.

The theoretical objective of the research is to provide design principles underpinning the impact of games in this specific educational context. The insights and design principles shall improve built environment educational practice by providing a framework for “gameful” learning environments that deal with complex spatial or place-based issues and problems. In effect, the framework aims to improve the practice of teachers and educators in promoting learning to understand the spatial environment, as well as the practice of architects, planners, and designers working together with young people to transform spaces. Furthermore, the research aims to enrich the academic discourse on both applied games in a spatial context and built environment education with empirically grounded theories.

The practical objective of the research is to develop and produce a transformative game that is an effective educational tool for the improvement of children’s learning to understand and to transform space actively.

1.6.

The Outline of the Dissertation

In my thesis, I aim to provide a clear and linear account of a research journey that unfolded over several years, far from linear, but which has yielded countless invaluable insights along the way.

Chapter 1 sets the ground for the dissertation by introducing the research field and presenting my personal roots and motivations for conducting this research about transformative games in the context of built environment education.

Chapter 2 is dedicated to the critical reflection of relevant theoretical frames of the research objective by exploring the dynamic interplay among fundamental concepts: games, learning, and space. This progression unfolds gradually, initially through the development of a relational perspective, enabling a transactional exploration of their interconnectedness. Subsequently, I delve into their dual relationship to identify common points. From this synthesizing work, it gradually emerged that to harness the transformative potential of play for built environment education—that is, to foster learning to understand and act for the built environment—it is necessary to consider the relationships between games, space, and learning in terms of continuity of experience, situated action, and social participation.

In Chapter 3, I then explore the three points of intersections developed in more depth from the perspective of triadic interrelation of games, learning, and space in theory and practice, and conclude with initial design principles and open questions to be addressed in the empirical research.

Chapter 4 explains the way I have been gaining knowledge through design research. I first present the methodological implications elaborated on the basis of Dewey's pragmatist theory on inquiry to justify the choice of the educational design research methodology. Next, I explain the research design, as well as the strategies, methods, and instruments of data collection, analysis, and sampling. The chapter concludes with a reflection on my role in the research process, and ethical considerations.

Chapter 5 unveils the progress of knowledge about transformative game design as it has emerged through the reflective action and multiple iterations of a game design process. It explains how the design principles emerged and evolved during the development and evaluation of three successive prototypes.

Chapter 6 presents how the final prototype contributed to learning to understand and act upon space.

Finally, Chapter 7 concludes with the discussion of the design principles and relate these to the theoretical framework on game design, education, and space, offering a broader context that facilitates the transfer and adaptation of these principles into theory and practice.

Notes

- 1 I use the term “children” for all people under 18, as defined by the United Nations, and use the term “young people” synonymously. For older teens and young adults, I apply the term “youth.”
- 2 Dewey argues that play is not only an action of the moment without any meaning but it “has an end in the sense of a directing idea which gives point to the successive acts” (1916/1980, 211ff). Work, in his understanding, is an activity that involves caring about consequences. It only becomes labor when the consequences fall outside the activity as an end, and the activity becomes merely a means.
- 3 Games that deliberately push the boundaries of the contractual magic circle are called pervasive games. The term pervasive gaming refers to a variety of forms and genres, from location-based games to massively multiplayer online games or games based on augmented reality.
- 4 Dewey (1949/1989) and situated learning theorists like Lave and Wenger (1991) conceive of knowledge not as an entity or thing, but as an action, therefore expressed through a verb.

2. SETTING THE GROUND FOR THE INTERPLAY OF SPACE, LEARNING, AND GAMES

To see the relations between the individual and the environment, between content and method, and between social and intellectual factors as complementary and as two sides of the whole thing is to shift the center of gravity of educational philosophy. (Dewey, 1938/2008, p. 58)

This chapter sets the ground for a transactional inquiry on transformative games in the context of built environment education by defining key concepts related to games, learning, and space and their possible interrelations.

The first step involves adopting a dynamic and relational approach to the core elements of the subject, enabling a gradual exploration of their interrelations within the context of transformative play. In Section 1.3, I outlined my approach to games as systems encompassing rules, play, and culture. From this perspective, games are viewed as open, complex, and emergent systems that continuously interact with players and the broader cultural and social contexts in which they are created and experienced. This approach is crucial for studying the phenomenon of transformative play, as it helps us understand how games can facilitate learning and engagement with space. However, this requires working with concepts of learning and space that allow us to explore their interrelationship within the framework of games.

Following this, Sections 2.1 and 2.2 elaborate on a dynamic and relational approach to learning and space, applicable to the field of built environment education. In the subsequent intermediate concluding chapter, I integrate the concepts of learning and space, contributing to the definition of the objectives of built environment education and the practical part of the thesis. Subsequently, Sections 2.4 and 2.5 present the existing knowledge on the dual relationship between games and space, and games and learning, from the perspective of the research object. These theoretical considerations provide the basis for combining aspects of games, learning, and space in transformative game design, and for developing the research questions of the empirical study in the following chapter.

I consider my role as a researcher to be integral to the situation, actively contributing to the development, organization, and reflection of theoretical insights throughout the research process. As mentioned in the introductory chapter, my practical work in the field of built environment education has fundamentally shaped my perspective on the research field, particularly in how I approach learning about space. Therefore, this theoretical chapter is presented as a dialogue between theory and practice: I support theoretical considerations with examples from my practice to make my position and thinking transparent.

2.1.

Toward an Understanding of Learning

My personal experiences, theoretical reflections, and the immersion in transformative play have led me to the conclusion that learning, especially in the context of built environment education, cannot be understood as a closed mental process but is always part of a wider, ongoing human-environment interaction. This approach is related to Dewey's (1916/1980) understanding of learning, which is grounded in the idea that humans' permanent adaptation to the environment generates a continuous process of alternation. In other words, people change their environment through their actions and continuously readjust their actions to the changing environment. This process of readjustment implies a continuous reconstruction and reorganization of experiences. New knowledge emerges in experience through interaction with the material, social, and cultural environment and gives direction and meaning to subsequent experiences. Thus, according to Dewey, learning can be considered a "by-product" of trans-actions or life-experiences (1916/1980, p. 204). He summarized this idea as follows:

[S]ince man as an organism has evolved among other organisms in an evolution called 'natural,' we are willing under hypothesis to treat all of his *behavings*, including his most advanced *knowings*, as activities not of himself alone, nor even as primarily his, but as processes of the full situation of organism-environment; and to take this full situation as one which is before us within the *knowings*, as well as being the situation in which the *knowings* themselves arise. (Dewey & Bentley, 1949/1989, p. 97)

This idea of learning became tangible during my built environment education practice while observing children performing at mock-up workshops. Their activity of creating cardboard cities turned the material at hand into something different, into representations of houses, trees, and streets. Meanwhile, they experimented with tools and materials, explored how to cut the cardboards at best – by pulling with their hands or using scissors and cutters. They gained insights through experimentation, and these insights informed their next steps. When they were doing well in cutting and customizing the cardboard, they focused on new challenges. They experimented with folding, sticking, and inserting in order to create solid constructions. After some time, they obtained the basic skills needed for building models and were acquainted with the qualities of different materials and functions of various tools. They then started to produce a number of buildings and objects and placed them in relation to each other on the imaginary city-board. While placing the cardboard constructions, they reflected on aspects and qualities of the environment at a larger scale: how to relate and connect the buildings? Where are roads, parks, and green areas needed? Where is a suitable location for the industrial sites? In sum, while transforming the cardboard, children learned how to fix, cut, balance, familiarized themselves with the qualities of the materials, learned implicitly about structures, statics, and construction, as well as their living environment. New knowledge emerged from the situation through children's interactions with materials, peers, and educators. The new knowledge informed and triggered new experiences, thus ensuring the continuity of experience and the continuity of growing.

This example of my educational practice illustrates the key aspects of Dewey's theory of learning. It reveals, first, how learning emerges in reflective and continued experience. Second, it reveals that since knowing is inseparable from doing, knowledge is situated in specific activities or experiences. And third, seeing how knowing emerges in collaborative activity through interaction with peers and educators underpins the notion that learning is an inherently social process. In the following subsections, I further elaborate on these aspects to set up a comprehensive understanding of learning for this research. Subsequently, these general insights on learning are adapted for developing design principles for transformative game design.

2.1.1.

Continuity and Reflective Experience

The previous section exposed how skill and information are acquired while activities are carried on for their own sake, underlining the concept that knowing emerges from the reorganizing activity, which goes along with the action. This view contrasts with classic learning theories, which either treat learning as a mental process, that is, something that happens inside people's minds or emphasize the role of external impulses or environmental stimuli in forming behavior. In contrast, Dewey dissolves the dualisms of body and mind, human and environment, and indicates that the experience itself, the "intimate union of activity and undergoing its consequences leads to recognition of meaning" (1916/1980, p. 149).⁵

Although experience is the key to learning, Dewey points out that not every experience is genuinely or equally educative: an experience that has a negative effect on following experiences, which hinders growth, decreases sensitivity and responsiveness, or the ones disconnected from other everyday life-experiences are "mis-educative" (1938/2008, pp. 11–13). A meaningful experience is one that is not isolated but connected with past and future experiences. It is an experience that "incorporates something from previous experiences, and at the same time, shapes the quality of future experiences" (1938/2008, p. 19), and thereby contributes to the continuity of growing.

Growing and continuity presuppose reflection, insofar as "an activity is continued into the undergoing of consequences, when the change made by action is reflected back into a change made in us, the mere flux is loaded with significance. We learn something" (Dewey, 1916/1980, p. 146). Thus, to learn from experiences, we need to build connections between our actions and their consequences. In other words, we need to think. Thinking evolves when we face new challenges in uncertain and incomplete situations, and we need to inquire and investigate as we cannot rely completely on previous experiences. This process of inquiry brings about learning, but as Dewey stresses, "acquiring is always secondary, and instrumental to the act of *inquiring*" (1916/1980, p. 155).

Let us return to the example of the mock-up workshop, where the children involved often found themselves in new and incomplete situations. For instance, when at the end of the work-

shop they realized that, although they had created a beautiful river flowing through the cardboard city, it was not possible to cross it from one bank to the other. The bridges were missing. Once they recognized the problem, they started to think and discuss. How many bridges are needed? How much time they have left? And what materials and tools were available? Then they came up with a very simple solution: they cut a narrow strip of paper a bit longer than the width of the river, bent it slightly over the river, and glued both ends of the paper strip to the cardboard. This quick and simple solution served their purpose perfectly.

This example thoroughly illustrates the stages of thinking as they emerge from an incomplete situation. Dewey (1916/1980, 1938/1986) defined these steps as 1) the sense-making of the situation; 2) exploration and analysis of the conditioning environment; 3) development of a tentative hypothesis or solution; 4) and active experimental testing. These are the general features of reflective experience and inquiry, which Dewey called the experimental or scientific method.⁶

In reflective experiences, we make connections between past and present experiences, and the connections we make are crucial to learning and growing; “the *measure of the value of an experience* lies in the perception of relationships or continuities to which it leads up” (Dewey, 1916/1980, p. 147). Gee explains this process as follows:

When people are faced with a new situation in the world, aspects of this situation remind them of aspects of experiences they have had in the past. They use these elements of past experience to think about the new situation. Sometimes they can just apply past experience pretty much as is to the new situation. Other times they have to adapt past experience, more or less, to apply it, in the process learning something new that can, in turn, be applied to future situations. (Gee, 2007, p. 72)

In line with Dewey, Gee indicates that we do not store isolated facts and information in our minds, but through complex patterns that we pick up through our experiences in the world.⁷ These patterns consist of a number of conceptual elements or nodes that are linked through stronger or weaker connections. In this way, cardboard, shoebox, roll tube, glue, cutter, scissors, building, and house can be a set of nodes that form the concept of a mock-up. These patterns can be activated, in whole or in part, in later experiences. A mother once reported to me at the end of a mock-up camp that her daughter, when she saw the shoeboxes on the top of the wardrobe at home, immediately took them off, took the shoes out, cut and colored them, and turned them into dollhouses. Obviously, the child developed a pattern for mock-up in her mind on the basis of her experiences, and the shoebox was such a strongly connected element within this pattern that the sight of it directly activated the whole concept and prompted her to action.

Sometimes we can apply our familiar patterns to new situations to develop solutions. For example, we can use our experience in model building when planning to build a camera obscura. This strategy of “calling on previous experience” is called transfer in education (Gee, 2007, p. 126). In other situations, our old patterns do not work. In these cases, we have to adapt, merge, and

transform the strategies we know. This happened in an outdoor activity where children wanted to model their visions for a particular area using pre-cooked savory dough. Suddenly they realized that the salt dough was too liquid to use for modeling. There was no flour available on site to fix the dough's consistency, so they had to find a solution to this problem. They thought, discussed, and immediately started collecting natural materials they found in the park, such as sticks, pinecones, and leaves. These materials were used as frames or skeletons that held the structures together, and the salt dough became just an outer covering. This way of thinking "of something new ... in the context of keeping what is useful from past experience" describes Gee as innovation (2007, p. 127). Transfer and innovation are seen as desired outcomes of education. However, this needs a careful and well-thought-out design of the learning activities.

2.1.2.

The Situated Nature of Learning

The previous section discussed learning as a result of experience. In this understanding, knowing is recognized as action: the way we deal with, use, and shape our environment occurs through processes of exploring, judging, acting, and forecasting the consequences of our actions.

For the doctrine of organic development means that the living creature is a part of the world, sharing its vicissitudes and fortunes, and making itself secure in its precarious dependence only as it intellectually identifies itself with the things about it, and, forecasting the future consequences of what is going on, shapes its own activities accordingly. If the living, experiencing being is an intimate participant in the activities of the world to which it belongs, then knowledge is a mode of participation, valuable in the degree in which it is effective. (Dewey, 1916/1980, p. 347)

Considering knowledge as a mode of participation presupposes that knowing is tied to a specific situation. While reflecting on and acting in a given situation, we make meaning out of specific signs, symbols, objects, and actions (Gee, 2007). The situatedness of meaning-making was strikingly evident in the mock-up workshops, where cardboard was transformed into building materials, colored paper into house paint and cotton wool into the canopy of trees. Certainly, these objects would have different meanings in different contexts, but within a mock-up building process, these meanings emerged and were accepted and shared by all participants. Thus, to give meaning to any sign, symbol, object or action presupposes knowledge of the context in which they were created.

This situational approach to cognition reinforces the notion that learning is not happening inside people's heads, disconnected from the social, cultural, and physical environment but is fully embedded in or situated within these contexts. More recent theories on situated cognition or situated learning further developed this approach and gained influence in educational research and practice (J.S. Brown, Collins & Duguid, 1989; Lave, 1988; Lave & Wenger, 1991).

These theories share with Dewey the central concept of placing the situation at the center of cognition and oppose educational approaches that “assume a separation between knowing and doing, treating knowledge as an integral, self-sufficient substance, theoretically independent of the situations in which it is learned and used” (J. S. Brown, Collins, & Duguid, 1989, p. 32). Proponents of situated learning theories criticize traditional schooling, where the primary focus is on the transmission of abstract, decontextualized formal concepts that learners are expected to internalize and transfer into different contexts. In contrast, situated cognition theory emphasizes that knowledge is born out of embodied experience, and only through repeated experience and the development of rich connections between experiences leads to more general understanding (Dewey, 1916/1980; DiSessa, 2000; Gee, 2007; Lave, 1988).

Meaning is material, situated, and embodied if and when it is useful. Abstract systems originally got their meanings through such embodied experiences for those who really understand them. Abstraction rises gradually out of the ground of situated meaning and practice and returns there from time to time, or it is meaningless to most human beings. (Gee, 2007, p. 87)

The assumption that meanings and knowing arise in situations and are revised and reorganized in subsequent experiences “so as to enable us to adapt the environment to our needs and to adapt our aims and desires to the situation in which we live” (Dewey, 1916/1980, pp. 354–355) means that concepts are never to be taken as finished. What we know is always reorganized and reconstructed in every new experience. Thus, according to Dewey, “knowledge is not just something which we are now conscious of but consists of the dispositions we consciously use in understanding what now happens” (1916/1980, p. 354). This means that knowledge is not only constructed and reconstructed in our mind, but situations “co-produce knowledge through activity” (J. S. Brown et al., 1989, p. 32).

Another snapshot from the mock-up workshop provides an example of the co-constructing role of situation in meaning-making. At the beginning of a five-day workshop, the children wanted to build houses for the inhabitants of the cardboard city. As an introduction, we discussed what kinds of houses exist and how it is like to live in a city. To inspire the discussion, I made drawings of different types of housing. It soon became apparent that the children had very different ideas about housing: some lived in suburban areas and only knew single-family houses, others lived in prefabricated houses or historic tenements in the densely populated city center. Their individual experiences brought with them different values, interests, and preferences, and these in turn strongly influenced their general perceptions of housing. It is their ideas or perspectives that have determined how they wanted – or not wanted – to build the neighborhoods of the cardboard city. One participant even rejected the construction of prefabricated houses because he thought they were unattractive and out of keeping with the cityscape. At this point, a heated debate ensued, where all the children had the opportunity to express their opinions and to collect the advantages and disadvantages of their preferred housing types. The debate developed their understanding of housing by exploring other perspectives and the heterogeneity of approaches to the topic. Through arguments that emerged from personal experience, they accepted the views of others and decided to build a city with a diversity of housing types.

This experience demonstrates how different contextual elements influence the meaning-making process: the objects at hand, such as drawings of houses or materials and tools; one's own experience and knowledge, as well as the experience and knowledge of other participants; and even the wider spatial and cultural conditions of the city. Accordingly, Dewey (1916/1980) refers to a situation as the "contextual whole", which encompasses the material, social, and cultural background of the activity. This is inclusive of any aspect, object, or person that influences our actions. He points out that the elements of a situation are not limited by spatial or temporal distance. A situation also includes elements that are not physically present but nonetheless influence the way we act or think. For instance, skyscrapers that children saw in a book or the faraway house of grandparents could influence one's conceptualization of housing.

The example of the construction of residential buildings for the cardboard city also reveals how meaning-making is strongly driven by individual experiences, values, preferences, and interests. Gee (2007) refers to these as "cultural models", which are patterns we carry of the world. Cultural models, he points out, are tacit "images, story lines, principles, or metaphors that capture what a particular group finds 'normal' or 'typical' in regard to a given phenomenon" (2007, p. 149). Thus, cultural models are shared by a social group, and as Gee emphasizes:

Cultural models are not true or false. Rather, they capture, and are meant to capture, only a partial view of reality, one that helps groups (and humans in general) go about their daily work without a great deal of preplanning and conscious thought. (Gee, 2007, p. 149)

Cultural models are usually tacit. Only when they "are challenged or come into conflict with other such models, then they can come to people's conscious awareness" (Gee, 2007, p. 150). This means that when we are confronted with other cultural models, or, in other words, different perspectives on the world or a particular phenomenon, we can become aware of our own cultural models, and learning can take place.

2.1.3.

Learning as a Social Process

The previous section discussed the situated nature of learning, which stressed that learning is not an individual account but a process constituted by the situation as a whole. Since humans are constantly embedded in situations where they interact with other people and objects, acting in a situation also means participating in joint activities with our social environment. In consequence, learning is considered an essentially social process (Dewey, 1916/1980, 1938/2008).

By doing his share in the associated activity, the individual appropriates the purpose which actuates it, becomes familiar with its methods and subject matters, acquires skill, and is saturated with its emotional spirit. (Dewey, 1916/1980, p. 26)

This means that by participating in shared experiences with other people, we acquire skills, knowledge, methods, and understandings of the world. The mock-up workshop mentioned earlier was framed as such a shared activity, and provided an in-depth view of how the children, while constructing residential houses for the cardboard city, collaboratively constructed new knowledge about creating cardboard houses and the idea of housing in general.

On the basis of our desire to belong to certain groups – which can range from small groups in our immediate environment, such as a family or school class, to the whole nation or even the whole of mankind – we tend to act in accordance with and in line with the interests of those groups. As a consequence, our social environment forms our mental and emotional disposition of behavior by engaging us in activities that “arouse and strengthen certain impulses that have certain purposes and entail certain consequences” (Dewey, 1916/1980, p. 20). In other words, in everyday life we behave in certain ways, and we recognize the reactions of our social environment to our actions and adapt to them accordingly. In the same way, we adopt cultural models that capture “what a particular group finds “normal” or “typical” in regard to a given phenomenon” (Gee, 2007, p. 149), and thus provide a particular perspective and interpretation of the world.

Cultural models are picked up as part and parcel of acting with others in the world. We act with others and attempt to make sense of what they are doing and saying. We interact with the media of our society and attempt to make sense of what is said and done there, as well. Cultural models are the tacit, taken-for-granted theories we (usually unconsciously) infer and then act on in the normal course of events when we want to be like others in our social groups. (Gee, 2007, p. 153)

Let me return to the previous example to show how I observed this process in practice. When the children were confronted with the task of making dwellings for the cardboard city, they all had certain images and ideas, in other words cultural models of “home”, which were pre-structured through their previous experiences and the cultural models shared in their families. They all had a vision of “home” and wanted to reproduce this model in the cardboard city. The children who grew up in neighborhoods characterized by single-family homes wanted to build a suburb for the cardboard dwellers and fill it with spacious single-family homes with gardens. In a similar way, the children from prefab apartments wanted to construct prefab housing developments for the residents with whom they identified themselves in that situation. Their socially pre-structured cultural models about housing were very influential, which reveals that thinking is social, “something attuned to and normed by the social groups to which we belong or seek to belong” (Gee, 2007, p. 192). However, the ideas that children carried about housing were challenged when they became part of a new community that was created through the collective activity of the mock-up camp. After an intense discussion about housing types, the group established (new) norms for the cardboard city, norms that encompassed the preferences and ideas of each participant. They experienced that neither concept is right or wrong, “but they become meaningful (‘right’ or ‘wrong’) only from the perspective of the workings of social groups that ‘enforce’ certain patterns as ideal norms toward which everyone in that group should orient” (Gee, 2007, p. 196). Our thinking about the world and our cultural models

are thus shaped by our social environment. Our thinking, knowing, and patterns of processing can be transformed in experiences and interactions with other people.

So far, I have argued that learning takes place through social interaction and participation in shared activities, and that our conceptions of the world are socially pre-structured. This means that learning and thinking are inherently social, and our knowledge and knowing are socially co-constructed. To situate learning within lived experience, in ongoing transaction with the environment, means acknowledging that knowing and knowledge are inherently distributed (J. S. Brown et al., 1989; DiSessa, 2000; Gee, 2007; Lave, 1988).

'Cognition' in everyday practice is distributed – stretched over, not divided among – mind, body, activity and culturally organized settings (which include other actors). (Lave, 1988, p. 1)

That is, our knowledge and skills are stored in the minds and bodies but also in our social and physical environment. The idea of an “extended mind” has its roots in early progressive theories of cognition, which emphasize the role of artifacts (Dewey, 1916/1980), as well as the role of peers and “more knowledgeable others” (Vygotsky, 1978)⁸ in thinking and learning. This idea raised attention in the increasingly technologized modern world, where “it is equally or more important to know what people can think and do with others and with various tools and technologies” (Gee, 2007, p. 197). The extended mind theory, developed by Andy Clark and David J. Chalmers (1998), stresses the active role of the environment – both physical and social – in driving cognitive processes. Above I have discussed the power of the social environment to stimulate thinking and have supported the theories with examples from my educational practice. Yet the mock-up workshop also provided insights into how the physical environment, especially tools and materials, might contribute to cognition processes. The moment when the children faced the problem of missing bridges in the cardboard city, they shared their ideas with the group and also used the tools and materials available to help them think. Finally, finding a solution to the problem was a joint undertaking between the group members and tools and materials available.

Making models with children has highlighted the nature and essence of learning. Above all, it made vividly visible the way in which learning is created throughout the course of a transaction with the social and material environment. As the children perceived, understood, and shaped the materials and the ideas of their peers, they themselves were able to be formed by the experience and grow. The dynamics of this process of interplay between children and their environment helped to define the concept of space as an ever-changing element of children's life experiences.

2.2.

Toward an Understanding of Space

There are two fundamental challenges for defining the built environment in the educational context. First, there is no general definition of space but rather disciplines that approach the concept of space in different ways (Breckner & Sturm, 1997). For instance, traditional geography dealing with the characteristics of place and distances, focuses on physical and material concepts of space, while social sciences focus on the dimensions of social structure, practices, or power relations in space. The different interpretations relate to specific manifestations of space and are therefore adapted to different issues and problems. The explanation of such a variety of contextual readings of the concept of space is related to the fact that space is not a physical element of reality that can be concretely measured and described, but rather the spatiality of very complex systems that have many exploratory and interpretive aspects (Faragó 2012). Space thus cannot be explored in itself but in its different forms of manifestation. Drawing upon a transactional background (Dewey, 1916/1980; Dewey & Bentley, 1949/1989), if our goal is to develop a comprehensive understanding and the capability to consciously transform our environment for its best, then there is a need to develop an unfractured perspective and “reconnect approaches to space” (Breckner & Sturm, 1997, p. 217). This unfractured perspective is particularly important for education because “space in all its variations [...] forms an integral component of the child’s world” (Freeman & Tranter, 2011, p. 6). Therefore, in the first subsection, I discuss the different spatial dimensions and their possible reconnection in educational theory and practice.

The second challenge in conceptualizing space for the educational domain stems from the enduring influence of the modernist dichotomy, which contrasts an unchanging nature with a historically conceived, transforming society. Despite progressive pedagogical trends advocating a more comprehensive view of space in recent centuries,⁹ broader educational practices have, with few exceptions, largely overlooked spatial considerations even to the current day (Gruenewald, 2003a). The traditional separation of humans and their physical environment has fostered a static, fragmented concept of space, treating space merely as a container for human action. Consequently, space and place have been detached from social processes, reducing the environment to a solid and stable backdrop for human life within educational content. This separation is evident in the division between humanities and sciences, where “sciences consist of technical information of the physical world” (Dewey, 1916/1980, p. 299). However, if we perceive learning as an integral part of an ongoing human-environment transaction, then education becomes an endeavor to “maintain the continuity of knowing with an activity which purposely modifies the environment” (Dewey, 1916/1980, p. 354). Accordingly, the concept of the built environment must be dynamic and assume constant adaptation and change. Therefore, the second subsection discusses current approaches to the constitution of space in education and concludes with a theory of space that places constitutive action at the heart of the concept of space.

2.2.1.

Providing Multiple Perspectives on Space

The approach to space in education is traditionally grounded in the absolutist notion of space, which concerns space as a background, against which objects and organisms rest, move, and act. This understanding of space is commonly referred to as “container theory”, because it treats space as a container of material substrates and human actions (Löw, 2016). The notion of container space is mainly influenced by Newton’s absolutist idea of space, whereby “absolute space, in its own nature, without regard to anything external, remains always similar and immovable” and “absolute motion is the translation of a body from one absolute place into another” (Newton, 1846, p. 77). In other words, absolutist or container space is considered rigid, uniform, and infinite, as distinct from the body, and thus, existent and constant independently from human action. This is the space of traditional geometry or geography, where we can describe, measure, and model spatial constellations with the rules and tools of Euclidean geometry and Cartesian coordinates. We can always connect two points in space – whether the edges of a triangle or two cities on the map – with a straight line. The space between the two objects is always the same for everyone. This way of conceptualizing space as three-dimensional and thinking in a coordinate system are indeed very useful for navigating our daily lives, but they provide a limited perspective on our spatial environment. Because the absolutist conception of space is fixed and uniform, it does not allow for the study of transactional processes between people and their environment, nor does it allow for the capturing of elements, properties, or dimensions other than the measurable, visually perceptible properties of the physical environment. Accordingly, as Martina Löw has pointed out in relation to the social sciences, the hegemony of the absolutist idea of space leads to a neglect of the study of space or to reflecting on “only points of contact between spatial reality and action” (2016, p. 105). Consequently, she underlines that both the complexity of spatial structures and the complexity of the constitution of spaces are “lost from sight” (2016, p. 105).

Löw’s conclusion is also valid in the field of education. However, as discussed in the introductory chapter, due to various social changes and the development of knowledge in related research fields, there has recently been a growing interest in conceptualizing space and introducing spatial matters into the field of education. Environmental psychology has provided fundamental insights into the transactional relationship between humans and their environment, revealing how we are affected by the spatial environment and how we shape our spatial environment through everyday practices. These insights have necessitated and justified a focus on the spatial environment, particularly given its increasingly urbanizing and thus complex nature. In addition, new insights from childhood studies and cognitive psychology, which have revealed the specific needs and competences of children and young people and the role of spatial environments and practices in their cognitive, social, and emotional development, have provided an opportunity to integrate spatial issues into education (Freeman & Tranter, 2011). Consequently, in parallel with the spatial turn in social sciences,¹⁰ voices arouse within the educational domains to theorize space, to emphasize spatial awareness, and to raise

awareness of the complex, dynamic spatial environment as a significant aspect of human life. Accordingly, new pedagogical approaches focusing on space and place have emerged since the last decades of the 20th century.

Place-based education, for instance, in opposition to the standardized, placeless curriculum at schools, strives to redirect the attention toward learners' living environment (Sobel, 2004). This relatively new pedagogical approach emerged in the 1990s and connects different initiatives which emphasize the local context of learning (Elfer, 2011).¹¹ Though there were many precedents in educational theory and practice which emphasized the local contexts for learning, place-based education is unique in integrating the surrounding context into the core of its program (Elfer, 2011). This approach is grounded in the belief that education should prepare people to be aware of and sustain the cultural and ecological integrity of the places where they live (Gruenewald, 2003b). Accordingly, it focuses primarily on the cultural, especially historical, context and the natural environment of a particular place. In this respect, it is strongly related to outdoor or environmental education and "new geography" approaches, such as German Heimatkunde or American home study (Elfer, 2011), but combines these aspects with a place-oriented approach.

Although place-based approaches have made significant progress in conveying new perspectives on the spatial environment and integrating them into education, they have been criticized for ignoring the social aspects of the spatial environment that are manifested in the urban and multicultural arena (Gruenewald, 2003a). To overcome this shortcoming, critical place-based education proposes a synthesis of place-based education and critical pedagogy, emphasizing both the local aspects and the critical themes around social and political contradictions. Accordingly, the pedagogical aim of critical place-based education is to become conscious of being "placemakers and participants in the sociopolitical process of placemaking" (Gruenewald, 2003b). This means that critical place-based education conceptualizes space as socially constructed. It focuses on the process of making places and the social dimension of this ongoing process, such as urbanization or cultural conflicts in urban, multicultural environments. This approach is strongly related to urban pedagogy, which evolved from the practice of community development (Dobson, 2006). Urban pedagogy targets mainly young inhabitants in segregated enclaves and yields to "develop their knowledge and capabilities as users of the larger urban area" (Frandsen & Pfeiffer Petersen, 2014, p. 184). Hence, it addresses spatial issues by determining the urban experience as the core element in its educational practice because "to live in an urban environment requires the development of its fundamental skills" (Dobson, 2006, p. 99). The core assumption is that in a highly dynamic urban environment, one must learn to live, communicate, and collaborate with strangers and adapt to ever-changing situations. For this to occur, it is necessary to identify, understand, and interpret urban experiences and learn to actively co-create urban life. Although the emphasis is on the urban experience, this differs from the perceptual, phenomenological experience emphasized by place-oriented educators, and refers to the experience of the social activities of the urban community.

These educational approaches converge in their objective to emphasize spatial issues, draw attention to the local environment, and put the experience at the center of the learning pro-

cesses. However, although their conception of space goes far beyond the traditional notion of container space, these approaches still keep the focus on only specific facets of the spatial environment. All these facets are individually relevant, but in order to foster a comprehensive understanding of space and a given place, these facets, as well as their interconnections, need to be considered. This absence remains disregarded in these approaches, just as is the omission of the theorization of space.

Built environment education, which emerged within the community of architects and planners in the early 2000s, intends to merge the different perspectives on space to foster a comprehensive understanding of our spatial environment. Built environment education draws on the belief that architects have an obligation to promote architectural and urban qualities, and likewise promote the awareness of architecture in the broader society, particularly among young people (International Union of Architects [UIA], 2019, p. 3). Based on these considerations, the *International Union of Architects (UIA)* has established the global work program *Architecture & Children* to create a platform for developing methods, tools, and strategies for promoting and practicing built environment education. The working group published the *Charter for built environment education for children and young people*¹² with the following statement regarding the built environment:

Architecture and the built environment – our buildings, villages, towns, cities and landscapes – provide the framework for all human activity and interaction. We give it form and it forms us. It affects mind, spirit, body, the ways we move from place to place and the people that we meet. It involves collective, social and critical action. Through symbolic, significant, public and private structures and spaces it represents the values of a community in concrete form. (International Union of Architects [UIA], 2019)

As both – this statement and the term “built environment education” – already suggest that this approach focuses, first and foremost, on architecture and the physical environment. Built environment education highlights the physical environment – the buildings, villages, cities, and landscapes – as the context and content of learning (Million & Heinrich, 2014). At the same time, it states that the built environment is in a continuous transaction with humans, and it is an integral part of people’s lives. Thus, its conceptualization of the built environment refers to much more than the material setting for human activity. The built environment forms us – our bodies, minds, and spirits – and we give form to it with our activities. This means that the spatial environment is socially constructed, and accordingly, it encompasses social practices, actions, and interactions. As such, it represents values, beliefs, and ideas of a community. These manifest in symbolic representations, cultural meanings, and regulative structures.

Though the *Charter for built environment education for children and young people* intends to provide a comprehensive approach to space, it lacks a theoretical framework that combines the different aspects of space into a complex whole. Dieter Läßle’s concept of matrix space provides a framework that can fill this gap by integrating the different dimensions of space into a complex network (Läßle, 1992). Läßle describes the superposition of spaces by embracing human and material aspects, social practices, normative regulation systems, as well as the cultural systems of symbols and signs.

How these different dimensions manifest, interrelate, and compile into a specific space becomes tangible when looking at a specific place, where space becomes concretized. Let me illustrate this by describing the spatial environment of a mock-up camp that I implemented for children in the House for Civil Society in Pécs. The House for Civil Society is situated in the historic downtown of Pécs. It is in the middle of the sacral center of the town, surrounded by the paleochristian cemetery (UNESCO World Heritage), the representative cathedral of the Diocese and the bishop's palace, the medieval city wall, and the Szent István Park. The House is part of an ensemble of upper-class palaces from the 19th century. It has a baroque garden in the backyard with a small baroque pavilion. This garden and the pavilion served as the camp base for the mock-up camp.

The material-physical substrate, as indicated by Läßle, encompasses the socially produced artifacts and the socially and culturally altered nature of this place. Relating back to the example, it encompassed essentially the historical building, including a paved entrance hall behind the huge wooden gate, a spacious staircase, a number of small rooms, and a representative hall for events; the backyard, a site which originated as a baroque garden; the newly reconstructed north and south wings on the left and right; paved, curvy paths, which led to the pavilion; and several objects like an old fountain with a frog in the middle, benches, dust bins, tables, and plentiful of old trees.

The aspect of socio-spatial practices, that is, the production, appropriation, and use of the place could be recognized at various levels. Once the owners of the property built the house as a representative family residence and designed the interior of the house and the garden accordingly. However, due to the social transformation in the last century, both the owners and the function of the building changed. The building now accommodates the administration and activities of civil organizations. The new owners use the rooms as offices and for meetings and events, and the hall as a conference room. The south and north wings were reconstructed and gave place for offices, a kitchen, and a modern exhibition room. The fountain with the frog was converted into a sandbox. This brief insight into the transformation of the material substrate reflects how the place was continuously redefined, reappropriated, and reconstructed over time.

According to Läßle, normative regulations structure social actions and interactions and regulate the use and production of the physical-material substrate. These include both institutional and non-institutional regulation systems, such as forms of economy and ownership, law, administrative agencies like spatial planning, as well as social norms and ethical standards. Since the House of Civil Society is a listed ensemble, the regulation of monument protection is an obvious normative aspect in this case, which determines how it can or cannot be used and reconstructed, and in the end, due to this, the baroque pavilion has been preserved onto this day. Internal organizational structures and ownership determine which parts of the building can be used for what.

The fourth dimension in Läßle's societal concept of space is the system of signs and symbols. It includes cognitive processes and esthetic representations relating to the interpreta-

tions of physical space and its social functions. The main building of the House of Civil Society preserved many of the prestigious elements which were meant to represent the power and social status of the owning family: the rich architectural decorations of the façade, the huge wooden entrance gate, the wrought-iron balustrade of the balcony at the belle etage, or the prestigious staircase in the interior. Later on, new symbols were added to represent the new, official function of the house, such as the national flag prominently waving over the main entrance. These representative exterior elements are somewhat contradictory to the everyday function and events of the house, and thus, they were counterbalanced with signs which address more the actors of civil organizations and the participants of their events. For instance, a monumental mural on the wall facing the garden, which serves as a representation of an ideal scene of a family passing time in nature. All these different, interrelating aspects of space constituted what we perceived as the place of our mock-up workshop.

When we consider built environment education as a pedagogical endeavor that aims to reflect and improve the relationship between humans and their living environment that considers the transaction as the core of this relationship, it implies a continuous adaptation and change of both humans and the environment and space has to be understood as socially constituted. And “understanding space as socially constituted means, as a first step, getting to know all four spatial facets presented [by Läßle] and reflecting on their effects on one another” (Breckner & Sturm, 1997, p. 218). In this regard, Läßle’s matrix space provides a persuasive theoretical framework for understanding space in its complexity, as well as a powerful theoretical tool for the design of learning environments that aim to promote a comprehensive understanding of the spatial environment. Yet, although this framework uncovers the different dimensions of space, it does not explain how space is constituted (Löw, 2016). If we consider learning as integral to action and built environment education as an effort to promote necessary skills in forming and co-creating the spatial environment, it is essential to understand how space is constituted and how these processes determine the basis for learning activities.

2.2.2.

Putting Action at the Heart of the Concept of Space

To be able to design educational experiences that foster transactions between people and their environment, it is necessary to put the “developing course of action” at the center of the conceptions of both learning and space and focus on “the unity which holds together what are often divided into an independent mind on one side and an independent world of objects and facts on the other” (Dewey, 1916/1980, p. 144). Martina Löw proposes an approach to space that puts the constituting action at the center. Her point of departure is that “the emergence of space is a social phenomenon and can thus only be understood on the basis of social developments, which also means that it ought to be understood as a processual phenomenon” (2016, p. 225). In her book, *The sociology of space* (2016), Löw explains the various aspects and the interactions which set up the processes of space constitution. She defines space basi-

cally as the relational arrangement of bodies that are constantly in motion. The elements of space are thus, the bodies – which encompass both objects¹³ and living beings – and the links which relate them to each other. Those process-related arrangements are grounded in the perpetual activity of space constitution.

The bodies, that is, physical objects and people, are constantly moving by way of placing or building, and we constantly perceive, reconstruct, and reorganize the spaces we experience. Hence, as Löw argues convincingly, space is constituted through two elemental processes: On the one hand, space is constituted through “spacing”, which refers to the physical acts of building, placing, and deploying objects or people (Löw, 2016, p. 134). On the other hand, space is constituted through the mental processes that Löw calls “operations of synthesis”, which means that objects and people are “amalgamated to spaces by way of processes of perception, imagination and memory” (2016, p. 135).

Let me return to the example with the camp to illustrate the processes of spacing and synthesis. When we entered the garden of the House for Civil Society on the first day of the camp, we saw two benches placed vis-à-vis in front of the pavilion. We immediately recognized that this is a place where all of us can take a seat at the same time, facing each other, and thus, engage in common activities and group discussions. From that time, we started every camp day on the benches with collective reading and attuning for the topic of the day. Dewey explains this process as follows:

Having received a store of sensory impressions, association or some power of mental synthesis is supposed to combine them into ideas – into things with *meaning*. (1916/1980, p. 34)

The example above reveals the interrelated nature of spacing and synthesizing. The physical and the mental acts of space constitution are simultaneous processes. We perceive the results of spacing activities, in this case, the placing of two benches vis-à-vis, synthesizing them in places with meanings – e.g. the corner where we can sit together as a group –, and this, in turn, makes us act in a certain way – e.g. using this corner for the joint morning activities.

On the other hand, the example reveals that space constitution is always dependent on a given spatial arrangement and the person perceiving it. This means that spaces are not arbitrarily created from the scratch but “out of what is available or what can be procured for acts of synthesis and spacing” (Löw, 2016, p. 161). Due to Löw, this understanding of space embraces all pre-given material and symbolic factors and, at the same time, pre-structures our actions as action situations. The transformation of the baroque fountain into a sandbox in the garden of the House for Civil Society illustrates how pre-given factors impact the constitution of space. The fountain was created once as part of a baroque garden ensemble and contributed to the pleasures and the representation of the power of the upper-class owners of the property. The ownership and the function of the property changed with time, but the material construction of the fountain with its ornate walling and its central statue representing a frog remained in the garden. The new owners of the house needed neither delighting nor representative objects in their garden but rather places to play for children. Thus, they turned the empty fountain into a sandbox. Surely,

they would have found distinct solutions if the fountain would have been constructed in a way that would not have been suitable as a sandbox. For instance, if it would have been elevated from the ground level or decorated with a voluptuous statue. The pre-given material conditions determined the space constituting activity of the new owners. This “reciprocal conditionality of action and structure” is what Löw calls the “duality of space” (2016, p. 145).

We have to realize the given elements in a situation, and this happens at first through perception. Hence, “the everyday constitution of place is bound to perceptual processes” (Löw, 2016, p. 165). Perception means gathering sensory impressions of the “external effectuality¹⁴” of bodies at places. Let me give an example of the perception of the external effectuality of bodies. One corner of the pavilion was used as storage for old carpets. The children detected these carpets on the first day of the camp and immediately realized the warm and cozy atmosphere the old textiles produced. From then on, they began to use that corner for relaxing during the breaks. As the example shows, perception of the spatial environment is more than just receiving sensory impressions; it is a process of meaning-making. We receive sensory impressions and select and organize them by making connections with existing knowings and patterns. Dewey emphasizes the processual nature of perception as being embedded in the continuity of reflection and action as follows:

To have an *idea* of a thing is thus not just get certain sensations from it. It is to be able to respond to the thing in view of its place in an inclusive scheme of action; it is to foresee the drift and probable consequence of the action of the thing upon us and of our action upon it. (Dewey, 1916/1980, p. 35)

Due to the fact that perception is not only considered as receiving sensory information but rather receiving, (re-)organizing, and (re-)interpreting such information, it has to be understood as a highly selective and constructive process. Entering the garden of the House for Civil Society, the children immediately saw a sandbox with a funny frog statue in the middle. However, from my perspective based on my degree in art history, I instantly recognized an abandoned baroque fountain. My predisposition to see the fountain as an artifact of history faded out the sand and sandbox toys inside. Thus, what we perceive and the way we perceive is profoundly subjective as it is influenced by our *habitus*¹⁵, education, and socialization.

Löw remarks that in everyday practice, “as a rule, space is constituted through practical consciousness, evidenced by the fact that people seldom consult on how they create spaces” (2016, p. 137). Following Anthony Giddens, Löw refers to practical consciousness as a “knowledge that acting people actuate in everyday life without taking recourse to conscious reflection” (Löw, 2016, p. 137). The habitual, repetitive actions, what Dewey refers to as “habituation”, are very important to mold our everyday lives:

Consider getting used to a strange city. At first, there is excessive stimulation and excessive and ill-adapted response. Gradually certain stimuli are selected because of their relevancy, and others are degraded. We can say either that we do not respond to them any longer, or more truly that we have effected a persistent response to them – an equilibrium

or adjustment. This means, in the second place, that this enduring adjustment supplies the background upon which are made specific adjustments, an occasion arises. We are never interested in changing the *whole* environment; there is much that we take for granted and accept just as it already is. Upon this background our activities focus at certain points in an endeavor to introduce needed changes. Habituation is thus our adjustment to an environment which at the time we are not concerned with modifying, and which supplies a leverage to our active habits. (Dewey, 1916/1980, p. 52)

This means that we develop habituations, or the knowing of dealing with situations without the need for conscious reflection as, for instance, moving according to the traffic rules and signs. These habituations that we exert in practical consciousness ease coming through the everyday situations we face. Habituations allow changes in the organism without modifying the external conditions, and in this way, they reproduce the structures and institutions (Löw, 2016). Dewey also draws attention to the danger of habituations: they can turn into routines, which hinder meaningful experiences insofar as the key to the meaningful experience is reflection. Only when we reflect on the consequences of an action, when the change made by action is reflected into a change made in us, do we learn something. Therefore, he emphasizes that growing or learning manifests in habits, that is, “in the active capacities to transform the environment, which embrace forms of executive skills, as well as emotional and intellectual attitudes” (Dewey, 1916/1980, p. 57).

In line with this, Löw remarks that it is possible to transform the constitution of spaces in discursive consciousness and thus reflect on it and take a directive influence on it. We can bring about actions that do not repeat everyday routines but rather change habits or transform spaces.

I understand reflexivity as both the monitoring influence that actors exert on their lives and their capacity to justify their actions. Thus, people can [...] verbally express the constitution of spaces, reconsider it, discuss it, and exercise a monitoring influence on it. (Löw, 2008, p. 37)

This is exactly the aim of built environment education: to transform the practice of everyday space constitution into discursive consciousness. To create the possibility to reflect on how we create spaces and how spaces affect our actions, behavior, and mood. To be able to drive our actions in a way that makes a positive change.

An aim denotes the result of any natural process brought to consciousness and made a factor in determining present observation and choice of ways acting. It signifies that an activity has become intelligent. Specifically it means foresight of the alternative consequences attendant upon acting in a given situation in different ways, and the use of what is anticipated to direct observation and experiment. (Dewey, 1916/1980, p. 117)

2.3.

Bridging the Gap: Concluding Thoughts on Space and Learning

Following Dewey, I understand learning as part of a continuous transaction between humans and the environment. Learning in this understanding is embedded in reflective experiences of real-life situations and is therefore considered as a situated and social process. Through interaction with the environment we reorganize our knowings, acquire new knowledge, and develop our skills and abilities, which manifest in the ability to transform a situation and in changing practices.

In this process of ongoing transaction, both the human and the environment are changing. It follows that space needs to be considered as a dynamic and socially constructed phenomenon. Löw indicates that space is constituted by the twofold processes of synthesis, meaning the mental processes of perception, ideation, or recall, and the physical act of spacing, which refers to erection, building, or positioning practices. It is through these intertwined and interacting activities that we create spaces that define us, our experience of the world, and our participation in it.

The transaction between people and their environment, the dynamic unity of children and the environment, at the heart of built environment education, gives direction to the educational practice. The perception and understanding of the built environment embedded in everyday situations needs to be complemented by learning to take action, more specifically to learn how to work with others, in a community, to develop a shared vision of our spatial world, and to bring it into reality (Chawla, 2008).

Chawla (2008) stresses that children are more likely to interact with their environment if they receive immediate feedback on their actions. The perception of immediate change helps them understand the relationship between their actions and their consequences, and this contributes to the development of a sense of competence (Bandura, 1997). And it not only enhances self-efficacy, which is essential for active action, but also reinforces learned optimism (Seligman & Csikszentmihalyi, 2000).

And this is where games return to the fore. Games, as systems of immediate feedback (Salen and Zimmerman, 2003), allow players the freedom to experiment and immediately perceive the consequences of their actions. They may have the potential to enhance young people's self-efficacy through their experience in the game world. What makes playing games an outstanding experience is fun and the positive emotions that players experience. This unique emotional state is what makes games attractive not only for leisure but also for learning purposes. Jane McGonigal describes the emotional state of playing games as "an opportunity to focus our energy, with relentless optimism, at something we're good at (or getting better at)

and enjoy” (2011, p. 28). Indeed, games are largely considered intrinsically motivating and engaging, and thus beneficial for learning (Klopfer et al., 2009). Intrinsic motivation is necessary to provide and direct the necessary mental energy for a deep learning process (Bruner, 1962; Illeris, 2009; Piaget, 1952). It incites a greater engagement, that is, to put more time and effort into learning, to feel better with the learning content, and to sustain interest in the long term (Malone, 1981). This optimum experience (Csíkszentmihályi, 1990) reinforces the transformative potential of games.

To harness the transformative potential for built environment education, it is crucial to comprehend how the various dimensions of space and learning, as elaborated in the previous sections, interact within game design. The subsequent sections thus center on gradually exploring these interconnections of games, space, and learning.

2.4.

The Interplay of Games and Learning

The twentieth century brought comprehensive insights into the relationship between play and human development, and showed that play is a natural way of learning (Dewey, 1916/1980; Froebel, 1826/2012; Müller-Schwarze, 1978; Piaget, 1952; Sutton-Smith, 1997). Although institutionalized forms of education have long been defined by a strict separation of learning and play (Crawford, 1984; Dewey, 1916/1980), these insights have stimulated interest in the potential of play and games for learning and education. From the 1980s onwards, the use of games for learning even became a central theme of research in pedagogy, psychology, and related fields (Breuer, 2010).¹⁶ As the field of games and learning matured, more and more reasons for using games for educational purposes were discovered (Ramirez & Squire, 2014).

The central question was which games could have a positive impact on the learning process. Many attempts have been made to bridge the gap between instructional design and game design, in other words, to link game attributes to learning outcomes (Bedwell et al., 2012; Echeverría et al., 2011; Gee, 2007). However, these attempts are general and often contradictory, resulting in the implementation of games in education progressing "without explicit knowledge as to why games are effective teaching tools" (Bedwell et al., 2012, p. 730). One obstacle to linking game design and learning outcomes is "lack of consensus regarding what constitutes games" (Bedwell et al., 2012, p. 730) and the diversity of underlying learning theories and strategies of learning (Schrader & McCreery, 2012). Thus, in order to explore these links, it was essential to define the underlying understanding of learning that underpins the research.

In Section 2.1, I explained my conception of learning as the result of reflective and continuous experience, and as an inherently situated and social process, based on Dewey. Framing both learning and games as part of an experience allows for the exploration of the interconnections.

To play a game is to *experience* the game: to see, touch, hear, smell, and taste the game; to move the body during play, to feel emotions about the unfolding outcome, to communicate with other players, to alter normal patterns of thinking. (Salen & Zimmerman, 2003, p. 314)

By conceptualizing play as an experience, Salen and Zimmerman underline its continuous, situated, and social nature, which are consistent with key features of learning. As they point out in the summary above, games provide embodied, multisensory experiences in the game world, enhance social interaction between players, and alter patterns of thinking within the unfolding outcome in a continuous experience: the experience of play.

The link between these central attributes of games and learning has been elaborated in detail by James Paul Gee in his influential book *What video games have to teach us about learning and literacy* (2007). Gee's starting point is that meaningful, deep learning occurs

while playing well-designed games, rather than in institutionalized, formalized educational settings. He has therefore looked closely at the learning principles embedded in good video games that engage players in complex problem-solving tasks and an ongoing process of deep learning and engagement, in order to derive insights for the design of learning environments.

One set of learning principles identified by Gee is consistent with what Dewey describes as a continuous and reflective experience, which “involves a connection or doing or trying with something which is undergone consequence” (1916/1980, p. 158). Games as systems of experience are capable to provide continuous and reflective experiences as players immediately perceive the consequences of their actions and, in order to achieve their goals, they must anticipate these consequences and shape their decisions accordingly. Gee points out that well-designed games are built on reflection in action: players are constantly learning as they evolve and face different, often increasingly difficult challenges in “cycles of new learning, automatization, undoing automatization, and new, reorganized automatization” (2007, p. 68). Learning in these games takes place in “a cycle of probing the world” (p. 111), a process of understanding the situation, thinking and developing hypothesis, (re)probing, and reflecting the consequences. This principle, which Gee calls the “Probing Principle” corresponds to Dewey’s scientific method. Continuity and reflection are thus fundamental principles of both learning and well-designed games.

Another set of learning principles identified by Gee in well-designed games relates to the situated nature of meaning-making. He emphasizes that games “can facilitate situated understandings in the context of activity and experience grounded in perception” (Gee, 2008, p. 203), and provides a rich detail of how knowledge and meaning emerge from the situation in the embodied narrative experiences of video games.

In games like *Deus Ex*, the meaning of any event, object, artifact, conversation, written note, or any other potentially meaningful sign is up for grabs. You don’t really know what it means unless and until you can give it a specific meaning in terms of the world through which you are moving as a character or the actual actions you carry out in that world. Furthermore, as that world and your actions in it change, the meanings of things you have seen or discovered can change as well. That is, meanings in video games are always specific to specific situations. They are always actively assembled (or changed) by the player, on the spot, in terms of images, materials, and embodied actions in the virtual world being mutually created by the game and the player. In other words, meanings in video games are [...] ‘situated meanings’ or ‘situation-specific meanings,’ not just general ones. (Gee, 2007, p. 82)

Game elements, images, and actions gain meaning within the unique universe of the game world, and we make out their meanings with “all perceptions, actions, choices, and mental simulations of actions or dialogue” (Gee, 2007, p. 79). The fact that well-designed games situate meaning in embodied experience is what Gee calls the “Situated Meaning Principle”. He also points out that games build up situated meanings and knowledge through various modalities, such as images, texts, symbols, interactions, abstract design, sound, etc., an aspect he

refers to as the “Multimodal Principle”. And because knowledge is embedded in both material objects and the environment, thinking and problem-solving occur alongside them (“Material Intelligence Principle”). This reinforces the learning effect.

This frees learners to engage their minds with other things while combining the results of their own thinking with the knowledge stored in material objects and the environment to achieve yet more powerful effects. (Gee, 2007, p. 110)

In relation to social learning in games, Gee (2007) points out that much of the learning in games is due to the social discourse that develops between players. He demonstrates this by analyzing how social interactions and learning are intermingled in the massively multiplayer online role-playing game *EverQuest*. In *EverQuest*, players must complete a series of quests individually or in groups while navigating a medieval fantasy world and battling enemies. The more quests players complete, the higher their in-game character level in terms of power, abilities, tools, and available quests. However, during the adventure, players can die and lose experience levels, weapons, power, and have to start all over again, away from their corps and teammates. “Adrian’s” player testimony reveals the fundamental role of social interaction throughout the game and indicates that “play for him is inherently social” (Gee, 2007, p. 187). The way in which he communicated with his team members inside and outside the game about the game, games in general, and a variety of other subjects, is recalling Fine’s (1983) discursive frames that emerged in role-play gamers’ social interactions.

As players shared their knowledge and skills, they contributed to a mutual learning process in a joint activity. The more advanced players helped the others in challenging situations. Adrian, for example, at one point lost his life at a very advanced level and fell back into a mistress where he had no access to the quest, he was on with his “clan”. It was at this moment that he asked the more advanced players in the community who had the knowledge, skills and abilities to help him regain his status. Based on what he learned, Adrian later set up a website to inform others about how to exploit game tips. This example illustrates how players’ knowledge and knowings are distributed in the context of gameplay. Not only in their minds and bodies but also in the other players they interact with, and in the tools and technologies, such as hex editors, that Adrian uses to manipulate the game’s code.

So learning here is social, distributed, and part and parcel of a network composed of people, tools, technologies, and companies all interconnected together. Adrian is a node in such a network. And much of his knowledge and skill flows from his being such a richly interconnected node. Yet schools still isolate children from such powerful networks – for example, a network built around some branch of science – and test and assess them as isolated individuals, apart from other people and apart from tools and technologies that they could leverage to powerful ends. (Gee, 2007, p. 188)

Gee makes tangible through Adrian’s play experience that in well-designed games knowledge and meaning is distributed across players, objects, tools, symbols technologies, and the environment (“Distributed Principle”), as well as dispersed in the sense that players share

them with each other within and outside of the game (“Dispersed Principle”). And players form an affinity group, bound together by shared endeavors, goals, and practices (“Affinity Group Principle”).

In summary, the connection between play, games, and learning is profound, with an increasing recognition of games as valuable tools for education. Despite our limited understanding of how game design supports learning, a nuanced understanding of learning principles plays an important role in bridging the gap between game design considerations and educational outcomes. By drawing on Dewey’s transactional learning theory, I pinpointed three fundamental aspects – the continuity of experience and the situated and social nature of learning – that serve as common threads uniting the realms of learning and games. These principles offer a coherent framework that allows us to discover common ground in the ways in which learning and play unfold and are experienced. The next chapter explores the relationships between games and space with regard to these three aspects.

2.5.

The Interplay of Games and Space

Only a few analytical studies address the interconnections of space and games. The volume *Space.Time.Play* (Borries et al., 2007) provides the most comprehensive overview of the manifold interrelations between space and games by examining the relations and reciprocal influence of architecture, urban planning, and game design, aiming to reveal future design strategies through a mutual exchange. The book includes contributions from game researchers and designers, as well as architects and urban planners, providing useful insights for understanding the different levels of interaction between space and games. By defining five levels, the editors have developed a framework each of which suggests a different perspective for examining the relationship between games and space. Their concept is in line with Salen and Zimmerman's systems approach, which proposes an examination of the different dimensions of games, from internal structures, mechanics, and game elements, through experiential aspects, to the transactions between games and their social, cultural, and spatial contexts. Understanding the framework proposed by Borries et al. requires a gradual change in the perspective from which games and space are observed. These categories are not mutually exclusive but rather transitional perspectives for analyzing the different dimensions of the interaction between games and space.

At the first formal level, games are considered as a closed system. This perspective refers to the intrinsic spatiotemporal design of games. Each game has an internal space-time, that is, a time interval between the beginning and the end of the game, and a spatial extension within which the game activity takes place. This can apply to the physical game board or the virtual environment of digital games to the football pitch. At this level of analysis, games are reduced to formal, closed systems, and space is conceived as a fixed environment for play activity, a container for the players' experiences. The internal space-time of games constitutes what Huizinga called the magic circle, and although transformative play is outside its scope, this narrow perspective is essential to the design of the internal structures and elements of play.

The second level of analysis focuses on the production of space within games. Borries et al. call this level "make-believe urbanism" (2007, p. 12), referring to Roger Callois, who in his book *Man, play and games* defined the "make-believe" aspect as a fundamental characteristic of games, which marks out "special awareness of a second reality, or a free unreality, as against real life" (Caillois, 1961/2001, p. 10). This means that this level retains the focus within the magic circle, but conceives the internal spatiality of games as dynamic, emergent, and co-constituted by the players themselves. Examples of this approach to the interaction of games and space are the so-called sandbox games¹⁷, which are user-generated analogue or virtual

environments. The continuously expanding space of these games is co-created by the players themselves. Sandbox games like *The Sims* (2000), *Second Life* (2003), or *Minecraft* (2009)

attract players to build and create the gamespace by building houses, cities, and communities. Players can therefore decide what, when and how they want to create in the game: the physical and narrative space, the rules and norms that govern the virtual environment, or the social space of the community. Pearce's (2007) ethnographic study presented in this volume is an insightful example of how gaming communities create game environments, virtual societies and cultures. Pearce has researched inter-game immigration between massively multi-player online games and observed how communities of players in the game *Uru: Ages Beyond Myst* (2003/2007) transferred their culture into other virtual worlds, such as *Second Life*.

When *Uru* closed in early 2004, not wishing to see their communities destroyed, players from the game immigrated en masse into other virtual worlds where they began to re-create numerous cultural artifacts from their former 'home.' Members of the 'Uru diaspora' in *Second Life* created a near exact replica of *Uru*, while another group of *Myst* fans created a totally original *Myst*-style game. (Pearce, 2007, p. 204)

This example illustrates how different spaces are created within the magic circle, showing how the former *Uru* play communities reproduced themselves in new virtual environments: how players' social groups, objects and environments were reproduced, including their cultural and symbolic meanings, and even the specific rules and norms that determine how players can act and use the new environment. Similar processes of creative space-making and cultural reproduction are at work in analogue sandbox games, such as in tabletop role-playing games like *Dungeons & Dragons* (Wizards of the Coast, 2014). In sum, although the level of "make-believe urbanism" still operates within the magic circle, it is characterized by a dynamic interpretation of (game) space, created by the players' playful exploration, construction, and socialization in the game environment.

At the third level, games and space meet through the superimposition of gamespace and real space. These "ubiquitous games" involve ludic activities in urban space that transform the city into a hybrid playground (Borries et al., 2007, p. 12). Urban games are a general term for this type of games (Ferri & Coppock, 2013). Urban games embrace a broad spectrum of genres and technologies: from traditional scavenger hunts where players are implored to find several objects or locations at a certain place to location-based games such as geocaching and alternate reality games that use localization technologies and combine the experience of playing in urban space with transmedia storytelling. Although ubiquitous play disrupts the boundaries of the magic circle by merging real space and gamespace, the complexity of their relationship and their transformative potential can vary enormously depending on the complexity with which the spatial environment is reflected and integrated into the game. Accordingly, urban games have been often criticized for being "location-free" (Flanagan, 2009, p. 191) as they transform urban space into a playground, where streets and landmarks become mere places on the game board without reflecting their cultural and social specificity. This means that the spatial environment within which ubiquitous play is performed is often considered merely a setting, a container of play activities. Space is again conceived as fixed, rigid, and disconnected from its social and cultural dimensions. However, not every urban game is limited to using the physical structures of the spatial environment as a game board, but there are indeed

games that reflect on the multiple dimensions of space and incite players to critically deal with or even transform their environment. Respectively, McGonigal (2007) identifies three types of ubiquitous gaming from the perspective of their interplay with the real-world environment. The first type is “deployed to colonize new objects, environments, and users” from outside of the gamespace (McGonigal, 2007, p. 233). The emphasis is here on the integration of parts of everyday life into the game world, like in the case of the famous alternate reality game *Can you see me now?* (2001) in which participants pursue online players through city streets using handheld computers, GPS, and transceivers to navigate their avatars within a virtual representation of the same city. The second type of ubiquitous play McGonigal identifies not only “colonizes” parts of the everyday environment, but also reflects on spatial phenomena and integrates its diverse aspects as core content elements into the game world. McGonigal points out that these games often “aim to disrupt social conventions of public spaces” (2007, p. 233). An often-cited pervasive game is the *Big Urban Game* (2003), which was meant to change people’s perspectives on the urban landscape of the “*Twin Cities*,” Minneapolis and Saint Paul, by converting them into a large-scale playing field. In the third type of ubiquitous game, play actions and interactions completely merge into players’ everyday life and potentially activate players to transform their environment. An illustrative example is *Perplex City* (2005). This game, which became a global treasure hunt, started from the fictional metropolis *Perplex City* and expanded step-by-step toward real-world locations. As the game grew, players initiated and invited others to organize real-world meetings, attend live events, and collectively solve puzzles and tasks. In sum, the term ubiquitous games came to represent the type of games where the traditional magic circle of play is dissolved, and the space-time of games mingles with the space-time of the real world. The transformative potential of ubiquitous games increases with the complexity concerning the interrelation of gamespace and real space.

The last two levels of the framework point out how space and games can get indirectly involved in a transaction and exert mutual influence. On the fourth level, Borries et al. discuss games as instruments for urban design, demonstrating “how the ludic conquest of real and imagined gamespace becomes an instrument for the design for the space-time” (2007, p. 13). This level encompasses games developed and applied as alternative design tools, intending to deliver relevant outcomes for architecture and urban planning.¹⁸ Although game worlds and real-world are usually not directly connected here, the outcomes and decisions taken in games inform planners and decision-makers and thus indirectly contribute to spatial transformation. The *Harbour Game* (2003), presented as an example, is a debating game that aims to engage citizens in rethinking the harbor areas in Aarhus, Denmark. The IT-supported board game consists of a large game board, physical game elements, and projected visual and text information. According to the developers, the game aims to facilitate “the understanding of complex relations in urban planning” and involve citizens in the discussion from the beginning of the planning process (Løssing et al., 2007, p. 388).

On the fifth level, games are framed as lenses through which we can look at and reflect on the spatial environment. The focus here is on how gamespaces present and represent space and how represented spaces affect our notion of real-world spaces. As Stephen Graham expounds:

[A]s various electronic media become ever more dominant in shaping the tenor of urban culture, so do their depictions of cities crucially affect collective notions of what cities actually are and of what they might actually become. (Graham, 2007, p. 420)

Borries' framework is a useful tool for understanding the complex interrelationships between space and games, as it offers a perspective on the game world as a specific space that can be transformed by players and even merge with the real world. Moreover, it highlights the role of games as mediators in the human-environment transaction – serving both as instruments for modifying the environment and as media that transform our perceptions of space. This perspective opens up the possibility of developing a triadic view of games, space, and learning, thereby exploring new implications for transformative game design.

Notes

- 5 Dewey's approach laid the groundwork for constructivist philosophy and educational theories, that emphasize active and experiential learning. It was within this framework that Piaget developed his theory of cognitive development, see Piaget and Inhelder (1969/2000); and Vygotsky developed the social constructivist approach, see Vygotsky (1978).
- 6 Dewey refers to the process of reflective experience as the experimental method or the scientific method (1938/1986; 1949/1989), noting that both children and professionals follow this method for inquiry and learning. The concept of Dewey's experimental method of inquiry was integrated and further developed in a number of learning theories, for example, in Kolb's (1984) experiential learning cycle and Schön's (1983) reflection-in-action.
- 7 Gee refers here to the connectionist approach in cognitive sciences that stresses the ways in which humans are powerful pattern-recognizers. See more on this approach in Clark (1989, 1993).
- 8 A key construct in Vygotsky's (1978) theory of learning is the "zone of proximal development", which refers to the space between what a learner can do without assistance and what a learner can do with adult guidance or in collaboration with more capable peers. This is the area of learning that occurs when a learner is assisted by a more knowledgeable person.
- 9 Thinking about building and construction as drivers of learning and development is not new, as it was already present in Fröbel's (2012) gifts and Montessori's (1914/2003) sensorial materials. This idea has been further developed in Waldorf education and is also linked to Dewey's (1938/2008) theory of education, which emphasizes the emergence of the educative experience from the continuity of interactions between individuals and their environments.

- 10 The spatial turn is a paradigm shift that occurred in the late 1980s, which emphasizes place and space in the social sciences and humanities. See more on the spatial turn in Crang and Thrift (2000).
- 11 Elfer (2011) refers to the different terms used in literature for educational approaches that emphasize place and space, such as place-consciousness, pedagogy of place, community-oriented schooling, or bioregional education.
- 12 The aim of the Charter is to strengthen the role of architecture in education and establish a framework for this educational field. The document urges collaboration among architects and teachers, for educational projects and activities that increase children's and young people's sensitivity to architecture, and for governments to integrate built environment education into their educational strategies. The second edition of the Charter, published in 2008, can be downloaded at the UIA website: <http://www.architectureandchildren-uia.com/>
- 13 Löw uses the term social goods in order to refer to both their material and symbolic aspects.
- 14 Löw (2016) refers to the atmospheres of social goods and people in their spatial arrangement as realized in perception as "external effectuality".
- 15 Habitus refers to socially ingrained habits, skills, or dispositions. See more in Bourdieu (1977)
- 16 The terminology relating to the use of games for educational purposes is as diverse as the approaches to that phenomenon. Early literature refers to them as "serious games", introduced by Abt (1970, p. 9). However, the term has been contested in academic discourse because the word "serious" might seem to deny the engaging character of those games. See more on serious games in Ritterfeld, Cody, and Vorderer (2009). The terms edutainment and entertainment education emerged in the 1980s as an alternative to serious games, stressing the purpose of both entertaining and educating. In current literature, the terms game-based learning and educational games are the most common. Find more on the history of the terminology in Singhal (2004).
- 17 The term sandbox is derived from the sandbox play due to the fundamental similarities between the two. In both sandbox and virtual sandbox games, such as Minecraft or SimCity, play is free, open-ended and without predetermined rules. For this reason, Salen and Zimmerman (2003) indicate that the classification of these games is controversial as they lack defining game characteristics such as rules and quantifiable outcomes. Although they are undoubtedly playful, they can be considered strictly games if the players themselves establish their own goals and their own set of rules. Sandbox games are therefore borderline cases, as they can be classified as games or playful activities depending on the players' performance within the game and the structuring of the game.
- 18 Games have been applied for supporting spatial transformation processes for several decades. In the 1950s early experimental urban simulation games set up the way for games as planning tools, which became more widespread in the 1970s due to the proliferation of public participation. See more on the history of simulation games as planning tools in Mayer, Bekebrede, Bilsen, and Zhou (2009).

3. TRIADIC PERSPECTIVE ON THE INTERPLAY OF GAMES, LEARNING, AND SPACE IN TRANSFORMATIVE GAME DESIGN

No one would be able successfully to speak of the hunter and the hunted as isolated with respect to hunting. Yet it is just as absurd to set up hunting as an event in isolation from the spatio-temporal connection of all the components. To attempt to separate any of the involved factors, such as the hunter, the hunted, the tools, the geographical conditions, and the timing, from the ongoing activity is to ignore the integral connection of all these aspects that constitute the whole event. (Dewey & Bentley, 1949/1989, p. 125)

During an extensive literature review, I found that a systemic analysis of the triadic relationship of games, learning, and space has been so far overlooked in research. This chapter represents a key step in the effort to overcome this gap.

In the previous chapter I laid the foundations by developing a relational approach to learning and space. The transactional approach, placing action at the heart of both learning and space, resonates with the inherent nature of games. Since learning is seen as a product of transactions between individuals and their environment, the continuity of experience, the construction of meaning within specific situations, and social participation are seen as key elements that make up this complex set of relationships. Building upon these insights, the subsequent exploration outlined the dual connections between games and space, as well as games and learning, drawing upon existing theories to inform the discussion.

Continuing the line of thought, this section unfolds the triadic perspective of games, learning, and space. Aligned with the core aspects previously developed, this triadic perspective refines the theoretical framework, offering a more nuanced understanding of the interrelationships between these elements. This chapter serves as a critical node, revealing open questions and gaps in knowledge that need to be filled in empirically grounded research to gather insights for transformative game design.

3.1.

Games, Learning, and Space Meet in the Continuity of Experience

The first aspect along which I examine the connections between games, learning, and space is the continuity of experience.

[T]he principle of continuity of experience means that every experience both takes up something from those which have gone before and modifies in some way the quality of those which came after. (Dewey, 1938/2008, p. 19)

Learning thus takes place in enacting and undergoing experiences or transactions with the environment that are linked to past experiences and influence the way we act in future situations. This process implies reflection, as we need to understand and build connections between our actions and their consequences. In well-designed games, this continuity is integral, as players consistently encounter new challenges. They must comprehend the situation, experiment with strategies, and receive immediate feedback from the game system. This process allows them to grasp and reflect on the consequences of their actions, shaping their approach accordingly in new situations to succeed in the game. This is what Gee (2007) calls the “Probing Principle”.

For an impact of game experience on the development of players and the transfer of learnings to their everyday experiences, a bridge must be built between what they learn in the game and their everyday experiences. To do this, games can be framed as a representational system. Salen and Zimmerman (2003) point out that “gameplay takes place within a representational universe, filled with depictions of objects, interactions, and ideas out of which a player makes meaning” (2003, p. 364). When we frame games as systems of representation, each of the game elements – objects, written, visual, and audio elements – can be conceived as narrative descriptors that communicate the story of the game and support players’ meaning-making processes. For example, the game board in *Monopoly* (1935), represents a city in a highly abstracted way. It consists of forty squares, each of which represents a street, a railway line, a public utility, a car park, a prison, a tax office, or any other square with a specific function in the game. Players move and act in this ludic urban space, buying properties, building houses and hotels, represented by miniature plastic figures that can be placed on the selected property. The city represented by the different game elements can refer to a fictional city or a real city. Today, there are over thousand versions of *Monopoly* (Hackett & Coghlan, 2023), most of which are exact copies of the original game, except that the street names are replaced by the place names of the cities.

Playing *Monopoly* means not only progressing in an abstract gamespace but also acting in the narrative context of property investment and development. Real estate can be bought and

developed with houses and hotels, players can negotiate, create strategies, form alliances, pay taxes or go to jail according to the rules of the game. This implies that games as complex and emergent systems are more than just representations of certain elements. Similar to simulations, games constitute a set of interactions, behaviors, and procedures, and consequently they “represent complex emergent systems, in which possible outcomes far exceed the formal complexity of the rule system” (Salen & Zimmerman, 2003, p. 366). Sanoff highlighted that games permit “learning about the process of change in a dynamic environment requiring periodic decisions” (Sanoff, 1979, p. 1). Thus, games can be seen as procedural representations of space, while all dimensions of space – physical, social, cultural, and normative-regulatory – can be linked to game elements, mechanics, and interaction patterns.

But also a game as a whole can be considered a representation itself, with the entirety of its elements, rules, and culture (Salen & Zimmerman, 2003, p. 427). Besides the meanings of each of the individual elements, games have an ideological dimension: they “carry beliefs within their representation systems and mechanics” (Flanagan, 2009, p. 3). They reflect the society and culture in which they were developed and in which they are played, helping to “instill and fortify a culture’s value system” (Salen & Zimmerman, 2003, p. 516). The fact that *Monopoly* represents the rules, regulations, and norms of the capitalist economy is common.

It is fascinating how players as young as 5, learn to tweak dynamics in order to exploit others through monopolizing private real estate markets. Unaware of the terms such as ‘capitalism’ or even ‘monopolize’, players quickly master the basic principles of running and maintain a capitalist system as they invest shrewdly, monopolize or go bankrupt. (Tan, 2017, pp. 10–11)

The role of the ideology as a driving force for gameplay becomes even more obvious considering that the original version of *Monopoly*, called *The Landlord’s Game* (1904), was designed by the social activist Lizzie Magie with the intention to promote Henry George’s political theories on the power of monopolies (Huber & Nelke, 2007). The aim of the original game was to make people aware of the connection between land laws, property rights, and social injustice. It had a clearly hostile attitude against speculative activities, which in *Monopoly* was completely turned on its head, by making buying parcels and building hotels the ultimate goal of the game.¹⁹ Although the two games share many formal elements, the alteration of rules and victory conditions created a fundamentally different ideological message.

The example of *Monopoly* shows that we can have an effect, whether intentional or unintentional, by the way we create representations in a game. Accordingly, due to the potentials of extensive in-game representations, games are increasingly used as “easy-to-understand instruments” (Flanagan, 2009, p. 262) to deliver complex content to a wider audience and to encourage learning.

The idea to use games for learning about spaces and places is not new. The atlas *Die Welt im Spiel* (Strouhal, 2015) presents a collection of old geography and travel games from the late 17th and 18th centuries, which invite players to discover cities and regions through play. The games presented in the atlas follow the basic structure of the *Game of the Goose*²⁰, but their

game boards outrage with depictions of nearby or faraway lands. These “playable maps” provide a sometimes fantastic, other times decidedly realistic image of given regions: The game board of *La Jeu Du Mond* (Duval, 1645), for instance, is based on real pieces of maps and was considered as a medium that promotes learning about the world (Strouhal, 2015, 5ff). These approaches to historical games are still popular today, and are followed by contemporary geographic games (Olson, 2012). In these games, space is often identified with a particular place with fixed, describable and learnable properties, and players have to obtain predetermined information about certain places. This raises two deep-rooted problems. The first is the pursuit of out-of-date learning theories, which is why memorization and behaviorist conditioning are built into most educational games (Jenkins et al., 2003). The second is the pursuit of out-of-date theories on space, which neglect its dynamic nature and consider it as a container of in-game activities and behaviors.

In contrast, there are also games that take special care to represent complex and dynamic spatial situations. The Amsterdam-based collaborative *Play the City* integrated elements of popular simulations and role-playing games into their city gaming method²¹ concepts, which have been successfully applied in urban planning processes (Tan, 2017). The games designed by *Play the City* address “burning urban challenges”, such as urban peace, land use, migration, energy and climate change, urban gentrification, and smart city or citizen dichotomies, and involve local stakeholders to find solutions for these problems collaboratively (Tan, 2017). They use games as “instruments of processual change that advances more collaborative, connected, interactive and inclusive decision-making among stakeholders tackling complex, existing and emerging urban challenges” (Tan, 2017, p. 315). *Play the City* provides concrete guidelines for planners and designers who want to adopt the approach to city making games for their own professional contexts (Tan, 2017). The *Play the City* games represent in rich detail a given planning area. The games are extensively elaborated mock-ups of specific locations and not only the physical environment but also the different actors, their relations and power structures are integrated into the contents and mechanics of the games. Nevertheless, these games require very intensive preparation to be able to play at all. This means, that players have to invest a lot of time and energy in preparation to be able to develop a comprehensive understanding of the planning situations, knowing the complex interrelations of the area, the different actors, and the economic, political, and historical factors, to be able to discuss and contribute in a meaningful way during the game. Players have access to substantial training materials, websites, and forums, but this might send the message that urban development and the transformation of spaces are expert fields, and one needs further education to take part in discussing them. Such unfiltered communication of complexity can discourage participation and make games impossible to use in an educational context (Benze et al., 2020).

In sum, games have the potential to foster learning about spaces by blending and merging game worlds and everyday experiences through spatial representations. But there is a gap in knowledge about how to represent children’s spatial worlds in games to support learning to understand and act for space. Therefore, this has become one of the questions I seek to answer through empirical design research.

3.2.

Games, Learning, and Space Meet in the Situatedness of Activity

The second aspect along which I examine the connections between games, learning, and space is the situatedness of activity. Learning is situated action, that is,

...learning is not merely situated in practice – as if it were some independently reifiable process that just happened to be located somewhere; learning is an integral part of generative social practice in the lived-in world. (Lave & Wenger, 1991, p. 35)

Understanding knowledge as a mode of participation in the social world (Dewey, 1916/1980) means that it is tied to specific situations, that meaning-making is situated and co-produced with the situation through activity (J. S. Brown et al., 1989; Lave & Wenger, 1991). Games can be framed as situated environments, which foster situated understandings within the context of activities and experiences rooted in perception (Gee, 2007). Accordingly, games can serve educational purposes by enabling participation and the application of existing or newly acquired knowledge in authentic situations (Barab et al., 2007).

Shaffer and Resnick underline that games can be “thickly authentic” learning contexts where activities are simultaneously aligned with learners’ interests, the structure of a domain of knowledge, valued practices in the world, and the modes of assessment used (Shaffer & Resnick, 1999). Shaffer introduced the concept of epistemic games²², which places real-world practices at the center of game design to promote domain-specific, game-based, and situated learning. In epistemic games, players can test themselves in a particular field and experience how the corresponding community sees and shapes the world (Bagley & Shaffer, 2009; Shaffer, 2006). For example, players may learn to think and act like journalists, doctors, or engineers by solving realistic tasks.

There are several known examples of games that put spatial practices, that is, acting upon and engaging with spaces and places at the heart of gameplay. Simulation games, for instance, in which players can try out the practice of urban development by taking on the role of urban planners. The well-known city-builder game, *SimCity* is increasingly used in educational contexts. In *SimCity*, players build, develop, and manage their cities, while they learn how each of their choices influences the whole urban system.

It is time – to be a Mayor? Do you have the empire-building skills to develop a metropolis of soaring skyscrapers or the aesthetic sensibilities to create a city that delights the eye? Do you enjoy tinkering with an entire world – widening a riverbed there, increasing a tax rate here – to see the effects on the inhabitants under your sway? Or do you want to get down and dirty with *The Sims* in your streets, taking on missions that have you hurtling down highways in a tank? (Lobo, 2007, p. 206)

SimCity models the complex interrelations of the different aspects that constitute a city and the life of its inhabitants, such as buildings and infrastructure, economics and social policy, landmarks, and natural disasters. Players have to deal with and develop these factors and meanwhile, they experience how each of their choices influences the whole urban system. *SimCity* is often highlighted for supporting learning about the complex, multi-dimensional systems of cities, as well as the interconnected aspects of planning decisions (Gaber, 2007). However, it is often criticized because it “is not completely disaggregated, behavior is deterministic, the number of incorporated behavioral concepts is limited, and the code is a black box” (Devisch, 2008, p. 217). Moreover, it represents an American-style metropolis that cannot be adapted to other environments (Beckett & Shaffer, 2005; Devisch, 2008; Lobo, 2007). Shaffer complains that *SimCity* is distorting the role and the practice of urban planners, since players have divine power and can arbitrarily do anything they want (Bagley & Shaffer, 2009; Beckett & Shaffer, 2005). Shaffer, in line with other scholars, point out that city-builder games like *SimCity* simulate large-scale, top-down urban planning and development processes, and thus ignore how people experience and shape cities in their everyday life. This prevents players from connecting their in-game experiences to real-life actions, and thus, it hinders meaningful learning (Beckett & Shaffer, 2005; Devisch, 2008; Lobo, 2007).

To overcome these limitations, Shaffer and his colleagues developed epistemic games where the urban planning practice, which determines the key mechanics, has been shaped according to the guidelines and values outlined by professional associations. The games *Urban Science* (Bagley & Shaffer, 2009) and *Madison 2200* (Beckett & Shaffer, 2005) base on the training of real urban planners. Accordingly, they include professional activities, such as site visits, surveys, staff meetings, design, and the presentation of proposals while players develop a land-use plan for a local shopping street in Madison, Wisconsin. Shaffer found that games that mimic the professional practice of urban planning can foster the understanding of cities as complex systems, as well as specific aspects related to both the domain and the professional practice of planning.²³ However, in these games players take the role of an urban planner and designer, and neither consider informal structures, which are extremely important for young people, nor take players’ individual spatial experiences and expertise into account. Such games fail to reflect and integrate players’ everyday environments and experiences (Benze et al., 2020), and thus, they interrupt the principle of continuity. This means that they do not build on players’ previous experiences and do not pave the way for incorporating learnings into future experiences.

In sum, games have the potential to provide a situated environment for learning about the constitution of spaces by embedding situated actions upon space into the play experience. But there is a gap in knowledge about how to integrate spatial practices into the game design in order to support learning to understand and act for space. Therefore, this has become one of the questions I seek to answer through empirical design research.

3.3.

Games, Learning, and Space Meet in Social Participation

The third aspect along which I examine the connections between games, learning, and space is the social dimension. In the preceding chapter, I established a conceptual framework in which learning is fundamentally social, arising from active engagement in collective activities within the social environment (Dewey, 1916/1980). Similarly, the notion of space is understood as socially constructed, evolving through people's interactions with their surroundings or "spacings" (Löw, 2016). The synthesis of the constituting elements of spaces occurs through intricate processes involving perception, imagination, and memory. These processes are not only shaped by pre-existing social structures but also influenced by socialization, education, and habitus. In essence, the concept of learning and space is closely intertwined with social dynamics and is grounded in the interconnectedness between individuals and their social environment.

Meaningful games can be framed as social phenomena that fosters social interactions occurring within an individual game or across larger play communities (Salen & Zimmerman, 2003). Games therefore have the potential to become a setting for social interactions that generate processes of learning and space constitution. Gee (2007) argues that well-designed games can provide an environment for joint activities where social learning emerges naturally out of gameplay. And urban planner Steve Mankouch stresses that games that are implemented as a tool for the transformation of spaces should primarily focus on enhancing dialogue and a shared engagement.

The games are much less about producing ideal spaces or the design of specific outcomes, and more about stimulating dialogues; the rules of the game should be established to facilitate conversation and social engagement. (Erfani et al., 2020, p. 63)

Social interaction in games has often a competitive nature where players follow individual goals competing against other players, instead of having a common aim or a shared problem that they have to solve through mutual effort (Zagal et al., 2006). The competitiveness seems to be such an essential characteristic of games that the aspects of competition and winning appear even as formal elements in academic definitions to games (Parlett, 1999). However, the emphasis on the aspect of competition has been widely criticized and challenged (Salen & Zimmerman, 2003). The *New Games Movement*, for instance, founded in the 1960's, was dedicated to promote the positive impact of play in society and thus, promoted a community-based approach to games which had a significant impact on the culture of games and the integration of play and games into school education (Salen & Zimmerman, 2003, pp. 256-257). Bernard DeKoven, member of the *New Games Movement* and author of the book *The well-played game* (2013), argued for a shift in emphasis away from competition, because the tension generated by the possibility of winning and losing distracts players of anything else but the competition.

It is clear to me now, that the result of such a union [playing to win] is separation, always separation. It divides us into winners and losers, those who have achieved and those who have failed. The division then leads us into further division. It becomes difficult, now that some of us have won and some of us have lost, to find a game that we are all willing to play well together. (DeKoven, 2013, p. 11)

Salen and Zimmerman partly disagree and point out that “all games are competitive and cooperative at the same time” (2003, p. 255). The authors stress that conflicts are inherent to games and the artificial conflict at the heart of a game makes meaningful play possible. But the conflict can raise both between players and/or between players and the game system. Considering players and the game system together dissolves the dualism of winning and losing. In this sense, all games are competitive, even the ones where players work collaboratively against the game system. And in the same manner, all games are cooperative in the sense that “to play a game is to cooperatively take on the artificial meanings of the game, to communicate to the other players through the artificial discourse that the game makes possible.” (Salen & Zimmerman, 2003, p. 256). The way in which Salen and Zimmerman distinguish between systemic cooperation, which ensures that players share the meaning of discourse and mutually participate in the game experience and player cooperation, in reference to the mutual efforts of players to achieve a common goal, opens up a wide range of game mechanisms as an alternative to competition.

Zagal et. al. (2006) defined three basic categories into which games on the cooperation scale could be classified, depending on the goal of the players. Competitive games at one end of the scale were defined as those in which players had to pursue completely opposite strategies. In contrast, cooperative games are those in which the players’ interests are neither completely opposite nor completely aligned. The third category includes collaborative games, where players pursue a common goal and where the challenge is to work together to maximize team results.

In recent years, many arguments have been made for the use of collaborative game mechanics, both for learning (Kapp, 2012) and for the collective transformation of spaces (Lerner, 2014)²⁴. However, there is little research on how to create and apply different game mechanics to support certain educational aims (Hämäläinen et al., 2018). Likewise, there are theoretical gaps on how the social dimension of space transformation can be integrated into games through collaborative mechanics, and most games that focus on transforming spaces are still competitive in nature. The question thus to be answered in empirical research is how to create a collaborative game design that encourages social participation in the production of spaces.

3.4.

Conclusion: Research Questions and Initial Design Principles

In the previous chapters, I have gradually developed a triadic perspective on the relationships between games, space, and learning that unfolds in transformative play. From this synthesizing work, it gradually emerged that in order to harness the transformative potential of play for built environment education, that is, to effectively prepare children to become aware of and act for the built environment, it is necessary to consider the relationships between games, space, and learning in terms of continuity of experience, situated action, and social participation. Examining these aspects from a triadic perspective has provided important initial design principles that have guided my empirical research. Design principles are heuristic statements (van den Akker, 1999b), which provide insight into the purpose, function, and key characteristics of transformative games, as well as in the process of designing and implementing them in authentic contexts (McKenney & Reeves, 2012). This means that they arise during the research process and are constantly tested and improved. During the early theoretical and practical explorations presented in the previous chapters, three initial design principles emerged. These principles provided a foundation and direction for the empirical research, guiding both game design and inquiry.

1. Transformative games ground in children's spatial worlds

Ensuring the continuity of experience, where past and future experiences are interconnected through the reflection of actions and their consequences in new and uncertain situations, is crucial for learning. Games establish connections to players' everyday experiences and thus ensure the continuity of experience through representations. The question, however, is how to represent children's spatial worlds in games to support learning to understand and act upon space?

2. Transformative games provide situated environments, where players experience spatial practices

Games are conceived as powerful tools for learning environments especially because they can be framed as situated environments, where situated meanings emerge out of players' embodied experiences. For the research on transformative games that aim to foster learning about spatial practices the question arises: what kind of practices should be integrated and how into the game design?

3. Transformative games integrate social participation in shaping the spatial environment

Considering the social dimension is crucial when designing games for learning about understanding and interacting with spaces. Learning, which stems from actively engaging in collective activities within the social environment, is inherently social. Moreover, space is socially constructed, with socially pre-structured mental processes and spacings embedded in the social world. Games can represent and promote social participation based on the collaboration among players. The question is, how to foster social participation in shaping the spatial environment through game design?

My empirical design research seeks to answer these questions, while further exploring and refining the design principles to provide theoretical insights to support transformative game design that helps young people learn to understand and act upon their spatial environment.

Notes

- 19 That the ideologies represented in games were taken highly serious manifests not only in Lizzie Magie's commitment, but also in the fact that Monopoly was prohibited in countries east of the Iron Curtain (Huber & Nelke, 2007). Later on, Ollman, a professor of political science developed the game as an alternative to Monopoly called class struggle is the name of the game. The game was released in 1978, in the Cold War, and taught about the inequalities of capitalism by taking the role of social classes (Ollman, 2002).
- 20 The Game of the Goose is a classic board game where players race their pieces along a spiral track, following the instructions on each space, to reach the end first.
- 21 Play the city calls its game-based collaborative decision-making method city gaming. See more on their approach in Tan (2017).
- 22 Shaffer (2006, p. 223) indicates that thickly authentic learning involves learning "the ways of knowing, of deciding what is worth knowing, and of adding to the collective body of knowledge and understanding of community of practice". Shaffer (2004); (2006) refers to this whole of the ways of thinking, doing, being, caring, and knowing as the epistemic frame of a certain community.
- 23 Beckett and Shaffer (2005) conducted research to explore how such modeling learning environments on authentic professional urban planning practices enable youth to develop a deeper understanding of ecology. The core assumptions of the study were that "the environmental dependencies inherent in cities have the potential to become a fruitful context for [...] ecological education"; and, since urban planning practice involves ecological aspects, it "it may provide an authentic medium for understanding the complex relationships of urban ecology" (p. 32).
- 24 In his book *Making democracy fun*, Josh Lerner (2014) explores how games can support democratic processes, and more concrete, what are powerful design principles for games supporting public participation. His research concludes by stating that games and game mechanics can make participation more enticing, efficient, transparent, and fair, but only if the game design effectively weaves together certain principles. Situations of public participation are in essence a social phenomenon, a joint activity of the community where people have to collaborate and find solutions for common societal challenges. Consequently, Lerner indicates that games which are applied in such democratic processes, should embed collaboration into the core mechanics of the games. Referring to Salen and Zimmerman (2003), he suggests that well-designed games should generate collaborative competition, that is, the cooperation among players striving to achieve a common goal while struggling with the game system. Collaborative competition both requires and enhances collaboration, and thus, creates a social environment which encourages joint knowledge construction and learning.

4. THE WAY OF ACHIEVING NEW KNOWLEDGE – THE METHODOLOGICAL APPROACH

Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say that our knowing is in our action.

(Schön, 1983, p. 49)

This research is driven by the interest in understanding how games can be applied to foster learning about space and spatial practices, which emerged from my built environment educational practice. While working with children and youth, I realized both the urgent necessity to find suitable ways, tools, or methods to raise their awareness of the built environment – the way it affects their everyday life and actions, and the potential they have to transform it with their everyday practices –; and the transformative power of play and games. Thus, the question of how this transformative potential of games can be used for fostering learning about space and triggering spatial practices gave rise to this dissertation.

The previous chapters displayed how the transformative potential of games is becoming increasingly important at the interface of urbanism, planning, and education: they are used as easy-to-understand instruments for learning and explaining spatial issues, as well as for transforming virtual and real spaces. This transformative capacity of games has great potential. Used consciously and effectively, it can help people to better understand their built environment and its complex interrelationships and to work with communities to create more liveable environments. But despite a growing number of successful and promising practical examples, we still lack a solid understanding of how to design and apply games in a spatial context to harness the transformative power of play.

To develop knowledge about transformative game design that fosters learning about space and triggers spatial practices, we must understand how games, learning, and space intermingle in transformative play. This endeavor calls for a methodology that remains open to emerging relationships while maintaining a holistic view. Moreover, since my primary research interest is enhancing built environment educational practice, this thesis requires a practice-oriented approach that develops theoretically grounded solutions with the potential to transform space and society. In the first section of this chapter, I argue that educational design research is well suited to generate such knowledge because of its holistic, practice-oriented, iterative, collaborative, and transformative nature.

In order to generate knowledge on transformative game design for built environment education, I conducted an extensive design research and developed three successive prototypes, which aim to foster young people's learning about space and spatial practices and empower them to actively shape their environment. The collaborative game design process has been a journey of five years that took place between 2012 and 2017 in Budapest and Pécs, Hungary. The process was shaped by the duality of theory and practice, heuristics and analyses that guided the intertwined design and research decisions.

In the following, Section 4.2 presents the research process, available resources, and reveals how the empirical study has been conceived and organized. Section 4.3 exposes the research and sampling methods, as well as the strategies for data analysis. Forasmuch as I was personally and actively involved in every stage of the study, I reflect on my role as a researcher in Section 4.4. Finally, since the empirical investigation involved a number of young people, the final section looks at ethical issues relevant to the participation of young people in research.

4.1.

Methodological Implications for the Research Design

The pragmatist epistemology of Dewey (1916/1980, 1938/1986) provides the underlying principles for the methodology of this research. The core assumption in Dewey's theory of inquiry is that knowledge emerges in action. Doing and thinking, action and reflection are inseparable, therefore research needs to be embedded in reflective practice, which is a process of observing the situation, thinking, developing ideas, testing them in practice and refining them on the basis of reflection on experience.

Donald Schön (1983, 1992) reworked and further developed Dewey's theory of inquiry on the basis of his observations of a growing gap between the knowledge produced and distributed in academia and practice. Schön argues that this gap results from alternating situations of practice, which became more complex, uncertain, unstable, and unique. In consequence, he remarks, "professionally designed solutions to public problems have had unanticipated consequences, sometimes worse than the problems they were designed to solve" (1983, p. 4). To counter this, he proposes an epistemology of practice, based on a reflection-in-action, where professionals become researchers in the practice context. The Schönian reflective conversation with the situation is aligned with Dewey's transactional inquiry and refers to the recursive process of action and reflection that leads to a deeper understanding of complex situations by constant evaluation, reconstruction, and testing of coherences.

Schön argues that the reflective conversation with the situation mainly occurs in the mode of design, a term he uses in a very broad sense including "both what architects, industrial designers, engineers, and other members of the 'design professions' do, but also what all of us do insofar as we make things out of the materials of a situation under conditions of complexity and uncertainty" (1992, p. 126). He positioned design at the core of his approach, asserting that designing, in its broader sense, constitutes the essence of practice across all professions, occupations, and everyday life.

The design approach found its way into the field of educational research (Kelly, Baek, & Lesh, 2008; McKenney et al., 2006; McKenney & Reeves, 2012; Plomp & Nieveen, 2009; van den Akker, 1999a; van den Akker et al., 2006a). Educational design research²⁵ aims at developing solutions for complex problems while embedded within the educational practice (McKenney & Reeves, 2012; Plomp & Nieveen, 2009). In the following sections, I argue for the use of educational design research as a methodological framework for research that seeks to provide theoretical insights into transformative game design that supports learning and action in space.

4.1.1.

Linking Theory and Practice in Research

The first assumption defining my methodological approach is that knowledge emerges in reflective action. The general features of a reflective experience are exploring and analyzing a situation, developing a tentative hypothesis, testing, and refining it (Dewey, 1916/1980, 1938/1986). This means that an inquiry is always embedded in practice.

An ounce of experience is better than a ton of theory simply because it is only in experience that any theory has vital and verifiable significance. (Dewey, 1916/1980, p. 151)

Educational design research evolved from the criticism of educational research practice, which has been claimed to be neither problem-oriented nor linked to practice, and consequently, lacking relevant findings for practitioners (McKenney & Reeves, 2012; Plomp & Nieveen, 2009; van den Akker et al., 2006b). Reeves denotes that the “educational research community has often been its own worst enemy as a result of focusing more on establishing the legitimacy of one educational research tradition over the other ... rather than on improving education per se” (2006, p. 53). Walker (2006) emphasizes the general disappointment of the low impact of conventional educational research approaches, and consequently, having educational advances far behind the achievements in other fields of science. Researchers have therefore urged new approaches to bridge this gap between theory and practice, which do not test but rather build theory in local, authentic contexts. The first fundamental publications on design research in education integrate the systematic development of instructional tools and their impact on learning (A. L. Brown, 1992; Collins, 1992).²⁶ These opened up the way for a new, emergent, and “hybrid” methodology that focuses on problems emergent in educational practice and allowed developing theoretically grounded solutions in a rigid design research process embedded in authentic, practical contexts (Kelly, Baek, Lash, & Bannan-Ritland, 2008, p. 4).

The introduction of the design research approach into the field of education aimed at setting a dual focus on theory and practice, proposing an integrated research and design process with both theoretical and practical outcomes (McKenney & Reeves, 2012, p. 76). The practical outcome comprises high-quality interventions designed to solve complex educational problems (Nieveen, 2009, p. 89), which reinforce the practical relevance of design research. In the context of educational design research, intervention refers to different designed solutions such as products, processes, programs, or policies (McKenney et al., 2006, p. 14). The theoretical outcome is the accompanying set of well-articulated design principles (Linn et al., 2004; van den Akker, 1999b) that provide insights into the purpose and function of the intervention and contribute to the existing body of knowledge. Thus, “educational design research is a linking science, in which regulative cycles come together to advance scientific understanding through empirical testing during the development of practical applications” (McKenney & Reeves, 2012, p. 10). This integrated approach increases the practical relevance of educational research, develops empirically grounded theories in natural settings, and increases the robustness of instructional design practice (van den Akker et al., 2006b, 3ff).

4.1.2.

Following an Iterative Route of Design and Research

The second assumption that defines my methodological approach is that in the interplay of doing and knowing the “knower” and the “known” transform constantly both ways round (Dewey & Bentley, 1949/1989). Hypothesis, ideas, or as Dewey calls them, “postulations”, rise out of the transactional observations, and they are always open to reexamination. Thus, emerging postulations aim to promote further observation, which in turn will advance and improve, and thus, trigger the dynamics of an iterative, ongoing inquiry. It follows that the process of inquiry is circular and iterative.

Educational design research is inherently iterative, as the development of theoretical understandings and practical interventions “evolve over time through multiple iterations of investigation, development, testing, and refinement” (McKenney & Reeves, 2012, p. 15). This means, that educational design research consists of cyclical iterations, within which theory morphs into practice and practice generates theoretical insights, producing interwoven processes of research and design. Practical development and theoretical reflection continually influence each other, leading to frequent refinements in theories as well as adjustments in both intervention and research design.

4.1.3.

Keeping a Holistic Perspective

The third assumption that defines my methodological approach is that in order to develop a profound understanding of a certain phenomenon, an “unfractured observation” is needed (Dewey & Bentley, 1949/1989). In other words, one must inquire about the situation as a whole, rather than focus on isolated elements.

Corresponding to this, educational design research is a holistic approach that yields a better understanding of learning and educational interventions. In contrast to most educational research approaches, which base on one cycle of qualitative or quantitative empirical testing at a fixed point in time and with a fixed focus on given aspects or variables, educational design research attempts to progressively generate and improve knowledge about a particular phenomenon from interconnected research and design cycles (Bannan, 2009, p. 56). Thus, instead of emphasizing isolated aspects or variables, it investigates processes of educational interventions as “integral and meaningful phenomena” (Plomp, 2009, p. 16), and interrelates the understanding of learners, learning, context, culture, and the dynamically maturing intervention.

Maintaining an overall perspective is especially important to grasp the complexity of the interrelations between games, learning, and the broader cultural environment within which play takes place. Salen claims that “there has been little work done to establish an overall ‘ecology’

of gaming, game design, and play, in the sense of all of the various elements – from code to rhetoric to social practices and aesthetics – cohabit and populate the game world”, and argues for situating the studies on games and learning in a wider, dynamic media ecology (2008, 2ff).

4.1.4.

Research as Collaborative Action

The fourth assumption defining my methodological approach is that we co-constitute knowledge with our environment in a continuous transaction. This principle implies that research and inquiry are inherently collaborative endeavors, reflecting the mutual influence between researchers and their contexts.

A fundamental assumption of many learning scientists is that cognition is not a thing located within the individual thinker but is a process that is distributed across the knower, the environment in which knowing occurs, and the activity in which the learner participates. In other words, learning, cognition, knowing, and context are irreducibly co-constituted and cannot be treated as isolated entities or processes. (Barab & Squire, 2004, p. 1)

Educational design research requires collaboration with practitioners (Ejersbo et al., 2008; Hjalmarson & Lesh, 2008; McKenney & Reeves, 2012; Plomp, 2009). Ejersbo and colleagues (2008) denote that educational design research is conducted in a team of researchers and problem owners, where researchers bring different competencies and perspectives from different disciplines, and the practitioners bring expertise from the field. The role of the practitioners can be different: they can participate as clients, experts, designers, or users, with their own goals (Hjalmarson & Lesh, 2008, 105ff). On the one hand, they can be contributors with the task to integrate inputs of eventual users into the design of the intervention, and thus, they ensure the practical relevance of the research outcome. On the other hand, practitioners are beneficiaries both as future users of the interventions and as participants of a collective learning process (Hjalmarson & Lesh, 2008; McKenney et al., 2006; Zawojewski et al., 2008). McKenney and colleagues denote that “if design research activities are to contribute to the professional development of participants, then design and development must be conducted in collaboration with and not for those involved”, and “data collection procedures should be mutually beneficial – addressing research needs while simultaneously offering meaningful experiences for the participants” (2006, p. 77). This understanding resonates with the co-design approach and implies a shift in perspective, changing from designing for users to one designing with users (Sanders, 2002).²⁷ This approach integrates professional experts and the stakeholders whom the product will serve, throughout the whole development process – from the problem definition to the product development and its implementation and spread. This means, that the entire design process occurs in collaboration with experts and end-users, who become equal partners in the collaborative creation by bringing their situated expertise into the design process.

4.1.5.

Doing Research for Transforming Society

The fifth assumption of my methodological approach is that research is an inherently transformative process. Inquiry is not merely a passive exchange; it is a dynamic transaction that invariably instigates change in both the inquirer and the subject of inquiry.

[W]e have no right to call anything knowledge except where our activity has actually produced certain physical changes in things, which agree with and confirm the conception entertained. Short of such specific changes, our beliefs are only hypotheses, theories, suggestions, guesses, and are to be entertained tentatively and to be utilized as indications of experiments to be tried. (Dewey, 1916/1980, p. 348)

Educational design research strives to positively impact practice, and hence, to bring about transformation through the design and use of solutions to real problems “because the merit of a design is measured, in part, by its practicality for users in real contexts” (van den Akker et al., 2006, p. 5). Moreover, since education fundamentally aims to foster personal growth, educational design research also targets the advancement of the entire learning ecosystem, encompassing both learners and their environments.

Merely understanding cognition, however, is rarely the end goal of our work as educational researchers. More commonly, we have transformative agendas where our goal is to not just understand a community or culture as an ethnographer might but rather to create social change. (Squire, 2004, p. 102)

In sum, I chose to apply design research as a methodological framework to uncover the complex interrelations of learning, space, and games in transformative play because it provides empirically grounded theories and practical solutions, which emerge in open, iterative research processes that allow to maintain a holistic perspective, an unfractured view on the situation, as well as integrating multiple perspectives through a distributed approach. The next section presents the detailed research design of the study.

4.2.

Research Design

The structure of educational design research is flexible and evolutionary, yet different approaches have been developed to describe its general process in terms of visual models (Bannan-Ritland & Baek, 2008; Ejersbo et al., 2008; Jonassen et al., 2012; McKenney & Reeves, 2012; Reeves, 2006) or conceptual frameworks (Gravemeijer & Cobb, 2006; Reinking & Bradley, 2008; Wang & Hannafin, 2005). McKenney and Reeves (2012) conducted a thorough analysis of existing models and frameworks and developed a generic model that merges common structural elements. This generic model provided a framework for my research design.

McKenney and Reeves (2012) divide the process of educational research into three major phases: 1) exploration and analysis, 2) design and construction, and 3) evaluation and reflection. The first phase refers to the initial field investigation and “it involves exploring and analyzing the existing situation in terms of both current knowledge and current practice” (McKenney & Reeves, 2012, p. 74). Thus, it focuses on understanding the problem, the context, and relevant topics, and on learning from existing research and field experience. The goal of this research phase is to set the problem and to develop “initial design principles” and “partial design requirements” (Bannan-Ritland & Baek, 2008) on the bases of existing knowledge. These set the ground for the second phase, which involves the design and construction of an educational intervention, in other words, the “drafting and prototyping to build solutions” (McKenney & Reeves, 2012, p. 74). Design refers here to the conceptual development of an intervention in collaboration with other experts and practitioners, whereas construction refers to building the embodied version of that conceptual design. The two processes are interwoven and mutually support and complement each other. The practical outcome of this phase is a usable prototype of an intervention, while the theoretical outcome includes the conceptual description of the intervention. The third phase involves evaluation and reflection, where evaluation refers to the empirical testing of the intervention and reflection refers to the process of “retrospective analyses” (Gravemeijer & Cobb, 2006) aiming to produce theory and enhance solution implementation.

Figure 2 provides a visual overview of my research process on the bases of McKenney and Reeves’ (2012) visual model. The upper line displays the three main phases of the research. The arrows between the two components of each phase, as well as the arrows between the phases themselves, refer to the iterative, non-linear character of the research process. The middle rectangles display the research cycles of each phase. The first phase focuses on cycles of needs and context analyses, as well as the initial theory development, which concluded in formulating the initial design principles that provided the foci of the empirical research. The second phase aims at the design and construction of three game prototypes, during which theories and design principles have evolved. The third phase is dedicated to the evaluation of the development of the final prototype, as well as to the retrospective analysis of the entire research process. The increasing triangle at the bottom shows the growing density of imple-

mentation and spread of the game over time, exposing that the interaction with practice was elementary in every phase of the research. In the phase of analysis and exploration, these refer to the exchange of the problem statement and concept validation with other practitioners and experts. In the second phase, implementation referred to the testing of preliminary game design ideas and the playtesting with the maturing game prototypes. In the third phase, the final game prototype was implemented in real-world settings, and strategies were developed to ensure sustained maintenance. The rectangles on the right side show the game *ParticiPécs* as the practical, and the design principles as the theoretical outcome of the research.

Each of the research cycles consisted of several research activities, which I have detailed in Appendix A.

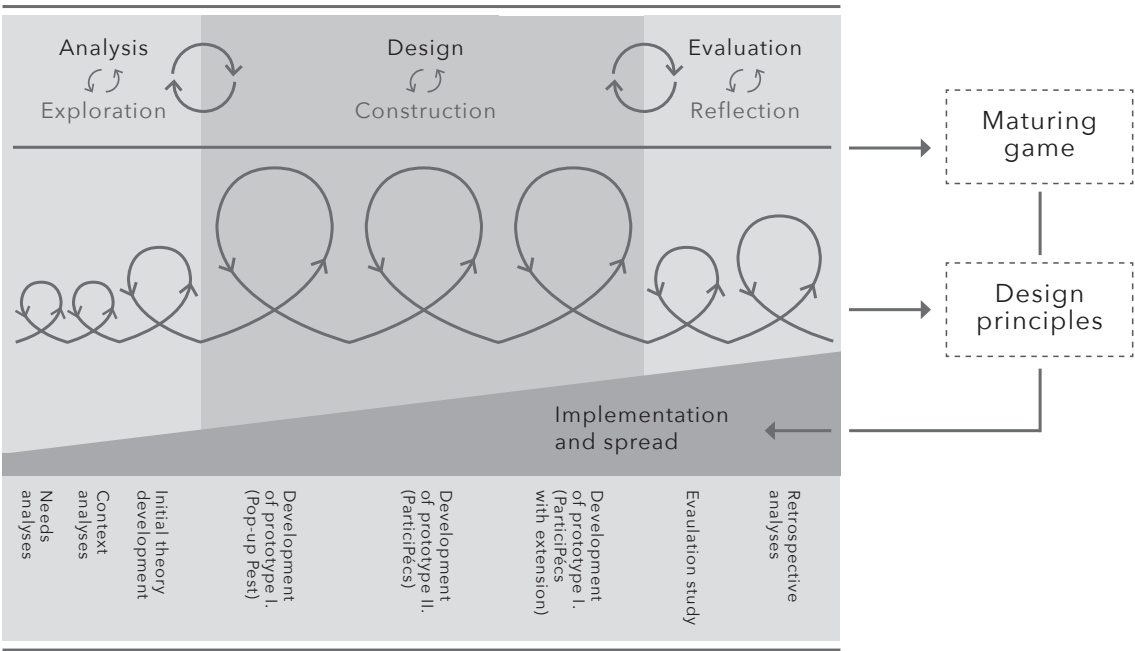


Figure 2
Overview of the research process
 (adaptation of the visual model of McKenney and Reeves, 2012)

4.2.1.

Available Resources for the Implementation of the Research

The extensive empirical research required a considerable amount of both human and financial, as well as material resources. In the role of the project lead, I took the responsibility to ensure that these needs are covered throughout the entire research process.

The implementation of the educational design research on transformative games required financial support from different parties at different stages of the project. During the early ex-

ploratory phase of the research, the support of Deutscher Akademischer Austauschdienst (DAAD), founder of the PhD Program Urban Metamorphoses at the HafenCity University Hamburg, made it possible for me to participate in different international conferences and conduct expert appraisals with different scientific communities. Afterward, the expenses of the game development process had to be covered through different grants. The development, production, and testing of the first prototype *Pop-up Pest* were financed by the Hungarian National Institute for Family, Youth, and Population Policy (application ID: IFJ-GY-12-B-6772) and supported by the Kunsthalle Budapest in the frame of the Ernst Museum's centenary festivities. The development process and the production of the second prototype *ParticiPécs* were financed through the Youth in Action Program of the European Union (project ID: HU-12-E131-2013-R2). The development, production, and testing of the third prototype (the creative add-on for *ParticiPécs*) were financed by the Municipality of Pécs, in the framework of the "Be the Future of Pécs - Contest for NGOs 2014". The exhibition and implementation of students' urban intervention ideas were financed by the Municipality of Pécs, in the framework of the "Urban Contest for NGOs 2015".

The practical implementation of the research required a remarkable workforce, and the conceptual work required a load of human capital. I received PhD grants from the DAAD (2013-2014), the Toepfer Foundation (2014), and the Sutor Foundation (2015) which enabled regular research stays in Hungary during the game development and implementation process, as well as to execute project management and coordination tasks. Yet the implementation of the research demanded additional support in terms of logistics, administration, game mastery, and assistance. Here I could rely on the network of volunteers of the kultúrAktív association without whom carrying out the research would have been impossible. A number of kultúrAktív volunteers participated in implementing game sessions, administrating the project, and, more importantly, they contributed to the game development process with their human capital. Additionally, PhD students from the Faculty of Engineering and Information Technologies at the University of Pécs contributed to the development of the third prototype, as well as to the implementation of the evaluation study in schools, and the realization of the exhibition of students' ideas.

Several partner organizations contributed to the project implementation with their material resources. The first research cycle of the game design process took place in Budapest. Here, the Bálint House Jewish Cultural Center offered its rooms and materials for the game development workshops and playtests, and the FUGA Budapest Architecture Center accommodated expert appraisals. The second and third research cycles were implemented in Pécs. Here, the Pécs Normandia Lions Club provided rooms and materials for the game development workshops, and the first playtests could be conducted at the Cultural Center Pécs. The House of Civil Society Pécs contributed to the last phase of the research by cooperating in the implementation of the exhibition of participants' ideas, as well as by offering space and infrastructure for playtests and expert appraisals.

4.3.

Research Methods

The use of a multitude of methods and techniques has been an essential aspect of this research. During the extensive educational design research, I investigated the interplay of games, space, and learning, all of which I understood as dynamic and complex phenomena. Therefore, the investigation of the core elements, as well as their points of intersection, and their interplay demanded the integration of multiple aspects, questions, and consequently, a variety of scientific ways to gain insights into the nature of transformative games in the context of built environment education. The use of a broad variety of research methods is inherent in educational design research, where the development of theory and intervention occurs through a responsively grounded process. This means that every decision that affects refinement or redesign, even the adjustment of research design, is taken on the basis of an empirical investigation (McKenney & Reeves, 2012). In other words, each of the research cycles consists of several research actions, which contribute to subsequent research steps with empirical data. Accordingly, every research action encompasses empirical investigation that focuses on a specific research question or evaluative aspect. And therefore, every research action needs the selection of suitable methods of data collection, sampling, and data analysis that permit direct investigation of a given question.

The following subsections present the methods for data collection, sampling, and data analysis applied in this research. See Appendix B for a full list of the methods used in each research action.

4.3.1.

Data Collection

Due to its open and processual character and the dynamic and emergent nature of design cycles, educational design research does not imply a fixed set of data collection methods but is open to a variety of approaches, methods, and techniques in compliance with the research questions as well as the domain and context of the research (McKenney & Reeves, 2012). It attempts to “progressively and dynamically generate (exploratory research), improve (constructive research) and learn about (empirical research) a particular phenomenon from interconnected research and design cycles” (Bannan, 2009, p. 56). Thus, it integrates multiple exploratory, constructive, and empirical research methods as well as multiple design and development techniques. According to Bannan (2009), exploratory methods are applied for structuring and identifying new problems, while constructive research methods – complemented by design techniques – aim at supporting the development of educational interventions by formative evaluation testing or testing of theories and constructs. Empirical research, in contrast, refers to the summative evaluation of the designed intervention.²⁸ In the following, I use these categories to present the research methods employed in my study. Table 1 provides a complete overview of the methods and techniques that are subsequently explained.

METHODS FOR EXPLORATION	DESIGN TECHNIQUES	METHODS OF FORMATIVE EVALUATION	METHODS OF SUMMATIVE EVALUATION	METHODS FOR DOCUMENTATION
Field investigation	Prototyping	Designer screening	Survey (with questionnaires)	Field notes
Expert appraisal	Brainstorming	Expert appraisal	Group discussions	Designer log
Benchmarking		Micro-evaluation	Interview	Photo
		Tryout / Playtesting	Observation	Video recording
			Expert appraisal	Audio recording

Table 1

Overview of the research methods applied in this study

Methods for exploration

The initial, broad research question on how games can foster learning about space and spatial practices guided the first phase of my research. In an intertwined process of analysis and exploration, the needs and gaps in both theory and practice were identified. The analysis included an extensive literature review, which aimed at establishing a common ground of games, learning, and space on a conceptual level. This served as a fundament for narrowing the research topic and for conducting a more tightly focused analysis of needs, as emergent in both scientific discourses and the local educational context where the game was meant to be implemented. Further, I used explorative techniques, such as field investigation, expert appraisal, and benchmarking to uncover the current practice of games in spatial contexts and to grasp prevailing discourses and knowledge gaps.

Field investigation refers in the context of my research, on the one hand, to networking and exchanging with expert communities, attending conferences, and conducting informal expert interviews (McKenney & Reeves, 2012). Since the research object is situated at the interface of game studies, education, and urban studies, it seemed necessary to get involved in related academic discourses and practices and to assemble the knowledge and identify gaps of knowledge in each of these fields. This occurred in large part via field investigations, also because of the lack of existing literature and research related to the subject matter of the study. On the

other hand, I also conducted fieldwork to gather insights from the educational practice. Conducting built environment education workshops with children and youth helped me to explore their needs, interests, and attitudes toward both game-based learning and spatial contents.

Expert appraisal refers to research activities where external experts were solicited to give feedback on concepts, theories, prototypes, or products that have been developed (Tessmer, 1993; Thiagarajan, 1991). In this study, I conducted expert appraisals with teachers, architects, planners, and game designers throughout the entire research process. In the first research phase, I used expert appraisals for concept validation of the initial design principles or game concepts via presentations and following discussions at conferences or in university contexts. During my research, expert appraisals were performed mostly as group discussions, which “simulates a discussion and uses its dynamic of developing conversation in the discussion as the central source of knowledge” (Flick, 2009, p. 196).

The method of benchmarking ensued to be an appropriate complementary method to the literature review, since there has been a lack of scientific literature on the implementation of games in built environment education, but there has been a variety of practical insights in existing project reports. Bannan-Ritland and Baek (2008) introduced the traditional marketing technique of benchmarking into educational design research to provide a method for practical needs analysis for instructional design. Benchmarking, thus, refers here to the collection and analysis of other products and best practices aiming at informing the own practice and research. Following, I made extensive research on games that had been developed for spatial contexts: I searched for publications and reports on games, exchanged experiences with game designers, and collected and tested games in my educational practice (Tóth, 2015).

Certainly, the process of theory development was not linear but rather iterative, where each research activity influenced and (re-)set in motion both previous and subsequent activities. The main challenge was to integrate practice, theory, and research perspectives on transformative games in built environment education, especially because of a lack of research and empirically grounded knowledge on the triadic relationship between games, learning, and space. Nevertheless, the in-depth qualitative exploration and the diversity of techniques and methods applied helped me understand the problem, narrow the focus of the research while maintaining a complex and holistic overview, and develop an initial theoretical conjecture. The insights gained during this phase were the fundamentals of the design and construction of the game prototypes.

Design techniques

Generative design techniques or “make tools” were crucial for the design and construction phase of this research. Sanders and Stappers underline that “one key ingredient of the designerly ways of doing research is that they involve creative acts of making” (2014, p. 6). By the involvement of creative acts, the authors refer to creating, using, discussing, and evaluating artifacts, as well as to transforming their meaning in a reflective and iterative process. Accordingly, in recent years, a focus shift in design research is to be observed toward more varied and

explicitly applied forms and formats of making. The careful selection of design methods and techniques is crucial, first of all in a collaborative design process with a highly diverse design team, which encompasses participants with different interests, needs, skills, and preferences (Sleeswijk Visser et al., 2005). The core techniques I used during the design and development of this research were prototyping and brainstorming.

Prototyping was the key method for developing a transformative game for built environment education. Prototyping refers here to the embodiment of the artifact to-be-designed in the form of throw-away prototypes, such as scenarios or paper-based mock-ups, or, in other words, of a continuously refined “evolutionary prototype” (Nieveen, 1999).²⁹ From research action to research action, the prototypes were designed, constructed, evaluated, and discarded, considering their evaluation results in the next prototype. The prototyping process continued until all uncertainties were covered and the final game was accomplished. Sanders and Stappers define this process of prototyping “as ‘growing’ early conceptual designs through prototypes into mature products” (2014, p. 6).

Brainstorming is another essential technique of design-based research (Fullerton, 2008; Schell, 2008), which I applied during the entire design and construction process. Brainstorming techniques, such as list creation, idea cards, or mind mapping is considered a “more formalized system of idea generation” (Fullerton, 2008, pp. 153-154), which support collaborative problem setting and solving, and supports design team members to express themselves creatively (Sanders & Stappers, 2014, p. 12). I used context mapping to elicit required contextual information, as well as the needs and wishes of the target group. This technique typically involves a sequence of research steps, including preparation, sensitizing participants, group sessions, analysis, and communication of results (Sleeswijk Visser et al., 2005). I applied mental mapping (Lynch, 1960) with participants to understand their images and knowledge of their spatial worlds. Additionally, I applied personas for exploring the general needs of the target group. Personas are “profiles created to inspire and guide design” (Ireland, 2003, p. 28), that is, real or imagined user profiles, often containing names, images, demographic and behavioral characteristics, barriers, and challenges (Don & Petrick, 2003). The aim of personas is to identify future users’ specific goals and needs during the design process.

Methods for formative evaluation

The development and construction phase of educational design research encompasses the iterative, gradual improvement of an educational intervention. In each step and each iteration, refinement and improvement procedures are performed based on empirical data. This kind of responsively grounded process of research and design requires ongoing and systematic formative evaluation, that is, constant “judgement of the strengths and weaknesses of instruction in its developing stages, for purposes of revising the instruction to improve its effectiveness and appeal” (Tessmer, 1993, p. 11). Nieveen defines formative evaluation in the context of design research as “a systematically performed activity (including research design, data collection, data analysis, reporting) aiming at quality improvement of a prototypical intervention and its accompanying design principles” (2009, p. 93). Nieveen (1999, 2009) underlines that

formative evaluation can address two key aspects, which require major attention during the design process: the conceptual framework of the intervention, referring to all its underlying, theoretical notions; and the presentation mode of the intervention, referring to its format and use. Accordingly, the results of the formative evaluation “give ground for both improving the prototype of the intervention toward a high-quality final deliverable and sharpening the underlying tentative design principles toward an elaborated set of design principles” (Nieveen, 2009, p. 91). In other words, it contributes to a successive approximation of both theoretical and practical outputs of the design research.

I applied a variety of formative evaluation methods during the design and construction phase of this research, from more informal and intern conducted techniques in early stages, to more formal and elaborated techniques involving external experts and participants in later stages. I employed four key formative evaluation strategies³⁰: designer screening, expert appraisal, micro-evaluation (primarily through playtests), and tryout.

Designer screening refers to the analytical and evaluative activity of the design team during design and construction cycles (Nieveen, 1999; Tessmer, 1993; Thiagarajan, 1991). This means that after each major decision and iteration, the design team evaluated and compared the results with the initially defined design principles. During designer screenings, we used different methods and tools, from the simple presentation of concepts to walkthroughs with paper-based prototypes, group discussions, or playful evaluation techniques.

Expert appraisal, as explained earlier in this section, refers to research activities where external experts were solicited to give specified feedback on the current stage of the research and the intervention. Accordingly, during the design and development phase of the research, I invited experts to conduct walkthroughs with the maturing prototype. We frequently applied cognitive walkthroughs, a common method for expert appraisals, defined as “a usability inspection method that focuses on evaluating a design for ease of learning, particularly by exploration” (Wharton et al., 1994, p. 105).

Micro-evaluation refers to formative evaluation activities involving small groups of users or experts. Since formative evaluation forms part of each design and construction cycle and focuses on the current state of the intervention – from early narrative descriptions to final high-quality products –, it requires a gradual alteration of methods and techniques, appropriate for each stage and research question (McKenney & Reeves, 2012). During the design and construction phase, the continuous playtesting with the maturing prototype was the most important source of empirical investigation that informed both design and development of the prototype and the design of the final evaluation. Most playtests followed a settled structure, beginning with a brief introduction to the game and a warm-up discussion, which was followed by the play session and ended with a postgame discussion or a survey on the game experience. Early-stage playtests included mainly group discussions, while mature-stage playtests involved more formalized techniques for data collection. For evaluating the final version of the first prototype and in the early phases of evaluating the second prototype I applied questionnaires with attitude scales (Likert, 1932). This instrument allowed

to gain insights about players' attitudes toward key game elements and reveal weaknesses that needed to be improved and strengths that needed to be emphasized on the bases of participants' experiences. I triangulated the data gathered via questionnaires with qualitative methods such as group discussions, interviews, and observation (see questionnaires used for formative evaluation in Appendix C).

At the end, I implemented a tryout of the final prototype in an authentic educational setting. Tryouts, which take place before the final evaluation, might serve as a pilot, and aim at testing the data collection methods, settings, and procedures of the final evaluation. Thus, tryouts create a bridge toward the summative evaluation cycles.

Methods for summative evaluation

The overall, summative evaluation of the intervention occurs in the final evaluation phase of educational design research (McKenney & Reeves, 2012). In contrast to formative evaluations, which focus on certain aspects or elements of the intervention, this research cycle aims at exploring its overall effectiveness and practicability in authentic educational context. Salen emphasizes that game-based learning should be approached as a "learning ecology" (2008, p. 3), which requires a holistic study of the dynamic interactions between actors, processes and related elements, and the cultural and social context in which the play takes place. Thus, methodological triangulation is required here to explore the game experience in its broader context and complexity and increase the scope, depth, and consistency of the research. Flick (2009) remarks that triangulation should be carefully planned, and methods should be chosen that allow for collecting different types of data from different perspectives. Accordingly, the methods I applied for the final evaluation of the prototype were manifold and included both outside and inside perspectives, considering both the magic circle of the game and the wider ecology of the play.

The evaluation study was implemented in authentic classroom contexts in different types of primary and secondary schools in Pécs. For the final evaluation, I conducted pre- and post-game episodic interviews with the participants to explore the players' contextual experiences relevant to the interpretation of their game experience, as well as the results of their meaning-making process, in order to explore possible learning outcomes. This technique is used to describe particular episodes or features of the interviewee's experience and to capture changes in these during repeated interviews, as episodic interviews are "sensitive for concrete situational contexts, in which little changes occur, and for overarching sedimentations of such changes" (Flick, 2000, p. 76). This interview technique is grounded in the theoretical assumption that individuals' experiences within a specific domain are stored as "episodic and semantic knowledge" (Flick, 2009, p. 185). Episodic knowledge, tied to concrete situations, can be investigated with pointed questions, while semantic knowledge involves abstract and generalized assumptions, which are better explored through open, narrative questions. The alternation of pointed and narrative questions in the interviews streamlined the interviewing process with children. I encountered challenges in eliciting young people's implicit knowledge about abstract issues like space or broader concepts related to their spatial environment. Ab-

stract questions proved too challenging for young participants, leading to the preference for the episodic interview technique, which stimulates specific, focused narratives, rather than requesting a single comprehensive response for each issue. Additionally, I observed game sessions, as game dynamics are more easily understood in actual gameplay, and might be grasped through observation of others playing (Lankoski & Björk, 2015).

Methods for documentation

In the educational design research, I used different data collection methods and consequently a variety of documentation techniques. In the first exploratory phase, I recorded the results of field investigations and peer reviews in field notes. Later, in the design and construction phase, I wrote a designer log to document relevant information and knowledge about the design process, such as design activities and decisions, problems and solutions, unexpected results and reflections. I used photo and video recordings to provide a more comprehensive and holistic documentation of the design workshops and playtests. These documentation methods allowed for non-reactive recording of observations and retrospective analysis. For the final evaluation, I video-recorded the game sessions, audio-recorded and transcribed the interviews, and took field notes to capture additional information about the interviewees, the context and circumstances of the interview, and supplemented these with my own reflections.

4.3.2.

Sampling

Educational design research is an act of collaborative creation, which aims at the integration of all stakeholders in order to provide space for different voices in the design process and to improve the quality and validity of the final outcome of the research (Ejersbo et al., 2008; Hjalmarson & Lesh, 2008; McKenney & Reeves, 2012; Plomp & Nieveen, 2009). Accordingly, I involved several consultants, participants, and co-designers in this study on transformative games. Hereby I followed a purposive overall sampling strategy (Nieveen, 2009), which implies a deliberate selection of participants based on previous analyses and contextual conditions (Flick, 2009). I ensured triangulation to enhance the reliability and internal validity of the findings by the maximum variation of the sampling strategy (Patton, 2002). This means that I involved experts from different fields of research and practice, and young people from different backgrounds throughout the study. This section describes the sampling of different groups of participants in the research. For the full list of participants assigned to each research action see Appendix E.

Participants of the field investigation

During the exploration phase of the research, I conducted several informal conversations with members of different scientific communities and playful workshops with children and youth. The main research action of the field investigation phase was an architecture-themed workshop for secondary school students, which was open to upper secondary school students from Pécs who were planning to study architecture-related subjects. A total of 30

students took part in the two-year course. Working with them in depth contributed to the understanding of the needs and interests of the target group, as well as to their knowledge and approach to space and urban games.

Participants of the design team

The design team was assembled from a variety of experts and young people, aiming to compose a multidisciplinary, cross-functional team to include different skills and knowledge in the development of a transformative game. However, the constellation of the team changed over time. The changes occurred at the beginning of a new research cycle, that is, at the starting point of the development of a new prototype. The participants were carefully and purposively selected, depending on the kind of knowledge that was needed at each stage of research. Main rationale behind these alterations was the need for involving new skills and new target groups in the design process, which became evident after playtesting and evaluating each version of the game. The design process involved a total of eight young people aged between 12 and to 17 and fifteen experts with backgrounds in education, architecture and planning, graphic design, engineering, and youth work.³¹

Experts involved in expert appraisals

Expert appraisals were a key research strategy throughout the inquiry. I purposively invited 30 experts from diverse fields to provide feedback on theoretical concepts, research design, and prototype development at various stages. Regular doctoral colloquia in my PhD Program *Urban Metamorphoses*³² at HafenCity University Hamburg facilitated ongoing expert input. During the first prototype's design phase, three appraisals were conducted: one with a game researcher to discuss design principles, one with teachers during school playtests, and one with the *GeoGames Lab*³³ at HafenCity University Hamburg. In the second phase, four appraisals were carried out: initially, the chief architect of Pécs provided feedback on a paper-based prototype; subsequently, a playable prototype was evaluated by educational professionals at a symposium, by members of the *kultúrAktív* Association (architects and planners in built environment education), and finally by school teachers selected for the final evaluation.

Participants involved in the evaluation of the prototypes

The main target group was local children aged 14 to 18, who formed the core of the investigation. Additionally, public events and playtests included both older and younger children to assess how the game worked across different age groups, enabling a more nuanced understanding of player profiles and determining the game's optimal audience.

The first prototype, *Pop-up Pest*, was tested during Budapest's Ernst Museum centenary celebrations and *European Mobility Week* in public spaces. These open sessions engaged 167 players (with 44 completing a survey) but did not yield sufficiently detailed insights, prompting additional closed-group playtests at the Jewish Cultural Center with 8th-grade students, 11th-grade students, and university students. For the second prototype, *ParticiPécs*, an initial

playtest with family members assessed playability and external feedback, followed by testing at the *Green Family Day* festivity in the Pécs Cultural Center with twenty players from diverse family groups. During the development of the third prototype, an intensive reflection-in-action process combined design workshops with playtests. An initial session with 20 University of Pécs students, along with two playtests involving 18 teachers from schools selected for the final evaluation, provided crucial insights. Four pilot tryouts with 73 participants in Pécs schools further refined both the game and data collection methods.

In the final evaluation phase, nine game sessions in various primary and secondary schools in Pécs involved 184 youths aged 14–18, and nine in-depth pre- and post-game interviews were conducted with participants selected via purposive sampling. Triangulation across different class grades, school types, and locations was employed. See Section 5.1.2. for more detailed description on participants.

4.3.3

Data Analysis

In design research, the interaction with the designed system in an iterative process can be conceived as a form of research that informs and influences design decisions and the refinement of the design solution (Zimmerman 2003, p. 176). This kind of reflective practice leads not only to the improvement of the design product, but also to theoretical insights and the professional development of the researcher (Schön 1983, McKenney and Reeves 2014). The development of theories requires a rigorous data analysis strategy, which inherently fits the nature of design research: pragmatist in that it focuses on practical testing of theories, interpretivist in that it builds upon the researcher's ongoing creative interpretation as a driving force, and iterative to allow developing theories gradually in the interpretation of actions and consequences. Miles, Huberman and Saldaña (2014) provide a data analysis approach that meets these requirements. Their analytic sequence is closest to ethnographic methods and grounded theory:

It moves from one inductive inference to another by selectively collecting data, comparing and contrasting this material in the quest for patterns or regularities, seeking out more data to support or qualify these emerging clusters, and then gradually drawing inferences from the links between other new data segments and the cumulative set of conceptualizations. (Miles et al., 2014, p. 10)

Thus, this data analysis approach builds upon the “creative crafting” (Maher et al., 2018) of the researcher, staying close to the data and remaining open and flexible for the course of further research steps and design actions. Consequently, data analysis was conceived as an ongoing process (Miles et al., 2014), and carried out throughout the entire process of the empirical research.

During the intermediate analyses, which took place after each research action, I processed the raw data, which included transcription of interviews, conversion of field notes into comprehensive write-ups, creation of charts and tables, and the selection and detailed descrip-

tion of photos and video excerpts, which were further expanded upon with memos. An initial analysis of this material helped isolate patterns and processes that informed the subsequent design cycle and guided the review of data collection strategies, as reflected in the subsequent changes in techniques.

The retrospective analysis of the entire data set took place at the end of the data collection period and aimed at gaining an overall perspective on the findings of the study (Gravemeijer & Cobb, 2006). Here I followed the two-round coding process of Miles et al. (2014). The first cycle of coding was crucial in terms of data condensation and involved assembling related data chunks and condensing the overall bulk into analyzable units. For this coding cycle, I used the MAXQDA software, which allowed a systematic approach in handling the large size and variety of data. A major component of this coding phase was the creation of patterns and categories using a descriptive coding approach (Miles et al., 2014) with a predefined list of researcher-generated codes, derived from earlier investigations and initial design principles. The primary goal was to establish an inventory for the fundamental research topics, including the spatial representation, situated action, social participation, and play experience. These codes were continuously expanded with subcodes that emerged progressively during data revision. This expansion facilitated more extensive subcategorization and enabled a nuanced qualitative analysis.

I then organized and categorized the codes and coded segments using a visual mapping strategy. This manual process involved mapping the codes, segments, and initial blocks of text onto a poster according to the design cycle or prototype and design principle. The use of visual representations proved helpful in recognizing patterns and identifying connections between different prototypes and principles.

4.4.

Reflecting the Role of the Researcher

Design research studies involve complex interactions and feedback cycles that can significantly blur the roles of researchers, teachers, curriculum developers, instructional designers and assessment experts (Kelly, Baek, & Lesh, 2008). This requires a high level of adaptability on the part of the researcher, meaning the ability to take on these different roles with awareness and preparation. As McKenney et al. (2006) point out, this adaptability is necessary to create synergy between research and practice without losing sight of their primary research role. Throughout the research, I had to assume different roles, from designer to researcher, educator, facilitator, and project manager, each with different, sometimes conflicting interests, perspectives, and challenges.

The designer's role, notably prominent throughout the design and construction phases of the prototypes, which formed a fundamental aspect of this research, demanded extensive creativity in both thinking and practical implementation. The emphasis was on crafting a functional game that aligns with its transformative agenda. Being fully immersed in the game design process established a strong sense of ownership, and this hid the potential for one of the major pitfalls. McKenney et al. (2006) point out that design researchers can easily become overly attached to their prototype, which can lead to a less objective view of the data set. Plomp (2009) suggests strategies for overcoming (co-)authorship bias, such as to include formative evaluation early on in the development process and to apply triangulation of data sources, methods, evaluators, and theories.

I believe that, as a design researcher, by engaging in a reflective conversation with the situation (Schön, 1992), I co-constituted the reality of the research environment and the meanings that emerged within it. Rather than eliminating the subjectivity of the researcher, I endeavored to make it transparent on various levels. At the beginning of the thesis, I disclosed what experiences and knowledge influenced my interest for the research topic and the choice and development of the research question and approach (see Section 1.2). Here in this section, I reveal the challenges that arose from the research situation during the design and construction phase of data collection and analysis, as well as my strategies for dealing with them. And finally, at the end, I reflect on the challenges that arose during the retrospective analysis and presentation of the research (see section 6.5). Nevertheless, I have applied the strategies suggested by Plomp (2009) to maintain the scrutiny and scientific rigor of the research and to retain the researcher's perspective. Therefore, I applied research actions of formative evaluation from the early design phase, and triangulated data sources, methods, participants, theories, and involved the perspective of external evaluation through frequent expert appraisals. These helped me also to "shift from a dominance of 'creative designer' perspective in the early stage, towards the 'critical researcher' perspective in later stages" (Plomp, 2009, p. 30).

One of the biggest challenges in design research is the constant, cyclical shift between the designers' and researchers' perspectives. Therefore, the involvement of external reviewers is often recommended to maintain scientific rigor. However, as Nieveen underlines, engaging in evaluation activities tend to lead to important learning experiences of the design researchers.

They will experience themselves the problems that occur and hear out of firsthand the suggestions for improvement that respondents come up with during their use of a prototype (for example, by observing or interviewing teachers or students). This usually has stronger and more direct impact on their thinking and design activities, compared to cases where external evaluators report the results to the developers. (Nieveen, 2009, pp. 97–98)

I chose the path to experience this deep learning experience and therefore followed and guided the whole design research process. I am convinced that my interventionist role has been crucial in every research cycle, whether it was designing the research framework, developing the game, or evaluating the prototypes. To minimize personal biases and ensure the reliability and general validity of results, I used the aforementioned strategies, and in what follows I present the entire reflection-in-action process of design research, which itself carries these verification mechanisms.

The dilemma of rigor or relevance may be dissolved if we can develop an epistemology of practice which places technical problem solving within a broader context of reflective inquiry, shows how reflection-in-action may be rigorous in its own right, and links the art of practice in uncertainty and uniqueness to the scientist's art of research. (Schön, 1983, p. 69)

The interventionist role is inherent to the role of the educator. The aim of my research is to help children learn to understand space and act upon it in order to bring about positive change in their spatial environment. It is a transformative program with clear goals and objectives, which I emphasize in different parts of the thesis: at the beginning by setting out the general pedagogical objectives (see section 1.5), before the design and construction phase by presenting the pedagogical objectives of the prototype I have designed (see section 5.1), and in the final phase by reflecting on the pedagogical objectives and their achievement.

4.5.

Ethical Considerations

Conducting educational research with a collaborative approach and with minors requires particular care concerning research ethics (Howe & Moses, Michele, S., 1999; Manzo & Brightbill, 2007). I followed ethical principles that contributed to enhancing the conduct of research and the dignity, privacy, and beneficence of the participants.

One of these ethical principles was the assurance of voluntary participation and informed consent. Participants could enter the research freely and with full information about what it meant for them to take part in a given research action, and they gave consent before they entered the research. Before starting a design process with the design team or any formal evaluation of the prototypes, I informed participants and, in the case of classroom settings, the educational institutions about the research and obtained their consent. The members of the design team joined the project voluntarily and were free to quit at any time. Likewise, the participants of the playtests organized during the development and construction phases participated voluntarily and were free to quit at any time and to decide for themselves whether they wanted to give feedback at the end of the game sessions. During the final evaluation in schools, students participated in the game in a classroom setting. This meant that their physical presence was compulsory, however, their participation in the game was not.

I obtained ethical clearance and written consent from schools and participants (or their legal guardians for minors) to include session photos in my thesis. I ensured confidentiality and anonymity by using only images in which participants are unrecognizable, by altering participant names, and by omitting the names and locations of schools involved in the final evaluation. I noticed that play experiences and outcomes thoroughly varied across schools and classes. However, to avoid unfair and undesirable evaluations of students' statements and performances that might be traced to the participants or their teachers and schools, I chose to anonymize schools and rather put the focus on the general outcomes regarding the design of the prototypes. That is, to focus on the performance of the games rather than participants' performances. Yet, in terms of understanding the impact of the game design, it was also necessary to explore and show the variety of outcomes, which also depended on players' place of residence and the resulting differences in their knowledge of and connection to the city, and on their existing practical experiences and skills, and the resulting differences in dealing with the design task of the *ParticiPécs* add-on. Therefore, the general location of the schools (inner city, suburbs) and their pedagogical orientation (primary school, secondary school, vocational secondary school) are mentioned in the study as both aspects could have an impact on students' meaning-making process concerning the transformation of urban spaces.

The game design process was an important part of knowledge production, which was essentially collaborative in nature. Hence, at this stage of the research, in addition to standard ethical principles, the principles of participation had to be taken into account (Manzo & Brightbi-

ll, 2007). This included basic principles such as transparency, equality, or sharing of control. Transparency referred to the honesty and clarity about the purpose of the research, the limits of what can and cannot be reached, and what happens as a result, throughout the entire design process. Equality meant that every member of the design team, regardless of age and education, could participate equally in collective decision-making, and we used a variety of methods and design techniques to ensure that all participants had an equal chance to express their views. Sharing of control meant that each participant had a say in the creation of the process, that is, we returned to re-discuss previous decisions or add new iterations to the process if design team members requested.

Another important aspect of research ethics relevant for this study was the principle of beneficence, since both educational and participatory research approaches aim not only at doing no harm, but maximizing beneficial outcomes for participants and society (Manzo & Brightbill, 2007).³⁴ My research aimed at an impact, intended to trigger positive change, and empower participants to be able to help themselves by actively co-creating their living environments. Therefore, participants' benefit was of key importance during the entire study. I have ensured this through continuous interim evaluations and reflections, on the one hand, and the involvement of external educational experts, on the other. For example, the coach accompanied and shaped the co-design process precisely from the perspective of the participants' learning and development, and we conducted several playtests with teachers and other professionals to optimize the process for the students involved in the playtesting.

The design approach of my research, and especially the complexity of educational game design raises other ethical issues because neither education nor games are value-free. Warren and Lin (2014) point out that value assumptions are inherent in the decisions of educators and designers. They influence the selection of a theoretical approach, the development of a conceptual framework, or the application of information and, thus, they have an ethical responsibility to design games and simulations. It was from the same idea, namely that games carry beliefs through their representations and mechanics, that Flanagan (2009) developed her critical play method for game design. The critical play method integrates additional steps of reflection into the traditional iterative game design process in order to verify that both design goals and desired values are fulfilled. In this way, designers are constantly reflecting on the values and approaches they want to convey. This is the approach I followed in the present design research in order to ensure the desired learning impact. The dissertation presents the underlying psychological, social, and learning principles which were present in the prototypes to ensure interrogation.

Notes

- 25 There are several terms used in the literature to describe design-oriented research, for example, design-based research in Design-Based Research Collective (2003); development research in van den Akker (1999a); design experiments in A. L. Brown (1992) and Collins (1992); or formative research in Walker (1992). In this thesis, I use the term educational design research following van den Akker et al. (2006a), as it underpins both the educational context and the design approach to research.
- 26 Pedagogical design has informed the development of theories of instruction for well over a century. For the impact of previous approaches and theories on educational design research, see McKenney and Reeves (2014). The introduction of the term design experiment into educational research is associated with A. L. Brown (1992) and Collins (1992). Their studies initiated a dynamic discourse on educational research methodology, which led to the development and establishment of systematic and integrated design research in education.
- 27 Literature from the field of design practice, especially the existing body of knowledge on co-design and participatory design, provides useful knowledge regarding the implementation and quality of collaboration in educational design research. Since the 1970s, designers and design theoreticians claimed more participation of non-experts in the creative processes as experts of their own experiences, thinking, and understanding Cross (1972); Ehn (1988); Sanders (2002).
- 28 Scriven (1967) revealed the distinction between formative and summative evaluation on the bases of their different function. He remarks that formative evaluation focuses on uncovering shortcomings of an object during its development process with the purpose to generate suggestions for improving it. Thus, its function is to improve the designed intervention. On the contrary, summative evaluation is carried out to gain evidence for the effectiveness of the intervention, that is, to prove the designed intervention.
- 29 Nieveen (2009, p. 90) defines a scenario as a narrative description of typical and critical aspects or situations of the intervention, which “may be used to make the tentative design specifications more concrete”, while a paper-based mock-up comprises a pile of papers representing elements of the intervention with the “focus [on] the attention of the user more on content and overall structure than on appearance”.
- 30 The methods discussed here are better understood as strategies (Nieveen, 1999) that encompass a range of additional methods and techniques, depending on the context, the research question, and the prototype’s development stage.
- 31 See Section 5.1.3 for a detailed description of the design team members and the changes to the design team.
- 32 The UM group was comprised of eleven experts and twelve PhD students from the fields of GIS, urban planning, urban sociology, urban history, engineering, economy, and architecture, though the members of the group changed slightly over time.
- 33 More information on the group is at geogameslab.net
- 34 The belief that any research should facilitate the empowerment, or the development of an informed critical perspective among participants traces back to Freire (1970), who described this with the term “conscientization”.

5. AN ITERATIVE JOURNEY – ADVANCING TRANSFORMATIVE GAME DESIGN

It is the nature of an experience to have implications which go far beyond what is at first consciously noted in it. Bringing these connections or implications to consciousness enhances the meaning of an experience. Any experience, however trivial in its first appearance, is capable of assuming an indefinite richness of significance by extending its range of perceived connections. (Dewey, 1916/1980, p. 225)

This chapter explores the evolution of knowledge in transformative game design through reflective action and multiple iterations of the game design process. The methodology employed is educational design research (McKenney & Reeves, 2012; Plomp & Nieveen, 2009), and included the development of three interdependent prototypes. The primary aim of this empirical research was to integrate and refine initial design principles, thereby offering theoretical insights and practical guidelines for creating transformative games that help learners understand and engage with their spatial environments.

The initial design principles were derived from a triadic perspective on the relationships between games, space, and learning, as developed in the theoretical part of this research. This perspective, informed by a synthesis of literature and initial explorations, emphasized the importance of continuity of experience. It grounded the game environment in children's spatial worlds, incorporated situated experiences of spatial practices, and highlighted the role of social participation in shaping the environment (see Figure 3).

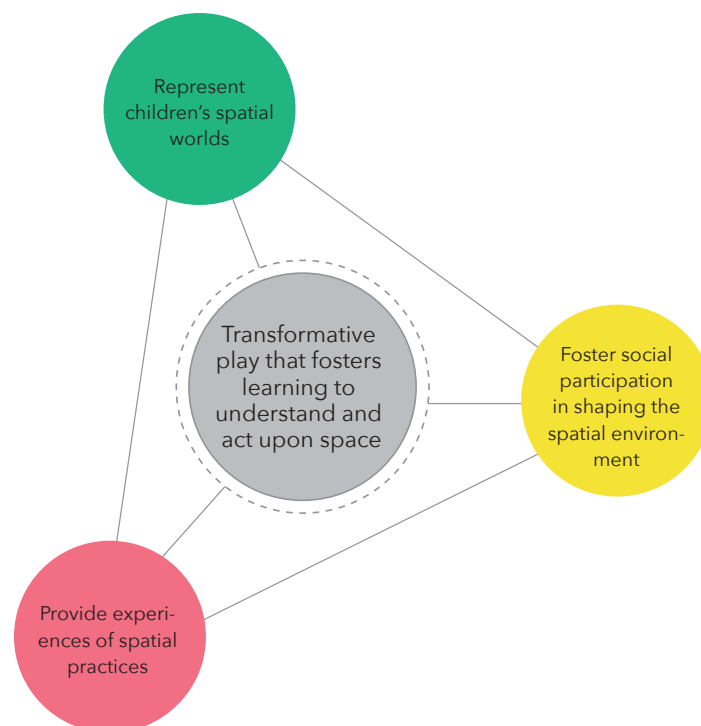


Figure 3
Initial game design principles for transformative games that support learning to understand and act upon space

Based on these initial design principles, I embarked on an extensive development process for a transformative game, which deepened my understanding and expanded my knowledge of transformative game design. This chapter expounds the evolution of these insights.

The chapter is structured as follows: it begins with an overview of the design process, outlining the context, the participants and the iterative steps and strategies employed. Following

this, the chapter delves into the emergent design principles, organized into three thematic areas: spatial representations, situated actions upon space, and social participation in shaping urban spaces. Each section provides detailed insights into how these principles evolved through reflective practice and empirical research, highlighting their significance in the context of transformative game design.

5.1.

Framing the Design Research Process

The design process of the three prototypes was inherently iterative, embodying a cycle of continuous refinement and improvement. This approach was crucial in achieving the educational aims of promoting learning to understand and actively shape the spatial environment. By systematically revisiting and revising the prototypes through continuous cycles of development, testing, and reflection in action, each iteration brought the design closer to fulfilling its intended educational objectives. This process not only led to the growth of theoretical insights, but also saw the evolution of the design research's frames and context in a reflective manner.

The spatial context played a significant role in shaping the game design. Initially set in Budapest and later in Pécs, these urban environments provided varied backdrops that influenced the game's content and structure. The choice of these locations was strategic, aimed at leveraging familiar urban settings to enhance players' engagement and learning experiences, as explained in Section 5.1.1.

The selection of target groups was driven by the educational goal of enabling young people to be active agents in their environments. Through playtests, I gained a deeper understanding of how to better target and define these groups, refining the approach to ensure the game effectively met their needs and expectations. By tailoring the game to diverse age groups and backgrounds, the design process aimed to address the varied ways in which young people perceive and interact with their spatial environments, as explained in Section 5.1.2.

The composition of the design team was a critical factor in the success of the iterative process. There was a significant evolution of the design team throughout the three design cycles based on the learnings and insights gained from each phase, which helped refine and enhance the team composition for better outcomes, as detailed in Section 5.1.3. I managed each phase of the study, guiding the project and conducting comprehensive evaluations of the processes. The teams included experts from various fields – such as education, urban planning, and graphic design – ensuring a holistic and multidisciplinary approach.

The methodology employed in the design process was multifaceted and became more enriched over time. It incorporated various design techniques, such as creative brainstorming, prototyping, storytelling, personas, playful design techniques, and creative writing. The research strategies involved designer screenings, such as walkthroughs and reflections by design team members, external feedback sessions in expert appraisals, micro-evaluations like small-scale playtests, and tryouts with mature prototypes where I conducted observations, surveys, and interviews. These methodologies evolved and developed over time, as outlined in Section 5.1.4.

The educational aim, set at the beginning and framed by the theoretical framework, became more deeply understood and nuanced throughout the process, as detailed in Section 5.1.5.

Reviewing this iterative design process is crucial for understanding how the prototypes evolved and how the design principles were established. Each cycle of development provided valuable insights that informed subsequent iterations, ultimately leading to the creation of a well-designed transformative game that promotes learning to understand and actively shape the spatial environment.

5.1.1.

The Spatial Context of the Research

The first prototype was developed and tested in downtown Budapest, a practical choice based on several considerations. My familiarity and professional connections within the city, having resided and worked there, provided a comprehensive understanding of the local context. This allowed me to tap into an established network of professionals, facilitating support for the design process. Additionally, I could readily mobilize participants to test the game and secure the necessary financial backing for the prototype's development and production. The opportunity to conduct the project within the Ernst Museum's centenary festivities provided both financial backing and playtesting participants, narrowing the local context of the research.

Situated in Budapest's 6th district, the Ernst Museum and its surrounding neighborhood seemed ideal for both development and testing phases. The area is highly heterogeneous, representing both the densest and poorest, as well as the noblest and most touristic parts of Budapest (Szabó et al., 1998). Marked by a mix of cultural, leisure, and entertainment venues, and a high density of educational institutions, these areas serve as important landmarks and contextual elements in the everyday practices of young people living in Budapest. This, coupled with the availability of resources, made it an optimal choice for the first prototype.

During the evaluation of the first prototype, however, it became clear that effective game development needed increased involvement of young people and local educational institutions, refining design principles through their ongoing engagement. Therefore, I looked for a location offering closer links with educational institutions where I could ensure intensive and ongoing collaboration through my permanent presence. An important lesson from the first cycle was that implementing a place-based game in Budapest's bustling downtown posed challenges due to the diverse mobility patterns of young people, the high attractiveness of the neighborhood attracting a transient population, and the significant number of students lacking local connections, which impeded their familiarity with the area and engagement with local communities.

For these reasons I chose Pécs as the location for developing the subsequent prototypes. Being my hometown, Pécs, situated in southwestern Hungary, offered extensive personal and professional connections with numerous teachers, schools, and educational institutions. This enabled the involvement of a broad professional network throughout various research stages.

With a population of 140 237³⁵, Pécs stands as the country's fifth-largest city, categorizing it as a medium-sized city. Its size and centralized nature foster a shared environment of everyday life for many young people. This shared environment was crucial for effectively harnessing the potential of transformative play, as gleaned from the prior prototype experience.

5.1.2.

Target Groups and Participants

The selection of the target group was based on practical considerations, emphasizing participants' familiarity with the neighborhood and urban spaces. It was crucial that the target group could form independent opinions, actively engage with their environment, and benefit maximally from participation. Consequently, children aged 12 to 18 living and studying in the 6th district were chosen as the primary target group. This age group is capable of independently exploring the urban environment and represents a significant user group of public spaces, where social interactions are prevalent. Social inclusion is particularly important for their development, as highlighted by Derr et al. (2018).


During my work with teenagers, I identified a need for educational activities targeting the built environment and participation for this age group. In 2011, while working at LudwigInzert, a temporary cultural project area in Budapest's 8th district, I conducted a survey among local teenagers to explore their knowledge of their living environment. The findings aligned with related research (Derr et al., 2018; Freeman & Tranter, 2011), showing a decrease in free outdoor movement and a preference for staying at home. This led to a lack of knowledge about their immediate environment and disinterest in participation due to feeling unheard. However, "young people themselves want to be seen as valued contributors and to be included in urban decision-making and public places within their communities" (Derr et al., 2018, p. 8).

The evaluation of the first prototype reinforced the choice of the target group. Initial playtests at festivals involved a diverse audience across all age groups. Younger children found the urban development topics too abstract and struggled with the complex game rules and spatial contents, making it difficult for them to relate to their everyday experiences and knowledge transfer. Adults found the game's purpose and theme relevant but were challenged by the game format's complexity and the embedding of contents in gameplay.

Following this, I organized three additional playtests to refine the target group: with 8th-grade primary school students,³⁶ 11th-grade secondary school students, and university students. These tests highlighted the need to focus on children aged 14 to 18 as the main target group. This age group was able to understand and engage with the game's complex themes and mechanics effectively and relate the spatial situations emerging in the game with their everyday urban experiences, making them the ideal participants for the project.

The final evaluation with the third prototype comprised nine game sessions carried out across various primary and secondary schools in Pécs, involving children aged 14 to 18. In

selecting the classes to be included in the study, particular attention was paid to ensure diversity in terms of school locations, types, and student age groups. Consequently, the final evaluation encompassed three distinct primary schools with 8th-grade classes, as well as four secondary schools, each representing different grades: one 9th, one 10th, one 11th, and two 13th-grade classes. These schools were strategically selected from five different districts spanning the city of Pécs. Table 2 provides an overview of the selected schools and their distribution across Pécs.



SCHOOL TYPE	LOCATION	GRADE
primary school	city center	8 th grade
primary school	suburbs	8 th grade
primary school	suburbs	8 th grade
secondary school (gymnasium)	suburbs	9 th grade
secondary school (art gymnasium)	city center	10 th grade
secondary school (gymnasium and vocational school)	suburbs	10 th grade gymnasium and 11 th grade vocational classes
vocational school	city center	two 13 th grade classes

Table 2
Schools selected for the final evaluation

In each game session, I conducted a pre-game and post-game interview with one participant. The triangulation of respondents was ensured by a careful selection of schools and classes, which provided diversity in age and partly in neighborhood or residential area. On the other hand, I took care to ensure a gender balance among the interviewees in order to capture different perspectives. Figure 4 provides an overview of the nine interviewees, detailing their gender, age, and the neighborhoods in which they live. This comprehensive approach allowed for a stronger and more nuanced understanding of the impact of the game on different demographics and geographies.

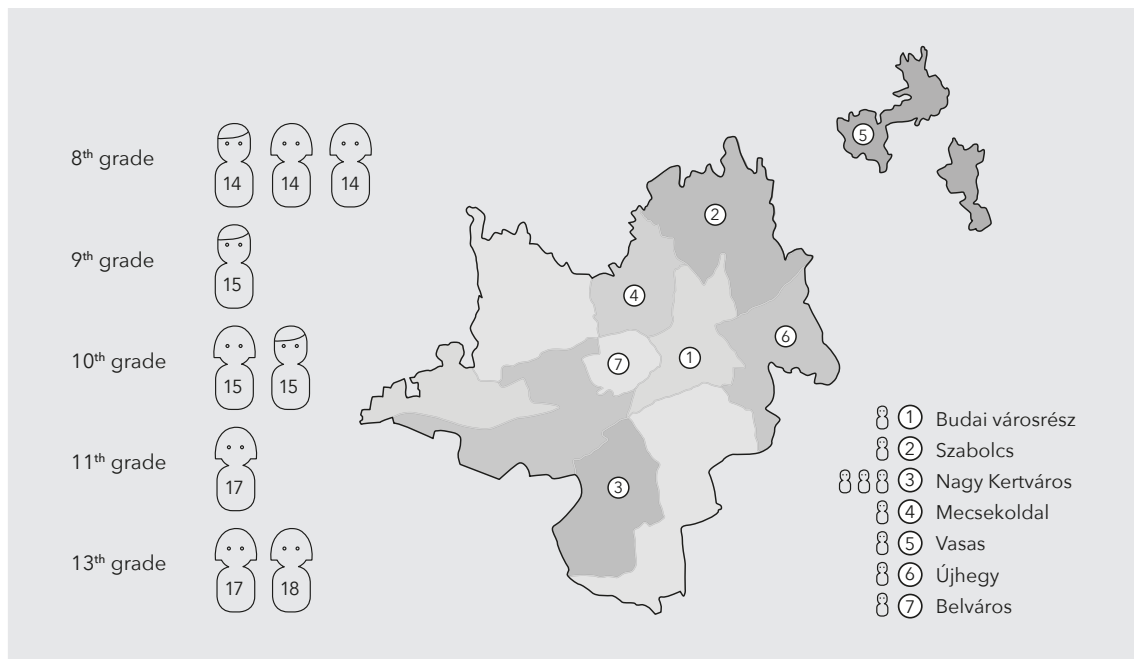


Figure 4

Interview participants of the final evaluation (indicating age, gender, and living area)

5.1.3

Composition of the Design Team

The beginning of the research process, I had to assemble a design team with different expertise to contribute to the development of the prototype. The main challenge seemed to be the creation of a game that would effectively support the learning process and that could be integrated into different educational situations. Therefore, I asked three educational experts to join the design team, all of whom had teaching experience in different educational settings: two of them were secondary school teachers and one worked as a museum educator and had experience in non-formal education. They have contributed to the development of the game, in particular by including aspects of educational design. The team was complemented by one graphic designer who brought creative and visual skills to the group. She was primarily responsible for the visual design and production of the game. Given that all team members had a thorough knowledge of the local environment and an extensive network in educational and cultural institutions in downtown Budapest, they were involved in the whole design process from content development to game testing. As the researcher, I managed the content development, project management, and scientific evaluation of the design process.

Reflecting on the first design cycle, we identified areas for improvement: incorporating target group members to better meet their needs and perspectives, and involving built environment experts to enhance spatial content development. With the decision to shift the research context from Budapest to Pécs, the new design team was formed by combining local experts and young people from Pécs with core members from the first prototype's development, ensuring continuity and effective knowledge transfer.

The design team of the second prototype thus included an architect, an urban planner, an engineer, and a youth worker, integrating diverse competencies essential for further game development. Additionally, six adolescents aged 12 to 16, representing the target group, joined the team. They were recruited from different schools and districts to ensure a diversity of geographical and socio-cultural backgrounds. Continuity in the development process was maintained by key team members from the first prototype. The chief graphic designer of *Pop-up Pest* led the visual design and prototyping in the second cycle, and a secondary school teacher from the first cycle became the learning coach. Her role was crucial in engaging young people in the design process, ensuring that their voices were heard equally alongside professionals.

During the third design cycle, the team underwent significant changes. Three students left due to final secondary school exams, and the coach and graphic designer departed as financial support expired. Additionally, an engineer and a youth worker from Pécs exited for family reasons. To address these vacancies, we recruited new members: two PhD students in architecture to assist with the third prototype and a new graphic designer for the *ParticiPécs* add-on and final exhibition materials. Figure 5 provides an overview of the design teams.

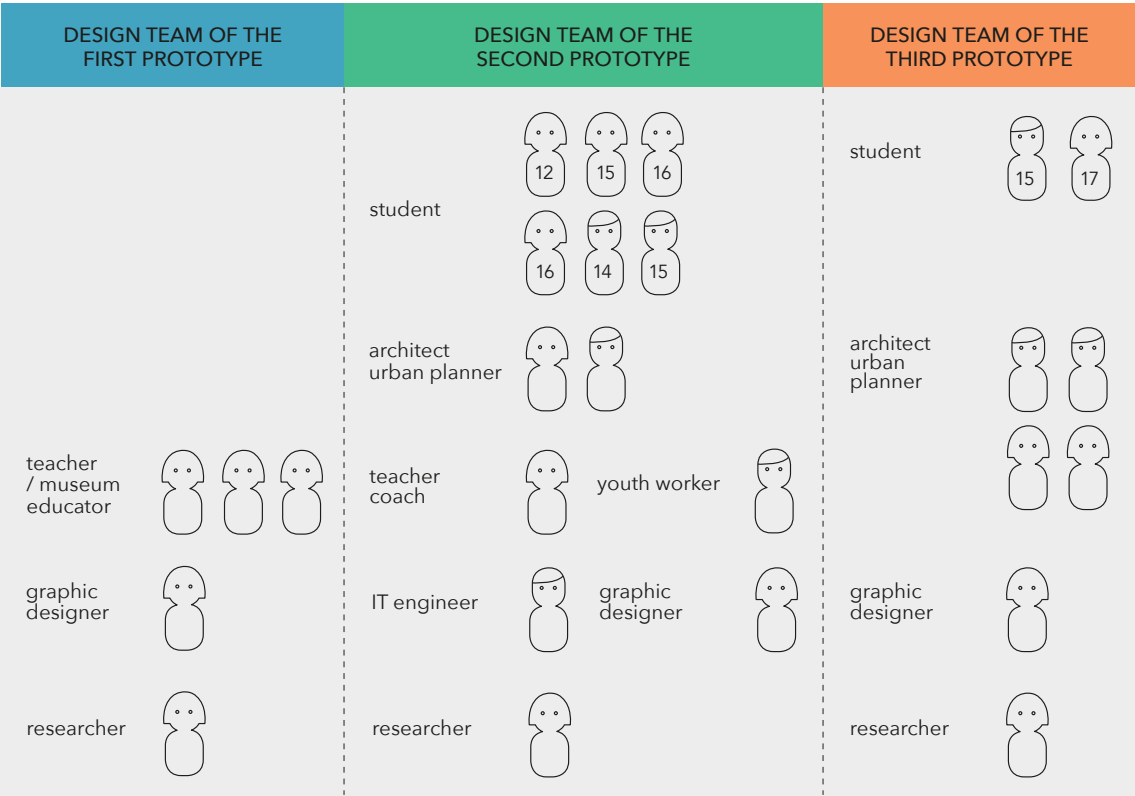


Figure 5
Participants of the design team

Note. The first column presents the design team for the first prototype, the second column for the second prototype, and the third column for the third prototype. The figures indicate the gender and professional background of the experts, as well as the age and gender of the young people participating in the design team.

5.1.4.

Iterative Design Process

Developing the initial prototype was my first attempt at designing a transformative game for built environment education. The design phase was brief yet intensive, with the main objective being to practically interweave previously elaborated design principles within the game design. The goal was to gain valuable insights on questions, issues, and challenges warranting further exploration in subsequent design cycles. Figure 6 provides a visual overview of the design process, and Appendix A offers a detailed account of each research action.

The first design cycle began with foundational concept validation sessions, gathering feedback from researchers and local experts. The initial step of the on-site game development process involved presenting the initial design principles to the design team in a one-day workshop in Budapest. This workshop aimed to ensure the concept's validity and involve participants in the overall game design process. Experts were encouraged to provide feedback on the design principles and theoretical considerations and to explore the game's implementation possibilities. An expert appraisal with a game researcher from Budapest followed, discussing the game idea and initial design principles from a game design perspective, with suggestions on organizing the game development process and improving the game experience.

Two prototyping workshops in the summer of 2012 progressively refined the game concept, integrating pedagogical aims, spatial context, and game mechanics. The result of this phase was the prototype of *Pop-up Pest* (see Figure 7, and for a more detailed description of the game see Appendix F).

Playtesting with *Pop-up Pest* started in September 2012 during the centenary celebrations of the Ernst Museum in Budapest and continued during the European Mobility Week. Both events took place in Budapest's 6th district public spaces. Additional playtests were organized for school groups and university students, alongside three expert appraisals to evaluate and reflect on the first prototype. These playtesting sessions provided real-world feedback essential for further iterations and improvements.

Following the playtests and evaluation of the game *Pop-up Pest*, the design team engaged in a thorough reflection process to identify areas for improvement and refinement. This reflective phase yielded several key suggestions aimed at enhancing both the game design and the game development process. These insights, grounded in the empirical material collected during design workshops and formative evaluations, provided a strong rationale for initiating a new design cycle.

The design process of the second prototype was deeply informed by the insights and lessons learned from the development of the first prototype. Building on the foundations laid during the initial cycle, we aimed to address the shortcomings and capitalize on the strengths identified in *Pop-up Pest*. This reflective and iterative approach was guided by the game design guidelines of Schell (2008) and Fullerton (2008), ensuring a structured yet flexible framework for the game design process.



Figure 6
Overview of the design research process

THE GAME POP-UP PEST

Pop-up Pest is an educational game where local young people can actively transform downtown Budapest through small-scale interventions. Players engage in activities like planting trees, preserving historic monuments, renting community garden plots, or organizing street festivals to make their neighborhood more attractive and livable. Through these actions, they learn about practices that change urban spaces.

Players are divided into three groups: the environment group, the transport group, and the culture group. Each group has the common goal of improving their living environment but with specific focuses. The environment group aims to create more green spaces, the transport group works on better, eco-friendly transportation, and the culture group expands cultural activities and preserves local values.

Players complete individual missions related to their group's objectives. To achieve these missions, players must collect and place building blocks on the playing field by visiting specific activity spaces like transport hubs or cultural institutions. They receive situation cards at these spaces, which determine if they gain a building block or need to try another location.

The game requires collaboration between group members, fostering teamwork and strategic planning. The groups are competing but interdependent. The first group to complete all individual missions wins the game.



Figure 7

The game Pop-up Pest

The initial workshop in September 2013 focused on team building with the new design team in Pécs and establishing a participatory design process, crucial for fostering a collaborative environment. Subsequent workshops refined the desired player experience and immersed the team in Pécs' spatial context, identifying key content elements for the game. These sessions laid the groundwork for a cohesive and engaging game experience.

Expert appraisals at the *Building Games Conference* in Budapest and the *FROG Conference* in Vienna provided valuable feedback from architects and game researchers. This input was instrumental in refining the game's educational and design approach. Further validation came from symposium presentations at the UM Doctoral Programme and the *Built Environment Education Conference* in November 2013, offering insights that refined both the approach to learning and space in our game design.

In the subsequent design workshop, the team focused on understanding the target audience by developing personas and using storytelling techniques, ensuring the game design was closely aligned with their needs and interests. Following this, design workshops concentrated on developing the narrative framework and identifying key spatial contents and practices that would form the foundation of the game. This process also included refining the core mechanics and fostering player interactions and collaboration, which continued into early 2014.

As the narrative and mechanics took shape, we began prototyping the game. Feedback from the chief architect of Pécs was instrumental during this phase, as he integrated local development visions into the game's design. Subsequently, we balanced the game through iterative playtests using the paper-based prototype. Initial playtests with confidants (Fullerton, 2008) helped identify and address any remaining issues. These tests provided critical insights into the game's functionality and engagement levels, allowing for final refinements to be made. The culmination of this development and design phase was the creation of *ParticiPécs* (see Figure 8, and for a more detailed description of the game see Appendix G).

THE GAME PARTICIPÉCS

ParticiPécs unfolds on an extraordinary Saturday where young residents enhance their city through small urban interventions. Players communicate, form temporary groups, schedule appointments, and collaborate to initiate changes in the urban space. They navigate through town, experiencing and driving transformations, encountering both familiar and unexpected events.



The collective goal is to accrue as many points as possible by executing urban interventions within 12 rounds.

As players have only a limited number of building blocks and limited time to implement actions, they have to develop collaboratively a strategy and effectively find common goals. In each round, a player rolls the dice, and all players move the corresponding number of squares on the playing field.

ACTIONS

Take a situation card: Drawing cards which influence the game with positive or negative consequences.

Go home: Returning to the starting point to receive a building block.

Go to Town Hall: Lobby decision-makers by rolling the town hall dice, earning building blocks or situation cards.

Implement an intervention: Placing building blocks on development sites to fulfill urban interventions. Collaborating to earn more points for joint efforts. Completed interventions are displayed on the playing field with descriptions.

At the end of the 12th round, the game is over and all points achieved by the players are counted. A scoreboard shows how successful players have been in improving urban spaces.

Figure 8

The game *ParticiPécs*

The evaluation of *ParticiPécs* was conducted through playtests at the Festival in Pécs Cultural Center and additional sessions with educators at a symposium on built environment education. Despite receiving many positive affirmations during the testing phase of the second prototype, the evaluation phase yielded profound insights that highlighted weaknesses in the game. These findings underscored the need for a third design iteration.

Rather than starting from scratch, the third iteration focused on creating a creative add-on to enhance the existing framework of *ParticiPécs*. This design phase was not merely an extension but a critical turning point in refining the prototype. The primary goal was to develop a framework that would enable players to formulate and implement their individual ideas for transforming urban spaces.

The development of the third prototype was embedded in an intensive reflection-in-action process, alternating between design workshops and playtests. Implemented between September 2014 and May 2015 in Pécs, this research cycle included three design workshops, an expert appraisal, a playtest with students, a series of playtests with teachers, and a pilot study for the final evaluation. The outcome of this phase was the *ParticiPécs* add-on (see Figure 9).

THE PARTICIPÉCS ADD-ON

In the *ParticiPécs* add-on round players have the chance to plan a small-scale urban intervention in small groups. Over four rounds, participants must select a location, identify the issues affecting that particular site, establish objectives and strategies for enhancement, decide on the type of action they wish to pursue, and outline a brief action plan. To aid them in this process, players are provided with a set of cards for each of these steps, each containing various aspects to facilitate their planning endeavors.

1st round: Defining the place and the problem

Players have to choose a specific site for improvement and define the problem they want to work on. As a support, each group receives a deck of card with possible aspects to work on.

2nd round: Defining the goal and developing a strategy

Players have to define the goal of their intervention. As a support, each group receives a deck of card with possible objectives, such as repair, create, embellish, raise awareness, etc.

3rd round: Action

Players must agree on the type of action they want to undertake. To support this, each group receives a deck of cards outlining possible actions, such as creating a community garden, doing guerilla knitting, organizing a flash-mob, repairing a bench, etc. Additionally, players are encouraged to invent and propose their own unique actions.



Figure 9

The ParticiPécs add-on

The final evaluation aimed to explore the transformative potential of the developed game. This phase was crucial for testing the functionality and effectiveness of the design principles, as well as validating the insights gained through the reflective practice of the collaborative and iterative design process. The primary focus, however, was on understanding how the game facilitates participants' learning to understand and actively shape their spatial environment. We conducted nine game sessions in schools, observing the game sessions and conducting interviews with participants (see Section 5.1.2 for a detailed explanation of participants and Appendix I for a sample game session).

Following the conclusion of the school game sessions, we organized an exhibition to showcase a selection of young people's ideas developed during these sessions. The exhibition aimed to engage the broader community by inviting not only the participants and representatives of their schools but also residents and decision-makers (see Figure 10). The opening ceremony attracted representatives from the participating schools and classes, as well as an interested and professional jury and audience.

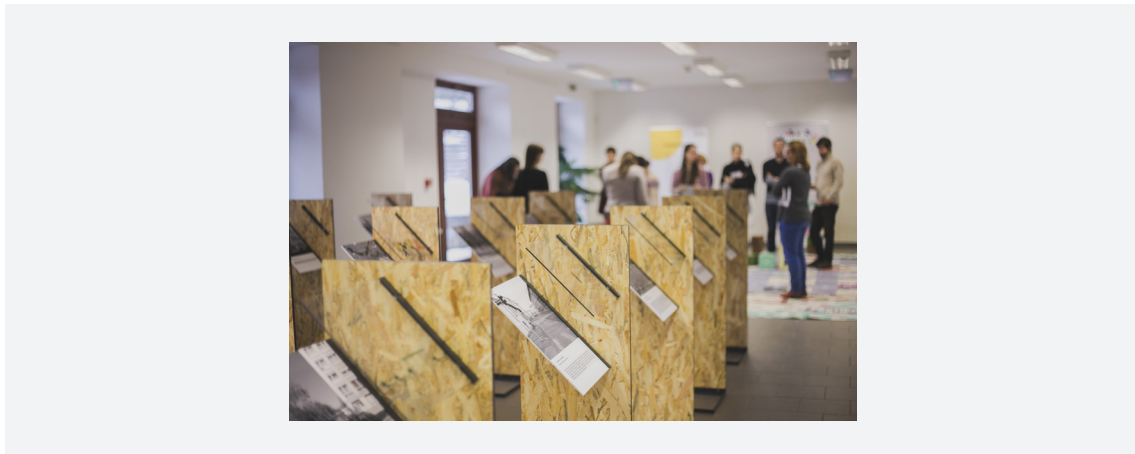


Figure 10
The exhibition of students' intervention ideas

Note. The interventions planned by the students were displayed on a plexiglass sheet in front of black and white photos of the existing condition, with the photo in the background and the transparent cover sheet containing the design showing the ideal condition.

5.1.5.

Educational Aims and Objectives

The primary educational aim of this research was to create a game that promotes learning to understand and act upon space, encouraging children to actively participate in transforming their spatial environment. Drawing from Dewey's theoretical framework (Dewey, 1916/1980;

Dewey & Bentley, 1949/1989), this research posits that learning is fundamentally rooted in the ongoing transaction between individuals and their environment. Dewey asserts that both the human and the environment are constantly evolving through this transaction, suggesting that genuine learning arises from engaging with and influencing one's environments.

In this context, our educational approach emphasized a holistic understanding of space. We recognized space as an intricate web of physical, social, cultural, and normative dimensions, all of which are interdependent and constantly evolving (Läpple, 1992). This perspective highlights that space is not a static backdrop but a dynamic, socially constituted phenomenon shaped by interwoven processes of spacing and mental synthesis (Löw, 2016).

Building on this theoretical foundation, the design goal of our game was to create situations where players can experience and actively participate in this transformative process. We aimed to develop a game environment that allows children to see themselves as active agents capable of shaping their spatial surroundings. To learn how to take action, more specifically to learn how to work with others, in a community, to develop a shared vision of our spatial world, and to bring it into reality (Chawla, 2008).

The theoretical foundation, especially the commitment experience-based learning, determined our decision to develop an analogue game. Dewey emphasizes that genuine learning arises from direct engagement with the world – experiences that are sensory, interactive, and situated in the continuity of action and consequence. In contrast to mediated, screen-based environments, analogue games provide opportunities for embodied, tactile interaction that supports this kind of experiential continuity.

This experiential grounding is particularly significant in participatory processes, where learning is not merely the acquisition of abstract knowledge but a transformation of perception and understanding through doing. As Reed (1996) argues in *The Necessity of Experience*, primary experience is not only a condition of learning, but a means of grasping complexity and forming situated judgments. In this context, analogue games act as concrete situations where players experiment, negotiate, and co-construct meaning in a shared physical space. Choosing an analogue format thus strengthens the game's potential to support embodied, situated, and socially meaningful learning.

Throughout the iterative design process, the educational objectives were continuously refined to support the aim of creating a game that helps children learn how to understand and actively shape urban space.

In the first prototype, our focus was on identifying thematic areas where children could potentially intervene and influence their everyday environments. We defined three key fields of activity: mobility, urban green spaces, and culture (see Section 5.2.1). These themes provided a structured framework to help players explore relevant aspects of urban development in a way that connected to their daily lives.

For the second prototype, we revised the overly rigid structure of the first version. Instead of predefined thematic tracks, we introduced small-scale urban tactics—actionable ideas that could be flexibly combined with different urban spaces. This change allowed for more creativity and adaptability during gameplay. Examples included activities like greening a train station or organizing a parkour event. By encouraging this kind of imaginative engagement, the game began to support a more nuanced understanding of how urban space can be used, appropriated, or transformed.

In the third prototype, we shifted toward a more player-driven approach. Players were now invited to use, adapt, and invent spatial practices based on their own experiences and interests. They could creatively connect actions with places that mattered to them. This freedom deepened their personal connection to the spatial practices they enacted in the game and helped them see how they might actively contribute to improving their real-life environments.

The next section offers a closer look at how the design principles of the game emerged and evolved throughout this iterative process. It traces the key turning points and learning moments that shaped the final design and demonstrates how the game ultimately became an educational tool for empowering children to engage with and transform the spaces around them. These design principles are not only central to the gameplay mechanics but also stand as theoretical contributions of this research.

5.2.

Advancing Design Principles on Spatial Representation in Transformative Games

One of the design principles developed during the phase of exploration and analysis was that transformative games represent dynamic spatial situations that are connected to players' spatial worlds. This principle was based on the premise that games can integrate and represent dynamic spatial situations, as they themselves have an internal spatial logic and representational elements. On the other hand, it was based on the recognition that in order for players to successfully translate what they learn from the game into their real-world experiences, it is essential that the spatial world of the game is connected to the learners' everyday environment. Therefore, one of the key questions I sought to answer during the development of the first prototype was how to represent and integrate children's spatial world into the game in a way that supports their learning to understand and act upon space.

This chapter delves into the iterative design cycles, illustrating how the understanding of this principle deepened through successive phases of development and testing. As we progressed, the design principle evolved, becoming more refined and enriched with additional insights. Each iteration not only enhanced the comprehension of representing children's spatial worlds in the game but also led to the emergence of new design principles.

5.2.1.

Understanding Children's Spatial Worlds

Understanding children's spatial worlds is essential for bridging the gap between the game environment and the real world. By situating educational content within familiar settings, the game becomes relatable and impactful. The spatial worlds of children form the foundational context for transformative games, ensuring in-game experiences resonate with their daily lives. This theoretical perspective guided the game design and research, emphasizing the importance of accurately representing and integrating children's spatial worlds to enhance learning.

The initial step in developing the game prototype was to understand and define this spatial context. Given the game's showcase at the Ernst Museum centenary celebrations, held in the surrounding public spaces, the target group consisted of children residing or studying in the area. It was crucial to accurately define their spatial world to create a game environment that genuinely reflects and engages with their daily experiences, thereby enhancing the game's educational value and relevance.

The first step was to define the physical context of children's spatial worlds. We began by conducting field visits to observe the environments where children live, learn, and play. Collaborating with

local educators provided deeper insights and helped validate our understanding of the spatial environment. For the initial design workshop, the team convened at the Bálint House Jewish Cultural Center in Budapest, where we enlisted the expertise of a museum educator and an experienced downtown guide, who later joined our team. This session focused on understanding the neighborhood surrounding the Ernst Museum, delving into its history, urban fabric, and cultural and social characteristics. To determine the spatial boundaries for the game, we projected a map of downtown Budapest onto a white wall and engaged in a collaborative exercise, identifying key locations frequented by young people and integrating historical urban structures into our discussion.

The neighborhood of the Ernst Museum is situated in the bustling 6th district of downtown Budapest, known for its cultural institutions, theatres, and nightclubs, earning it the informal designation “Broadway in Pest” (Surányi J., 2009). Key landmarks such as the Grand Boulevard to the east, Andrásy Avenue to the south, and the City Park, a significant leisure area for young people, define this vibrant area. To the north, the Broadway neighborhood converges at Nyugati Square, a major transport hub and meeting point, while the west is bordered by Deák Ferenc Square, another crucial transport hub. These landmarks were chosen for their importance to mobility and leisure activities for young people, forming the game’s spatial boundaries.

Additionally, the 6th district’s connection with the 7th district, which together form the city center, was considered. The 7th district, known for its high density and popularity among young people, hosts the Jewish quarter, historical and culturally significant, also known as the “Party district”, famous for its nightlife and ruin bars. The southern boundary was set at Rákóczi Road, a vital orientation point linking Astoria junction and Keleti Railway Station. The design team integrated these areas to create a relatable and engaging game environment for young participants. Figure 11 outlines the selected spatial context for the game.

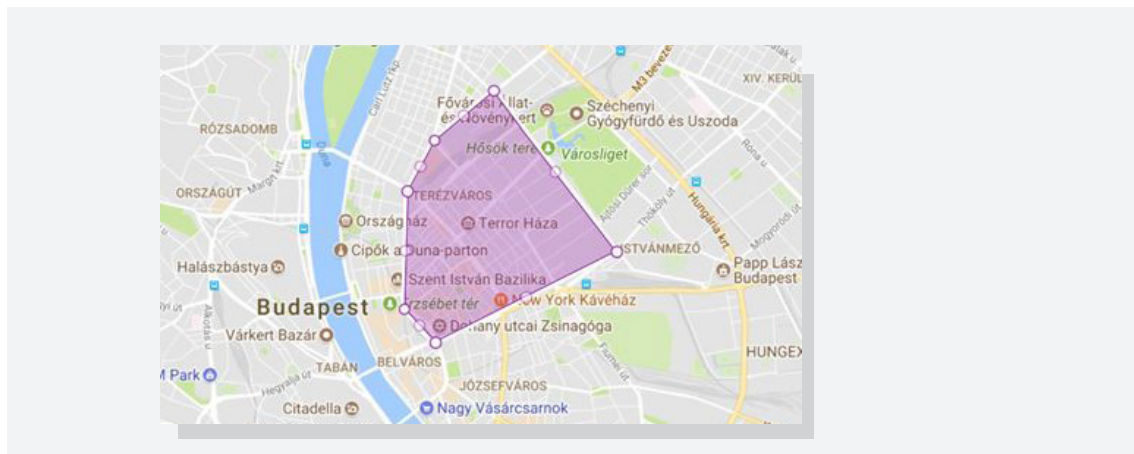


Figure 11
The chosen spatial context for the first prototype (Pop-up Pest)

Note. The purple spot marks the area selected for the spatial context of the game, a part of the downtown area of Budapest, which is bounded by the Nyugati Railway Station and its surroundings to the north, Deák Ferenc Square to the west, the City Park to the east and Rákóczi Ferenc Road to the south.

After defining the extent of the spatial context, the next step was to define children's experiential spaces within this area. Here we focused on children's activity spaces, around which their everyday experiences are organized. Dewey (1916/1980) suggests that children's experiences are organized around practical centers of interest. The home is, for example, the organizing center of a child's geographical knowledge, which expands and gains further connections through movements about the locality, journeys, or friend's tales. In line with this, we wanted to highlight practical centers of interest, or activity spaces, where children living in the area can perform their everyday practices, and where they can be active agents in shaping urban spaces and the community. We initiated the process by identifying and defining key categories of practices. This step was essential for collecting and organizing the various spaces where children engage in activities.

The initial category we identified was leisure and recreational activities. Our emphasis was on capturing young people's leisure activities, particularly those occurring outside institutional settings, as these play an important role in their socialization processes and self-organized pursuits. In the densely urbanized downtown of Budapest, urban green spaces serve as arenas for young people to freely explore, engage in self-organized activities, observe the world, become active members of the community, and connect with the natural environment. However, these urban green spaces are not only sources of potential for young people; their loss or absence can also symbolize the deprivation of free spaces used by young people, with dramatic consequences for their lives. Freeman and Tranter (2011), in their analysis of changes in children's urban environments, highlight the disconnection from nature, the marginalization of free play and leisure activities, and the displacement of children from public spaces as the most significant changes in children's use of urban space and their urban relationships in recent decades. These considerations led us to concentrate on children's practices and activities in urban green spaces. Consequently, we conducted a mapping exercise to identify and incorporate these green spaces within the spatial representation of the game.

The second category we identified was mobility and transport. This category addresses the significant issue of mobility for children aged 12 to 18, who are independent users of urban spaces. In this age range, they navigate diverse and flexible pathways between their homes, schools, and leisure spots, utilizing various modes of transportation (Wüstenrot Stiftung, 2009). Children actively contribute to the production of spaces through their mobility. However, Freeman and Tanter (2011) highlight a concerning trend in young people's mobility that significantly impacts their lives. They observe a substantial shift where children's independent mobility has been supplanted by adult-dependent mobility, leading to increased isolation and disconnection from place. Given these potentials and challenges, we prioritized mobility as a key focus within the game. Subsequently, we mapped key transportation hubs to integrate them into the spatial representation of the game.

The third category we focused on was cultural practices. Children often follow routines and practices from previous generations, engaging in cultural traditions and institutions. These "culturally rooted routines and practices are crucial contributions to human development that are often overlooked" (Rogoff et al., 2016, p. 472). In the game, thus, we chose to emphasize

cultural practices and included cultural institutions where young people can experience and participate in culture. Here we focused on museums, art galleries, and libraries, which provide important service spaces for children in terms of cultural education and playful experiences (Freeman & Tranter, 2011, p. 128). Figure 12 presents the final list of selected activity spaces for the game environment.³⁷

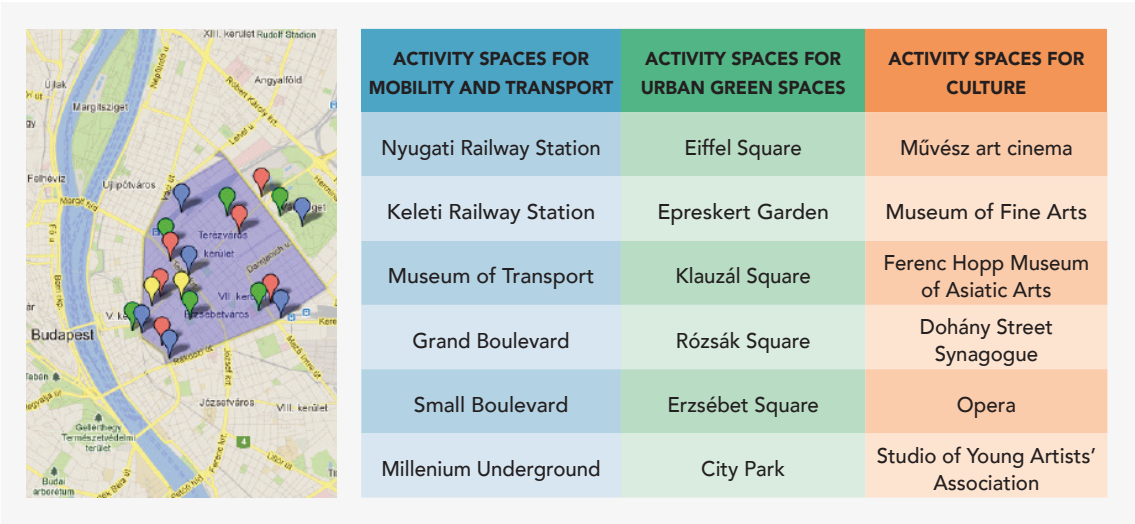


Figure 12
Selected activity spaces for the game board of Pop-up Pest

Note. The selected activity spaces are marked with the colors corresponding to the categories (blue for mobility, green for urban green spaces, red for cultural institutions). The yellow markings indicate the locations of the playtests, the Ernst Museum Budapest and the Bálint House Jewish Cultural Center.

In sum, to create the game world, we first needed to understand and define the physical and experiential context of children’s spatial worlds. This involved identifying and mapping the various environments that children interact with daily. This process allowed us to gain a comprehensive understanding of the significant places in their lives and how they navigate and use these spaces. By grounding the game in these familiar settings, we aimed to bridge the gap between the game environment and the real world, making the educational content more relatable and impactful.

5.2.2. Integrating the Spatial Context into the Game Design

Our next task was to integrate this spatial context into the game design, specifically into the game mechanics and the spatial logic of the game, through an iterative development process. This involved translating the physical characteristics and spatial relationships of real-world environments into the game world, with a strong focus on playability and play experience. By using these real-life spaces as a foundation, we aimed to create mechanics and a spatial logic for the game

that mirrors the children's everyday experiences, ensuring that the game environment feels familiar and intuitive to the players, in order to facilitate their engagement with the game and enhancing their ability to apply learned concepts to real-world contexts. But while it was important to create a realistic representation of the children's spatial worlds, we also needed to ensure that the game remained engaging and fun to play. This required a balance between reproducing real-world elements and simplifying or abstracting certain aspects to enhance playability.

The first step in integrating the spatial content into the game design was to establish the core mechanics. Our goal was to provide children with a playful experience of actively shaping their environment, which involves taking action, collaborating within a community, and bringing shared visions to reality (Chawla, 2008). Accordingly, we determined that the central challenge of the game would be coordinating players' movements around the board, which required visiting specific sites, collaborating with peers, and implementing interventions in the area. This concept served as a guiding principle for the subsequent design phase, shaping our conceptualization of the spatial logic of the game.

The spatial logic of the game refers to the spatial features of the game mechanics, such as movement pathways, access methods, and spatial conquest (Randl & Lasansky, 2023, p. 18). According to the core mechanics, the game required distinct areas: homes for players to start from, pathways for movement, activity spaces to visit, and development sites for implementing interventions. Thus, we defined four types of spaces on the game board, each serving a specific function within the game:

Starting Points: Each player had a unique starting point, marking the beginning of their journey on the game board.

Routes: These pathways allowed players to move around the game board, reflecting the road network of the area. Movement was crucial for gameplay, with routes open to all players, providing freedom of movement in any direction.

Activity Spaces: Representing green spaces, transport areas, and cultural institutions, these were key locations players needed to visit. Each activity space was significant for the game's objectives and narrative.

Development Sites: These were places where players could implement interventions. Both activity spaces and development sites were semi-open, designated for specific player groups, adding strategic depth and competition.

In the next step, we integrated these elements into the game design, starting with the creation of the game board. To achieve this, we used a grid structure for its ease of implementation, familiarity, and playability. The grid's familiarity, seen in popular games like chess, checkers, and battleships, aimed to provide young people with a comfortable gaming environment (Salomon, 2023). Using a square grid also simplified the design of the playing field by clarifying paths and functional spaces, easing to create balanced distances and equal chances for all players.

We implemented this by overlaying the grid structure on the map of the selected area, defining the squares and their functions. Each square served a distinct function – route, activity space, development site, or starting point. This approach clarified both the representation of the area and player navigation within the game.

The gridded layout streamlined the game board design, facilitating a systematic arrangement of content elements and easing gameplay. However, the grid also imposed limitations. Ensuring equal chances and distances between starting points, activity spaces, and development sites influenced location selection, merging conceptual and practical considerations. We adapted the initially brainstormed activity spaces to balance the game board, dropping some locations and adding new ones for even distribution. The selection criteria included: 1) relevance to categories (urban green spaces, mobility, culture), 2) equal number of sites per category (six each), 3) equidistant placement from each other, start spaces, and development sites, and 4) diversity of children’s activity spaces. Figure 13 illustrates the arrangement of content elements on a grid, which served as the basis for the *Pop-up Pest* game board.

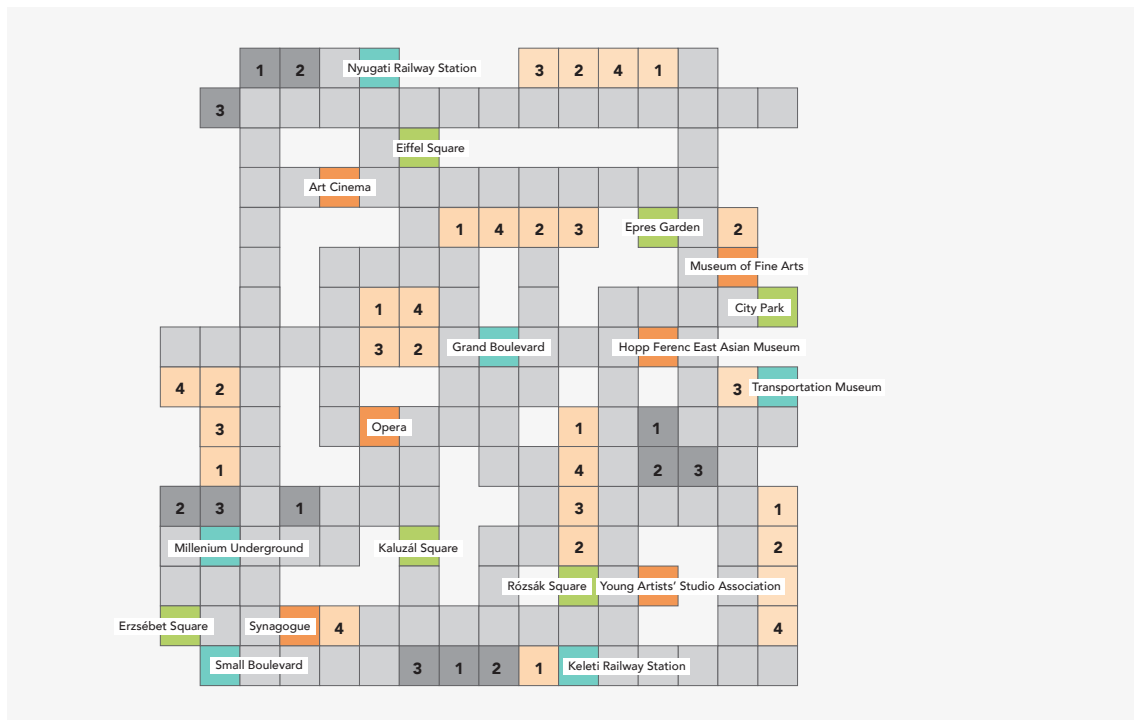


Figure 13

Draft of the Pop-up Pest game board showing how the routes, activity spaces, development sites, and start spaces are arranged on the map abstracted onto the grid

Note. The selected activity spaces are indicated by color-coded squares corresponding to the categories (blue for mobility, green for urban green spaces, red for cultural institutions). The twelve start spaces are indicated by dark grey squares and the development sites by beige squares. These functional spaces are connected by light grey squares, which mark routes along which players can move. The areas left white have no function in the game.

5.2.3.

Crafting the Visual Representation of the Game World

By integrating spatial content into both the core mechanics and spatial logic of the game, we crafted an environment that closely mirrors children's real-world experiences. Now we necessitated a thoughtful visual design. Our objective was to develop a visual representation that would enhance playability, enrich the play experience, engage the target group, and effectively deliver spatial content in an accessible and relatable manner for young people. This process involved critical decisions regarding format and visual language to represent spatial content elements.

We opted for a format consistent with traditional board games, utilizing a physical board as the primary medium on which players could perform their activities. This decision was guided by practical considerations, ensuring the game's accessibility and familiarity to the target audience. Another important aspect was that board games are easy to produce and implement, allowing us to closely and easily observe the evolution of design principles throughout the development process and assess their effectiveness during implementation. A distinctive aspect of our design concept was the intention to create a life-size board game. This approach aimed to transform the traditional board game experience by immersing players in a physical environment where they could engage with the game elements at a full scale. This life-size format – played on a 5 m x 5 m board – was designed to enhance player interaction, physical activity, and spatial awareness, providing a more immersive and engaging experience compared to conventional tabletop board games (Randl, 2023).



Figure 14

The final design of the gameboard of Pop-up Pest designed by Dóri Sirály

The game board served as the central visual element of the game, providing a visual representation of the selected area of downtown Budapest, as shown in Figure 14. The concept of this visualization balanced thematic and abstracted spaces to effectively engage players.

Thematic space in the visualization aimed to mirror children's perspectives on the area, aligning with the urban structure while emphasizing places linked to their urban experiences and functionality within the game. This approach highlighted children's activity spaces and main orientation points, which were visually accentuated. For instance, activity spaces were represented with icon-like symbols, as illustrated in Figure 15. Prominent landmarks such as the Basilica, Szimpla Bar, and the tram line No 4 and 6 were depicted in a neutral grey shade, indicating their lack of specific function within the game. This thematic representation aimed to reinforce children's perspectives within the spatial depiction of the city, helping players recall their surroundings and navigate the game smoothly. These visual cues aimed to strengthen the connection between the game board and the actual urban space, enhancing the immersive game experience and deepening the learning process.

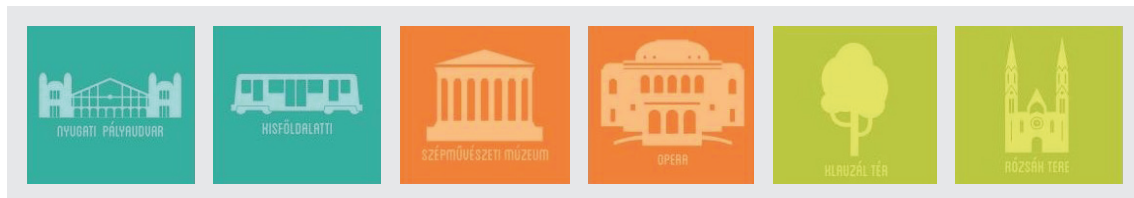


Figure 15

Visual signs for the activity spaces in Pop-up Pest

Note. The examples show the following sites from left to right: Nyugati Railway Station; Millenium Underground; Museum of Fine Arts, Opera, Klauzál Square, and Rózsák Square. The colors follow a color code: blue is for transport-related sites, green marks green spaces, and red is for cultural sites.

The concept of abstracted space meant that areas not highlighted for gameplay purposes were intentionally left blank, and location-free development sites were marked in an abstract manner. The level of abstraction served two key purposes. First, it directed players' attention to relevant elements essential for their in-game activities while maintaining a clear separation from non-functional urban features. Second, it enabled the projection of individually perceived spaces onto the game board, making the game more adaptable and inclusive of players' personal experiences and interactions with their urban environment.

5.2.4.

Key Insights from Evaluating the First Prototype

The development and testing of the first prototype yielded crucial insights that advanced our understanding of the design principles necessary for effectively representing children's spatial

worlds in game design. By closely examining how these principles played out in practice, we were able to identify both strengths and shortcomings in our approach.

The primary observation from the evaluation of the game *Pop-up Pest* is the misalignment between the game's representation of the spatial environment and the actual spatial experiences of children. A key moment of recognition was a secondary school student's astonishment at seeing Klauzál Square designated as an urban green space in the game. Klauzál Square, located in Budapest's bustling 7th district, is the largest square in the former Jewish quarter, featuring a fenced park with a playground, flower beds, public artworks, and benches. However, it is predominantly known for its surrounding tenement buildings, alternative shops, and popular bars, making it a social and entertainment hub in the mental maps of young people rather than an open green space. This discrepancy highlights a broader issue with the game's activity spaces, which often did not align with children's perceptions or not even with their actual centers of interest. Cultural institutions of high art or alternative cultural venues represented on the game, such as the Opera or the Hopp Ferenc East Asian Museum, were culturally significant but largely irrelevant or unknown to the participants.

These observations led to the realization that the game failed to accurately understand and represent children's spatial worlds. As a consequence, these misrepresentations caused irritation and distractions, preventing the core message of children's active contribution to improve urban spaces from resonating. This disconnect obstructed the establishment of a meaningful connection between the game world and children's real-life environments, disrupting the continuity of their learning experiences and impeding knowledge transfer to everyday contexts.

Another key insight was the difficulty in integrating the spatial context into the game design, particularly evident in the misalignment between the game's spatial logic and actual urban spaces. The game's spatial logic, designed to coordinate player movements and urban interventions, included starting points, routes, activity spaces, and development sites, each serving distinct functions.

During playtesting, players found starting points and routes intuitive. Each player had an individually assigned starting point, and the routes allowed unrestricted movement, which was easily understood. However, significant challenges arose with activity spaces and development sites.

Activity spaces, intended to represent real-world locations like cultural or green areas, facilitated navigation and resource access. Despite being visually marked with team-specific color-coded indicators, players struggled to distinguish and effectively use these spaces. The restriction to team members only caused confusion, distracting from the game's message and content.

Development sites added further complexity. Unlike real urban sites, these were randomly placed on the game board and assigned to individual players rather than teams, disrupting the coherence of the game's spatial logic. This random placement made it challenging for players to coordinate and collaborate effectively, as the arbitrary positions and restricted access did

not align with the logical flow of an urban environment. Additionally, the regulated progression of the game and predetermined interventions prevented players from associating these locations with their personal spaces, leaving them abstract and disconnected from their actual urban experiences.

Additionally, an important lesson from the first design cycle was the complexity of implementing a place-based game in Budapest's bustling downtown. This area, characterized by diverse mobility patterns of young people, posed unique challenges. The neighborhood's high attractiveness and the large supracity attraction of its educational institution network resulted in a transient young population, making it difficult for players to establish a sense of place and continuity. Additionally, a significant number of students in the area lacked local connections, which impeded their familiarity with the area and their engagement with local communities.

These insights highlighted significant gaps in the initial design, underscoring the necessity for a second design cycle to improve the prototype and refine the design principles. The misalignment between the game world and children's actual spatial experiences revealed the need for a more accurate and meaningful integration of children's spatial worlds. Additionally, the observed divergence between the game's spatial logic and the real-world urban environment demonstrated the importance of creating a coherent and intuitive game structure that resonates with players' everyday urban experiences. These findings informed the subsequent design phase.

5.2.5.

Co-Designing the Game World

Building on the lessons learned from *Pop-up Pest*, the development of the second prototype employed new strategies to better align the game world with children's spatial environments. Pécs, a medium-sized city with a centralized nature fostering a shared environment for young people, was chosen as the new location for the second prototype. This context provided a more coherent setting for exploring transformative play. We enhanced the co-design process by involving target group members to ensure the game design addressed their specific perspectives and interests. In addition, local built environment professionals contributed to refining content development. This collaborative approach was crucial for creating a game design that accurately reflected the local context and resonated with the target audience.

The initial step, similar to the first prototype, was to define the physical context of children's spatial worlds. A central approach involved creating mental maps of the city with the children and young experts of the design team. We employed Kevin Lynch's (1960) method to visualize and understand children's perspectives on the city. This method enabled us to explore the young people's spatial knowledge, perceptions, and preferences. The exercise resulted in imagined maps, uncovering young people's unique interpretations of Pécs (see Figure 16). The collective analysis and evaluation of these maps formed the basis for defining the spatial environment represented in the game. This approach aimed to ensure that the game environment was rooted in the actual spatial experiences and perspectives of the target group.

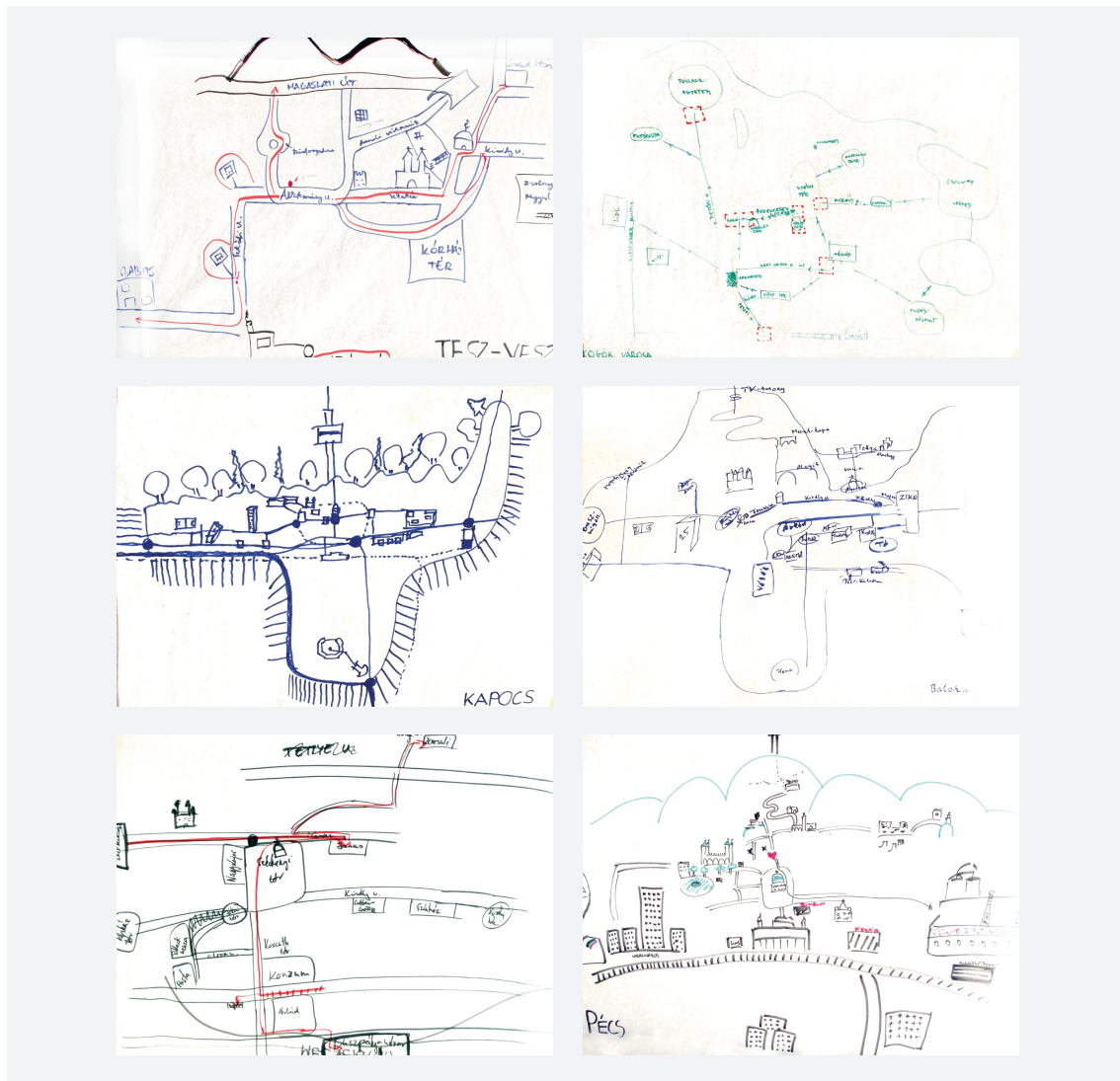


Figure 16
Mental maps of the design team members

The mental maps revealed the dominance of the historic city center, with Széchenyi Square at the geometric center of almost all drawings. This area around the main square was depicted in rich detail, featuring named streets, squares, and significant buildings such as the mosque and the cathedral. Children's drawings focused primarily on this central area, rarely including neighborhoods outside it. In contrast, adult maps showed a larger section of the city, but the city center still received the most detailed attention. Landmarks like the Barbican and Kórház Square marked the boundaries of the historic city center and featured prominently in most drawings. The areas west of the city center, including the Szigeti district and Uranium City, were the only outer parts regularly appearing on the maps, likely due to the proximity of the university and cultural attractions in Uranium City, popular with young people (Trócsányi & Orbán, 2012).

In contrast, the eastern parts of the city did not appear on the maps at all. This area, developed around – actually defunct – coal mines, became spatially and socially disadvantaged after the 1989 regime change (Faragó, 2013). To compensate for this, the city sought to transform the

imposing Zsolnay Porcelain Factory complex, located between the eastern mining district and the city center, into a cultural quarter.³⁸ This transformation made the area a popular destination for young people, frequently appearing on their maps. But despite this cultural quarter, the eastern outskirts remained blank.

The north-south extension of the city is constrained by the Mecsek Mountains to the north, prominently shaping the town's visual landscape and frequently featured on mental maps. The TV tower atop Misina Hill, visible from all parts of the town, was a recurring graphic element. Except of some popular recreational sites in the Mecsek Mountains, the extensive residential areas along the mountainside were often left blank. To the south, the railway line forms a sharp dividing line in the urban fabric, highlighted on the maps. Only the Árkád shopping center appeared between the city center and the railway line, serving as an important meeting and orientation point for young people due to its proximity to the Long-distance Bus Terminal. The southern neighborhoods, such as Garden City (despite its name, it is a prefabricated housing estate), were notably absent from the maps, despite almost a third of the city's population residing there.

Figure 17 shows an aggregated map of the mental maps, as well as the area defined as the spatial context of the game.



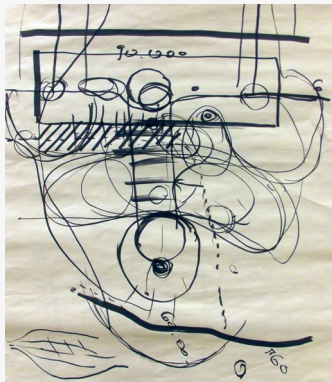
Figures 17

Aggregated map of the mental maps drawn by the members of the design team and the selected spatial context for the second prototype (ParticiPécs)

Note. The left side of the figure shows an aggregated map of the mental maps drawn by the design team members, and the right side shows the area defined as the spatial context of the game. The representation of the city is centered around

the historic city center. It extends to the Zsolnay Quarter in the east, covering the entire Sziget district and Uranium City in the west. The Mecsek mountain range is depicted to the north, and the southern boundary is drawn at the railway. However, symbolically, the southern part of the city is also included in the space where the game is set. The circle in the top right corner shows the area projected onto a map of the city of Pécs.

Subsequently, we sought feedback from the chief architect of Pécs on the prototype's concept, specifically on how the city should be represented within the game. He provided a walk-through and an impromptu presentation on the city's long-term urban development plans. His input reinforced and provided context to the mental maps, highlighting the west-east orientation of the city and the satellite-like expansion. He emphasized the importance of the city center and surrounding inner districts in the game (see Figure 18). Based on the analysis of the mental maps and feedback from the chief architect, we finalized the extension of the spatial context of the game.



"What you can see is that certain features are starting to move out of the downtown, and a ring around the downtown is starting to form, and it's going a little bit toward the city. To show the tension in the city, you have to do a cut-out that shows the trends that are now the tension in the downtown".³⁹

Figure 18

The chief architect's sketch of the city of Pécs

Once we defined the physical context for the game, our next task was to develop the spatial contents that would authentically reflect children's spatial worlds. Drawing from the lessons learned in the first prototype, we recognized the importance of accurately identifying and representing children's activity spaces to ensure the game's relevance and impact. Therefore, we placed a strong emphasis on co-designing these spatial elements with the children themselves.

As a first step, we identified key categories and fields of activity that helped us to identify children's activity spaces. These categories corresponded to those of the first cycle: mobility, open green spaces, and culture were again prioritized. Additionally, the categories of sport and entertainment were considered to be particularly relevant for young people. The next step was dedicated to the activity spaces associated with these categories using various brainstorming techniques.

Children's involvement in these collective discussions showcased its added value, as they consistently presented their perspectives, made distinctive and valuable contributions, and either affirmed, rejected, or supplemented the suggestions put forth by the experts. In other words, they ensured that we kept discussing the city from the children's perspective. This was very obvious when we discussed cultural venues. As the city has a wide cultural offer⁴⁰ and the members of the design team had a strong interest in culture, there was a risk that, as with the first prototype, we would make the mistake of highlighting cultural sites that were culturally prominent but irrelevant to the target group. During the brainstorming process, we began by listing museums, initially focusing only on those with exceptional programs for young people. As enthusiasm grew, team members increasingly added their personal favorites, causing the list to expand rapidly. At this point, the coach intervened, urging the team to critically reflect and ensure that only cultural institutions integral to young people's daily lives were included. A young designer highlighted that children seldom visit museums of their own accord or get involved in cultural practices, prompting a critical discussion. This analysis allowed us to systematically evaluate and filter out museums that did not genuinely engage the target age group, ensuring the final list accurately reflected spaces meaningful to the participants.

During the discussion about urban green spaces, another illustrative example emerged. The city center of Pécs was notably lacking in green areas, leading to a somewhat hesitant brainstorming session compared to the enthusiasm shown for cultural venues. At one point, I suggested incorporating the Botanical Gardens into the game. Situated on the Mecsek hillside, offering diverse educational programs, and being close to Tettye – a popular spot among young people – it seemed a fitting addition. However, the children expressed reluctance, ultimately leading to its rejection. Instead, they highlighted the North Castle Promenade, an atmospheric, relatively unknown, and enclosed green space near the historic city walls. Its secluded nature and reputation for being a spot for “illegal activities” made it attractive to young people. Consequently, we added this site to the list.

These key moments of co-design with young people underscore the importance of our approach in aligning the game world with children's spatial worlds. By actively involving the target group in the identification of the physical context and activity spaces, we aimed to ensure that the game environment accurately reflected their lived experiences and preferences.

5.2.6.

Aligning the Spatial Logic of the Game with the Logic of the Real-world Spatial Environment

After compiling the game content, the next step was to integrate the spatial contents into the game design. A critical insight from the first prototype revealed that the game's spatial logic needed to align with the actual logic of the city. This alignment would enable players to relate their in-game experiences to their everyday realities, enhancing both comprehension and enjoyment of the gameplay. Furthermore, it would facilitate the transfer of experiences gained in the game to players' everyday practices. Therefore, during the development of the second

prototype, we aimed to ensure that the contextual logic was consistent with the game's core mechanic and spatial logic.

A key illustration of this effort can be seen in how we approached the design of players' progress within the game. Our primary objective was to align the spatial dynamics of the game with the actual urban environment. This required us to carefully consider the routes and activity spaces within the game world and ensure they mirrored the spatial relationships and movement patterns found in the real city. For instance, we mapped out the streets, landmarks, and significant areas of Pécs based on the mental maps and integrated these elements into the game board in a way that reflected their real-world counterparts.

We then designed a set of rules to facilitate players' movement within the game world. Similar to *Pop-up Pest*, players moved along designated paths that mirrored the main routes of the selected areas of Pécs, allowing free movement in any direction by rolling a dice. However, during the balancing phase, we identified that the distances players had to cover were great and feared that the game flow would become sluggish. Consequently, we addressed the issue of game dynamics, specifically how to enhance the speed and fluidity of players' movements and overall game progression. At this point, two fast lanes were added to the game's road system, where players could double up and accelerate. One of the fast lanes was the bicycle lane connecting the Zsolnay Quarter to the Szigeti district, and the other was the bus route connecting the Zsolnay Quarter to Uranium City. During the first test play with the paper-based prototype, we found that players moved too quickly, reached development sites easily, and rapidly ran out of building blocks, reducing excitement. To balance player progress, we initiated a debate on the fast lanes. Concerns were raised about the advantage for players living near the bus or bicycle lanes and the strong east-west mobility impact overshadowing north-south movement. While these concerns were valid from a game perspective, we agreed that the fast lanes reflected the city's logic and its inhabitants' mobility habits. To balance player progress, we retained the fast lanes but reduced the dice maximum to four, controlling speed and maintaining challenge, and keeping alignment with the logic of the city.

To improve game flow and better align players' actions with their real-world experiences, we decided to merge activity spaces and development sites, transforming them into public spaces and institutions accessible to all players (see Section 5.3.5 for more details). This change aimed to create a more realistic representation of the spatial context by reflecting the actual logic of a city. In this revised design, public spaces and institutions represented real-world locations where urban activities and interventions typically occur, such as parks, streets, community centers, and cultural venues. By making these spaces open to all players, we ensured that the game environment mirrored the inclusive and interconnected nature of urban spaces. This approach allowed players to engage more naturally with the game, as they could easily navigate and access different areas without confusion.

5.2.7.

Crafting the Visual Representation of the Game World

In terms of visual representation, we decided to retain the format and grid structure of the game board. This strategic decision was made keep simplified both the design and the testing of the game's design principles. The game board remained the central element in the second prototype, depicting the city of Pécs. The game board encompassed an area identified in the co-design process, bounded by the Zsolnay Quarter to the east, Uranváros to the west, the Mecsek Hills to the north, and the railway line to the south, with a reference to the Garden City at the bottom. The pixelated background utilized brown shades to represent the city's outline, green shades for the Mecsek Hills, and a dark brown stripe for the railway line. Key orientation points, such as the mosque, the cathedral, and the shopping center, were illustrated in beige, serving decorative and orientation purposes to help players recognize and recall their home-town. Figure 19 shows the final version of the game board.

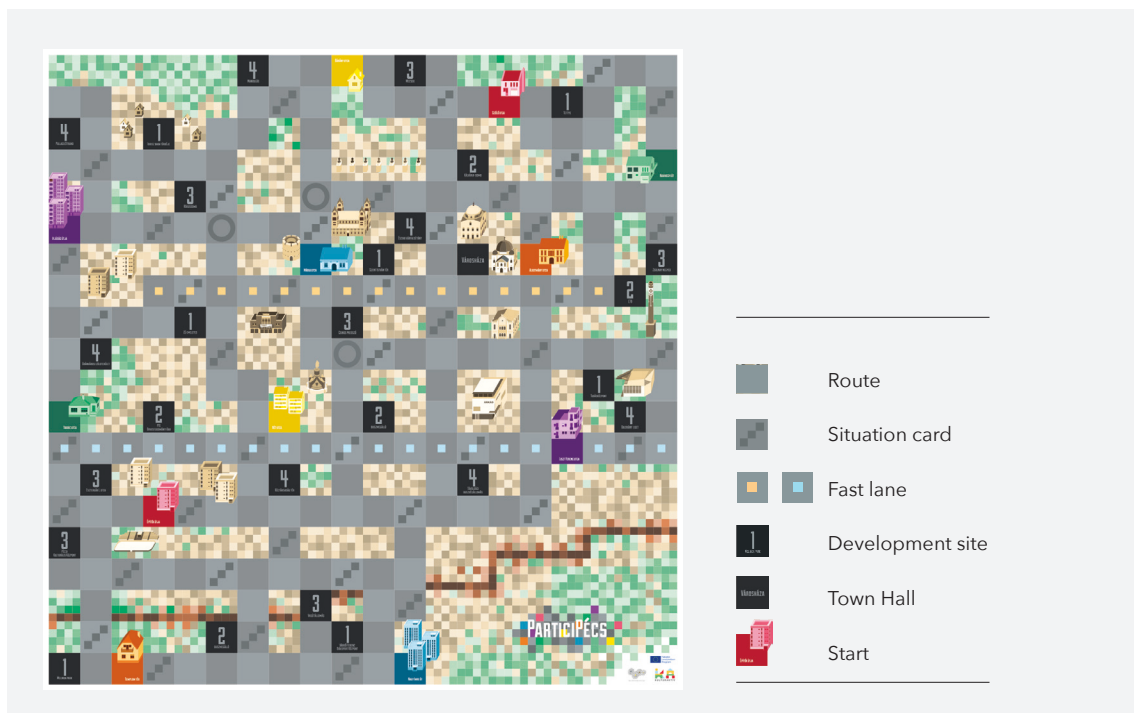


Figure 19

Final game board of ParticiPécs designed by Dóri Sirály

We balanced abstract and thematic space similar to Pop-up Pest in our visualization. The thematic elements aimed to mirror children's perspectives by highlighting their activity spaces and main orientation points, ensuring these elements were visually prominent. Abstract spaces were intentionally left blank and marked only for gameplay purposes, enabling a clear distinction between functional and non-functional urban features, and integrating players' individual spaces. This aspect was not further developed in the second prototype, however, during the evaluation of the *ParticiPécs* game the need for improving this aspect became evident.

5.2.8.

Key Insights from Evaluating the Second Prototype

The evaluation of the *ParticiPécs* game showed significant progress compared to the first prototype, particularly in the integration of children's spatial worlds into the game design. The game board evolved into a visual representation of the city of Pécs as seen through the eyes of young people. This time, the game successfully avoided disconnection by steering clear of unfamiliar places or misrepresentations that contradicted the players' understanding. However, the game still depicted a generalized space, albeit one tailored to the perspective of children. The spatial representation lacked the capacity to integrate players' individual spaces – those unique and personal locations that significantly shape their everyday lives. This limitation was evident as the game did not allow for the personalization of the game environment to reflect the distinct spatial experiences of each player.

This shortcoming became evident during the expert appraisal with the chief architect, who criticized the reliance on existing structures for limiting players' creativity and agency in urban spaces. He emphasized that the game was fostering users rather than empowering young people as active agents. He argued that an abstract game space would better empower young people to invent and transform urban spaces rather than merely reproducing existing structures. This feedback marked a turning point for the design team. We realized the need to create a possibility space within the game that players could fill with their individual spaces, allowing for personal interpretation and adaptation based on their life experiences.

However, we agreed not to completely redefine the game or start the design process from scratch. We still recognized the importance of understanding the context and having the knowledge and tools to make informed decisions about our spatial environment, as these are essential for meaningful social participation in shaping the living environment. The first version of the *ParticiPécs* game aimed to enhance this understanding by integrating spatial representation and situated actions into the game design, creating immersive, place-based situations. These situations enabled players to view familiar places from their everyday lives within a broader perspective, grasp their dynamics and complexity, and connect them to scenarios where young people become agents for shaping these spaces. Nevertheless, we acknowledged the importance of allowing players to incorporate their personal spaces and real-world environments into the game mechanics, ensuring that actions taken to transform urban spaces resonate with their everyday experiences. Consequently, we identified the need for a third design phase to reconcile and harmonize these two approaches.

5.2.9.

Integrating Players' Individual Spaces into the Game World

Based on the insights of the evaluation of the second prototype, we recognized the significance of allowing players to incorporate their individual spaces into the game, spaces that hold personal significance and are part of their life transactions. We also recognized that these spaces are inherently unique to each individual, making it impossible to pre-define them within the spatial representations of a game world. Therefore, the provision of free, open spaces within the game world became fundamental to ensure the integration of players' individual spaces. Yet, this element was notably absent from our prototype, presenting us with a significant challenge: how to combine the representation of a collective spatial reality for children with the inclusion of their individual spaces?

The chief architect's method of collaborating with university students on similar issues provided a compelling solution to our challenge. His approach involves thinking in multiple scales, ranging from the entire city to a neighborhood, and down to individual houses. This multi-scale perspective offered valuable insights for our game design. Consequently, we adopted a two-scale concept in the redesigned game. The first scale depicted the city on the *ParticiPécs* game board, synthesizing children's collective perceptions of the city with landmarks and activity spaces significant to them. The second scale focused on individual micro-spaces, abstractly represented in the *ParticiPécs* add-on, which introduced an additional round without spatial representation. This dual-scale approach ensured that the game could effectively capture both the collective and individual spatial experiences of the players, thereby enhancing the game's relevance for the target group.

The *ParticiPécs* add-on acted as an empty canvas, inviting players to designate locations of their choice. Players had the autonomy to define these spaces according to their experiences and perceptions, filling the game world with their personal narratives. Thus, the third prototype embraced an open-ended approach, allowing players to shape the gamespace. In this manner, we balanced thematic spatial representation, reflecting the collective experiences of children, with an abstract space that encourages players to populate it with their individual spaces, in order to foster engagement and facilitate deeper learning experiences.

5.2.10.

Insights from the Final Evaluation

The final evaluation demonstrated significant advancements in the integration of children's spatial worlds into the game design. This subchapter delves into these findings, exploring the design principle manifested in practice, that is, how the alignment of the game environment with children's spatial realities fostered engagement, motivation, and a deeper learning experience.

The primary finding was that the representation of the city of Pécs in the game, co-created with children, closely aligned with players' perceptions of their city. Despite participants coming from diverse social and cultural backgrounds, from different districts and neighborhoods, and some being commuter or boarding students, there were striking similarities in how they perceived Pécs. When discussing their urban experiences, participants often recalled places highlighted on the game board, such as squares, streets, pubs, or the shopping mall. These central landmarks formed the core of their urban experiences and shaped their collective image of Pécs. The findings highlighted that the target group possessed a strong familiarity with and independently used the areas of the city as depicted within the game. These findings suggest a strong alignment between the children's image of the city, their urban experiences and the game environment.

The success of co-designing the game environment with young people was underscored by a game session with elderly people. Many elderly participants, despite their familiarity with the city, encountered unfamiliar locations within the game, which disrupted the flow of gameplay and diverted their attention. This lack of recognition stemmed from the fact that the locations highlighted in the game did not align with the participants' personal experiences and mental maps of Pécs. Consequently, they struggled to establish connections between the game environment and the physical city they knew. In some cases, participants assigned entirely different meanings to the depicted locations, further contributing to their confusion. An illustrative example occurred when a senior participant entered the Csinos Bar development field. Csinos Bar is a popular venue among 14 to 18-year-olds in the city center, and also known for its monthly farmers' and creative markets. Young players were generally enthusiastic about discovering this bar on the board, often prioritizing it for interventions despite the logical arguments within the context of the game. However, this elderly participant was entirely unfamiliar with the location and expressed confusion about its purpose and significance. A heated discussion ensued among the players until one participant remembered that his daughter frequents the market there to buy meat, which convinced the others and allowed the game to proceed. This game session with elderly participants underscored the importance of ensuring that the game's depiction of Pécs accurately reflects the lived experiences and spatial understanding of its intended audience. Such alignment is essential to maintain engagement and coherence within the gaming experience.

Aligning the game world with both children's perspectives and the logic of the actual environment proved to be instrumental in enabling players to relate their in-game experiences to real-life situations.

It is so realistic. In concrete terms, all the locations are in Pécs, and the events can be implemented in this way, for example, the ones written on situation cards, might be feasible to implement in the near future. Of course, the positive ones. (Benjamin, 15-year-old Gymnasiumstudent)

Grounding the game in children's lived experiences and spatial environment created a deeply engaging and meaningful experience. Participants were delighted to recognize places on the game board, drawing attention to favorite or shared memories. After the game, many expressed that they enjoyed the game's focus on their own city. This personal connection heightened their enjoyment and contributed to a sense of ownership and investment in the game. Converse-

ly, children unfamiliar with the city or the parts represented in the game struggled to immerse themselves in the gameplay. For these participants, the events unfolding in the game felt abstract and disconnected from their daily realities. They struggled to bridge the gap between the game world and their lived experiences, making it difficult for them to fully immerse themselves in the gameplay. This lack of identification with the game hindered their ability to participate actively and enjoy the experience. During a gaming session with a class primarily consisting of boarding students who lacked local knowledge and connections in the city, a boy voiced his frustration with the game, exclaiming, “What is this town? I don’t even know this”. This statement reflected the students’ sense of disconnection and alienation due to their unfamiliarity with the city depicted in the game. These students were notably less motivated by the game.

Moreover, the alignment of the spatial representation in the game and players’ everyday urban experiences also influenced their success in navigating the game. Players familiar with the city had an advantage in navigating and understanding the game and comprehending the unfolding situations. Their familiarity with the cityscape provided them with a mental map that aligned closely with the game environment, enabling them to make quick and accurate decisions based on their spatial understanding. As a result, these players were better equipped to anticipate and respond to challenges presented within the game, maximizing their overall gaming and learning experience.

Well, as a Pécs resident, I recognized the locations, so I knew where I was going, what I was doing there, and what we were renovating in that particular case. (Patricia, 19-year-old vocational school student)

In contrast, participants with limited knowledge of the city or limited mobility, generally commuter or boarding students or children living in the suburbs, often found it difficult to navigate through the game and their in-game experiences remained distant and abstract. This was particularly apparent in the game we implemented in the eastern suburbs of Pécs. Here, a significant number of children are disadvantaged, segregated, and have little experience outside their immediate neighborhood. These children faced significant challenges in their ability to orient and navigate within the *ParticiPécs* game and gave an uncertain impression as they moved through unfamiliar roads and locations depicted on the game board. Thus, they relied on intense support from the game masters. However, there was one player who navigated the game with outstanding independence and confidence. Further examination revealed that this participant had a strong familiarity with the city, regularly exploring its downtown and various neighborhoods on his own. Consequently, he was able to recognize familiar landmarks within the game, which facilitated his navigation, expanded his experiences, and enhanced his receptiveness to the game’s contents. This player was the only one in his group who expressed appreciation for the game’s focus on Pécs.

These examples underscore that representing children’s spatial world in the game has a positive impact on players’ motivation, resonance with the game’s content, engagement, and successful navigation within the game. These factors are crucial for facilitating a deep learning process among players.

The significance of individual spaces became particularly evident during the final evaluation of the game, especially in the add-on round where players worked in small groups. Each group selected a location significant to their daily lives that presented a challenge or problem, and then designed an intervention aimed at enhancing the livability of that location. Players demonstrated commitment and effectiveness in planning interventions only when the location was relevant to their everyday experiences. In other words, personal attachment to the chosen site directly influenced their engagement and success in conceptualizing and designing interventions for that place.

This became evident during the game session at a suburban school, where most students had limited connections to other parts of the city. Consequently, they perceived the *ParticiPécs* game as abstract and disconnected from their daily lives. When tasked with designing urban interventions in their own living environment, the students, divided into three groups, faced significant challenges, particularly in choosing locations for development. After prolonged discussions, two teams eventually selected the central square of their district, though with uncertainty and a lack of better alternatives.

One team experienced a heated argument over which problem to address, leading to conflict and tears, which hindered their progress. The other team identified the square's lack of vibrancy, noting it was empty except during events when temporary benches were placed, allowing people to sit and interact. They planned to place permanent benches in the square. However, upon visiting the site after the game session, I observed a newly renovated playground and actively used benches. This discrepancy suggested that the students' perception of the square differed from reality, likely due to their lack of active engagement with the location. This lack of engagement could explain their difficulty and lack of motivation in generating ideas for interventions.

An encounter at the end of the game further underscored this point. When I asked one of the students if she would be willing to participate in the renovation of the square, she declined, stating that she did not live in the area. Interestingly, this student's home and school were only a short walk from the square. The harsh reality of segregation in this part of the city was tangible, with neighborhood identities drawing clear boundaries that effectively separated this student from the surrounding community. Despite physical proximity, psychological and social barriers created by neighborhood segregation were evident. The student's unwillingness to participate in efforts to improve the space stemmed from a sense of disconnection and exclusion from the neighborhood identity, undermining the potential for collective action and community participation.

In contrast, the third group of participants in this game session was able to identify an area in the neighborhood whose improvement would genuinely impact their everyday experiences: the local "dog track". This spot, a former sports field next to the school on the outskirts of the town, was in a state of complete disrepair. Dogs are trained here twice a week, hence its colloquial name. Otherwise, it remains unused and is frequented by individuals with substance abuse issues. Despite its dangerous and unsuitable condition, children spent their afternoons here to play football, socialize, and spend their free time due to the lack of other open spaces. The group that chose to work on this area exhibited a high level of engagement and demon-

strated a clear understanding of the game's objectives. They efficiently brainstormed ideas for enhancing the dog track and showed a high level of motivation.

Some weeks later, I received a call from the school, indicating their eagerness to improve the area of the dog track and implement the students' ideas. As a first step, we organized a site visit with the students, where they could formulate the most necessary improvements to create a usable and lovable space for them. Subsequently, the school organized a community day attended by students, teachers, parents, and groundskeepers (mainly parents of participating students). The group worked in parallel on thinning bushes, making compost bins from twigs, filling holes, removing the fence, and tearing out concrete posts with the help of groundskeepers' machines. It took half a day to clear the dog track, remove the dangerous areas, and turn it into a safer and more pleasant place for children. Figure 20 shows the transformation of the dog track by the children.



Figure 20

Transformation of the “dog track” – from the idea to implementation

This experience underscores the crucial role of personal connectedness to a space in fostering motivation and engagement. The students' commitment to improving a site that held personal significance highlights the importance of leaving open spaces in games for children's individual spaces. Such openness allows players to integrate their unique spatial experiences, which not only enhances their engagement but also facilitates meaningful learning and active participation. By incorporating spaces that resonate with children's daily lives, games can better support their understanding and agency in shaping their environments, ultimately leading to more impactful and sustained community involvement.

5.2.11.

Concluding Design Principles on Spatial Representation in Transformative Games

From the outset, one initial design principle guiding the game design process was that transformative games should represent children's spatial worlds. This principle was based on the premise that games can integrate and represent dynamic spatial situations due to their internal spatial logic and representational elements. Additionally, it recognized that for players to successfully transfer learning from the game into real-world experiences, the game's spatial world must be connected to their everyday environment. The iterative journey of designing and testing the prototypes has provided invaluable insights into effectively integrating children's spatial worlds into the game design to foster learning and active engagement with urban spaces.

First, it became clear that deep learning occurs when the game world genuinely aligns with children's everyday urban experiences. This alignment is essential for bridging the gap between the game environment and the real world, making the educational content relatable and impactful. During the development phase, we learned that achieving this alignment requires a profound understanding of children's spatial worlds, which can only be obtained through direct collaboration with the target group. This collaboration is essential for accurately capturing their perspectives on the spatial environment.

During the iterative design and testing of the game environments, we identified the necessity for a holistic integration of spatial contents into the game design. It became clear that merely providing a visual representation of the spatial environment was insufficient. Instead, the entire game environment needs to be aligned with the spatial context it represents. This means that not only the visual elements but also the game mechanics and rules must mirror the logic and dynamics of real-world spatial environments. This alignment ensures that the game environment is both relatable and meaningful for the players. By integrating these elements holistically, we can create a game world that is both educative and engaging. This approach is essential for fostering a meaningful connection between the game and the players' real-world experiences, thus enhancing the educational impact of the game.

Another critical insight from the game design process concerning spatial representation was the necessity of incorporating players' individual spaces into the game environment. Young people experience spatial environments in highly personalized ways, with unique perceptions and interactions shaping their lived experiences. These personal interpretations of urban space cannot be fully captured within a fixed visual representation of the city. Therefore, it is essential to provide players with the freedom to co-create the game world by integrating their individual spaces, ensuring the game environment is both meaningful and reflective of their real-world spatial experiences. This can be achieved by a good balancing between thematic spaces that reflect children's views of their spatial environment and abstracted spaces that enhance inclusivity and provide open spaces for the inclusion of players' individual spaces, and a game mechanic that facilitate players to co-create the game world.

These insights led me to derive design principles that can guide future transformative game development processes to foster learning to understand and actively shape the spatial environment.

Spatial Worlds Principle

Spatial worlds of children form the foundational context for transformative games, ensuring that in-game experiences resonate with their everyday spatial experiences, and thus, enabling the transferability of learnings and knowings between the two worlds.

Co-designing Spatial Contents Principle

Spatial contents in transformative games are co-created with the target group, ensuring a genuine alignment between the game world and children's perspective on their spatial environment.

Holistic Integrating of the Spatial Context Principle

Transformative game design involves a holistic integration of children's spatial worlds, ensuring that every aspect of the game, including elements, mechanics, and rules, aligns with the physical characteristics, logic, and dynamics of the real-world spatial environment. This alignment ensures the game environment is both relatable and meaningful for the players, enhancing their engagement and learning experience.

Dynamic Space Principle

Transformative game design offers a dynamic representation of the spatial environment, highlighting the fluid and evolving nature of space to foster an understanding of how space is continuously shaped and reshaped by human activities and interactions.

Balance Between Thematic and Abstracted Space Principle

Transformative games balance thematic spaces that reflect children's views of their spatial environment with abstracted spaces that enhance inclusivity for individual experiences, ensuring that the game resonates with children's real-world perceptions while providing flexibility for diverse personal interpretations.

Player-generated Spaces Principle

Transformative games provide opportunities for players to incorporate their own individual spaces allowing personalization of the game environment.

5.3.

Advancing Design Principles on Situated Action Upon Space

The second initial design principle that set the ground for the game design process was that transformative games provide situated environments, where players experience spatial practices that are connected to their real-life experiences. This principle was based on the premise that games are situated environments where situated meanings emerge out of players' actions. On the other hand, it was based on the insight that for the learning process to be successful, it is essential that these actions mirror spatial practices that have the potential to change urban spaces. This chapter delves into the iterative design cycles, illustrating how the understanding of this principle deepened through successive phases of development and testing. As we progressed, the design principle evolved, becoming more refined and enriched with additional insights. Each iteration not only enhanced the comprehension of providing situated experiences of spatial practices in the game but also led to the emergence of new design principles.

5.3.1.

Conceptualizing Spatial Practices for the Game

The process of determining which actions to emphasize in our prototype evolved gradually, informed by an increasing understanding of spatial dynamics and young people's contribution to urban development processes. The core of every game situation and the essence of gameplay revolve around players' actions. In transformative games designed to foster learning about spatial dynamics, these actions center around spatial practices.

Initially, we intentionally kept the concept of spatial practices broad and open-ended to capture the complexity and richness of urban spatial dynamics. Our goal was to provide players with a nuanced and engaging understanding of how they can actively shape and transform their urban environments. By doing so, we aimed to enable young people to recognize their potential as active agents in urban development, fostering both their understanding and their capacity for action.

Our intention was to provide a comprehensive understanding of the diverse ways individuals engage with and influence urban spaces. This involved delineating between routine practices and reflective tactics, highlighting the intentional and reflexive dimensions inherent in the shaping of urban spaces. Routine practices encompassed familiar activities, such as the seemingly unconscious act of picking flowers from a flower bed. In contrast, tactics referred to reflexive practices consciously applied in response to identified problems in the urban space. Examples of such tactics included urban gardening and yarn bombing, targeted inter-

ventions addressing perceived challenges within an urban context. Additionally, we considered actions making a lasting difference to the fabric of urban spaces, such as the creation of bicycle lanes or the preservation of buildings of local value.

We aimed to reflect the multifaceted nature of space within spatial practices, recognizing the complex interplay of physical, social, normative, and cultural elements. We considered a variety of activities that highlighted the social aspect of space, such as breaking or creating social norms within a given space, like riding a bike on the pavement, and activities that fostered communal ties, such as organizing neighborhood events. Additionally, we included actions that changed the physical structure of a space, like placing flower boxes on a patio, and activities that engaged with the cultural dimension of a space, such as participating in cultural events or promoting local cultural heritage. Through this comprehensive approach, we sought to ensure that the game not only engaged players but also equipped them with a deep and actionable understanding of spatial practices.

5.3.2.

Integrating Spatial Practices into the Game Design

Once we had conceptualized spatial practices for the game context, our next endeavor was to integrate them into the game design framework. This integration occurred at two distinct levels. The first level involved embedding spatial practices into the overarching narrative of the game. The central theme was the positive transformation of our immediate living environment, emphasizing that the creation of space is accessible to all ages, including children and young people. This thematic focus was essential to permeate the game as a whole, ensuring it was prominently and clearly presented to players to have a tangible impact on their mindsets.

The second level involved integrating spatial practices into the individual narrative threads shaped by players' in-game actions. This was achieved by aligning players' core actions with these spatial practices. Each player had an individual mission to complete, focusing on a specific aspect of urban development. These aspects were connected to one of the main thematic fields identified earlier: transport, urban green spaces, and culture (see section 5.2.1 for further explanation). For instance, within the urban green spaces theme, individual missions included tasks such as tree protection, waste recycling, urban gardening, and park maintenance. These specific missions determined the actions players encountered.

To involve players effectively in situated actions, we designed game mechanics that aligned with the intended spatial practices through structured gameplay activities. Firstly, players had to visit designated activity spaces. At these locations, players draw a situation card, each depicting a scenario that engaged them in actions shaping the urban space. These scenarios formed the core content of the game, allowing players to experience various forms and dimensions of spatial practices through which they could actively shape the spatial environment. For instance, the player with the mission of promoting urban gardening might be involved in rent-

ing a plot in a community garden, organizing a community cookout, creating a herb garden in the yard, neglecting the community garden, harvesting the neighbor's tomatoes, or breaking the communal tools. By participating in these activities, players became active agents in the game, directly engaging in practices that mirrored real-world spatial interactions. These activities not only drove the narrative of the players and advanced the overall story of the game but aimed to provide patterns of actions transferable to players' real-life contexts.

5.3.3.

Crafting Contextualized Spatial Practices

The next step was to elaborate the situations involving spatial practices. Here we adhered to two guiding principles derived from Dewey's learning theory: connecting these actions with children's everyday experiences and allowing them to experience the consequences of each action.

To develop connections with the players' everyday environment and experiences, we situated the actions within the physical environment of the neighborhood. For instance:

You were riding your bike on the pavement on Rákóczi Street and scared pedestrians to death.

Rákóczi Street is an important road, with heavy pedestrian and motorized traffic, which did not have a bicycle lane when the game was created. The broad sidewalk accommodated pedestrians moving in various directions, setting the stage for a scenario where a cyclist navigates through the crowd. This situation was easy for us to envision or recall.

To further connect the in-game situations with players' everyday experiences, we opted in some cases to keep the localization open-ended. We situated actions in generic places such as players' houses, streets, or neighborhoods, allowing players to mentally insert their own individual locations into the game. For instance:

You decorated the rusty lampposts in your street with colorful crocheted yarn.

In order to make the consequences of the actions experiential, we used contextual feedback. The situations indicated actions with both positive and negative impacts on the spatial environment. Positive impacts included actions contributing to protecting and caring for the natural environment and green spaces, promoting sustainable and accessible mobility, or creating cultural values in the neighborhood. Conversely, actions with negative impacts were destructive or neglectful, breaking community-set rules, such as damaging a statue, neglecting the community garden, or letting a dog foul the sidewalk. These impacts determined the outcome of actions in the game. Positive actions were rewarded with a building block that players could place in a development area, symbolizing positive change in the urban space. Negative actions did not reward a building block, requiring players to visit another activity space to draw another situation card.

The building blocks were then placed on designated development sites within the game, providing a tangible representation of their efforts to improve the urban environment. As the game progressed, the playing field gradually became populated with these urban interventions, visually transforming the gamespace in a dynamic and impactful manner (see Figure 21). Additionally, this aimed to provide players with an embodied experience, reinforcing the connection between their in-game actions and the real-world implications of spatial practices.



Figure 21

Building blocks symbolizing urban interventions reconfigure the downtown of Budapest

5.3.4.

Key Insights from the Evaluation of the First Prototype

The primary objective we set for the prototype was to convey the idea that children possess the capacity to catalyze positive changes in their immediate living environment. This thematic emphasis was deliberately interwoven throughout the entire game and had a highly positive reception from the participants. They appreciated the opportunity to mold the city according to their own ideas, stating, “That I could change the city as I wished.” A notable highlight was the recognition that young people could have a positive impact: “That kids can make a lot.” The game’s message was universally clear and understandable to players, and its positivity and relevance resonated consistently across all age groups throughout the entire evaluation phase.

However, the educational outcomes related to specific spatial practices did not meet our expectations. Our design aimed to provide players with opportunities to explore diverse patterns of action, which they could transfer into real-world experiences. Although players engaged with the situations and acknowledged “the realization of how many simple things we can do to improve our living environment” as a key learning outcome, they struggled to recall these situations and actions during post-game discussions and questionnaires. Players often repeated the same examples, indicating a need to investigate why young people had difficulties in recalling specific action patterns.

A significant factor contributing to this challenge was the general unfamiliarity of players with the spatial practices introduced in the game. This unfamiliarity was consistently revealed through questionnaires and discussions, showing that players lacked prior knowledge and experiences related to actions that shape the spatial environment. When reflecting on their prior experiences, participants predominantly recalled practices related to environmental protection. Many participants cited examples such as picking up rubbish or separating waste as their contributions to improving their environment (see Figure 22 for a visual summary of participants' previous experiences). These familiar practices were the ones most easily remembered after the game sessions. The game aimed to bridge this experiential gap by creating a platform for young people to interact with spatial practices in an accessible and playful manner. However, it fell short of achieving this objective.



Figure 22

Participants' previous experiences in shaping their living environment

Note. The size of each word indicates the frequency with which it appears in participants' responses (nothing = 10; selective waste = 8; and the occurrence of other words is 1).

The primary issue was that the action patterns were not integrated organically into the game-play. Instead, they were presented in a disconnected manner on situation cards, which prevented the learning experience from being truly situated. These cards described various actions that players could take to positively impact the urban space, such as planting trees or organizing a street festival. However, players did not actually perform these actions; they merely read about them on the cards. When drawing these situation cards, players received building blocks, which they could place on designated development sites. However, there was a significant disconnect between the actions described on the situation cards and the actual game mechanics: the building blocks and the development sites were not contextually linked to the specific actions outlined on the situation cards. This meant that players did not see a direct and meaningful connection between the actions they read about and the changes they made in the game world. For example, reading about planting a tree or organizing a festival did not directly translate to how the building blocks were used or how the development sites were

improved. This disconnection prevented the players from experiencing a coherent narrative that tied their actions to tangible outcomes in the game's urban environment.

This lack of integrating action patterns into the game mechanics failed to provide players with a meaningful, situated experience of spatial practices, undermining the game's educational potential. And this caused confusion among players, as the relevance of the action patterns to their gameplay was not clear. Consequently, the narrative elements, including the intended action patterns, became irrelevant and were often overlooked by the players. Instead of engaging deeply with the educational content, players focused primarily on the mechanical aspects of the game, such as moving to specific locations and placing building blocks, which made them progress in the game. As a result, the game did not effectively bridge the gap between in-game experiences and real-life situations. The intended educational benefits, which relied on players understanding and internalizing spatial practices through gameplay, were not realized.

Another significant challenge in players' learning process was that the situations presented in *Pop-up Pest* did not consistently align with children's lived experiences, causing confusion and frustration among players. For example, a player encountered a situation card describing the replacement of an old, ornate, wrought-iron staircase with a less valuable aluminum handrail during an apartment building renovation. He read the card surprised and with bewilderment. As it turned out, his indignation stemmed from his knowledge that aluminum holds greater value than iron at scrap yards, highlighting a disjunction between the presented scenario and the player's real-world understanding.

Similarly, another notable incident occurred during a playtest involving boarding students from a prestigious high school of the neighborhood. The mention of community gardens elicited surprise and irritation from the participants. Contrary to expectations based on previous game sessions where urban gardening was well-received, these players found the concept alien and incomprehensible. At the end of the game session, one player explained that in his rural home village, extensive vegetable gardens with tomatoes alongside fruit trees were commonplace. The notion of cultivating vegetables in the urban concrete landscape was, therefore, perceived as unfamiliar and discordant with his own experiences. These instances underscore the nuanced challenges encountered in aligning game scenarios with the diversity of player's real-life contexts. The discrepancies between presented situations and participants' lived experiences highlight the importance of cultural, contextual, and individual considerations in game design, emphasizing the need for greater sensitivity to the varied backgrounds and perspectives of the target audience.

Finally, we recognized that the lack of a clearly delineated understanding of spatial practices, that is, the broad and vague concept of urban development posed significant challenges for players. This ambiguity made it difficult for them to grasp how they could effectively contribute to improving urban spaces. This issue underscored the need for a more focused and precise approach to integrating spatial practices within the game.

Recognizing this deficiency prompted an investigation into which specific spatial practices

resonated with young people. The objective was to identify the elements that captured their attention, those that were easily memorable, and, most importantly, those that effectively conveyed how they could actively participate in transforming their environment. This exploration aimed to identify the key actions and practices that would not only be engaging for the players but also provide them with a clear understanding of their potential role in urban development.

A survey conducted during subsequent playtests revealed a clear pattern: participants consistently highlighted urban tactics in post-game questionnaires. These tactics, increasingly popular among youth, are mechanisms employed to reclaim public spaces. Quotations such as: “Everything was very interesting, but the best part was the yarn bombing!” underscore the enthusiasm of young participants for creative tactics. Urban gardening emerged as the most frequently referenced activity, closely followed by yarn bombing. Other examples, such as legal graffiti, street decorations, and guerrilla actions, were sporadically mentioned by individual participants (see Figure 23).



Figure 23

The most frequently mentioned activities that players have learned in the game

Note. The size of each word indicates the frequency with which it appears in participants’ responses (urban gardening = 7; yarn bombing = 4; and the occurrence of other words is 1).

Players’ responses lacked examples of everyday routine activities that could shape the environment, as well as more formal, structural ways of participatory design. The increased interest in creative urban tactics can be attributed to the novel idea that young people themselves can make positive changes in their environment. This newfound perception is particularly evident in tangible practices that produce immediate results, such as urban gardening, yarn bombing, or graffiti painting. This understanding underscores the importance of focusing game design on overtly transformative and personalized spatial practices that are tailored to the context of the game and the dispositions and interests of the target audience.

These insights highlighted significant gaps in the initial design, underscoring the necessity for a second design cycle to improve the prototype and refine the design principles.

5.3.5.

Redesign: Integrating Spatial Practices into the Game Design

One of the key findings from the first design cycle was the necessity to integrate spatial practices into the core mechanics of the game in a way that makes these practices experiential for players. Ensuring that the game design consistently reinforces the main message – that young people are active agents in shaping their spatial environment – requires a meticulous integration of spatial practices into both the content and mechanics at every level of the design. To achieve this integration, we adopted a gradual approach. First, we refined the overall theme of the game. Next, we created a narrative frame based on this theme, and finally, we adapted the players' actions to align with this narrative.

The design team started with refining the overarching theme of the game, which ties all elements together and should be supported by every aspect of the game design. Schell (2008) notes that basing design around a single theme ensures that all elements reinforce one another and the core message of the game. In the first iteration of the second prototype's development, we focused on this refinement to create a cohesive and impactful game experience. Our original intention was to create a game that supports learning to understand and act upon space by reflecting how young people can actively contribute to urban development. However, this broad theme required a more nuanced focus to make the game both engaging and educational. We initiated an ideation process with a phase of attunement, characterized by immersive exploration of the dynamic relationships between young people and the urban spaces of Pécs. This process involved diverse creative techniques, including the collection and discussion of places, themes, and issues relevant to the target group, which then served as a catalyst for subsequent storytelling exercises. We prototyped possible overarching themes for the new prototype in expert-children pairs, resulting in eight different ideas (see Table 3). These ideas were reviewed, discussed, and evaluated by the design team, leading to the identification of the overall theme for the prototype.

Two ideas with the most support focused on children's public space use and appropriation. The first concept, "*In the city without money*," required young participants to spend a day in the city without engaging in any consumption. The second idea, "*Use of public spaces*," explored how young people create their spaces, what makes these spaces work for them, and why. Both concepts emphasized children's desire to reclaim and appropriate public spaces, which is consistent with the relevant literature and research (Derr et al., 2018; Driskell, 2002; Freeman & Tranter, 2011). Freeman and Tranter (2011) highlight that "the public domain has become an area of contestation for children as their relationship to public space is questioned", due to the facts that "children have become increasingly relegated to 'child spaces' and seen increasingly unwelcome in parts of the city" (p. 11). However, they point out that children attempt to pursue their needs passionately and autonomously to access the spaces that they need.



NAME / DESCRIPTION	PROTOTYPE	GENRE
CRIME IN THE CITY		A crime thriller with a love story – while players solve the mystery, they get to know the city.
USE OF PUBLIC SPACES		How do people of different ages use public spaces and how can we work together to design a public space that everyone is happy to use?
FESTIVALS		Visit the festivals in Pécs and get to know the city and its surroundings!
SPORTS		How do people of different ages use public spaces and how can we work together to design a public space that everyone is happy to use?
TRANSPORT		How do people of different ages use public spaces and how can we work together to design a public space that everyone is happy to use?
BAKERIES IN THE CITY		Mapping and trying out bakeries in Pécs.
PEOPLE WITH DISABILITIES IN THE CITY		How do people of different ages use public spaces and how can we work together to design a public space that everyone is happy to use?
IN THE CITY WITHOUT MONEY		How to spend a day in the city without spending money?

Table 3

First iteration drafts for the overall theme of the second prototype

In sum, after careful deliberation, the design team reached a consensus that children's use and appropriation of public space should be the central theme of the game. This decision provided a clear and coherent direction for subsequent development phases, guiding the narrative and design choices to reveal how young people interact with and shape the public spaces of Pécs in an engaging way.

This ideation process also revealed a tension between two different approaches to the topic, which later influenced the entire design process. On one hand, spatial experts viewed the game through the lens of urban problems, positioning specific urban challenges as the focal points and primary challenges within the game's framework. Examples include ideas like *"Transport"*, *"Use of public spaces"*, and *"Bakeries"*, which centered on optimizing transport, transforming public spaces to attract young people, or distributing bakeries to serve children's needs. These ideas emphasized urban problem-solving as the core of the game concept and mechanics. On the other hand, students and youth experts focused on young people's everyday problems, embedding these within the game's narrative. This approach resulted in ideas like *"In the City Without Money,"* *"Crime in the City,"* and *"Festivals,"* where players navigated daily challenges, solved crimes, or attended festivals, thereby engaging with the city in a more narrative-driven, adventure-like manner. These differing approaches led to heated and emotional, yet valuable discussions during decision-making processes. The contrasting viewpoints created distinct directions at each juncture of the design process, intensifying the challenge of reconciling and integrating these perspectives for an enriched game design.

The next level was developing a narrative frame based on the overall theme of young people's use and appropriation of public space. This step highlighted the conflict between narrative-driven concepts, which emphasized a structured storyline, and problem- or action-centered concepts, which allowed for emergent actions at the expense of a coherent narrative. This conflict became evident in the diverse prototype versions created by the design team (see Table 4).

Urban adventure tour prototypes, favored by children, adhered to a linear storyline, such as *"Kaukázus"*, where players aim to reach a concert, solving tasks along the way, or *"New Year's Eve"*, where players face various challenges while trying to gather for fireworks. Conversely, problem-solving prototypes, preferred by architects, omitted the narrative element, and focused on urban problems to be solved. Examples include *"Empty Plots"*, where players invent social enterprises for empty buildings, and *"Urban Development Game"*, where players implement small-scale urban interventions around the city. A significant tension arose between reinforcing the narrative and affording players creative agency. Strengthening the story was seen as crucial for enhancing the gaming experience and supporting the learning process by embedding spatial practices within a narrative context. However, providing players with the freedom to plan and implement transformative actions, empowering them as creative producers, was equally important. Balancing narrative richness with player agency proved challenging, as open-ended decision situations introduced complexities, multiplying the potential story threads.

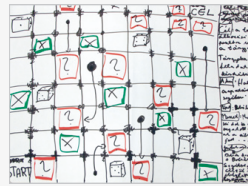


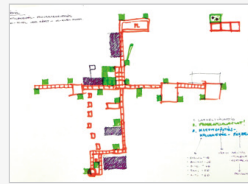
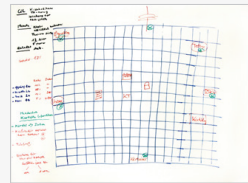
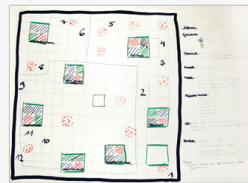
NAME / DESCRIPTION	PROTOTYPE	GENRE
<p>TREASURE HUNT</p> <p>Players had to find specific objects related to Pécs on the covered fields of the game board, and while treasure hunting, they could learn interesting facts about the city.</p>		Treasure hunt / Trivia
<p>KAUKÁZUS</p> <p>Players have to get to the Kaukázus concert in Est Café on Saturday night. On the way, they visit sites and solve different tasks.</p>		urban adventure tour
<p>EMPTY PLOTS</p> <p>Players have to occupy empty plots and implement a new creative venture there, like a community kitchen or an alternative street theatre.</p>		urban problem-solving
<p>URBAN DEVELOPMENT GAME</p> <p>Players have to make small interventions in six development areas connected to transport, culture, sport and nature (e.g. planting a tree, building a bicycle shed or creating legal graffiti).</p>		urban problem-solving
<p>NEW YEAR'S EVE</p> <p>The players share a common goal: they have to get to Széchenyi Square at New Year's Eve by midnight so that everyone could watch the fireworks together! On the way, they have to solve tasks, choose the right means of transport and help each other</p>		urban adventure tour
<p>WEEKEND</p> <p>Players have to implement small-scale interventions by visiting different locations in the city.</p>		Mix of urban adventure tour and problem solving

Table 4

Second iteration for the overall theme of the second prototype

After a difficult decision-making process, we reached a consensus on a narrative direction. The “Weekend” told the story of a Saturday in Pécs: players aim to meet in the evening but must improve various places through small-scale urban interventions to make this happen. This narrative seemed to have the potential for combining the approaches of urban adventure and problem-solving. To achieve this balance, we integrated an additional iteration to refine the narrative further, ensuring both a strong storyline and creative problem-solving were unified in the concept.

Game designer Schell (2008) indicates that the problem of the duality between story and gameplay is deep-rooted and a frequent topic of debate among game designers. He points out that story-oriented individuals often fear that gameplay will ruin the story, while others, on the contrary, worry that a strong story will undermine the gameplay experience. This tension arises because traditional stories are typically linear, whereas games are designed to offer multiple outcomes. Schell suggests that this challenge can be addressed through the intricate design of game mechanics that dynamically generate a coherent and immersive series of events.

Following Schell's approach, we developed a prototype in the next iteration that successfully synthesized narratives and game elements, earning acceptance from the design team. This version began with a captivating narrative introduction, setting the stage for an ordinary Saturday in Pécs, where a group of young people aimed to enhance urban spaces through small-scale interventions (see the paper-based prototype in Figure 24). The game's elements were woven into an emergent narrative structure, creating an evolving story that unfolded organically based on players' decisions and interactions.

Players were free to choose development sites for their interventions, allowing their choices to influence the story's direction and dynamically shape the urban context as they navigated through the game. However, the interventions themselves were predefined. This compromise aimed to harmonize the narrative character with the players' creative agency. While players had the freedom to decide which sites to improve, the specific actions they could take at each site were detailed in a predefined story. This approach ensured a smooth game flow and the development of a coherent narrative, balancing the need for a structured storyline with opportunities for player-driven contributions.



Figure 24

The final version of the paper-based prototype (*ParticiPécs*)

The third level involved integrating these spatial practices into the game design, ensuring alignment with the core actions performed by players. Our primary objective was to create a situated experience, in contrast to *Pop-up Pest*, where activities were often disjointed from the contextual situations. To achieve this, we anchored the spatial practices to specific devel-

opment sites – real locations identified through a co-design process with young participants. These locations served as the settings for the planned interventions, embedding players' actions within a pre-generated story.

This approach required players to visit development sites and place a specified number of building blocks through collaboration with other players. Once the necessary building blocks were in place, players received a development card that narrated the story of the intervention, providing a rich, contextual understanding of the action. By embedding spatial practices within specific, tangible locations and tying them to narrative elements, we transformed the gameplay into a narrative journey of urban transformation.

5.3.6.

Redesign: Crafting Contextualized Spatial Practices

Once we had established the overall theme, the narrative frame and the core mechanics for the prototype, we focused on creating meaning for players' actions aligning these with practices that positively impact the spatial environment. The lesson from the first design cycle emphasized the importance of well-defined, easily understandable actions that deeply resonate with players. As the evaluation of the *Pop-up Pest* game revealed that young people were most attracted to informal, self-initiated, and self-managed urban interventions that reclaimed and transformed public spaces on a small scale, we focused on these types of actions. These kind of interventions, described by de Certeau (1984) as tactics – individual actions that creatively subvert and manipulate established urban structures – are closely related to the principles of tactical urbanism. Tactical urbanism, characterized by its immediacy in scale, process, and resources (Lydon et al., 2015), aligns with the concept of isolated yet impactful actions by individuals, particularly those who typically have little or no voice in urban development. Recognizing the effectiveness of tactics such as yarn bombing, pop-up bike lanes, and guerrilla gardening in conveying the idea that young people can shape their living environment, we adopted this approach and its associated tools as the foundational framework for defining spatial practices within the prototype.

Based on these considerations, we created the situations and stories for the development sites. The stories were carefully organized around urban interventions specific to each location and its local context. We crafted these narratives to ensure that the actions described were realistic and achievable for young people in real life. This approach aimed to ensure that the narrative context made each action meaningful and engaging, grounding them in practical, real-world scenarios. For instance, consider the following scenario:

You have become an active member of the Balokány-liget Association, helping to clean up and maintain the park.

You read on Facebook that some NGOs have joined forces to clean up Balokány Grove. You thought it was really cool because everyone is always complaining, but now finally some-

one is doing something to change things. Together with three friends, you joined the initiative and took it upon yourself to clean up and renovate the waterfront stage. When it is finished, you can organize poetry slams and performances there.

Furthermore, to better match these spatial practices with the life experiences of the target group, we involved young members of the design team in content development, drawing inspiration from their real-life experiences. For example, one design team member attended a media course at the Pécs Cultural Center and edited an internet newspaper for young people; her story was included in the game as a possible action. We also incorporated successful examples already implemented in Pécs, such as the Balokány-liget initiative or the graffitied concrete walls hiding the rubbish bins in Uranium City. Table 5 presents the full list of developments.

While crafting the narrative thread, we remained committed to adhering to the logic of the city. An example of this is evident in how we conceptualized the role of the Town Hall in the game. Initially, the focus was on highlighting young people's appropriation of urban spaces through small-scale interventions, therefore, governmental decision-making levels were not explicitly discussed during the content development process. However, as the game concept took shape, a member of the design team with expertise in urban planning raised a crucial point about the absence of political power representation. Consequently, it was proposed that the Town Hall should be symbolically incorporated into the game to represent policy-making potentially influencing players' initiatives.

This idea was particularly timely as we needed to create opportunities for players to access new building blocks. Initially, players could approach the Town Hall to seek support for implementing their intervention ideas. However, this concept sparked extensive discussions among the design team members, leading to multiple revisions of the Town Hall's role in the game. During the balancing process with the paper-based prototype, we discovered that allowing unlimited visits to the Town Hall disrupted the overall gameplay balance. Some players exploited this by repeatedly visiting the Town Hall to collect building blocks and place them in nearby development sites. This imbalance led to a debate within the planning team, with some members advocating for the abolition of the Town Hall altogether. However, the architects on the team emphasized the importance of "sticking to the logic of the city" and argued for its retention. After extensive testing and discussions, a consensus was reached. We agreed that the municipality could support or hinder young people's ideas as they saw fit, and this dynamic should be reflected in the game design. We considered having players argue in favor of their intervention ideas when they arrived at the Town Hall, earning a building block if they succeeded in convincing the representatives. However, we realized that such an interlude would disrupt the flow of the game. To address these challenges, we developed an alternative solution: simplifying the decision-making process by introducing the Town Hall dice. When players reached the Town Hall, they could roll the dice to determine whether they had successfully convinced the council with their intervention idea. Additionally, we limited each player to only one visit to the Town Hall. This process of developing additional rules exemplifies our efforts to integrate all the details into the game's internal logic, strengthening situated meaning-making while adapting to the reality, the "logic of the city."



























ICON	LOCATION	ACTION
	MANDULÁS	You organized with your friends a workshop with young architecture students to renovate and complete the sports equipment for the forest gym.
	MECSEK	You organized a spring clean-up in Mecsek.
	POLLACK SWIMMING POOL	You were involved in the Pollack Swimming Pool green space development.
	TOMB OF IDRIS BABA	On Cultural Heritage Day, you gave a guided tour of the tomb of Idris Baba.
	TETTYE	You helped to build a skateboard track at the Tettye with crowdfunding.
	CALVARY HILL	You put a sunset-viewing bench at the top of the tunnel.
	RÓKUS HILL	You made Rókus Hill more beautiful with benches, flowers, and pieces of art.
	NORTHERN RAMPARTS PROMENADE	Together with an environmental association, you built an insect hotel on the Northern ramparts promenade.
	SZENT ISTVÁN SQUARE	You volunteered at the House of Civic Communities.
	ZSOLNAY QUARTER	You organized a parkour competition in the Zsolnay Quarter.
	E78	You designed a light installation in the Pirogranite Courtyard at the Zsolnay Quarter.
	25-STOREY BUILDING	You took part in an ideas competition for young people and shared your ideas with decision-makers on how you would transform the 25-storey building.
	CSINOS BAR	You participated in the ASzPIK artists' market at the Csinos Bar.
	GREEN SPACE IN URANIUM CITY	You planted trees in the green space in front of your house.
	PTE FACULTY OF MEDICINE	You installed a bicycle rack in front of the building.
	BUS STOP	You put up poetic posters at bus stops to make the wait more exciting.
	KNOWLEDGE CENTER	You created a temporary work of art in front of the Knowledge Center.
	BALOKÁNY LIGET	You have become an active member of the Balokány-liget Association, helping to clean up and maintain the park.
	ESZTERGÁR LAJOS STREET	You painted graffiti on the wall which hides the rubbish bins on Lajos Esztergár Street.
	KÖZTÁRSASÁG SQUARE	You designed an urban game with your friends and play with them in Köztársaság Square and at festivals.
	LONG-DISTANCE BUS STATION	You participated in the community planning for the redevelopment of the long-distance bus station.
	PÉCS CULTURAL CENTER	You edit an internet newspaper for young people in Pécs.
	TRAIN STATION	You decorated the train station with flowers.
	BUS STOP IN VERSENY STREET	You cleaned up and painted the benches at the bus stop.
	FERENC VÁRKŐI STUDENT SPORTS CENTER	On the sports field you have designed a wheelchair obstacle course with disabled young people.
	MELINDA PARK	You rent a plot in the community garden.

Table 5

List of interventions with their associated locations and the number of players required to complete them

We also introduced situation cards that included specific places, problems, personalities, and institutions of the city relevant to young people to enhance the narrative and add excitement to the gameplay. These cards presented short scenarios with unexpected consequences: a player might have to move to another location, have reduced movement in the next turn, or choose three players to receive extra building blocks. These functions were embedded in stories located within the context of Pécs, following the city's logic. This approach ensured that the game remained grounded in the city's realities while providing a dynamic and engaging gameplay experience.

5.3.7.

Key Insights from the Evaluation of the Second Prototype

The evaluation of the first prototype, *ParticiPécs*, revealed significant advancements in crafting and integrating spatial practices into the game design to enhance children's understanding of their agency in shaping urban spaces. By structuring gameplay around these actions, the game provided a clear and organized framework that helped players understand specific ways they could engage with and influence their environments. However, a critical shortcoming was identified: the game lacked opportunities for players to bring their own ideas into the game. This limitation meant that players were not able to freely decide what, why, and how to change urban spaces, which is essential for fostering creativity and real-world problem-solving skills.

Despite successfully engaging players in problem-solving, their engagement was primarily focused on creating strategies for improved collaboration to progress within the game rather than consciously and reflectively interacting with the spatial environment. While their actions were not as rigidly predefined as in *Pop-up Pest*, the freedom they had did not relate to meaningful interactions with urban space, questioning assumptions, and exploring new ideas. Though this type of engagement is crucial for developing the ability to adapt to and shape one's surroundings, a core aspect of urban agency.

Therefore, it became evident that the game needed to evolve into a platform that did not only structure predefined actions but also allowed for the spontaneous creation and implementation of players' ideas. This realization led the design team to integrate this insight into the third design iteration, aiming to create a game that facilitates a deeper, experiential understanding of urban transformation and individual agency in order to better align with the educational goal of enabling young people to actively participate in and shape their urban environments.

5.3.8.

Designing a Game Environment for Personalized Actions on Space

During the evaluation process, it became evident that integrating individual actions reflecting children's needs and ideas was crucial. The game needed to offer a platform where players could creatively contribute actions aimed at enhancing their living environments. This involved fostering a space within the game where players could experiment with becoming proactive agents of change.

The first question was whether it was necessary to structure such a creative process within the game itself. To explore this, we conducted a playtest with university students. After playing a round of *ParticiPécs*, we tasked them with inventing small-scale urban interventions in groups, providing only paper, pens, and clay. The experiment failed as students struggled to cope with the task or took it frivolously, resulting in chaotic and unproductive outcomes. The playtest indicated that developing ideas for urban interventions seemed daunting or unfamiliar to participants. We assumed that by structuring interactions, providing opportunities for contribution, and embedding unfamiliar tasks within familiar gameplay, the creative process could become more accessible and engaging. Thus, we aimed to present this task as an integral component of gameplay, making it more approachable and allowing participants to experiment, learn, and collaborate in a low-risk environment.

In structuring the development process for urban interventions within the *ParticiPécs* add-on, we drew inspiration from Dewey's scientific method. Dewey's approach involves several key steps which can be tailored for quick prototyping of urban intervention ideas. The initial step, sense-making, involves observing and exploring the situation. In the add-on, this translates to players reflecting on their environment in small groups and identifying a location that is important in their everyday lives but problematic in some way. The next step, exploration and analysis, refers to examining and defining the site's problem. This is followed by developing a solution strategy for the site. Finally, players test their proposed solution through a thought experiment of a concrete action.

To facilitate these steps, we allocated specific time frames for each step and prepared a deck of cards with potential problems, solutions, and tactics (see Figure 25). These cards served as inspiration for players facing challenges with the task. This structured approach, rooted in Dewey's method, provided a framework for players to engage in the creative process of generating and testing urban intervention ideas within the *ParticiPécs* add-on, fostering collaboration and problem-solving directed to their active agency in urban development.




	elhanyagolt	ronda	ronda
	megjavítani	gondozni, gondozottá tenni	felhívni a figyelmet
	aláírást gyűjteni	gondozni, gondozottá tenni	felhívni a figyelmet

Figure 25

Sample cards for the ParticiPécs add-on

Note. The first row presents ideas for problem definition: neglected, ugly, uncomfortable. The second row presents ideas for problem definition: repair, care, raise awareness. The third row presents ideas for problem definition: collect signatures, paint something onto the tile, organize a flashmob.

5.3.9.

Insights from the Final Evaluation

The final evaluation revealed that the game effectively conveyed its primary message – that children can actively contribute to shaping their living environment. The core of the positive learning experience was participants' ability to engage in spatial practices within the game, which allowed them to feel their power and agency to positively impact their city.

It's about coming together and developing the city. For me it was really to keep feeling that when you drew a good card, you felt what it was like to be rewarded for doing something good and developing something. And you can be proud of it. And you didn't have to do a lot, like Leo, I don't know if I can say a name, he pulled the card with the bench and created it. And he didn't do anything but just straighten up and pick up the trash, so I thought it was really good. (Patricia, 19-year-old vocational school student)

Patricia's reflection highlights that experiencing actions within the game was fundamental, as it allowed participants to immerse themselves in situations of action and witness their consequences firsthand. This immersive experience is reflected in their feelings of pride upon completing interventions within the game world, demonstrating that they truly engaged with the actions, experiencing them as real positive deeds that elicited genuine emotions. This was particularly evident in how they reflected on the consequences of their actions. Some participants specifically mentioned an instance where they tagged and had to clean up afterward, resulting in them missing a turn. They found it easy to relate this to their real lives yet admitted they had not previously considered the consequences of such actions, but the game allowed them to experience this firsthand. This sense of agency, even within the confines of the game, provided a profound learning experience for many participants.

Patricia's reflection highlights another important aspect: the effectiveness of incorporating urban tactics as a central theme in helping young people understand their potential to shape urban spaces. Like many of her peers, Patricia was struck by the idea that even small-scale interventions can lead to positive changes in their living environment. This sense of wonder is evident when she mentions that "Leo" didn't have to do much – just fix a bench and pick up some trash – and yet, he created a pleasant space and contributed to the positive transformation of the urban environment. This illustrates the power and educational impact of incorporating spatial practices, scaled to the life situations of the target group, into the core theme of the game.

In the final evaluation, creating a situated experience through a well-designed, player-generated narrative thread proved crucial as well. Observing the gameplay, it became evident that the narrative thread had a significant positive impact. Players immersed themselves in the stories, giving meaning to their actions through the narratives. This often felt serendipitous, as players found themselves embodying strong characters in various situations. For instance, some players consistently encountered scenarios involving partying, vandalism, or breaking community rules, while others found their actions aligning with efforts toward environmental conservation. One of the participants explained this as follows:

Yes, I thought it was very good. Especially that there were characters, so you could get more involved in the game. So, Bonifác, Juli and G and Zsuzsi, we were shared with characters who fit us in some ways, maybe that's fate, but in some ways not so much. And you had to identify with that, and I think it was really good to have to think in that way. I, for example, got the lucky card that said I vandalized a bus stop after a party. And so I could totally imagine going to a party with my friend Andris, and unfortunately we were a bit drunk and vandalizing. So, I thought they were really good. I really liked it. If we'd had more time, I would have said we'd play another round. (Maja, 15-year-old art school student)

Maja's reflection reveals how the narrative strengthened both the play and learning experience. Players not only learned about these actions on a rational level but also experienced emotional engagement, allowing them to connect deeply with the scenarios. These consequences, in turn, affected the gameplay, promoting reflection on these spatial practices. This emotional involvement made the learning process more impactful, as players could empathize with their

characters and the situations they faced. These insights highlight the importance of integrating spatial practices within the narrative framework of the game, ensuring that players are not just passive recipients of information but active participants in a meaningful and engaging story.

The integration of spatial practices into the core mechanics was highly effective, as most participants found the urban development ideas the most intriguing aspect of the game. They eagerly read the situation and intervention cards aloud to each other, with some even requesting their peers to share if they did not. This demonstrated a high level of curiosity and engagement. Their interest was particularly evident when one team created a skateboard park at Tettys and read the card aloud, prompting a teammate to exclaim excitedly: “Finally! There would be a skateboard park in Pécs!” In the same team, the concept of an insect hotel resonated so strongly that players involved in the development narrated their actions in their own words, performing for their peers without even reading the development cards. This shift in attention from merely achieving progress in the game to understanding the meaning behind these actions highlights the successful integration of spatial practices into the game’s mechanics.

This was crucial, as participants generally had no knowledge or could not recall patterns of action that could improve or change urban spaces. As Martin pointed out, a major barrier to taking active steps to improve their environment is that young people do not have concrete ideas.

Researcher: And what hinders you from shaping your environment?

Martin: Not having a concrete idea.

It was therefore crucial to introduce young people to patterns of action that would enhance their imaginative capacity, enabling them to generate creative ideas for effecting positive change in their spatial surroundings. The impact of the actions presented in the game was so profound because participants encountered new insights and ideas that had previously escaped their attention.

Well, I didn’t know about these actions, like the flag-raising with the dog bark, I didn’t know about that either. I wasn’t informed about the smaller events like that, but now that I was told that it was real, it was interesting to hear. (Benjamin, 15-year-old Gymnasiumstudent)

Well, for example, I’ve learned a lot from playing the game. So, I didn’t know there was that flag thing. (laughs) Very cute, I didn’t know. And I didn’t know about the trash cans. Doing them now like that, I don’t know, maybe I’ll pay more attention to it now, more than I did before. (Barbara 17-year-old vocational school student)

Wow, well, I really liked it. It was very creative and funny. And it really made you think about things you hadn’t thought about. So, to paint a bench. And how that alone would help the city. I, for one, hadn’t thought of something like that. And I think it was really good that it used these situation cards to draw attention to the fact that it is possible to do things like that, that you don’t have to think in such huge steps. I thought it was really good. (Maja, 15-year-old art school student)

The final evaluation highlighted that meaningful connection between action patterns and children's everyday experiences is crucial for facilitating understanding and transferring learning into real life. This connection enables players to envision actions, contextualize them in real scenarios, and grasp their relevance and consequences. Resonating with their personal experiences, these actions fostered a sense of involvement and relevance, deepening players' understanding and learning. This is exemplified by a player who refurbished a bench at the Verseny Street bus stop in the game. After the game, he highlighted this situation as enlightening. He regularly goes to training sessions on Verseny Street and waits for the bus without a bench to sit on. Enthusiastic about installing a bench as part of a small community action, he found personal relevance in the game. This connection to a familiar place and problem increased his engagement and understanding, demonstrating how integrating real-life experiences into the game enhances learning and involvement.

The significance of personal connection and relevance is underscored by experiences where players struggled to establish this connection. In such cases, the situations presented in the game failed to resonate with the players, leading to disinterest and rejection. This phenomenon was evident in a suburban school setting, where the majority of students appeared to lack experience with volunteering and participation and showed little interest in the subject. These students showed no interest in urban issues and viewed civic engagement negatively.

During pilot testing and the final evaluation, two different classes at this school included one participant in each session who had prior experience in co-creating their environments. These were the only participants exhibiting a positive attitude toward the game and its themes, setting them apart from their peers. One student shared her involvement in an association and participation in a flashmob aimed at raising awareness about homelessness in the city center. Unfortunately, her classmates reacted with laughter, showing a lack of receptiveness to civic engagement efforts. The other student had previously renovated a playground in her housing estate with her father, remained silent about her experience in front of the class. She only opened up about her past experiences during a private post-game interview.

During the game, motivating students of this school proved to be a challenge. They were not fully engaged in the game and showed little interest in participating in the interventions. Surprisingly, even actions that are common in their neighborhood, such as tagging, graffiti, or parkour, failed to capture their attention. When these terms appeared on the situation or development cards during the game, they were met with confusion. It became evident that the students struggled to identify these concepts by name, despite being familiar with them in their neighborhoods. When I realized this, I provided brief explanations when such concepts emerged in the game. Suddenly, the students began to connect these concepts to their own experiences and surroundings and became interested. For instance, when I explained tagging, the students quickly identified tags on the school building and even attributed them to specific "authors". Likewise, when we talked about parkour, I found that some of the boys were practicing it themselves and were keen to show off their skills. One boy initially showed little interest in the game, refusing to play, and preferring to sit on the floor. However, when he heard about the parkour competition in the game, he quickly got

involved, placing a building block on the given development site, and persuading his friends to join in. This moment underscored the importance of personal relevance and continuity in learning. By recognizing familiar elements in the game, the students became more open and receptive to new topics and activities. It highlighted how establishing a personal connection to the subject matter can enhance motivation and engagement, ultimately facilitating learning and exploration of new ideas.

Experiences gathered from various game sessions shed light on the necessity of connecting with the diverse life experiences of children. The differing social and cultural backgrounds, and the different neighborhood contexts influenced how young people perceived spatial practices. For instance, downtown gymnasium students were unfamiliar with concepts like tagging and parkour, which resonated with the children from housing estates and helped them understand their potential to influence their environments. Conversely, downtown gymnasium students showed much more interest in actions related to environmental protection, such as tree or flower planting, or embellishing public spaces with decorations and street furniture. The action that garnered the most positive response in downtown schools involved players posting posters of contemporary poets' verses at bus stops for National Poetry Day. Several students highlighted this and expressed a desire to implement it in real life. However, in the eastern outskirts, this action was met with bewilderment by the players, who could not relate to it at all, and even the teachers chuckled at the idea.

These experiences underscore the importance of designing game scenarios that resonate with the diverse life experiences of children, enabling them to relate personally to the situations they encounter in the game. When children see their own lives and challenges reflected in the game, they are more likely to engage deeply and derive meaningful lessons. However, given that each child's life experience is unique, it is impossible for pre-generated content, no matter how responsive to cultural, social, and spatial specificities, to fully capture the breadth of these differences. Therefore, transformative games must create space for players to reflect on their own everyday experiences, problems, and challenges, and to devise actions that can improve their unique circumstances. This was facilitated through the *ParticiPécs* add-on.

The variety of ideas developed during the add-on phase (detailed in Section 6.3) highlights the necessity of providing an open, creative space. Players were able to leverage what they learned from the *ParticiPécs* game to generate ideas that genuinely reflected their needs. A compelling example of this is the *Birdhouse* conceived by art school students. These students felt isolated from the urban community and public visibility, with their creativity and innovation confined within the institution. Three sculpture students proposed to claim the adjacent green space of Rókus Hill by leaving an artistic mark. Their plan was to create a tradition where each class of sculptors would leave an artwork in the green area, starting with a birdhouse.

Despite the school's lack of support – offering no time, space, or materials – the students' commitment to their idea drove them to pursue it independently. We introduced them to the Normandia Lions Club of Pécs, a partner organization from previous game design workshops.

The students spent several weeks working at the club's premises to construct the birdhouse according to their design. When it was ready, they faced unexpected challenges during installation. They had not anticipated the height of the trees in the park nor formulated a plan for hanging the structure. But the situation was resolved with the timely intervention of the public groundsman who happened to be present, as shown in Figure 26.

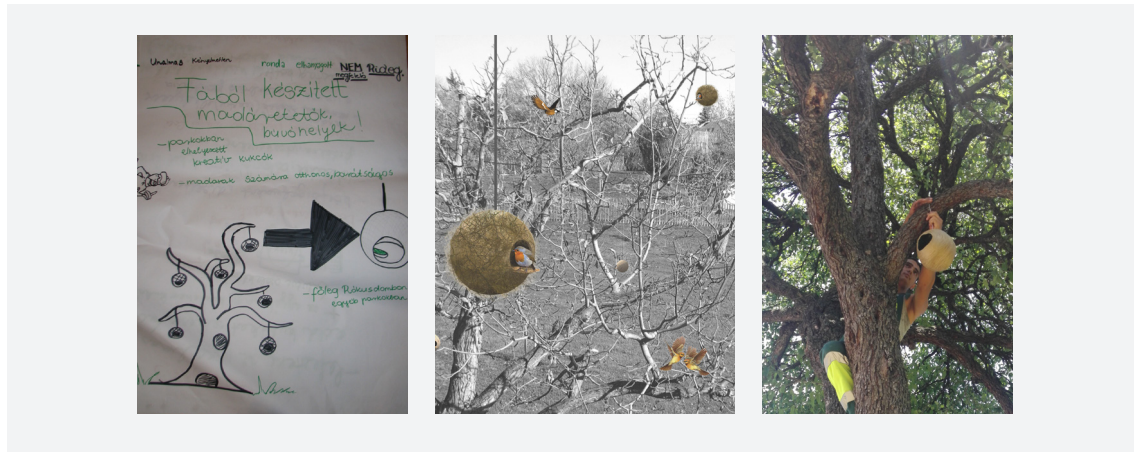


Figure 26
Birdhouse – from the idea to the implementation

Note. On the left: The poster created by participants during the game session. In the middle: The exhibition display, designed by Borbás Réka and Borbás Renáta, based on the children's idea. On the right: Spontaneous assistance from the public groundskeepers during the implementation of the idea.

5.3.10.

Concluding Design Principles on Situated Actions upon Space

From the outset, one initial design principle guiding the game design process was that transformative games should provide situated environments where players experience spatial practices connected to their real-life experiences. This principle is based on the idea that games create environments where situated meanings emerge from players' actions. To foster learning to understand and actively shape the spatial environment, these actions must reflect spatial practices that shape urban spaces. The iterative journey of designing and testing the prototypes provided invaluable insights into how spatial practices can be effectively integrated into game design to foster meaningful, situated learning experiences for players.

First, it became clear that deep learning occurs when spatial practices, central to the game design, are clearly defined and tailored to the context of the game, its educational purposes, and the dispositions and interests of the target audience. It is essential to identify which actions and practices align with the game's purpose and are understandable and relevant to the tar-

get group. In the case of the *ParticiPécs* game, our purpose was to emphasize young people's active agency in shaping their spatial environments. We found that urban tactics – small-scale interventions in public spaces that require little resources and show immediate results – best communicate this message. Therefore, we placed such actions at the heart of our game design.

Another insight was that these spatial practices must be meticulously woven into every aspect of the game system, ensuring they permeate the overall theme, narrative framework, and players' actions. This comprehensive integration is crucial for reinforcing the core content and message of the game. By embedding spatial practices at every level, players are provided with a cohesive and immersive experience. This approach allows players to remain captivated and focused on the overall theme, fully engage in the game's narrative, and derive meaningful insights from their actions. Such deep integration fosters a profound learning process, making the educational objectives of the game more impactful and meaningful to the players.

The research process emphasized the critical importance of designing genuinely experiential situated practices. The logic, process, and context of spatial practices must be accurately reflected in the game mechanics. This leverages the inherent strength of games to dynamically represent processes, allowing players to experience these activities as genuine practices rather than abstract tasks. When players engage in actions that mirror real-world spatial practices, they understand the underlying processes and contexts, making their learning experience more authentic and impactful.

To provide authentic experiences of spatial practices, these need to be contextualized in a manner that aligns with children's life experiences. This can only be effectively achieved through co-creating content with the target group, ensuring that the content authentically reflects children's urban experiences (see Principle of Co-designing Spatial Contents in Section 5.2.11). Aligning action patterns with children's life experiences is crucial for establishing a strong connection and continuity between the game world and their real-world environments. This alignment ensures that players can relate to the game scenarios and see the relevance of their in-game actions to their daily lives. However, it is equally important to ensure that these action patterns not only reflect children's experiences but also align with the actual spatial logic and context of the urban environment represented in the game. By embedding spatial practices that are both personally relevant to the players and contextually accurate to the game's setting, we can foster deeper engagement and understanding among the players.

Finally, this reflective journey led to the crucial recognition that to fully harness the educational potential of transformative games, they must move beyond predefined scenarios and embrace player-driven innovation. These games should provide a platform for players to develop and implement their own ideas for shaping their spatial environment. This approach promotes autonomy and creativity, inspiring players to become proactive agents of change in their communities. It not only reinforces educational goals but also fosters a sense of ownership and responsibility towards their real-world environment.

These insights led me to derive design principles that can guide future transformative game development processes to foster learning to understand and actively shape the spatial environment.

Spatial Practices Principle

Transformative games are designed to reflect spatial practices, thereby fostering a deeper understanding of space constitution.

Tailor-made Spatial Practices Principle

Spatial practices, that are at the heart of the transformative game design, are well-defined and tailored to the context of the game, aligning with its educational purposes and the interests of the target audience.

Holistic Integration of Spatial Practices Principle

Transformative games integrate spatial practices into every aspect of the game system, ensuring they permeate the overall theme, narrative framework, and players' actions, and making the educational objectives more impactful and meaningful to players.

Experiential Spatial Practices Principle

Transformative games represent spatial practices in their dynamic, processual nature, ensuring that the logic, processes, and contexts of these practices are accurately embedded in the game mechanics. This approach fosters situated meaning-making and promotes a profound understanding of how spaces are constituted and transformed.

Contextualized Spatial Practices Principle

In transformative games, spatial practices reflect children's experiences and align with the spatial logic and context of the urban environment represented in the game to support the continuity of experience and enhance learning. To ensure these practices are both personally relevant and contextually accurate, co-creating the content with children is essential.

Player-generated Spatial Practices Principle

Transformative games move beyond predefined scenarios and embrace player-driven innovation by providing opportunities for players to develop and implement their own ideas for actions upon space within the game. This approach fosters creativity, autonomy, and a sense of ownership, encouraging players to become proactive agents of change in their real-world environments.

5.4.

Advancing Design Principles on Social Participation

The third initial design principle that set the ground for the game design process was that transformative games foster social participation. This principle was based on the premise that games can be framed as a social phenomenon that fosters social interactions, which enhance co-construction of meanings, essential to learning, and integrate the social dimension of space constitution. Thus, during the development of the first prototype, one key question I was looking to answer was how to bring together social participation in shaping the spatial environment and social learning within a transformative game design? Through this iterative process, we aimed to create a game that not only engages children in meaningful social participation but also enhances their understanding of their role in urban development.

As we progressed, this design principle evolved, becoming more refined and enriched with additional insights. Each iteration brought us closer to understanding social participation in shaping urban spaces from the perspective of children and game design, leading to the emergence of new design principles.

5.4.1.

Integrating Social Participation into the Core Game Content

While developing the first prototype, our goal was to provide players with a comprehensive understanding of how individuals engage with and influence urban spaces. We aimed to contextualize individual contributions within the framework of social participation in urban development, emphasizing its social aspects and various forms of collective action. By embedding social participation into the game's core content, we wanted players to see themselves as active participants in shaping their environment, highlighting the importance of collaborative efforts in urban development. This meant creating opportunities for players to engage in collective actions that mirror real-world urban development processes. For instance, we incorporated activities that required players to collaborate in urban interventions, such as community gardening projects, organizing neighborhood events, or advocating for new public amenities. These activities were designed to reflect the social dynamics and collective efforts involved in actual urban development.

This integration of social participation into the game's core content was not only about understanding spatial practices but also about experiencing the social processes that drive urban development. By doing so, we sought to relate a transformative game experience that encouraged young people to see themselves as active agents capable of making meaningful changes through collaborative efforts in their communities.

5.4.2.

Translating Social Learning into Game Mechanics

To effectively promote social learning, we aimed to integrate it into the game mechanics. Cooperative learning theories provided a robust foundation for this integration. These theories offer a well-established framework for fostering collaboration and teamwork among learners, ensuring that learning emerges through social interactions.

Specifically, we drew on Kagan's (1994) approach to cooperative learning, which operationalizes cooperation in a way that can be directly applied to game design. Kagan identified four key characteristics of cooperative learning: 1) positive interdependence, where the success of groups or individuals is linked; 2) individual accountability, meaning everyone is responsible for their own work and the group's overall performance; 3) equal participation, which ensures that responsibilities are shared equally; and 4) parallel interactions, which promote continuous social interaction among individuals. By incorporating these principles, we aimed to create a learning environment within the game that emphasizes collective effort and social engagement.

Our goal was to translate these cooperative learning principles into the game's fundamental mechanics to provide a structured way for players to engage in meaningful, cooperative interactions that mirrored real-world social dynamics and urban development processes. We found the jigsaw method, formulated by Elliot Aronson (1972/2007), to be particularly suitable for our purposes. In the jigsaw method, each learner holds a piece of the material necessary for the overall understanding, requiring cooperation to assemble the complete picture. This method fosters learning by making individuals dependent on each other's knowledge and contributions to achieve a common goal, while also having the potential to mirror the interconnectedness and social embeddedness of urban spaces, emphasizing both individual roles and collective responsibilities.

Following the jigsaw-method, we devised the framework for players collaboration within the *Pop-up Pest* game but introduced a competitive element by organizing participants into three competing groups. This competitive aspect aimed to enhance the gameplay's excitement and fun. The division placed participants into three groups corresponding to the previously identified fields of activity: transport, urban green spaces, and culture. While all groups shared the overarching objective of improving their living environment through everyday spatial practices and urban interventions, each group had its distinct goal aligned with a specific field of activity and every player was assigned an individual mission (see Section 5.3.2). Figure 27 shows the group goals and their associated individual missions. Each team comprised the maximum of four players, and the collective goal was achieved only when every player successfully fulfilled their individual mission, thus illustrating the interconnectedness of cooperative efforts in enhancing a specific aspect of the neighborhood.

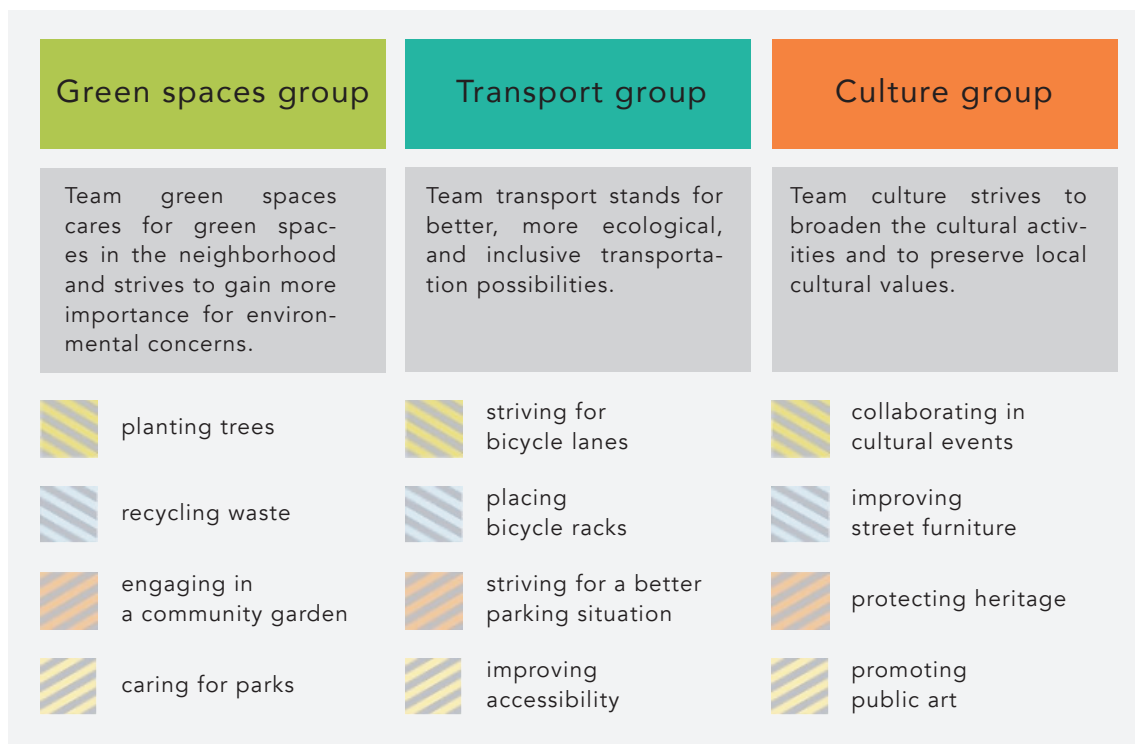


Figure 27
Teams and individual missions in Pop-up Pest

Similar to the jigsaw method, in the *Pop-up Pest* game, every player's contribution was vital for achieving the team objective. The game design emphasized positive interdependence, meaning that players could only succeed if each team member fulfilled their role. Players were organized into teams, each striving toward a shared goal, and the success of the entire team hinged on the accomplishments of each individual member. The achievement of the group's objective was contingent on the active participation of every player within the group.

To enhance individual accountability, we implemented a system where each player was assigned a specific task directly contributing to the group's overall objective. The failure of any player to complete their designated task resulted in the failure of the entire group. Communication of each player's individual mission was reinforced through various game elements, such as personalized situation cards (e.g., a player assigned the mission of improving accessibility received situation cards related to this topic), the customization of building blocks (e.g., the building blocks of a player with the mission of improving accessibility depicted a ramp), and the customization of development sites (each player had designated development sites, which was shared with one player from each of the other teams). Figure 28 illustrates the personalized game elements, and Figure 29 displays the designs for each building block.



Figure 28
Personalized game elements in Pop-up Pest

Note. On the pictured part of the game board, there are two numbered starting fields with colored stripes and four development sites with grey-colored stripes, indicating which player they belong to. Next to the game board on the floor are the personalized situation card sets, with the personalized building blocks in the background next to them.



Figure 29
Designs of the building blocks in Pop-up Pest by Dóri Sirály

Note. The first row shows individual missions in team transport: striving for bicycle stands, improving accessibility, striving for bicycle lanes, striving for better parking situation. The second row shows individual missions in team culture: protecting heritage, improving street furniture, promoting public art, participating in cultural events. The third row shows individual missions in team urban green spaces: caring for parks, recycling waste, planting trees, engaging in a community garden.

To ensure an equitable distribution of responsibilities, we established on a functional level uniform tasks for each player. This meant that every player had to acquire and place a total of three building blocks symbolizing their actions in development sites to fulfill their tasks.

Additionally, we implemented rules to enhance interaction and cooperation among players. For instance, players could assist their teammates in placing building blocks or reserve a development site. To foster interaction and positive interdependence across different teams, we introduced the visiting rule. After successfully developing a site, players were required to visit an activity space of another team. This rule aimed to encourage communication and cooperation within and between teams.

In summary, our objective was to create a cohesive learning experience that harmonized social participation and social learning within the game design. By embedding social participation into the game's main content, we aimed to contextualize individual contributions within the broader scope of urban development, emphasizing the importance of collective action. Simultaneously, we integrated social learning into the core mechanics by leveraging cooperative learning theories. With this dual focus we wanted to ensure that players not only understand the significance of their roles in shaping urban spaces but also experience the dynamics of teamwork and collaboration firsthand.

5.4.3.

Key Insights from Evaluating the First Prototype

The evaluation of the first prototype aimed to explore how the cooperative game mechanics were received and influenced players' experiences and interactions, as well as to assess the success of integrating social participation and social learning into the game design.

Evaluation showed a very positive reception of the cooperative game mechanics. Both the aspect of sharing a common goal as a team and the teamwork itself were appreciated, and even highlighted by participants as the key sources of fun while playing. Players were attentive to each other and engaging in constant communication to succeed as a team. They shared successes, interesting insights, and laughter, and provided help when needed (see Figure 30).

This was noteworthy given the challenges faced by team members in playing together successfully at the festival setting, where players often did not know each other and decided to play spontaneously. Despite the constant hustle and bustle, music, and other activities at the festival, players managed to keep track of each other, monitor progress, and offered assistance if someone encountered difficulties (see Figure 31).



Figure 30

A moment of sharing excitement with teammates



Figure 31

Players turn their attention to another player while placing their building block on a development site

The positive effects of cooperative mechanics, particularly positive interdependence, were even more pronounced during school playtesting, where external disruptive effects were minimized. Positive interdependence supported collaboration among players, enabling even those who had difficulty socializing to participate effectively. For instance, during one school playtest, a socially isolated boy who was initially excluded by his peers became an integral part of the team once the game started. The common goal and positive interdependence transformed peer interactions, allowing the boy to contribute effectively and be recognized by his classmates.

Despite the positive feedback on the cooperative game approach, the evaluation also revealed areas for improvement. While players enjoyed teamwork and were motivated by a common goal and positive interdependence, the game still emphasized individual engagement rather than deep cooperation. This was also reflected in the situations players engaged with in the game: these scenarios often involved players in activities like volunteering, community events, or participatory processes. These activities were frequently designed to be

more about observing and participating in pre-defined roles rather than initiating and leading collective actions. For example, players might have been tasked with supporting a community garden project by following instructions, rather than collaborating with others to plan and execute the project from start to finish. This design choice led to a form of participation that was more about following along with the given tasks, rather than actively engaging in decision-making and collective problem-solving. As a result, while players were involved in community-oriented activities, they did not fully experience the empowerment and agency that comes from being actively involved in shaping and directing those activities. The findings highlighted a critical need to shift from cooperation in pre-defined actions to deeper, meaningful collaboration among players.

The other fundamental insight was related to the quality of the cooperative game mechanics. We found that the game mechanics, guided by teaching methods, were somewhat disconnected from how young people naturally interact in and with space. This disconnection stemmed from the complex goal system implemented in the game, which often left players struggling to differentiate between individual missions and team goals. For instance, while the game aimed to teach players about collective urban development, the structure of its objectives made it challenging for players to clearly see the connection between their personal tasks and the overarching team goals.

The mechanics felt overly mechanical, which impeded the natural flow of play and learning. Instead of feeling immersed in a dynamic and engaging environment that mirrored their real-life interactions with urban spaces, players were frequently bogged down by the need to manage and balance multiple, often competing, objectives. The game presented a series of tasks and goals that felt more like an academic exercise than a real-world application of urban engagement. This lack of alignment with players' lived experiences meant that the educational potential of the game was not fully realized, as players were unable to fully understand collective actions on space reflected in the game world.

The next iteration of the game therefore concentrated on creating collaborative patterns that mirror young people's real-life spatial practices and to improve the integration of social participation and learning into the game design.

5.4.4.

Redesign: Collaborative Game Mechanics

One crucial outcome from the initial design cycle was the overwhelmingly positive response to the cooperative game mechanics. As a result, the second design cycle focused on enhancing player collaboration. This involved reducing competitive elements and restructuring the game to allow more self-organization and fewer constraints. The goal was to move beyond cooperation towards genuine collaboration, improving meaningful social interactions central to the game.⁴¹ Additionally, the collaborative structure was adjusted to better reflect children's real-life experiences and collaborative approaches to space production.

The concept of collaboration between players was developed early in the game design process. The early paper-based prototypes on the narrative framework showcased diverse approaches to player collaboration, setting the stage for robust discussions within the design team about the integration of social participation into the game design (see Table 3). Out of the six prototypes, three failed to show any improvement over the original *Pop-up Pest* game. But three prototypes introduced new approaches to players' collaboration.

In the prototype “New Year’s Eve”, for instance, all players teamed up to compete against the game system. In this version, all players had the same goal: get to Széchenyi Square by midnight so they could watch the fireworks together. Meanwhile, the players had to overcome individual obstacles, but players helped each other to reach their common goal. In other words, this prototype eliminated competition between teams, but the focus was still on achieving individual goals for the sake of reaching the common goal.

Two prototypes, “*Urban development game*” and “*Empty plots*”, introduced a novel approach. In these versions, players were required to spontaneously organize themselves into temporary groups to address a specific challenge. Members of these impromptu groups collaborated for a brief, predefined duration. Once the task was accomplished, they reorganized into new alliances for subsequent challenges. This innovative mechanic aimed to inject dynamism into the collaborative aspect of the game, fostering flexible and dynamic collaboration among players.

Following a thorough discussion during the designer screening, the design team opted for the strategy of temporary alternating groups. This decision was guided by considerations related to play experience, learning, and space production.

In terms of play experience, the approach of collaboration in alternating temporary groups stood out. This structure required players to consistently reorganize themselves, introducing elements of variety, surprise, and continuous interaction. Collaboration, recognized by players in previous playtests as a key factor for a positive gaming experience, appeared most intense in this form. It necessitated ongoing communication and coordination between players, fostering a strong reliance on collaboration in the absence of individual tasks.

From a learning perspective, this form of collaboration allowed the integration of collaborative learning structures, such as positive interdependence, individual accountability, equal participation, and parallel interaction, in a more open manner. This approach empowered players to self-organize and, by requiring more intensive exchange and interaction between players, could potentially contribute to a richer learning experience (Bruffee, 1995; McWhaw et al., 2003).

Moreover, considering the spatial dimension, this collaborative gameplay design aligned with the lessons learned from the previous design cycle. The concept of constantly changing and temporarily collaborating teams proved most fitting, mirroring the way young people organically organize themselves, often facilitated by digital communication technology, within physical spaces (Juris, 2012; Skelton & Gough, 2013).

Based on the above considerations, we developed the concept of collaboration in spontaneously organized groups for the *ParticiPécs* prototype. During the design process, several questions arose about the concept that challenged the design team. Initially, it was difficult to imagine how a game mechanic based on spontaneous self-organization could work, how it could be incorporated into a set of rules, and how it could be managed through rules to prevent self-organization from ending in chaos and disrupting the gameflow. Our solution to this was to simplify both the goal system and the rule system. We therefore set one common goal for the players: to implement as many public space interventions as possible with the resources available. In other words, the players had no individual goals, no teams, no thematic categories, nothing that diversified the common goal in any way. All players worked to implement as many interventions as possible – that is, to make the city a better place for young people – and they collectively scored points for their interventions, with a common outcome at the end of the game.

On the other hand, as we progressed in developing the concept of collaboration, it became evident that a set of rules was necessary to avoid chaos and ensure the smooth running of the game. While our initial intention was to make collaborative actions as open as possible, allowing players to decide what to do, with whom, and how many players to involve, we gradually introduced elements to support players' decision-making. For instance, we related interventions to specific (real-world) locations and specified how many players (1, 2, 3, or 4) needed to collaborate to carry them out successfully. Ultimately, we crafted the stories and contents of the interventions. Players could read these on the development card they received after successfully implementing an intervention.

Further in the design process, the question arose if collaboration is so important, how do we ensure that constant strategizing does not distract from the main message of the game? During the development of the second prototype, we adhered to the guiding principle that the overall theme of the game serves as the directorial principle governing every element and detail. Accordingly, we extended this principle to the collaboration between players. This meant that collaboration could not be an end in itself or a mere enhancement of the game experience; it had to align with the logic of the game's overall theme – the appropriation of urban space by young people through small-scale interventions.

The revised design of the *ParticiPécs* game emphasized collaboration as a key component of urban interventions. The collaborative process was integral to the gameplay, as players were required to work together from the inception to the execution of their projects. In practice, this meant that players had to engage in several collective decision-making steps. Initially, they needed to identify and agree upon a specific site within the game that they wanted to improve. Once the site was selected, players had to find collaborators who were willing to join forces for the implementation phase. The actual implementation of the intervention required joint effort, represented in the game by the physical placement of building blocks on the selected site. This mechanic was designed to simulate the collaborative nature of urban interventions, where multiple actors contribute to the development and transformation of a space. The process of placing building blocks symbolized the tangible efforts and coordination required to bring a collective vision to life.

We also took care that players' collaborations became a constituting and integral part of the unfolding narrative of the game. If, for instance, three players needed to collaborate to execute an intervention, this collaboration was seamlessly integrated into the storyline:

You decorated the train station with flowers.

You read about guerrilla gardening on a blog. You are very interested in anything that is revolting, resistant, but still has some positive results. You decided to give it a try, and you went into "illegal flower planting". Together with two friends, you planted marigolds in the empty flowerbeds of a train station under the cover of night. One of them brought flower seeds from home, while your other friend shone a flashlight while you planted the marigolds. A few weeks later, the platforms were in bloom and a much more beautiful sight awaited visitors to Pécs. It was a great action!

Another concern was how we can get players interested in collaborating with each other. To encourage collaboration, we implemented a graduated point system that rewarded increasing points based on the number of people collaborating in interventions. Implementing interventions individually earned 1 point, two-person interventions earned 3 points, three-person interventions earned 6 points, and four-person interventions earned 10 points. Additionally, we imposed limits on building materials to motivate players to use their resources efficiently. This limitation prompted effective collaboration among players to make the most of their limited resources.

With these improvements we aimed a holistic integration of social participation and social learning into the game design and to create collaborative patterns in game mechanics that mirror young people's real-life spatial practices.

5.4.5.

Key Insights from the Evaluation of the Second Prototype

The evaluation of the second prototype provided critical insights into the collaborative game mechanics. A significant improvement was achieved compared to the first prototype by organizing the game objectives around a common goal, entirely eliminating competition, and focusing exclusively on collaboration between players. This included developing a common strategy and executing joint actions. Initial observations and surveys revealed that players appreciated the collaborative mechanics, finding them motivating, easy to understand, and adaptable. The continuous coordination, strategy development, and random group organization were well-received, aligning seamlessly with the game's theme, message, and narrative.

However, upon deeper analysis of players' social interactions, it became evident that the principle of social participation in acting upon space was not fully adhered to. The initial game design principle, guided by Dewey's learning theory, emphasized that learning occurs through active engagement in collaborative inquiry and communication with others. The game's col-

laborative mechanics aimed to foster this by providing a platform for active engagement in collaborative actions, where success depended on social interaction among players. Despite this, the interactions within the game primarily revolved around the functional aspects of game actions rather than substantive discussions related to shaping urban spaces. Players focused on strategy and rule clarification, such as: “In the next round I can put my building block on the northern city wall. Are you coming as well?” and “Yes, we can enter the same intervention field at the same time”. While these interactions facilitated game progression, they did not align with the intended learning objectives of engaging in shared inquiry and problem-solving activities about urban spaces. Moreover, interactions related to shaping urban spaces occurred mostly through game elements like drawing situational or developmental cards. Brief dialogues sometimes followed these actions, with players commenting on the cards, but collaborative thinking, problem-solving, and reflection were infrequent or absent.

This realization highlighted the need to reassess the prototype from the perspective of social participation. It became clear that the game needed to introduce scenarios where players could exchange ideas about the game’s theme, collectively contemplate relevant urban spaces, and formulate problems and collaborative solutions. By doing so, the game could better align with Dewey’s collaborative approach to learning, ensuring that social interactions within the game foster deeper understandings of urban development and enhance the educational impact of the game.

5.4.6.

Redesign: Collaboration on Transforming Spaces

Our primary objective in designing the third prototype was to enhance players’ experiences of collective action, emphasizing strategic planning and real-world applicability over mere game progression. We aimed to shift the focus of social interactions from achieving in-game goals to developing actionable plans that players could implement to effect positive change in locations that were relevant to them.

To achieve this, we retained the basic game structure to provide players with familiar action and collaboration patterns. In addition, we introduced an add-on round specifically designed to foster deeper engagement with the concept of urban interventions. During this round, players were tasked with collaboratively developing an idea from start to finish. This process included setting a problem, brainstorming solutions, and creating an action plan. This approach was intended to mirror real-world processes of collective action, thereby providing players with a practical understanding of how they could contribute to improving their spatial environment.

5.4.7.

Insights from the Final Evaluation

The final evaluation demonstrated significant advancements in the understanding of integrating social learning and social participation in shaping spaces into the game design. This subchapter delves into these findings, exploring the design principles manifested in practice, and how the alignment of the game environment with collective action upon space fostered engagement, motivation, and a deeper learning experience.

The collaborative game approach received overwhelmingly positive feedback from young participants, emerging as a key source of enjoyment. The collaborative game approach not only made the game more enjoyable but also reinforced key educational objectives. By experiencing the benefits and challenges of working together in a simulated environment, young people gained valuable insights into the dynamics of social participation and collective action in urban spaces.

The evaluation revealed significant insights into how social learning was effectively fostered through the collaborative gameplay of *ParticiPécs*. In the first round, the absence of competition encouraged players to be more open and supportive of each other's achievements. This environment of mutual support and positivity was crucial in enhancing the overall learning experience. Players found particular enjoyment in engaging with situation and development cards, which facilitated exchange of ideas and experiences. This interaction could lead to spontaneous learning moments, especially when players encountered unfamiliar concepts or actions presented on these cards. For instance, during one game session, players were tasked with constructing an insect hotel on the north castle wall. Many participants were initially unfamiliar with the concept, viewing it as more amusing than practical. This unfamiliarity sparked a collaborative brainstorming session, where players shared ideas and discussed the potential purposes and benefits of an insect hotel. This exchange not only clarified the concept but also demonstrated the power of collaborative learning. The game's collaborative approach also highlighted the importance of social interactions in learning. Players frequently sought assistance from the game master or their peers when faced with new challenges, exemplifying a learning environment where knowledge is co-constructed through dialogue and shared experiences.

In the *ParticiPécs* add-on, social learning among participants reached a higher level, as players engaged in meaningful exchange while experimenting with collective action by ideating urban interventions. Most groups successfully devised interventions, finding motivation as their ideas took shape. However, individual differences in skills, attitudes, and strategies led to varying success levels. This diversity was evident in how three teams from one school approached the task.

One group from this school chose to focus on renovating the school's football pitch. One of the boys in this group was visibly passionate about the cause and was visibly concerned about

the state of the pitch. The group outlined specific defects they aimed to fix through a community initiative. Some aspects, such as replacing torn nets or repairing the asphalt, would require financial resources. Another member of the team could connect with the idea at this point, suggesting community actions such as paper collection or bake sales that they could carry out themselves to raise the necessary funds. This group, thus divided different tasks and aspects of planning the action to improve the football pitch regarding their personal interest and skills: one being responsible for defining the task, another one to find resources, other two assisted in hands-on tasks like weeding or constructing. This group's success exemplified effective collaboration, with each member contributing uniquely to a collective idea. The structured add-on phase helped guide their idea development smoothly.

A second group could not agree on a specific location and problem to solve, but they were clearly captivated by the creative tactics they had learned through the game. As a result, they chose the city's main square as the intervention site, where every team member could develop a specific intervention of his or her personal interest. Their ideas included placing flowers in raised beds, allowing children to paint graffiti on its walls, painting footprints on the pavement to guide tourists, and installing bicycle stands. This group's example illustrates how the creative tactics introduced in the *ParticiPécs* game inspired players who struggled to generate ideas collectively to improve their environment.

A third group initially resisted the task, struggling to brainstorm urban interventions. Recognizing their struggle, the facilitator provided intensive support, prompting the group to explore personal experiences for inspiration. In a last-minute breakthrough, one member proposed the renovation and embellishment of the children's hospital, drawing on personal experiences. The other members of the team were able to relate to this experience with their own experiences, thus motivating them to think together. Although time constraints limited their idea's development, a class discussion highlighted the concept's compelling nature, resonating deeply with the group. They collectively developed further the idea to painting the pediatric wards with cheerful drawings. This idea resonated deeply with the entire class, with one participant even declaring it their favorite among all proposed ideas and expressing a keen interest in participating in its realization. This example underscores the significance of facilitation in guiding participants through unfamiliar terrain, enabling them to overcome barriers such as feelings of powerlessness, perceived lack of competencies, or lack of ideas. At this point, the game master played a key role by guiding the group's collective thinking with targeted questions, breaking the deadlock, and bringing new perspectives to the collective deliberation.

These experiences highlight the importance of a structured yet flexible add-on phase, allowing participants to explore and self-direct collaborative processes contextualized for collective action planning for improving the living environment. This approach provided a framework within which participants were guided through the process of ideation and planning while providing space for individual problem-solving and collaboration strategies, fostering ownership and involvement among diverse participants. The success of this approach underscores the importance of providing a possibility space in transformative games where players can collectively generate ideas for change.

The final evaluation demonstrated that the collaborative game approach enhanced the understanding of how social participation and collective action shape the spatial environment.

What was new was maybe the fact that I think you set the games so that you needed four people, then that's obviously something that's not easily achieved. So that requires a lot more mobilization. And I think the others also got that, and so they got a sense of how much energy, how much dedication, enthusiasm, and perseverance it takes to make the whole place better. (Maja, 15-year-old art school student)

Maja, like other participants, emphasized that collaborative efforts highlighted the importance of community collaboration in urban changes. This suggests that the game's collaborative mechanics were crucial for deepening participants' understanding of the social dimensions involved in transforming spaces. Experiencing collaboration in the game illuminated both the potential and the process of collective action. From a game design perspective, it can be concluded that transformative games with collaborative mechanics help players learn to understand and act upon space.

However, the findings also revealed that the adoption and practice of collaboration and thinking in terms of shared goals and community showed significant differences. In two schools, there were instances where participants exhibited confusion or resistance towards collaboration during the game sessions. In these cases, participants expressed a preference for competition. This sentiment was further highlighted by behaviors such as individuals keeping track of their points independently, reluctance to cooperate with teammates in interventions, and the pursuit of individual strategies instead of working towards a common goal. Moreover, participants seemed to derive satisfaction when a teammate drew a situational card with negative consequences, indicating a competitive mindset where the misfortune of others was perceived as beneficial. In these schools, the collaborative process of developing ideas for urban interventions during the add-on phase presented significant challenges.

Exploring the potential reasons behind these differences exceeds the scope of this research. Nevertheless, it became apparent that in educational settings where pedagogical approaches emphasizing collaboration are commonplace – such as vocational or art schools where students frequently engage in collective hands-on projects – participants demonstrated a greater ease in embracing collaboration within the game and understanding the social dimension of the transformation of urban spaces. In contrast, in elite high schools characterized by a competitive atmosphere that permeates students' daily experiences, collaboration posed more challenges. These disparities in collaborative behavior and mindset were not easily reconciled within a single gaming session. The observed variations underscore the influence of educational culture and institutional norms on students' readiness and ability to engage in collaborative endeavors. While further investigation of the factors underlying these differences is warranted, these results underscore the importance of considering the broader educational context when designing transformative game experiences that aim to promote social participation in the shaping of urban spaces.

5.4.8.

Concluding Design Principles on Social Participation in Transformative Games

From the outset, one initial design principle guiding the game design process was that transformative games foster social participation. This principle was based on the premise that games can be framed as a social phenomenon that fosters social interactions, which enhance co-construction of meanings, essential to learning, and integrate the social dimension of space constitution. The iterative journey on designing and testing the prototypes has provided invaluable insights into how social participation can be effectively integrated into the game design to foster learning about the social dynamics of space and the collective actions directed to shaping the spatial environment.

The development and testing of the prototypes underscored the essential role of the aspect of social participation in developing an understanding of the dynamics of space. Social participation allows individuals and communities to actively engage in shaping their environment, highlighting how urban spaces are continuously influenced by collective actions. This understanding is crucial for fostering a sense of agency and responsibility among players, making them aware of their potential to contribute to urban development.

It became also evident that to promote learning about the social aspects of space, it is important to integrate the social aspects into the different levels of game design from the core contents to the mechanics. This can be achieved, on the one hand by integrating collaborative action patterns which provide players with practical examples of how social participation impacts urban spaces, combined with collaborative mechanics that involve players in collective activities, which rely on teamwork, shared decision-making, and collaborative problem-solving. Through such a holistic approach, players experience firsthand the social dynamics of the spatial environment and the potential of collective actions in shaping it.

Thus, transformative games place collaboration at the heart of their design by incorporating collaborative game mechanics, where players pursue shared goals and make joint efforts to effect positive change. In these games, collaboration is not merely an ancillary feature but a core component that drives the gameplay and learning outcomes. This means, that collaboration in transformative games is contextualized: collaborative efforts within the game are not just about strategizing for the sake of winning but are deeply connected to the core content and educational objectives of the game.

This reflective journey led to the crucial recognition that transformative games must provide an experiential space for collective action. In such a space, players can fully engage in the effort and power of coordinated, strategic initiatives. This approach makes tangible how young people can become proactive agents of change in their local environments and communities. The core idea here is to shift from passive learning to active participation, where players are not just learning about social participation and urban development theoretically but are

actively involved in the processes. Through gameplay, they experience the complexities and rewards of collective action. This immersion helps them transfer these experiences to real-life situations, supporting young people to take active roles in their communities.

These insights led me to derive design principles that can guide future transformative game development processes to foster learning to understand and actively shape the spatial environment.

Social Participation Principle

Transformative games reflect the idea of social participation, essential in understanding the dynamics of space.

Holistic Integration of Social Participation Principle

Transformative games integrate social participation into every aspect of the game system, ensuring they permeate the overall theme, narrative framework, and players' actions, and making the educational objectives more impactful and meaningful to players.

Collaboration Principle

Transformative games place collaboration at the heart of their design by incorporating collaborative game mechanics, where players pursue shared goals and make joint efforts to effect positive change. This approach enhances both learning through meaningful social interactions, and the understanding of the social dynamics of spaces.

Contextualized Collaboration Principle

Collaboration in transformative games is contextualized and deeply connected to the core content and educational objectives of the game. This principle aligns collaborative tasks with real-world patterns of collective action, ensuring relevance and practical application.

Collective Action Principle

Transformative games provide an experiential space for collective action where players can fully engage in the effort and power of coordinated, strategic initiatives on transforming the spatial environment, transferring the learnings from the game into new, real-life experiences.

Notes

- 35 On the 1st of January 2021, based on the data of the Hungarian Central Statistical Office (Központi Statisztikai Hivatal). https://www.ksh.hu/apps/hntr.telepules?p_lang=HU&p_id=19415 (Retrieved 08/03/2024)
- 36 In Hungary, primary education typically spans eight years (grades 1 to 8). Secondary education typically spans four years (grades 9 to 12) and comprises two main types of schools represent in this research: gymnasium, which enroll the most academically gifted students and prepare them for the high school graduation exam and university studies; Secondary Vocational Schools, which provide education for intermediate-level students and last for four years, offering both vocational training and high school graduation exam, in some cases, they also offer technician training in the 13th year.
- 37 The list was finalized gradually through an iterative process that involved adapting both the game content and the play environment. Throughout this process, considerations of game rules and playability were also critically important.
- 38 Pécs was European Capital of Culture in 2010, and the city used the ECoC program as an opportunity to implement an urban development strategy for connecting the eastern districts with the downtown. See the description of the development plans in the application: (A Határtalan Város) <https://www.pecs2010.hu/assets/pdf/Hatartalan-varos.pdf> (Retrieved 08/03/2024)
- 39 The Chief architect explained the background of the unique urban structure of Pécs and the directions of future development. The city was growing very rapidly before the change of regime, and even in the 1990s experts thought that the population would grow to 200,000. This did not happen, and the population has been steadily decreasing ever since. Hence the satellite-like expansion, the large number of brownfield sites, and the lagging outer suburbs. Therefore, future urban development will aim to make the city as compact as possible. Accordingly, he urged that the city center and the surrounding inner districts should be emphasized in the game."
- 40 After Budapest, Pécs has the largest number of museums, galleries and cultural programs in Hungary (Faragó (2013))
- 41 Cooperative learning and collaborative learning are often used interchangeably, however, as pointed out by McWhaw, Schnackenberg, Sclater, and Abrami (2003), there are major differences: while cooperative learning follows a structure predefined by a teaching person to achieve a specific goal and outcome, collaborative learning is less structured and provides learners more power over their learning process. Therefore, cooperative learning is seen more appropriate to foundational factual knowledge, while collaborative learning is better suited for higher order knowledge, which requires critical approach to learning Bruffee (1995).

6. LEARNING FROM TRANSFORMATIVE GAMES

Learning is an integral part of generative social practice in the lived-in world. It is not an abstraction or decontextualized process, but a process of changing participation in changing practices. (Lave & Wenger, 1991, p. 49)

The educational objective of the *ParticiPécs* game was to promote learning to understand and actively shape the living environment. While developing and testing the game, several key aspects emerged as critical for achieving these learning objectives. Firstly, children need to comprehend the dynamic nature of spaces. Spaces are not static but are continuously evolving through everyday practices, spontaneous interventions, or strategic planning. Understanding this fluidity is fundamental for recognizing that actions taken by people contribute to constant spatial transformation. Secondly, it is essential for children to recognize their agency in these transformation processes. They need to understand that they possess the power to initiate positive changes in their spatial environments. Thirdly, children must believe in their capacity to develop ideas for change. Providing them with the tools and experiences necessary to support them in this creative process is crucial. Additionally, it is important for the broader society, especially experts and decision-makers, to acknowledge and support children's competence and power as active agents in shaping the spatial environment. Recognition from these professionals and decision-makers can reinforce children's sense of agency and encourage their active participation.

This chapter delves deeper into these aspects of learning to understand and act upon space and presents the findings from the final evaluation, demonstrating how *ParticiPécs* has succeeded in fostering these critical understandings among its participants.

6.1.

Understanding the Dynamic Nature of Space

The conceptualization of space as dynamic is fundamental in the context of urban development and spatial practices. It shifts the perception of space from being merely a backdrop for human activity to an active element shaped by and shaping those activities. Recognizing this dynamic nature allows individuals to see the potential for change and the role they can play in influencing spatial configurations. This understanding is crucial for cultivating a sense of agency and responsibility towards one's living environment.

The importance to give specific attention to this aspect became evident from the fact that young people were generally unaware or not conscious of changes in urban spaces. Many participants viewed their environment as a fixed backdrop for their everyday experiences, not considering it subject to change.

Hmm... well, I didn't really notice change. But maybe I just wasn't paying attention. (Petra, 18-year-old vocational school student)

Petra, for example, noted that this was not a topic she had ever reflected on. Despite studying to become an architect in a vocational school, she saw herself as a youth not yet responsible for considering such "expert" issues. When prompted to think about changes in her immediate environment, she could only recall large-scale development projects.

When participants recalled changes, they often referred to areas over which they had little personal control, such as large-scale developments related to the European Capital of Culture Program. This program, implemented in the years leading up to the research, enabled significant renovations of public spaces. These included the main square, various playgrounds and parks across the city, and the central squares of several districts. Additionally, it encompassed notable cultural projects such as the Knowledge Center and the transformation of the Zsolnay Porcelain Factory into a cultural quarter with institutions appealing to young people. As a result, many participants were familiar with the ECoC-related developments and cited these as examples of urban change.

Well, that was a few years ago. And then I think it was very (...) in the cultural field that we built and renovated a lot of places at the same time, like Zsolnay Quarter, the Knowledge Center, the Kodály Center, and so forth. Széchenyi Square has been renewed. But I haven't noticed much change since then. So that was five years ago, or the Zsolnay Quarter was completed a little later, but I haven't noticed much change since then. (Benjamin, 15-year-old gymnasium student)

Benjamin's answer reveals how these large-scale changes tended to overshadow other aspects and everyday dimensions of urban transformations. This tendency was also evident when participants highlighted changes in the social dimension of urban life. Typically, they focused on shifts in neighborhood dynamics, atmosphere, and safety perceptions, as well as the decrease in the presence of children in public spaces. These changes stemmed from broader societal shifts, such as migration patterns or demographic changes, which were beyond their control. This emphasis on large-scale, external factors indicates that participants were less attuned to the smaller, everyday transformations that they could influence. Overall, prior to engaging with the game, young people's awareness of urban changes was limited and primarily centered around areas of external influence, broad societal shifts, or personal interests and was in any case beyond their direct powers.

Given the importance of understanding space as dynamic, it became evident that our transformative game should focus on this educational goal. By integrating the concept of dynamic space into the game's design, we aimed to provide players with the tools and perspectives necessary to recognize their potential to contribute to spatial change. This involved creating game mechanics that reflect the fluidity and evolving nature of urban spaces, allowing players to engage with and influence their environment in meaningful ways.

To achieve this, we designed the game to include scenarios and actions that mirror the dynamic processes of urban spaces. Players were encouraged to undertake interventions that reflect real-world urban tactics, such as creating community gardens or organizing local events, demonstrating the impact of their actions on the spatial environment. The final evaluation of the game *ParticiPécs* proved that by experiencing these dynamics within the game, players could develop a deeper understanding of how their real-world actions can contribute to the ongoing evolution of their communities.

After the game, participants generally developed a more nuanced understanding of changes in urban spaces. They began to perceive the spatial environment not as a static, fixed entity, but as something dynamic and shaped by human actions. For instance, Benjamin, who initially claimed he had not noticed any changes in the city since the ECoC developments, changed his perspective after the game. In a post-game interview, he acknowledged the ongoing, smaller-scale transformations and the role people play in shaping their urban environment.

I think it is changing, and maybe it can change because people, like ordinary people, can be encouraged to get involved in the life of the city and then they can do this kind of work. And that's why I think it can change. And it is changing, and it will change, I think. (Benjamin, 15-year-old gymnasium student)

This shift in perception underscores the game's effectiveness in fostering a more sophisticated and active understanding of urban dynamics among participants. Even if players like Petra remained focused on large-scale developments, they gained a more nuanced view of the stakeholders involved. For example, in the post-game interview, Petra highlighted the

Balokány grove project, which she worked on with teammates during the game and which was revitalized through civic collaboration in reality.

Improving the understanding of the dynamic nature of space was one of the fundamental learning achievements that brought participants closer to becoming proactive agents in shaping their living environments. By engaging with the game, young people developed a more nuanced perspective on how urban spaces evolve and how they can contribute to this process, fostering a sense of ownership and responsibility toward their communities.

6.2.

Understanding the Own Agency in Shaping the Spatial Environment

From interviews and conversations conducted before the game, it became evident that young people did not perceive themselves as having a significant role in shaping urban spaces. Most participants had a simplistic and hierarchical view of urban development processes, seeing the transformation of urban spaces as a task for city administrators, particularly the mayor or the prime minister. Martin, a 14-year-old primary school student, expressed this perception, suggesting that those working in city hall and the mayor were primarily responsible for changes in the city.

Researcher: And who do you think is driving these changes? Who is responsible for making things change in the city?

Martin: Well, I think it depends on a lot of things, because somebody has an idea, and then they vote on it, and decide whether they want it, and then they hire different companies to do it ... So a lot of people are responsible for it.

Researcher: And who do you think has the idea, or who can have the idea, who votes and decides?

Martin: Well, I think the ... I'm not really sure about this, maybe I'm saying something really stupid, but the people who work in the city hall and ... and the mayor maybe? I think he has a say in things.

Martin's response, while more nuanced than some, still revealed a sense of uncertainty and a lack of clarity about agencies in urban development processes. His confusion was further underscored when he expressed regret for not having more to say on the subject, feeling he had "no thoughts at all on the subject" and "hadn't managed to formulate any useful ideas".

A common theme among participants was the feeling of being too young and therefore not competent enough to influence urban development. Patricia, a 19-year-old vocational school student, articulated this sentiment, expressing doubt that anyone would take her seriously due to her age. She felt that while she cared about her surroundings, she lacked the influence to make a difference unless more young people collectively voiced their opinions.

I think, I don't know. ((laughs)) Hmm. Could I have a say in it? I've been a student here for five years, and it's actually very important to me how things look around me, but I don't know if I could have a say in it. Because I don't think anyone would listen to me. I don't think it would make much of a difference if I were to come up with any ideas for development, because I'm not really a well-known person, so I don't think it would make a difference. But if there were more of us, if more of us would want to, then I think we could make a change, I think we could make a difference. (Patricia, 19-year-old vocational school student)

The participants generally perceived urban issues as difficult, something that requires a lot of knowledge, but also courage, as there is a risk of rejection and misunderstanding. Thus, participants often stated that they had neither the motivation nor the information to explore their own potential in co-creating urban spaces.

Many participants stated they were content with the current situation and saw no need to influence urban development. For instance, Barbara, a 17-year-old vocational high school student, felt that young people could not contribute meaningfully beyond refraining from destructive behaviors, but she was satisfied with this situation.

Researcher: What do you think you could do to make a difference in the city as a high school student?

Barbara: ((laughs)) Well, as a sixteen, even a fifteen-year-old, I don't think I can make much of a difference. I don't litter in public places. Maybe. Or I don't vandalize. Well, they probably don't change these places because there's less vandalism that might happen. And yeah. We really don't have much other say in this.

Researcher: Have you had any experiences where you feel like you've been able to shape something?

Barbara: In the city?

Researcher: Mhm.

Barbara: No.

Researcher: And would you have any desire to have a greater say in how the city is shaping up? Or is it fine the way it is because it's going in the right direction?

Barbara: Well, er, the direction we're going in is good. So, I don't think I could change the situation that we have now, nor do I want to. Or these conditions.

However, some participants, like Kevin, a 15-year-old gymnasium student, were not satisfied with the current state of affairs. Despite perceiving an extreme concentration of power, Kevin believed that decision-making should involve citizens more and provide young people with opportunities to participate.

Researcher: And who do you think is driving these changes? Or who can change the city?

Kevin: ... I think ... it should work in a way that people sign the papers, and the prime minister takes the initiative.

Researcher: So that the prime minister figures out what should be changed {{ yes }} and then asks the residents if {{ yes }} it's okay. {{ yes }} And that's how it should be?

Kevin: ((laughs)) Yes, but that's not what they're doing.

Researcher: What do you think they do?

Kevin: I think the prime minister is pretending that, let's say, we're going to renovate the bus stop and they're going to raise money and then they're going to implement it.

Researcher: And you demand, you think it would be good to ask you or the residents?

Kevin: I think it would be good.

In sum, most participants viewed co-creating urban spaces as unfamiliar territory and saw urban development as dominated by top policymakers. They did not consider themselves, nor children in general, as competent enough to take an active role in this domain. However, two participants, Anna and Maja, stood out for their belief that anyone, including young people, could make a difference. As it turned out, their previous experiences in community-oriented actions shaped their conviction.

Anna, a 14-year-old primary school student, regularly helped her father maintain their apartment building's garden and playground, demonstrating a proactive approach to community care. Maja, a 15-year-old art school student, participated in a public art performance that aimed to effect positive change in the community, realizing the impact of small individual efforts.

Researcher: And how do you feel you can do something to change the city?

Maja: Well, I was thinking about community service. So for example, I'd be interested in picking up litter or cleaning the buses. So I'd be into that. And little community building projects like that, where we go and everybody's like running to the bus and they're nervous. I did one of those with my friend once where they had these free hug boards and a bunch of people came and everyone was really grumpy but then they were happy. And the ones who were sad, we went up to them and said we'd give them a hug. So we did things like that and I think it makes a lot more difference to people. Because if you're sad, if you don't care, if you're upset, you just throw things away, you don't care about anything. But if you see the world in a more positive way, then you pay attention to other things.

Maja later explained that her experience with a "free hug" performance in Budapest inspired her to implement similar community-building actions. This example showed how small-scale events helped Maja become more active and realize her potential to impact her surroundings. These experiences led her to believe that anyone, including children, could shape their environment.

Anna's and Maja's anecdotes illustrate the power of personal experiences in shaping beliefs and attitudes towards enacting change. Anna's neighborhood upkeep and Maja's community-oriented actions exemplify how hands-on engagement can cultivate a sense of agency and empowerment among young people. However, most young people had never had such experiences. The *ParticiPécs* game aimed to address this gap by providing players with situated experiences of small-scale urban interventions within the game world. By engaging in these simulated activities, players could take on the role of active agents making positive changes in their neighborhoods.

The game mechanics were designed to mirror real-world urban tactics, allowing players to experience firsthand the impact of their actions on their spatial environment. For example, players were tasked with interventions such as creating community gardens, organizing local events, or refurbishing public spaces. These activities were not only intended to be engaging but also to demonstrate how individual and collective efforts can contribute to urban development. By placing players in scenarios where they could see the immediate results of their

interventions, the game aimed to foster a sense of agency. This experiential learning approach was critical in helping players understand that they could indeed influence their environment, even if they had previously felt disconnected from such processes.

The final evaluation of *ParticiPécs* proved that participants developed a more nuanced understanding of urban spaces and their potential role in shaping them. They became more sensitive to the perception of change and believed they had opportunities to be active in transforming their spatial environments. Martin, for instance, noticed the moment of recognition while playing and came straight to me with a big smile. He said that he now sees things very differently and I should ask him the same questions again at the end of the game. So I did.

Researcher: And now, after the game, why do you think Pécs does or does not change?

Martin: I think that Pécs changes because, (...) is it a problem if I say something completely different than before the game?

Researcher: No, no.

Martin: But also what has not necessarily changed because of the game?

Researcher: No.

Martin: I mean, that if you have -, if you go around the city a lot and you observe what's going on, you can have more creative ideas on how to (...) actually beautify the city and develop it. ((laughs)) And if you have the possibility, you can do it, actually. With the municipality.

Researcher: So that the residents who use the city, can participate.

Martin: Yes, and I was also wrong to say that it's not necessarily only the municipality that can start such construction. Or the bigger things, they come from there, but the smaller things like the flowering. And the fact that it can actually be done by any company, even a group of friends.

Participants gained a more complex understanding of the process of change in urban spaces, with many recognizing that every citizen can play an active role in shaping the city. This recognition was supported by the tangible ideas and small-scale interventions presented in the game that had previously been overlooked by the young people. Benjamin put it this way:

The change, in hindsight, is mainly up to the political people, but, you know, the bigger changes like renovating whole squares. But the smaller things can be done by ordinary people, like planting flowers in a place, or trees, maybe. Cleaning up public spaces, maybe. (Benjamin, 15-year-old gymnasium student)

The experiences in the game also had their limitations. I could observe that some participants found it difficult to connect what they had experienced in the game with their real-life experiences. Cultural models are deeply entrenched, and the *ParticiPécs* game did not offer an alternative perspective for every participant. In fact, there were participants whose existing cultural models, in which young people are powerless and urban development is the exclusive domain of policymakers, were reinforced through the subjective interpretation of the game. This became obvious during the post-game interview with Barbara. Barbara had difficulties in understanding my questions about how urban spaces change and who has the power to

influence those changes. Thus, I decided to approach the topic differently by asking her to think about the changes implemented within the game world.

Researcher: So, there have been changes in the parks, and there have been bike racks.

And who led these changes, who created these actions?

Barbara: Well, I mean, how?

Researcher: Who made them happen in the game, in the stories?

Barbara: It was the mayor, wasn't it?

Researcher: The mayor. What did the mayor have to do with it?

Barbara: Well, he was in the dice dealing. Whether or not to accept the idea.

Researcher: And was there any action that was taken without the mayor's help?

Barbara: There was. Well, if people came in that way, it could be created.

Researcher: And then, when did you have to ask for the mayor's help?

Barbara: When they ran out of dice.

Researcher: So when new resources were needed. .. And how well do you think these examples can be translated into real life? So, how realistic is it to create small actions like this, even without the help of the municipality?

Barbara: Well, ... I don't know.

Thus Barbara, like some other players, saw her perspective on the world as justified in the narrative of the game, which was not captured by the small-scale improvements that she implemented with her peers, but by the role of local government, which she perceived as crucial for implementing any intervention or action. The decisive voice of the municipality, the feeling of depending on its support fitted into the cultural model of urban development that had previously been established by her. Other aspects contradicting this were apparently excluded. The learning experience was, thus, in some cases limited by participants' strong cultural models.

6.3.

Developing Ideas for Action

A significant barrier to young people taking active steps to improve their environment is the lack of concrete ideas. They often have not engaged with these issues before, do not see them as relevant, and thus have not imagined what they could do to enhance their city or surroundings. This lack of engagement was evident in responses like Martin's:

Researcher: And what hinders you from shaping your environment?

Martin: Not having a concrete idea.

The *ParticiPécs* game aimed to address this gap through several strategies. Firstly, it provided participants with actionable ideas that they could transfer to real life. By showcasing various urban interventions within the game, players could see practical examples of how they could contribute to their environment. This exposure was intended to spark their creativity and demonstrate the feasibility of making tangible changes. Secondly, the game offered a safe environment for idea development. The gameplay allowed participants to experiment with different concepts without the fear of real-world consequences. This safe space encouraged them to think outside the box and explore innovative solutions to urban issues. Thirdly, the game embedded structured support for idea generation. Through carefully designed game mechanics, participants were guided through the process of developing their ideas. This structured approach ensured that players had a clear framework to follow, helping them to systematically think through their interventions and refine their plans.

The game *ParticiPécs* served as a fundamental platform for participants to explore various urban actions and interventions. This experience equipped participants with knowledge and inspiration that later fueled their creativity and problem-solving during the add-on phase.

It's much more, so sticking up poems, or painting benches, or, I'm thinking now what other situation cards we had. So, writing applications, so, we didn't even know about a applications, a voluntary application. And planting flowers or something. So, um, there are a lot more opportunities than I thought. And it made me realize, I think, the others too. And thinking about that in the second part of the game was much more eye-opening, so to speak.
(Maja, 15-year-old art school student)

During the final evaluation, 180 students collectively developed 35 diverse public intervention ideas. These ideas provided a unique perspective on the city as experienced by young people, highlighting issues affecting their daily lives and proposing creative solutions for enhancing the urban environment. Participants utilized, transferred, and innovated ideas they learned through the *ParticiPécs* game, effectively bridging the gap between the game and real-life experiences. This process involved taking the concepts and strategies they encoun-

tered during gameplay and using, adapting, or re-creating them to address the specific needs and characteristics of their own environments.

For instance, in one vocational school, students, mostly commuters and boarders, found it challenging to define a place of interest due to their limited urban experiences in Pécs. However, they were inspired by the idea of creating a romantic meeting point on top of the tunnel, a concept from the game. The tunnel is located on the edge of the city center, right next to the medieval city wall. This location, though unofficially open, is a popular, secluded spot with a magnificent view of the city walls, the cathedral, the hills of Mecsek, and the sunset. However, the participants agreed that the site was neglected and unkempt, the bushes blocked the view, and it was uncomfortable as there was nowhere to sit. The students planned to improve it by cutting fig trees to clear the view and adding a bench. The group was so fascinated from this idea that their commitment led to implementation. With crucial support from their school, which provided materials, and the assistance of the deputy headmaster, they constructed a bench. This project was completed within a few hours and resulted in a tangible improvement to their environment. Figure 32 shows the development from the idea to the intervention.



Figure 32

“Romantic bench on the tunnel” conceptualized and implemented by the participants.

The visual design was created by Réka Borbás and Renáta Borbás.

In other instances, participants adapted concepts from the game to different locations. Ideas such as graffiti, refurbishing bus stops, and guerrilla actions were particularly popular. Figure 33 shows a selection of participants’ ideas, which adapted a tactic learnt in the *ParticiPécs* game to a specific location.

One example is the graffiti wall envisioned for the Long-distance Bus Terminal. Several groups consisting of commuter and college students chose this location because they spend a considerable amount of time here, yet the site is often dirty and neglected. The ambiance lacks any elements to alleviate the waiting experience: it is dull and uninspiring, with uncomfortable, worn-out seats and absence of greenery. One team proposed a community service project to plant flowers and trees and to repaint the benches. Additionally, they devised a graffiti called

the “*Students wall*”, where Pécs students could express their thoughts on the city and suggest changes they would like to see implemented.

Another example for the creative adaptation of graffiti and public art is the “*Artsy bus stop*”. Students wished for the presence of the Arts High School to be visible in the vicinity of the school. They believed it would be beneficial if creative expression did not just occur within the school walls but also manifested across the surrounding Rókus Hill. One group of students envisioned to create an “*Artsy bus stop*”: the bus stop next to the school would be adorned with artworks created by students. They proposed to take care of the bus stop and initiate renaming it.

An outstanding adaptation of guerrilla actions to address the needs of young people was the proposal for a guerrilla bike lane on the bustling Rákóczi Road. Students identified the absence of a bicycle lane network in the city as a significant challenge, especially in the downtown area where many students travel to the Árkád shopping mall after school. The lack of safe cycling routes poses a risk for cyclists attempting to reach this destination. In response, the students proposed a guerrilla initiative to paint a bicycle lane on Rákóczi Road clandestinely at night. This creative intervention aimed to raise awareness among decision-makers about the need for bike infrastructure and potentially encourage motorists to be more mindful of cyclists sharing the road.



Figure 33

Participants' adaptation of urban intervention ideas

Note. From left to right: “*Student’s Wall on the Long-distance Bus Terminal*”; “*Artsy Bus Stop*”; “*Guerilla bike lane at the Rákóczi Road*”. The visual design was created by Réka Borbás and Renáta Borbás.

These examples demonstrate that participants were able to effectively adapt the ideas learned in the *ParticiPécs* game to address their unique urban-related issues. However, most players went even beyond mere adaptation; they deeply understood the underlying principles of the game and generated entirely novel and innovative ideas. By building upon the concepts introduced in *ParticiPécs* and infusing them with fresh perspectives and approaches, partici-

participants showcased their ability to think critically and creatively about urban spaces. Their ideas reflected a comprehensive understanding of the issues and shortcomings they experienced in their environments. Participants employed inventive tactics to address these challenges, transforming urban spaces in ways that better suited their needs and preferences. Figure 34 presents a selection of participants' innovative ideas.

One illustrative example is the “*Tea initiative*” conceived by students from the art high school. Recognizing the challenges faced by students from other villages and cities, the group aimed to support newcomers during their initial period of adjustment to the city. Their plan involved setting up stands in the downtown area to offer tea to passersby, along with uplifting messages and city information on the cups. This approach provided warmth and comfort and served as a means for people to connect and familiarize themselves with their new surroundings. Through this thoughtful gesture, the students aimed to create a welcoming atmosphere and facilitate the integration of newcomers into the local community.

Another compelling instance showcasing how students internalized the message of the game and generated innovative ideas is exemplified by the proposal to enhance the sidewalk adjacent to the school with a protective fence. The current state of the sidewalk poses hazards as it is both narrow and in disrepair, particularly at the junction where students navigate daily. The technical students proposed a renovation plan aimed at improving safety and accessibility. Their vision involves constructing a ramp and installing a railing along the section adjacent to the main road, addressing safety concerns and enhancing the overall usability of the sidewalk for students and pedestrians alike.

An idea that resonated with the cultural aspects of the spatial environment was linked to the Balokány Grove, which, despite its potential as one of Pécs' most picturesque green areas, has been neglected in recent decades. Students from a vocational school proposed repurposing the abandoned bath building, strategically leveraging its proximity to the University's Faculty of Arts. The plan entailed clearing and revitalizing the surroundings of the pool, envisaging it as an outdoor exhibition space capable of hosting temporary sculpture exhibitions. This proposal envisions Balokány Grove as a dynamic space where art and culture converge, enriching the local environment and fostering community engagement.

In sum, the intervention ideas developed – and partly implemented – by participants demonstrate the game's effectiveness in inspiring children to become active participants in shaping their urban environment. By providing a dynamic and engaging platform for experiential learning and collaborative problem-solving, *ParticiPécs* has proven to be a valuable tool for promoting civic engagement and fostering positive change at the local level.



Figure 34

Participants' innovation of urban intervention ideas

Note. From left to right: "Tea distribution initiative"; "Ramp"; "Sculpture park at the Balokány Grove". The visual design was created by Réka Borbás and Renáta Borbás.

6.4.

Transforming Views on Children's Role in Urban Development

Researcher: And how do you see now, who are the ones shaping and directing the changes in urban spaces?

Petra: Actually, I'm not sure... We, as students, are part of it, but only if they let us. Actually, only if they ask for our opinion. Like now, with your help, listening to us, hearing our ideas. But this only happens if they're open to us, really. Because if we want to do something, and they don't listen to us, it doesn't matter much.

Petra highlighted a crucial aspect in the above interview excerpt. It is not enough for children to recognize and acknowledge their competence and agency to effectively contribute to shaping the spatial environment, potentially even at a systemic level. Society must also recognize and reflect this back to them, reinforcing their sense of agency.

To bridge this gap, we organized an exhibition showcasing a selection of young people's ideas following the conclusion of the school games, inviting residents and decision-makers to participate. The opening ceremony was attended by representatives of the participating schools and classes, as well as an interested and professional audience. The ideas were judged by a professional jury, and residents could also vote for their favorite idea. This provided young people with a wide range of feedback on their ideas and motivation to implement them.

The impact of the game and its outcomes on the broader context is exemplified by the radical shift in mindset of one of the jury members upon seeing the ideas proposed by the young participants. He arrived at the opening of the exhibition with clear skepticism, harboring doubts about the notion of supporting young people in realizing their own ideas. He expressed his concern that encouraging young people to dive into the design of urban spaces without professional support, training, and preparation could lead to chaos and deterioration.

Nevertheless, after reviewing the young people's ideas, he was so impressed by their quality that a total of seven ideas were rated "recommended for implementation". The first prize was awarded to the *Birdhouse*, an idea from students of an art gymnasium, who designed artistic, cheerful, wood-carved bird feeders to hang on the trees in the park in front of the school. The audience, made up mainly of young people, voted for the romantic meeting place at the top of the tunnel. The Chief Architect gave a special prize to the guerrilla bicycle lane on Rákóczi Road.

These examples demonstrate that when given the opportunity and recognition, young people can contribute meaningful and innovative solutions to urban development. The exhibition did not only provide a platform for these ideas to be shared but also highlighted the importance

of including young voices in the conversation about urban spaces. This shift in perception among decision-makers is a significant step toward fostering a more inclusive and participatory approach to urban development, where the contributions of all members of the community, including young people, are valued and integrated. This experience highlighted the transformative power of play, which was not limited to the players and the actions performed in the game but went beyond the magic circle and was able to bring about change in the broader social and physical context of the game.

Note

- 42 The game was developed in collaboration with the Veszprém-based DEMO Association, with the financial support of the VEB2023 European Capital of Culture Program.

7. THEORETICAL REFLECTIONS ON TRANSFORMATIVE GAME DESIGN PRINCIPLES FROM THE TRIADIC PERSPECTIVE OF GAMES, LEARNING, AND SPACE

In order to see, it is sometimes necessary to look at something from a perspective that is alien to the particular system of practice in which one is engaged. Such an inquiry takes the form of reflective conversation with the materials of a situation, during which the practitioner can surface and criticize his or her tacit understandings, and thereby make new sense of the situation. (Schön, 1983, p. 50)

My research interest emerged directly from my practice in the interdisciplinary field of built environment education, which aims to promote learning about spaces and places, and encourage active participation in shaping them. This field, at the intersection of education, architecture, and urban planning, requires theories and empirically grounded methods to enhance its practice (Million et al., 2019). Games are increasingly utilized in built environment education due to their engaging and immersive nature. However, there is a significant theoretical and practical gap in understanding how games can effectively contribute to this field (Dodig & Groat, 2020b). This gap motivated my guiding question: How should games be designed, developed, and implemented to effectively support learning to understand and act upon space?

To address this question, I conducted an educational design research (McKenney & Reeves, 2012; Plomp & Nieveen, 2009). This approach was chosen for its ability to uncover the complex interrelations between learning, space, and games through open, iterative processes and to provide design principles that can guide transformative game design in built environment education.

In the first part of my research, I developed a theoretical framework by integrating perspectives from education, urban planning and design, and game design. This framework served for exploring how space, learning, and games interplay to facilitate learning about space through transformative play. Through this triadic perspective, I identified initial design principles and key research gaps: 1) Transformative games must be grounded in children's spatial worlds to ensure the continuity of experience and facilitate the transfer of learnings from the game to their real-world environments; 2) Transformative games should provide situated experiences of spatial practices, helping children understand how they can actively contribute to shaping their living environments; and 3) Transformative games should foster social participation, to facilitate the understanding of the social dimension of space constitution.

To understand how these principles can be translated into practical game design and how they foster learning to understand and act upon space guided my empirical research.

The following sections present a synthesis of the design principles that emerged from the design research process, relating them to the theoretical framework on game design, education, and space. This comprehensive approach provides a broader context, facilitating the transfer and adaptation of these principles into both theoretical and practical applications.

The final evaluation demonstrated how the design principles for transformative games in built environment education enhance learning to understand and engage with space. Section 7.4 examines this from a theoretical perspective.

Subsequently, a reflection on the transferability of the findings and the role of the researcher underscores the robustness of the research. Finally, the chapter concludes with an outlook on future directions, offering a pathway for continued exploration and development in this field.

7.1.

Designing Game Worlds for Transformative Play

The guiding question of my research was directed towards understanding how games should be designed and developed to foster learning about space and promote action upon it. While there is extensive literature on how games foster learning (Gee, 2007; Kapp, 2012), the challenge lies in ensuring that the knowledge gained within the game transfers to players' real-life experiences, particularly in understanding and interacting with spatial environments.

I drew upon Dewey's (1916/1980) learning theory, which posits that learning occurs through active engagement and transactions with the environment. These experiences are linked to past knowledge and influence future actions. According to Dewey (1938/2008), effective learning environments must create continuity between past, present, and future experiences. The initial design principle, derived from this theoretical foundation, was that grounding games in children's spatial worlds supports continuity of experience (Spatial Worlds Principle). This principle posits that embedding games in familiar spatial contexts allows for the seamless integration of new knowledge with existing understanding. My research showed that contextualizing game settings within familiar spatial contexts enabled children to draw meaningful connections between the game and their real-world experiences. For instance, in the game *ParticiPécs*, scenarios that closely aligned with participants' real-life environments significantly enhanced the game's relevance and impact. An illustrative example was when a participant restored a bench in the game at a bus stop, he frequently used in real life. This action deepened his connection to the game and reinforced the practical significance of his actions. Participants consistently recognized that events in the game, which reflected their living environment, were directly applicable to their real surroundings. This recognition underscores the potential of transformative games to bridge the gap between game experiences and real-world outcomes.

The first crucial aspect identified was the dynamic representation of children's spatial worlds (Dynamic Space Principle). By understanding learning as emerging from a continuous interaction between individuals and their environment, a natural connection between learning and space constitution was established, and both were conceptualized as dynamic, evolving processes (Dewey & Bentley, 1949/1989; Löw, 2016). Framing games as systems of processual representations (Salen & Zimmerman, 2003, pp. 420-459; Sanoff, 1979, p. 1) allow to convey space as constantly evolving. To integrate this concept into the game's design, we developed game mechanics that reflect the fluidity and changing nature of urban spaces, enabling players to engage with and influence their environment meaningfully. This approach shifted the perception of space from being merely a passive backdrop – generally present among participants – to an active element that both shapes and is shaped by human activities. Recognizing

space as dynamic helped participants to see the potential for change, which is crucial for cultivating a sense of agency and responsibility towards their living environment.

The design research process revealed that a dynamic understanding of space is best achieved when the integration of different spatial dimensions is incorporated into every aspect of the game (Holistic Integration of Spatial Contents Principle). This unfractured view is necessary to understand that space is socially constituted (Breckner & Sturm, 1997; Dewey & Bentley, 1949/1989; Läßle, 1992), and can be conveyed through the different representational dimensions of games (Flanagan, 2009; Salen & Zimmerman, 2003, 420ff). The research highlighted that learning to understand and act upon space is most effective when games are framed as representational universes, ensuring that every game element aligns with the representation of children's worlds. In practical terms, the formal structure of the game – including visual representations, game elements, rule systems, and core mechanics – should correspond with real-world geographies, spatial elements, regulatory systems, and experiences. This holistic integration can illustrate the relationship between actions and their consequences, fostering a deeper comprehension of the interplay between spatial practices and their impacts, and foster learning (Dewey, 1916/1980). This approach was reinforced through key learning moments, for instance, when a participant realized that graffiti is not just artistic expression but can also signify a breach of social rules, leading to moral and material consequences. She reported this to be a profound learning experience.

The third key insight for designing a game world aligned with children's spatial worlds was the necessity of genuinely understanding children's perspectives, which can only be achieved through their direct involvement (Co-designing Spatial Contents Principle). In the first design cycle, a crucial realization was that merely aligning the game environment with maps and input from professionals who work with children was insufficient, as children often did not recognize their own living environments represented on the game board. They had an individual perspective on the city, which underscores that the constitution of spaces is intrinsically tied to perceptual processes (Löw, 2008), making it a selective, constructive, and subjective process (Dewey, 1916/1980, p. 35). And this subjective perspective on the spatial environment needs to be taken in account to resonate with children's spatial worlds. In other words, a transformative game world must consider the contextual whole of children's spatial worlds, which includes not only material, institutional, and cultural backgrounds but also individual perceptions, interpretations, and experiences (Lave, 1988, pp. 150-151). These unique perceptions and experiences can only be fully understood through direct collaboration with children. The second prototype, which followed this design principle, confirmed that co-designing spatial content with children ensures that game experiences resonate with their everyday life, thus enabling continuity of experience.

This leads to the fourth design principle: considering children's unique perspectives on their spatial environment requires balancing thematic representation with the integration of individual spaces (Balancing Thematic and Abstracted Space Principle). When representing children's spatial worlds within the game environment, we drew on Dewey's (1916/1980, p. 27) em-

phasis on educative environments that simplify and purify, focusing on fundamental features and eliminating unnecessary elements. We applied this approach by creating a themed space on the game board that reflects children's collective view of the city. However, young people's spatial experiences are highly personalized and shaped by their unique perceptions. These individual interpretations of urban space cannot be fully captured within a fixed visual representation. Therefore, it was necessary to complement the thematic space with abstracted space to accommodate individual perceptions and experiences. This dual approach ensures that the game environment is both collectively meaningful and personally relevant, enhancing the continuity of experience and engagement.

However, during the development process, we realized that providing an open, abstracted space alone was insufficient to incite the integration of players' individual spaces into the game world. Thus, it resulted to be crucial to incorporate a game design model that offers players explicit creative agency. Designs for open system games allow players to influence the game as producers (Salen & Zimmerman, 2003, pp. 536-555). This meant providing players with the freedom to co-create the game world by integrating their individual spaces, ensuring the game environment is meaningful and reflective of their real-world experiences (Player-generated Spaces Principle). When children integrated their individual spaces into the game, their motivation to engage with the spatial environment increased significantly. They became capable of developing ideas for positive change only when they encountered spaces and challenges that resonated with their everyday life experiences. This underscores the necessity of allowing children to co-create the game world in transformative games, ensuring that the game environment is both relevant and meaningful to them.

The research findings emphasize key design principles for creating a transformative game world that fosters learning to understand and actively shape the spatial environment. The resulting principles, developed through an iterative educational design research process, are visually summarized in Figure 35.

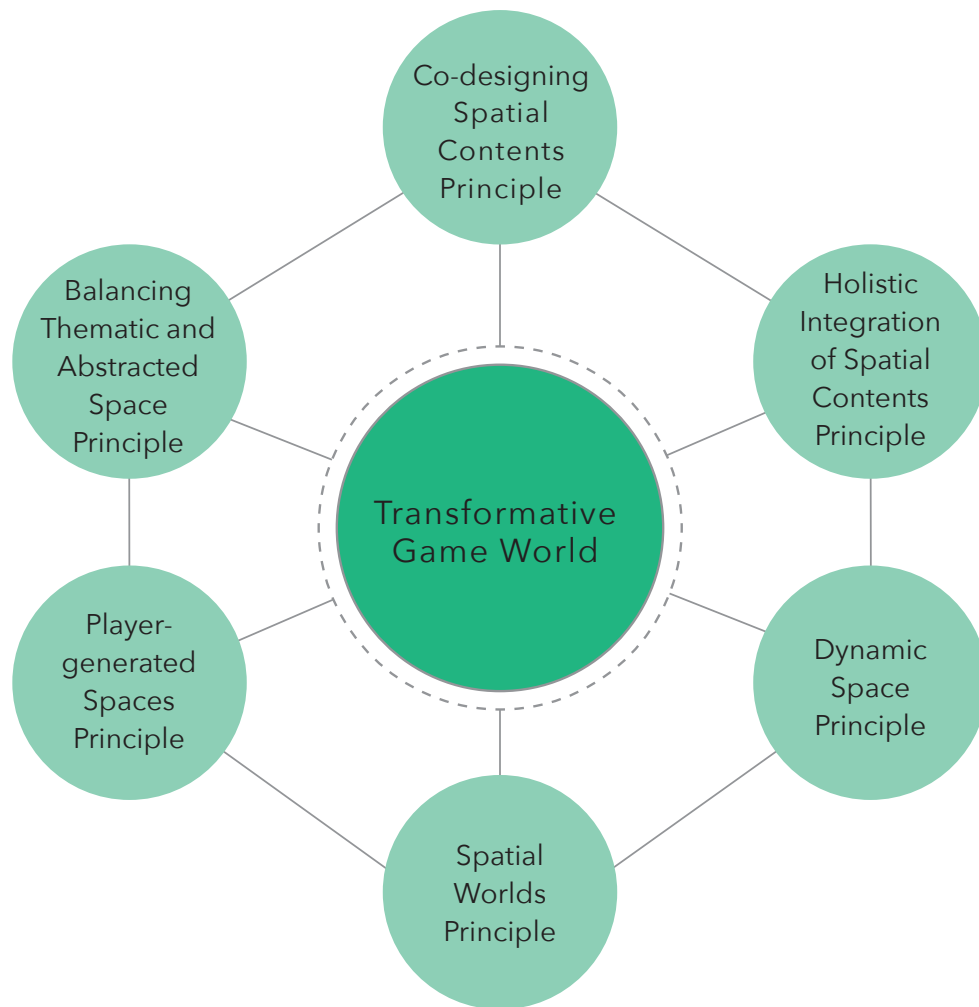


Figure 35

Design principles for creating a game world that promotes learning to understand and act upon space

7.2.

Designing Transformative Gameplay

Games are not merely culturally shaped objects but dynamic experiences that emerge when players interact with the system and each other through play. Understanding how to design gameplay that fosters learning about space and promotes action is crucial for transformative game design.

From a transactional perspective, action is central to both learning and the experience of space (Dewey, 1916/1980; Löw, 2016). In this view, active engagement with the environment – where actions and their consequences shape understanding – serves as the foundation for both acquiring knowledge and influencing spatial dynamics. Recognizing this connection, I formulated the initial design principle: embed spatial practices at the core of game design to promote effective learning and empower players to actively shape their spatial environment (Spatial Practices Principle). The empirical research reinforced this principle, revealing that participants' learning involved recognizing the numerous simple actions they could take to improve their living environment. By experiencing these actions within the game, which represented their spatial worlds, participants became aware of their own power and role in shaping their surroundings. These insights underscore that games are powerful learning environments because they enable participation and the application of knowledge in authentic settings (Barab et al., 2007, p. 752). The challenge was to determine which actions and practices should be prioritized in the game in order to promote learning about shaping spatial environments. While extensive literature shows how games can foster learning in urban planning processes (Beckett & Shaffer, 2005; Gaber, 2007), the difficulty lies in providing actionable experiences of space constitution that can be transferred to players' real-life contexts. The iterative design research offered valuable insights into creating gameplay driven by spatial practices for meaningful learning experiences.

First, the research process of game design highlighted the identification of actions and practices that align with the game's purpose and are relevant to the target group (Tailor-made Spatial Practices Principle). This research aimed to develop a game that emphasizes young people's active agency in shaping their spatial environments. The first prototype, with its broad spectrum of urban development practices, made the core idea difficult to grasp. However, we found that urban tactics – small-scale interventions in public spaces requiring minimal resources and yielding immediate, visible results – effectively communicated this message. By centering such actions in our second game design, we ensured that gameplay was educational and directly relevant to players' experiences and aspirations. This principle was strongly supported by the research findings. Misalignment with children's interests and experiences hindered learning, as seen, for instance, when boarding students from rural areas struggled with urban gardening concepts. Conversely, when game experiences aligned with everyday experiences, they became powerful catalysts for engagement and learning. For example, suburban students who initially rejected civic activism became engaged when familiar practices

like parkour were integrated into the game. This alignment with learners' interests, educational goals, and real-world practices ensures that the game's content is relevant and engaging, fostering deeper learning and a stronger connection to real-world contexts (Shaffer, 2006).

Moreover, the empirical research underscored the importance of creating authentic game environments by contextualizing spatial practices with the spatial worlds of the target group (Contextualized Spatial Practices Principle). In the first prototype, *Pop-up Pest*, interventions were location-free and therefore less meaningful to players. In contrast, the second prototype, *ParticiPécs*, adapted spatial practices to specific places, making them more meaningful and relevant. For example, in the first prototype, actions like placing a bench did not capture participants' interest. However, in the second prototype, placing a bench on top of a tunnel was so impactful that participants became deeply engaged and implemented the idea in real life. These findings support the theories that the knower and the known (Dewey & Bentley, 1949/1989), or in terms of space, the spatial arrangement and the constituting action (Löw, 2016, p. 145) are inseparable. These dualities must be considered when designing spatial practices in transformative games.

The empirical findings also revealed that simply contextualizing spatial practices is insufficient; they must also be made experiential to enhance learning (Experiential Spatial Practices Principle). In *Pop-up Pest*, spatial practices were decoupled from game actions and presented in situation cards, which proved to be less impactful. In contrast, *ParticiPécs* integrated spatial practices into the core mechanics and embedded them within the emerging narratives of gameplay. This approach made the practices tangible, resulting in deeper learning experiences. This reinforces the idea that learning in games is inherently situated and embedded in embodied experiences (Gee, 2007). By dynamically representing processes, games can allow players to experience activities as genuine practices rather than abstract tasks (Salen & Zimmerman, 2003, pp. 420-459; Sanoff, 1979, p. 1). Therefore, in transformative games, spatial practices must be represented as dynamic processes and made experiential for players. By creating opportunities for players to reflect on how they create spaces, games can elevate these practices to a level of critical awareness and understanding.

The research also highlighted that the creation of contextualized and experiential spatial practices requires meticulous consideration of these practices in every aspect of the game system. This ensures they permeate the overall theme, narrative framework, and players' actions (Holistic Integration of Spatial Practices Principle). Such comprehensive integration is crucial for reinforcing the core message of the game (Schell, 2008, pp. 49-52). By embedding spatial practices at every level of the game design, players experienced a unified and coherent world where their actions have clear and contextually relevant consequences. Such deep integration fosters a profound learning process by transforming abstract concepts into tangible experiences. Players can see the direct results of their actions within the game world and relate them to real-world scenarios. For example, one participant reported the significant impact of experiencing in-game consequences for vandalizing during a festival. This experience was aligned with the actions, characters, and gameplay, making the learning experience more meaningful and relatable.

The design research revealed that to bridge the gap between in-game and real-world experiences and foster deep learning, transformative games must offer opportunities for players to use, adapt, and innovate knowledge within the game’s context (Player-generated Spatial Practices Principle). This requires framing games as open systems that allow for emergent, open-ended play and meaning exchange with surrounding contexts (Salen & Zimmerman, 2003, pp. 536-555). Such an approach enables players to become creative agents, using their existing and newly acquired knowledge to develop and implement their ideas for shaping their spatial environment. By breaking the magic circle through transformative play, players can change not only their mindsets but also their actual spatial environments. This was confirmed in the *ParticiPécs* add-on, where children generated a variety of ideas that genuinely reflected their needs. Their commitment to these ideas led them to pursue and implement ideas independently.

The research findings emphasize key design principles for creating a transformative gameplay that fosters learning to understand and actively shape the spatial environment. The resulting principles, developed through an iterative educational design research process, are visually summarized in Figure 36.

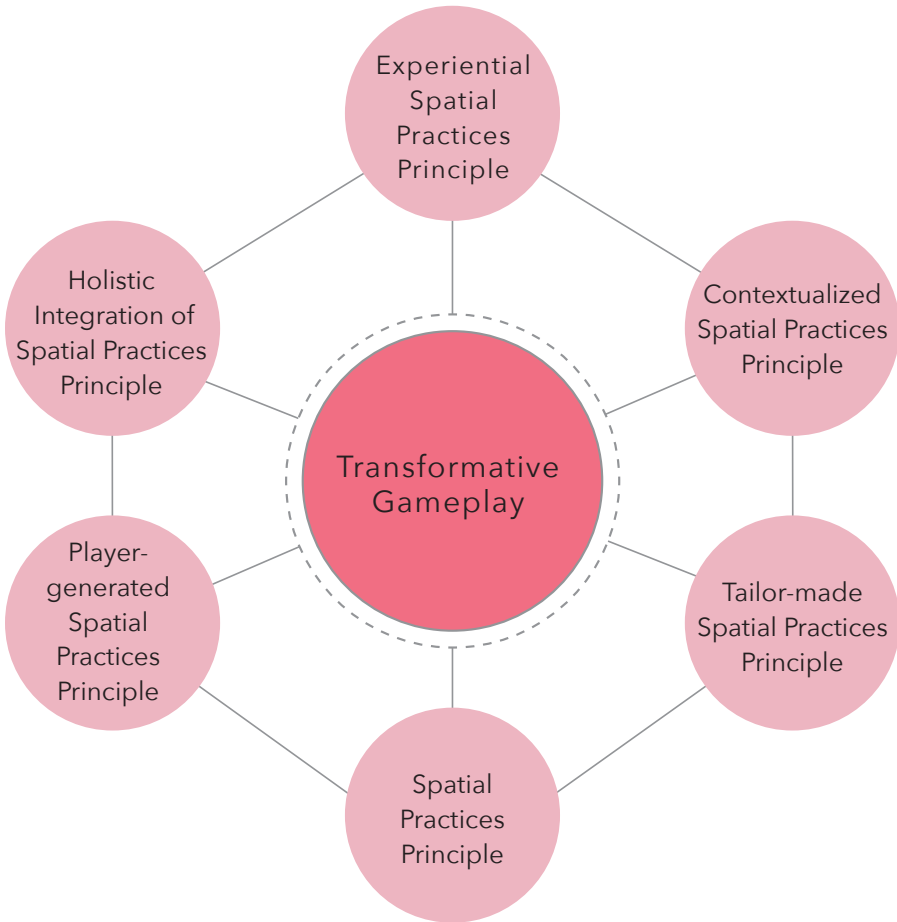


Figure 36
Design principles for creating a gameplay that promotes learning to understand and act upon space

7.3.

Designing Transformative Social Play

The guiding question of my research explored how games should be designed to foster learning about space and promote actionable change. By integrating perspectives on space and learning within the framework of Dewey's transaction theory, the research highlighted the crucial role of the social aspect in learning to understand and act upon space. Dewey (1916/1980, pp. 21–23) argues that learning emerges from individuals' interactions with their inherently social environments. In a similar vein, Löw (2016, p. 189) maintains that space is socially constituted – shaped by collective actions and pre-structured mental processes – which reinforces the idea that both learning and spatial understanding are fundamentally social processes.

This theoretical framework informed the initial design principle of this research: transformative games should emphasize social participation in the context of shaping the environment (Social Participation Principle). The empirical research underscored the relevance of this principle. A significant finding was that emphasizing social participation within game design can effectively promote learning outcomes. Participants discovered that collective action toward a shared goal could catalyze positive changes in their spatial environment. Initially, many participants felt powerless as individuals. However, through engaging in collective actions within the game, they experienced the tangible impact of their efforts and developed a stronger belief in their own agency. The iterative and reflective design research process revealed a more nuanced understanding of how social participation can be integrated into transformative game design.

The research revealed that merely designating social participation as the overarching theme of the game is insufficient; it must be integrated into both the narrative and mechanics of a transformative game to reinforce its message (Schell, 2008, pp. 49–52). This holistic integration transforms social participation into a tangible experience (Holistic Integration of Spatial Practices Principle).

Findings emphasized the importance of embedding action patterns in the game's narrative. These patterns provide practical examples of how social participation influences urban spaces and serve as vicarious experiences that enhance self-efficacy through social models (Bandura, 1997). Participants noted that experiencing successful collective actions was both enlightening and motivating, reinforcing their belief in their own capabilities. One striking example was the real-life implementation of the romantic bench atop the tunnel, where the narrative-driven action significantly boosted motivation to actualize similar interventions.

Furthermore, the research demonstrated that collaborative game mechanics—which rely on teamwork, shared decision-making, and collaborative problem-solving—are particularly effective in fostering social participation (Collaboration Principle). The evolution of the prototypes illustrated this shift: initial cooperative gameplay laid the groundwork for teamwork but

did not fully integrate collaborative mechanics. Over time, the design increasingly emphasized these elements, enabling shared endeavors that facilitated learning rather than distracting from it. Consequently, players became more open to sharing and reflecting on one another's experiences, leading to deeper engagement and understanding. This approach reinforced the game's educational objectives and transformative potential by showing that joint activities addressing common challenges promote collaborative knowledge construction and learning (Dewey, 1916/1980, p. 27; Gee, 2007, pp. 191–192).

The research also revealed that collaborative mechanics need to be conceptualized from the perspective of the spatial context. Without this, players' collaboration may be limited to strategizing without collectively reflecting on and discussing space, hindering their learning to understand and act upon it. In transformative games, collaboration should be contextualized: efforts are not just about strategizing to win but are deeply connected to the core content and educational objectives of the game (Contextualized Collaboration Principle). This approach avoids the dualism of content and mechanics, instead embracing their duality in terms of social participation. Thus, collaboration becomes a core component that drives both gameplay and learning. This principle became evident through the evolving prototypes. In the first prototype, cooperation was based on educational theories but was disconnected from the content and real-life logic of collaboration in everyday spatial contexts. The second prototype improved this by directing players' collaboration toward collective actions upon space, mirroring how young people organize themselves and interact in their everyday environments – forming fluid, temporary groups for temporary actions (Skelton & Gough, 2013). This integrative approach helped participants understand and experience how they can become active agents, learning action patterns not in abstract but through embodied experiences in the game (Gee, 2007, p. 87). Aligning with children's everyday life experiences ensures that the lessons learned within the game are transferable to their everyday lives, thereby enhancing the game's transformative potential.

The insights gained throughout the design research process underscored that integrating social participation in shaping the spatial environment into every aspect of the game design is necessary but not sufficient for deep understanding of collective actions upon space. It is crucial to integrate this into a collective thinking process, directing a reflective experience towards collective sense-making, problem analysis, solution development, and experiential testing (Dewey, 1916/1980, p. 156). In essence, players need to go through a comprehensive process of collective action upon space to achieve a mastery experience that enhances their self-efficacy (Bandura, 1997, p. 3). We implemented this approach in the *ParticiPécs* add-on round, which revealed significant insights into how knowledge is distributed across children and the game environment (Clark & Chalmers, 1998; Dewey, 1938/2008; Gee, 2007). While working in groups, children collectively contributed to the process – some brought relevant problems or ideas, while others offered skills for implementing these solutions. This collaborative effort enabled successful experiences, shifting their initial mindsets from “I can't do that” to “collectively, we can do that”. This shift highlights the importance of fostering a sense of collective efficacy, where children recognize the power of working together to effect positive change in their environments.

The research findings emphasize key design principles for creating a transformative social play that fosters learning to understand and actively shape the spatial environment. The resulting principles, developed through an iterative educational design research process, are visually summarized in Figure 37.

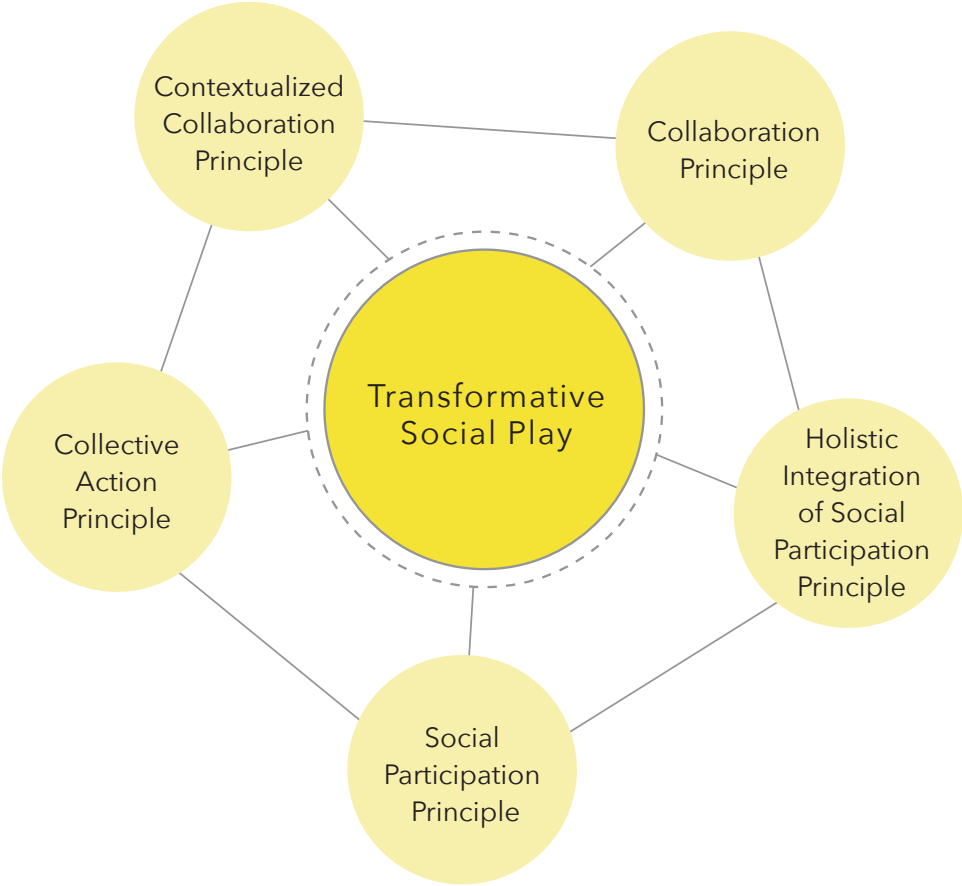


Figure 37
Design principles for creating social play that promotes learning to understand and act upon space

7.4.

Learning from Transformative Games – Potentials and Limitations

The research provided valuable insights into achieving transformative play through well-thought-out game design, as discussed in the previous sections. Additionally, it shed light on the potential learning impacts and limitations of transformative games. This section summarizes and discusses these findings from the perspective of their contribution to the field of built environment education.

Potentials for learning from transformative games to understand and act upon space

The design research demonstrated that well-designed games can promote transformative play experiences by helping players understand the dynamic nature of spaces. This understanding emphasized that spaces are not static; rather, they continuously evolve through everyday practices, spontaneous interventions, and strategic planning. This recognition of spatial fluidity is essential for players to grasp that their actions are a key component of ongoing spatial transformation.

By engaging with game environments that mirror real-world processes, players can experience and understand firsthand how individual and collective actions shape and reshape the spaces they inhabit. These immersive game experiences allow players to see the immediate impact of their actions, helping them grasp the direct relationship between actions and consequences. This perception of immediate change, grounded in the experience of play, can provide a mastery experience that is critical for developing a sense of competence and self-efficacy (Bandura, 1997, p. 3). Such experiences reinforce the understanding that they possess the agency and responsibility to influence and improve their spatial environments. Through repeated interactions and reflective practices within the game, players can internalize these concepts, realizing that their contributions are valuable and impactful in both the game and their real-world contexts.

Moreover, transformative games can instill in children the confidence to develop ideas for change. By offering patterns of actions for spatial practices that can improve the spatial environment, these games provide children with concrete examples and strategies for effecting positive change. Through gameplay, children encounter various scenarios where they witness the outcomes of effective spatial interventions, which serve as vicarious experiences (Bandura, 1997, p. 3) that inspire confidence in one's own abilities. This empowerment extends beyond mere confidence; it fosters their imaginative capacity, allowing them to envision new possibilities for their environments. The game scenarios act as a catalyst for creative thinking, encouraging children to apply these patterns of action to their own

real-world contexts. This dual enhancement of creativity and agency is vital for nurturing proactive, engaged citizens who are equipped to contribute meaningful and positive transformations of spatial environments.

Developing an understanding that space is dynamic, recognizing their power to direct change, and exploring actions for transformation provides a foundation for children to actively engage with their spatial environment. Dewey's philosophy emphasizes that educative experiences guide future ones. The research confirmed that transformative games offer such experiences. Children not only generated intervention ideas based on real needs in their specific contexts but also implemented some of these ideas in real-world settings, effectively bridging the gap between play and reality.

The contribution to the field of built environment education

Findings of the conducted research are substantial contributions (BEE), which still lacks extensive empirical research, particularly from the learning perspective (Million et al., 2019). These contributions span multiple levels, offering both practical guidelines and theoretical insights.

Firstly, this work provides a comprehensive set of design principles that can guide the creation of games specifically tailored for BEE. While games are increasingly utilized in this educational field, there is a gap in their theoretical underpinning (Dodig & Groat, 2020b). This research addresses this gap by offering empirically grounded practical guidelines that can be directly applied and adapted to the design and implementation of educational games focused on learning to understand and act upon space. Moreover, these principles extend beyond game design, offering adaptable insights that can be applied to various formats and contexts to create powerful learning environments for BEE.

Additionally, from a broader perspective, this research provides a theoretical framework to re-frame the educational field of BEE. Due to its intersectional and interdisciplinary nature, BEE is often fragmented by diverse perspectives. These perspectives either emphasize preparing children to participate in the decision-making of the spatial environment, focus on children's learning and development through engaging with the spatial environment, or highlight the learning of architects and planners through working with children (Million et al., 2018). The transactional approach proposed in this research can unify these different perspectives by understanding them as interconnected aspects of the same situation (Dewey & Bentley, 1949/1989).

Creating learning experiences for BEE within this approach involves thus designing activities or transactions where children, professionals, and spatial contexts develop synergistically. This holistic approach ensures that educational practices in BEE are not only inclusive of diverse perspectives but also integrative, promoting comprehensive learning and development for all participants.

Limitations of transformative games

The research pinpointed that despite their potential, transformative games are not a universal tool that works for everyone and in every context. The strength of BEE is the diversity of its methods, contexts, settings, and tools (Million et al., 2019), and games are one of the tools which can successfully foster learning about the spatial environment. It is important to be aware not only about their potential, but also about their potential limitations when applied as learning environments.

Learning often means challenging existing cultural models (Gee, 2007), and in the case of this research, one critical area for learning was to challenge children's belief that they are not able to contribute to transforming their living environment. Games can create experiences that challenge this belief by placing children in situations within the safe space of the game where they are actively involved in shaping the spatial environment. However, the empirical findings revealed that sometimes the experiences provided by the game are not strong enough to break deeply ingrained cultural models. For instance, children who have internalized the belief that they are not competent enough to effect change in their everyday lives may struggle to overcome this belief through a single game experience.

Similarly, overcoming behaviors learned through educational socialization proved to be challenging at times. For example, the attitude that emphasizes individual success over cooperation can hinder the collaborative aspects of transformative games. Children who are accustomed to competitive learning environments may find it difficult to adapt to the collaborative and collective action required in these games, and to internalize the idea of social participation for transforming spatial environments.

These deeply rooted cultural models and attitudes towards learning are not easily changed through a single game experience. They often require repeated, diverse experiences in different contexts to facilitate a meaningful shift in perspective. To gain deeper insights and empirical knowledge on how to effectively challenge and transform these entrenched beliefs and behaviors, further research is necessary. This line of inquiry goes beyond the scope of the current research, underscoring the need for ongoing studies to explore how repeated and varied game-based experiences can progressively alter cultural models and attitudes towards learning.

7.5.

Reflection on the Learning Process of the Researcher

Section 4.4 was dedicated to the reflection of my various roles as a design researcher. In the retrospective view the obvious fundamental challenge was the constant alternation between two distinct mindsets: Educational design research is an open and non-linear process, which integrates pragmatic, dynamic, and generative processes (Bannan-Ritland & Baek, 2008, p. 299). The challenge of this integrated research and design process lies in the alternation of reactive and proactive stances, that is, in “‘finding meaning’ in things that happen and ‘making meaning’ by causing things to happen” (Nelson & Stolterman, 2012, p. 49). McDaniel Johnson (2003, p. 39) points out that the nature of this approach is, thus, “inherently paradoxical: both empirical and imaginary”, and it requires both analytical thinking and creativity throughout the different phases of the research process.

This duality was particularly challenging during the development and construction phases, as being part of the design situation meant also emotional involvement. This situation stemmed not only from the sense of ownership over the evolving prototype but also from being part of a design team, where personal relationships and a shared commitment to a common goal emerged. The process was complex and extensive, with countless alternative paths to explore. Both rational and emotional aspects played crucial roles in decision-making, with each decision influencing subsequent steps and interpretations of earlier phases (McKenney & Reeves, 2012; Philips & Dolle, 2006; Plomp & Nieveen, 2009). To manage these challenges, I implemented an extensive retrospective analysis (Gravemeijer and Cobb 2006), which involved studying the entire data set with enough distance in space and time to maintain an analytical perspective and focus on theory building. This approach allowed me to critically examine the data and derive design principles and more comprehensive theories.

The research process pushed me out of my comfort zone, leading to significant personal and professional growth. According to Dewey’s learning theory, education is a process of living and not a preparation for future living. Learning occurs through active engagement with the environment, where experiences are not only undergone but also reflected upon, leading to growth and transformation. Dewey (1938/1986) emphasizes the importance of reflective thought in the learning process, which involves active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends.

Engaging in both the creative and analytical aspects of the research process required me to continuously reflect on my experiences, understand their implications, and apply these insights to further action. This reflective process, central to Dewey’s theory, facilitated my deep learning process. By actively participating in the design and development of the prototypes

and then stepping back to analyze and reflect on these activities, I was able to integrate practical experiences with theoretical understanding. This did not only contribute to the development of robust design principles but also significantly enhanced my growth as a researcher.

7.6.

Reflection on the Transferability of Transformative Game Design Principles

Educational design research provides a comprehensive framework for exploring the interrelations of games, learning, and space within an integrated research and development process. However, this methodology is inherently contextual and specific, making exhaustive theoretical and empirical generalization challenging (Bannan-Ritland & Baek, 2008). Therefore, the goal is not to produce universally applicable results but to generate insights and principles that can inform and enhance learning in various contexts (Plomp, 2009).

The design principles developed through my research are heuristic statements crafted within a specific context. They are tailored to the particularities of the research setting but can serve as foundational guidelines for other contexts (van den Akker, 1999b). This means that these principles are not prescriptive blueprints but adaptable frameworks that other researchers and practitioners can modify according to their unique situations.

In design research, generalizability is reconceptualized. Instead of seeking replicability, it frames the research as a paradigmatic example of a broader class of phenomena (Gravemeijer & Cobb, 2006). My design research can be seen as a representative case that illuminates broader educational principles and practices. These principles can then be applied, with necessary adaptations, across different settings.

To ensure the trustworthiness of the findings, I meticulously documented the development process. This included capturing artifacts, dialogues, key moments, and reflections throughout the design and construction phases, from concept validation and prototyping sessions to playtests and evaluations. Such thorough documentation allows others to understand the rationale behind decisions and the pathways explored, fostering confidence in the outcomes.

During the evaluation phase, I paid careful attention to the sampling of schools and participants to provide insights from a broad target context. This diversity in sampling helps to illustrate the applicability of the design principles across different educational settings, further supporting their transferability.

Finally, in the previous sections, I generalized the design principles emergent from my empirical study to a broader theoretical framework. This was done to explore the potential transfer of the research findings to theoretical propositions relevant to their own contexts (van den Akker, 2009). By aligning my findings with established theories, I provided a robust foundation for others to adapt and apply these principles in their educational practices.

The outcome of my empirical research is the game *ParticiPécs*, which has been adapted for use in Veszprém in 2023. Although this adaptation extends beyond the scope of my research, it demonstrates the transferability of my findings. For this adaptation, I retained the game's core concept, including its format, game elements, narrative framework, and rules, while re-designing the context-specific content in collaboration with local young people. This process involved three workshops held in four schools, during which we used mental mapping to design the spatial context depicted on the game board. We then collaboratively identified the participant's activity spaces and the spatial practices that defined the game's highlighted urban interventions, tailoring these to their needs and ideas. Together, we also developed site-specific stories and characters that lent a local flavor to the game's narrative elements. The adapted game, *Participy Veszprém*⁴², was played in various high schools, where students, similar to those in Pécs, devised and partially implemented their individual ideas to improve the spatial environments (see Figure 38).



Figure 38
Participy Veszprém

7.7.

Future Directions for Research on Transformative Game Design in the Context of Built Environment Education

To further develop the field of transformative game design in built environment education, it is essential to test the principles derived from this research in various contexts. This would enhance the validity and generalizability of the findings (Plomp & Nieveen, 2009). However, the objective is not only to validate the existing set of principles but also to deepen the understanding of them and how they operate in different educational settings and contexts. To give an example, the Spatial World Principle emphasizes the importance of grounding the game world in children's spatial realities to ensure continuity of experience. This principle has been confirmed to facilitate the transfer of learning from the game environment to real-world contexts. The research provided valuable insights into achieving this through holistic integration of representations and mechanics. However, future research should explore how this principle can be applied in games that do not rely on visual spatial representations. Understanding how to maintain continuity of experience in such games, and identifying the ways to create this continuity, would significantly enhance the understanding of the Spatial World Principle. Similarly, the Tailor-made Spatial Practices Principle, which emphasizes the importance of context-sensitive design, requires further exploration. This principle needs to be tested in different educational settings and for various educational goals. For example, what does it mean to tailor spatial practices for a game aimed at learning to understand and actively engage in urban planning processes? How can the principle be adapted for different age groups or learning objectives? Future research should address these questions to provide a more comprehensive understanding of context-sensitive game design.

Moreover, research should focus on the interconnections between different design principles within transformative play. How do these principles interact to create a cohesive and impactful learning experience? For instance, how does the integration of the Spatial World Principle with the Experiential Spatial Practices Principle enhance the overall impact of a game? Investigating these interconnections will provide a more nuanced understanding of how to design transformative games that are both educational and engaging.

Additionally, future research should aim to investigate the long-term impacts of transformative games on children's beliefs about their ability to effect change in their environments. This includes exploring how sustained and repeated game-based experiences can influence deeply ingrained cultural models and attitudes towards learning. Understanding these dynamics is crucial for developing educational tools that can effectively foster a sense of agency and competence among players.

In conclusion, the future directions for transformative game design in built environment education involve a multi-faceted approach. This includes validating and refining the existing principles, exploring their application in diverse contexts, and understanding the long-term impacts of game-based learning experiences. By addressing these areas, future research can build on the foundations laid by this study and contribute to the development of more impactful transformative games.

References

- Abt, C. C. (1970). *Serious games*. University Press of America.
- Aronson, E. (1972/2007). *The social animal* (10th ed.). Worth. (Original work published 1972)
- Bagley, E., & Shaffer, D. W. (2009). When people get in the way. *International Journal of Gaming and Computer-Mediated Simulations*, 1(1), 36–52.
<https://doi.org/10.4018/jgcms.2009010103>
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman.
- Bannan, B. (2009). The integrative learning design framework: *An illustrated example from the domain of instructional technology*. In T. Plomp & N. M. Nieveen (Eds.), *An introduction to educational design research: Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2007* (3rd print, pp. 114–133). SLO.
- Bannan-Ritland, B., & Baek, J. Y. (2008). Investigating the act of design in design research: The road taken. In A. E. Kelly, J. Y. Baek, & R. A. Lesh (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics* (pp. 299–319). Routledge.
- Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *Journal of the Learning Sciences*, 13(1), 1–14. https://doi.org/10.1207/s15327809jls1301_1
- Barab, S., Zuiker, S., Warren, S., Hickey, D., Ingram-Goble, A., Kwon, E.-J., Kouper, I., & Herring, S. C. (2007). Situationally embodied curriculum: Relating formalisms and contexts. *Science Education*, 91(5), 750–782. <https://doi.org/10.1002/sce.20217>
- Beckett, K. L., & Shaffer, D. W. (2005). Augmented by reality: The pedagogical praxis of urban planning as a pathway to ecological thinking. *Journal of Educational Computing Research*, 33(1), 31–52. <https://doi.org/10.2190/D5YQ-MMW6-VOFR-RNJJ>
- Bedwell, W. L., Pavlas, D., Heyne, K., Lazzara, E. H., & Salas, E. (2012). Toward a taxonomy linking game attributes to learning. *Simulation & Gaming*, 43(6), 729–760.
<https://doi.org/10.1177/1046878112439444>
- Benze, A., Mattsson, C. J., & Walter, U. (2020). Games as urban agora: An analysis of games as participatory research, co-design, and educational tools in urban planning. In M. B. Dodig & L. N. Groat (Eds.), *The Routledge companion to games in architecture and urban planning: Tools for design, teaching, and research* (pp. 221–233). Routledge.
- Borries, F. v., Walz, S. P., Böttger, M., Davidson, D., Kelley, H., & Kücklich, J. (Eds.). (2007). *Space time play. Computer games, architecture and urbanism: The next level*. Birkhauser.
- Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge University Press.
- Breckner, I., & Sturm, G. (1997). Raum-Bildungen: Übungen zu einem gesellschaftlich begründeten Raum-Verstehen. In J. Ecarus & M. Löw (Eds.), *Raumbildung Bildungsräume* (pp. 213–236). VS Verlag für Sozialwissenschaften.
- Breuer, J. (2010). *Spielend lernen? Eine Bestandsaufnahme zum (Digital) Game-Based Learning*. Landesanstalt für Medien Nordrhein-Westfalen. LfM-Dokumentation.
<http://www.lfm-nrw.de/fileadmin/lfm-nrw/Publikationen-Download/Doku41-Spielend-Lernen.pdf>
- Brinkmann, S. (2013). *John Dewey: Science for a changing world*. Transaction Publishers.

- Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, 2(2), 141–178. https://doi.org/10.1207/s15327809jls0202_2
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32–42. <https://doi.org/10.3102/0013189X018001032>
- Bruffee, K. A. (1995). Sharing our toys: Cooperative learning versus collaborative learning. *Change: The Magazine of Higher Learning*, 27(1), 12–18. <https://doi.org/10.1080/00091383.1995.9937722>
- Bruner, J. S. (1962). *On knowing: Essays for the left hand*. Harvard University Press.
- Caillois, R. (2001). *Man, play and games*. University of Illinois Press; Wantage : University Presses Marketing. (Original work published 1961)
- Certeau, M. de. (1984). *The practice of everyday life* (3rd revised edition). University of California Press.
- Chawla, L. (2008). Participation and the ecology of environmental awareness and action. In A. Reid (Ed.), *Participation and learning: Perspectives on education and the environment, health and sustainability* (pp. 98–110). Springer.
- Clark, A. (1989). *Microcognition: Philosophy, cognitive science, and parallel distributed processing*. Explorations in cognitive science: Vol. 6. MIT Press.
- Clark, A. (1993). *Associative engines: Connectionism, concepts, and representational change*. MIT Press.
- Clark, A., & Chalmers, D. (1998). The extended mind. *Analysis*, 58(1), 7–19. <https://doi.org/10.1093/analys/58.1.7>
- Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *NATO ASI Series, Series F: Computer and Systems Sciences: Vol. 96. New directions in educational technology* (pp. 15–22). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-77750-9_2
- Crang, M., & Thrift, N. J. (Eds.). (2000). *Critical geographies. Thinking space*. Routledge.
- Crawford, C. (1984). *The art of computer game design*. Osborne / McGraw-Hill.
- Cross, N. (1972). Preface. In N. Cross (Ed.), *Design participation: Proceedings of the Design Research Society's Conference* (p. 6). Academy Editions.
- Csikszentmihályi, M. (1990). *Flow: The psychology of optimal experience*. Harper Perennial Modern Classics.
- DeKoven, B. (2013). *The well-played game: A player's philosophy*. MIT Press.
- Derr, V., Chawla, L., & Mintzer, M. (2018). *Placemaking with children and youth: Participatory practices for planning sustainable communities* (1st edition). New Village Press.
- Design-Based Research Collective (2003). Design-Based Research: AAn emerging paradigm for educational inquiry. *Educational Researcher*, 32(1), 5–8. <https://doi.org/10.3102/0013189X032001005>
- Devisch, O. (2008). Should planners start playing computer games? Arguments from SimCity and Second Life. *Planning Theory & Practice*, 9(2), 209–226. <https://doi.org/10.1080/14649350802042231>
- Dewey, J. (1980). *Democracy and education*. In J. A. Boydston (Ed.), *The collected works of John Dewey: Vol. 9. The middle works of John Dewey: 1899-1924* (pp. 1–370). Southern Illinois Univ. Press. (Original work published 1916)

- Dewey, J. (2008). *Experience and education*. In J. A. Boydston (Ed.), *The collected works of John Dewey: 13, 1938-1939. The Later Works of John Dewey, 1925 - 1953*. Southern Illinois University Press. (Original work published 1938)
- Dewey, J. (1986). *Logic: The theory of inquiry*. In J. A. Boydston (Ed.), *The collected works of John Dewey: 12, 1938. The later works of John Dewey, 1925-1953* (pp. 1–528). Southern Illinois University Press. (Original work published 1938)
- Dewey, J., & Bentley, A. F. (1989). *Knowing and the known*. In J. A. Boydston & H. F. Simon (Eds.), *The collected works of John Dewey: 16, 1949-52. The later works of John Dewey, 1925-1953* (pp. 1–294). Southern Illinois University Press. (Original work published 1949)
- DiSessa, A. A. (2000). *Changing minds: Computers, learning, and literacy*. The MIT Press.
- Dobson, S. (2006). Urban pedagogy: A proposal for the twenty-first century. *London Review of Education*, 4(2), 99–114. <https://doi.org/10.1080/14748460600855153>
- Dodig, M. B., & Groat, L. N. (2020a). Architecture and urban planning? Game on! Games as tools for design, teaching/learning, and research in architecture and urban planning. In M. B. Dodig & L. N. Groat (Eds.), *The Routledge companion to games in architecture and urban planning: Tools for design, teaching, and research*. Routledge.
- Dodig, M. B., & Groat, L. N. (Eds.). (2020b). *The Routledge companion to games in architecture and urban planning: Tools for design, teaching, and research*. Routledge.
- Don, A., & Petrick, J. (2003). User requirements. In B. Laurel (Ed.), *Design research: Methods and perspectives* (pp. 70–81). MIT Press.
- Driskell, D. (2002). *Creating better cities with children and youth: A manual for participation*. Earthscan; UNESCO Pub. MOST/Management of Social Transformation.
- Dúll, A. (2009). *A környezetpszichológia alapkérdései: Helyek, tárgyak, viselkedés*. Kivülbelül. L'Harmattan.
- Echeverría, A., García-Campo, C., Nussbaum, M., Gil, F., Villalta, M., Améstica, M., & Echeverría, S. (2011). A framework for the design and integration of collaborative classroom games. *Computers & Education*, 57(1), 1127–1136. <https://doi.org/10.1016/j.compedu.2010.12.010>
- Eckardt, F. (2014). *Stadtforschung: Gegenstand und Methoden*. SpringerLink : Bücher. Springer VS.
- Ehn, P. (1988). *Work-oriented design of computer artifacts*. Arbetslivscentrum.
- Ejersbo, L. R., Engelhardt, R., Frølund, L., Hanghøj, T., Magnussen, R., & Misfeldt, M. (2008). Balancing product design and theoretical insight. In A. E. Kelly, J. Y. Baek, & R. A. Lesh (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics* (pp. 149–163). Routledge.
- Elfer, C. J. (2011). *Place-based education: A review of historical precedents in theory & practice* [Dissertation, The University of Georgia, Athens, Georgia]. https://getd.libs.uga.edu/pdfs/elfer_charles_j_201108_phd.pdf
- Erfani, K., Brkovic Dodig, M., Groat, L. N., & Mankouche, S. (2020). Playing pretend: An interview with Steven Mankouche. In M. B. Dodig & L. N. Groat (Eds.), *The Routledge companion to games in architecture and urban planning: Tools for design, teaching, and research* (pp. 63–75). Routledge.
- Faragó, L. (2013). Urban regeneration in a 'City of Culture' the case of Pécs, Hungary. *European Spatial Research and Policy*, 19(2), 103–120. <https://doi.org/10.2478/v10105-012-0017-4>

- Ferri, G., & Coppock, P. (2013). Serious urban games: From play in the city to play for the city. In S. Tosoni, M. Tarantino, & C. Giaccardi (Eds.), *Media and the city: Urbanism, technology and communication* (pp. 120–134). Cambridge Scholars Publishing.
- Fine, G. A. (1983). *Shared fantasy: Role-playing games as social worlds*. University of Chicago Press.
- Flanagan, M. (2009). *Critical play: Radical game design*. MIT Press.
- Flick, U. (2000). Episodic interviewing. In M. W. Bauer & G. Gaskell (Eds.), *Qualitative researching with text, image and sound: A practical handbook* (pp. 75–92). SAGE.
- Flick, U. (2009). *An introduction to qualitative research* (4th ed.). SAGE.
- Frandsen, M. S., & Pfeiffer Petersen, L. (2014). Urban co-creation. In J. Simonsen (Ed.), *Design thinking, design theory. Situated design methods* (pp. 181–200). The MIT Press.
- Freeman, C., & Tranter, P. J. (2011). *Children and their urban environment: Changing worlds*. Earthscan.
- Freire, P. (1970). *Pedagogy of the oppressed*. Herder & Herder.
- Froebel, F. (2012). *The education of man*. Dover Publications. <http://gbv.eblib.com/patron/FullRecord.aspx?p=1900651> (Original work published 1826)
- Fullerton, T. (2008). *Game design workshop: A playcentric approach to creating innovative games*. CRC Press.
- Gaber, J. (2007). Simulating planning: SimCity as a pedagogical tool. *Journal of Planning Education and Research*, 27(2), 113–121. <https://doi.org/10.1177/0739456x07305791>
- Gee, J. P. (2007). *What video games have to teach us about learning and literacy*. Palgrave Macmillan.
- Gee, J. P. (2008). Game-like learning. An example of situated learning and implications for opportunity to learn. In P. Moss (Ed.), *Assessment, equity, and opportunity to learn* (pp. 200–221). Cambridge University Press.
- Giedion, S. (1967). *Space, time and architecture: The growth of a new tradition* (5th ed., rev. and enl). Harvard University Press.
- Graham, S. (2007). War play. Practising urban annihilation. In F. v. Borries, S. P. Walz, M. Böttger, D. Davidson, H. Kelley, & J. Kücklich (Eds.), *Space time play. Computer games, architecture and urbanism: The next level* (pp. 420–424). Birkhauser.
- Gravemeijer, K., & Cobb, P. (2006). Design research from the learning design perspective. In J. van den Akker, K. Gravemeijer, S. E. McKenney, & N. M. Nieveen (Eds.), *Educational Design research* (pp. 17–51). Routledge.
- Gruenewald, D. A. (2003a). The best of both worlds: A critical pedagogy of place. *Educational Researcher*, 32(4), 3–12. <https://doi.org/10.3102/0013189X032004003>
- Gruenewald, D. A. (2003b). Foundations of place: A multidisciplinary framework for Place-conscious education. *American Educational Research Journal*, 40(3), 619–654. <https://doi.org/10.3102/00028312040003619>
- Hackett, L. J., & Coghlan, J. (2023). Why Monopoly monopolizes popular culture board games. *M/C Journal*, 26(2). <https://doi.org/10.5204/mcj.2956>
- Hämäläinen, R. H., Niilo-Rämä, M., Lainema, T., & Oksanen, K. (2018). How to raise different game collaboration activities: The association between game mechanics, players' roles and collaboration processes. *Simulation & Gaming*, 49(1), 50–71. <https://doi.org/10.1177/1046878117752470>

- Hart, R. A. (1992). Children's participation: From tokenism to citizenship. *Innocenti essays: no.4*. UNICEF International Child Development Centre.
- Hjalmarson, M. A., & Lesh, R. A. [R. A.]. (2008). Engineering and design research: Intersections for education research and design. In A. E. Kelly, J. Y. Baek, & R. A. Lesh (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics* (pp. 96–110). Routledge.
- Howe, K. R., & Moses, Michele, S. (1999). Chapter 2: Ethics in Educational Research. *Review of Research in Education*, 24(1), 21–59. <https://doi.org/10.3102/0091732X024001021>
- Huber, M., & Nelke, A. (2007). Monopoly. The multiple career of a concept. In F. v. Borries, S. P. Walz, M. Böttger, D. Davidson, H. Kelley, & J. Kücklich (Eds.), *Space time play. Computer games, architecture and urbanism: The next level* (pp. 472–473). Birkhauser.
- Huizinga, J. (2014). *Homo ludens: A study of the play-element in culture*. Beacon Press. (Original work published 1938)
- Illeris, K. (2009). A comprehensive understanding of human learning. In K. Illeris (Ed.), *Contemporary theories of learning: Learning theorists in their own words* (1st, pp. 7–20). Routledge.
- International Union of Architects (UIA). (2019). *Charter for built environment education for children and young people*. https://www.uia-architectes.org/wp-content/uploads/2022/03/charter_bee_2019.pdf
- Ireland, C. (2003). Qualitative methods: From boring to brilliant. In B. Laurel (Ed.), *Design research: Methods and perspectives* (pp. 23–29). MIT Press.
- Jenkins, H., Squire, K., & Tan, K. (2003). “You can’t bring that game to school!”. In B. Laurel (Ed.), *Design research: Methods and perspectives* (pp. 244–252). MIT Press.
- Jonassen, D. H., Cernusca, D., & Ionas, G. (2012). Constructivism and instructional design: The emergence of the learning sciences and design research. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (3. ed., international ed., pp. 45–52). Pearson.
- Juris, J. S. (2012). Reflections on #Occupy Everywhere: Social media, public space, and emerging logics of aggregation. *American Ethnologist*, 39(2), 259–279. <https://doi.org/10.1111/j.1548-1425.2012.01362.x>
- Kagan, S. (1994). *Cooperative learning*. Resources for Teachers, Inc.
- Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. Pfeiffer.
- Kelly, A. E., Baek, J. Y., Lash, R. A., & Bannan-Ritland, B. (2008). Enabling innovations in education and systematizing their impact. In A. E. Kelly, J. Y. Baek, & R. A. Lesh (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics* (pp. 3–17). Routledge.
- Kelly, A. E., Baek, J. Y., & Lesh, R. A. (Eds.). (2008). *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics*. Routledge.
- Klopfer, E., Osterweil, S., & Salen, K. (2009). *Moving learning games forward. Obstacles, opportunities & openness*. Massachusetts Institute of Technology. http://education.mit.edu/wp-content/uploads/2015/01/MovingLearningGamesForward_EdArcade.pdf

- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Lankoski, P., & Björk, S. (2015). Formal analysis of gameplay. In P. Lankoski & S. Björk (Eds.), *Game research methods: An overview* (pp. 23–36). ETC Press.
- Läpple, D. (1992). Essay über den Raum: Für ein gesellschaftswissenschaftliches Raumkonzept. In H. Häussermann (Ed.), *Stadt, Raum und Gesellschaft: Bd.1. Stadt und Raum: Soziologische Analysen* (pp. 157–207). Centaurus.
- Lave, J. (1988). *Cognition in practice: Mind, mathematics and culture in everyday life*. Cambridge University Press.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation. Learning in doing : social, cognitive, and computational perspectives*. Cambridge University Press.
- Lerner, J. (2014). *Making democracy fun: How game design can empower citizens and transform politics*. MIT Press.
- Likert, R. (1932). *Technique for the measurement of professional attitudes*. The Science Press.
- Linn, M. C., Bell, P., & Davis, E. A. (2004). Specific design principles: Elaborating the scaffolded knowledge integration framework. In M. C. Linn, E. A. Davis, & P. L. Bell (Eds.), *Internet environments for science education* (pp. 315–340). Lawrence Erlbaum.
- Lobo, D. G. (2007). Playing with urban life: How SimCity influences planning culture. In F. v. Borries, S. P. Walz, M. Böttger, D. Davidson, H. Kelley, & J. Kücklich (Eds.), *Space time play. Computer games, architecture and urbanism: The next level* (pp. 206–209). Birkhauser.
- Løssing, T., Nielsen, R., Lykke-Olesen, A., & Delman, T. F. (2007). The Harbour Game. In F. v. Borries, S. P. Walz, M. Böttger, D. Davidson, H. Kelley, & J. Kücklich (Eds.), *Space time play. Computer games, architecture and urbanism: The next level* (pp. 388–389). Birkhauser.
- Löw, M. (2008). The constitution of space. *European Journal of Social Theory*, 11(1), 25–49. <https://doi.org/10.1177/1368431007085286>
- Löw, M. (2016). *The sociology of space: Materiality, social structures, and action*. Palgrave Macmillan.
- Lydon, M., Garcia, A., & Duany, A. (2015). *Tactical urbanism: Short-term action for long-term change*. Island Press.
- Lynch, K. (1960). *The image of the city*. Publications of the Joint Center for Urban Studies. MIT Press.
- Maher, C., Hadfield, M., Hutchings, M., & Eyto, A. de (2018). Ensuring rigor in qualitative data analysis. *International Journal of Qualitative Methods*, 17(1), 160940691878636. <https://doi.org/10.1177/1609406918786362>
- Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. *Cognitive Science*, 5(4), 333–369. https://doi.org/10.1207/s15516709cog0504_2
- Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning, and instruction: Vol. 3. Cognitive and affective process analyses* (pp. 223–253). Lawrence Erlbaum Associates.
- Manzo, L. C., & Brightbill, N. (2007). Toward a participatory ethics. In S. L. Kindon, R. Pain, & M. Kesby (Eds.), *Routledge Studies in Human Geography: Vol. 22. Participatory action research approaches and methods: Connecting people, participation and place* (pp. 33–40). Routledge.

- Mayer, I. S., Bekebrede, G., Bilsen, A., & Zhou, Q. (2009). Beyond SimCity: Urban gaming and multi-actor systems. In E. Stolk & M. t. Brömmelstroet (Eds.), *Model town: Using urban simulation in new town planning* (pp. 168–181). SUN.
- McDaniel Johnson, B. (2003). The paradox of design research. In B. Laurel (Ed.), *Design research: Methods and perspectives* (pp. 39–40). MIT Press.
- McGonigal, J. (2007). Ubiquitous gaming. A vision for a future of enchanted spaces. In F. v. Borries, S. P. Walz, M. Böttger, D. Davidson, H. Kelley, & J. Kücklich (Eds.), *Space time play. Computer games, architecture and urbanism: The next level* (pp. 26–31). Birkhauser.
- McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. Penguin Press.
- McKenney, S. E., Nieveen, N. M., & van den Akker, J. (2006). Design research from a curriculum perspective. In J. van den Akker, K. Gravemeijer, S. E. McKenney, & N. M. Nieveen (Eds.), *Educational design research* (pp. 67–90). Routledge.
- McKenney, S. E., & Reeves, T. C. (2012). *Conducting educational design research*. Routledge.
- McWhaw, K., Schnackenberg, H., Sclater, J., & Abrami, P. C. (2003). From co-operation to collaboration: helping students become collaborative learners. In R. M. Gillies & A. F. Ashman (Eds.), *Cooperative learning: The social and intellectual outcomes of learning in groups* (pp. 69–86). Routledge Falmer.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods source book* (3rd ed.). SAGE Publications.
- Million, A., Coelen, T., Bentlin, F., Klepp, S., & Zinke, C. (2019). *Educational institutions and learning environments in baukultur: Moments and processes in built environment education for children and young people* (1st ed.). Wüstenrot Stiftung.
- Million, A., & Heinrich, A. J. (2014). Linking participation and built environment education in urban planning processes. *Current Urban Studies*, 2(4), 335–349. <https://doi.org/10.4236/cus.2014.24032>
- Million, A., Parnell, R., & Coelen, T. (2018). Editorial: Policy, practice and research in built environment education. *Proceedings of the Institution of Civil Engineers - Urban Design and Planning*, 171(1), 1–4. <https://doi.org/10.1680/jurdp.2018.171.1>
- Montessori, M. (2003). *Dr. Montessori's own handbook* [Reprinted]. Schocken Books. (Original work published 1914)
- Montola, M., Stenros, J., & Wærn, A. (2009). *Pervasive games: Theory and design*. Elsevier/Morgan Kaufmann.
- Müller-Schwarze, D. (1978). *The evolution of play behaviour*. Dowden, Hutchinson & Ross.
- Nelson, H. G., & Stolterman, E. (2012). *The design way: Intentional change in an unpredictable world* (2nd ed.). MIT Press.
- Newton, I. (1846). *Mathematical principles of natural philosophy* (Andrew Motte, Trans.). aniel Adee.
- Nieveen, N. (1999). Prototyping to reach product quality. In J. Akker, R. M. Branch, K. Gustafson, N. Nieveen, & T. Plomp (Eds.), *Design approaches and tools in education and training* (pp. 125–136). Springer Netherlands.
- Nieveen, N. (2009). Formative evaluation in educational design research. In T. Plomp & N. M. Nieveen (Eds.), *An introduction to educational design research: Proceedings of the*

- seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2007 (3rd print, pp. 89–101). SLO.
- Ollman, B. (2002). *Ballbuster? True confessions of a Marxist businessman* (1st ed.). Soft Skull Press.
- Olson, J. A. (2012). Geography, GIS and gaming: Learning tools or just for fun? *Journal of Map & Geography Libraries*, 8(3), 290–294. <https://doi.org/10.1080/15420353.2012.696533>
- Parlett, D. (1999). *The Oxford history of board games*. Oxford University Press.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). SAGE.
- Pearce, C. (2007). Narrative environments. From Disneyland to World of Warcraft. In F. v. Borries, S. P. Walz, M. Böttger, D. Davidson, H. Kelley, & J. Kücklich (Eds.), *Space time play. Computer games, architecture and urbanism: The next level* (pp. 200–205). Birkhauser.
- Piaget, J. (1952). *Play, dreams, and imitation in childhood*. Norton.
- Piaget, J., & Inhelder, B. (2000). *The psychology of the child*. Basic Books. (Original work published 1969)
- Plomp, T. (2009). Educational design research: An introduction. In T. Plomp & N. M. Nieveen (Eds.), *An introduction to educational design research: Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2007* (3rd print, pp. 9–35). SLO.
- Plomp, T., & Nieveen, N. M. (Eds.). (2009). *An introduction to educational design research: Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2007* (3rd print). SLO.
- Ramirez, D., & Squire, K. (2014). Gamification and learning. In S. P. Walz & S. Deterding (Eds.), *The gameful world: Approaches, issues, applications* (pp. 629–652). MIT Press.
- Randl, C. (2023). Tables and floors: The playscapes of board games. In C. Randl & D. M. Lasansky (Eds.), *Playing place: board games, popular culture, space* (pp. 169–172). MIT Press.
- Randl, C., & Lasansky, D. M. (Eds.). (2023). *Playing place: board games, popular culture, space*. MIT Press.
- Rauterberg, H. (2016). *Wir sind die Stadt! Urbanes Leben in der Digitalmoderne* (4th ed.) Edition suhrkamp: Vol. 2674. Suhrkamp.
- Reed, E. S. (1996). *The necessity of experience*. Yale University Press.
- Reeves, T. C. (2006). Design research from the technology perspective. In J. van den Akker, K. Gravemeijer, S. E. McKenney, & N. M. Nieveen (Eds.), *Educational design research* (pp. 52–66). Routledge.
- Reinking, D., & Bradley, B. A. (2008). *On formative and design experiments: Approaches to language and literacy research. Language and literacy series*. Teachers College Press.
- Ritterfeld, U., Cody, M. J., & Vorderer, P. (Eds.). (2009). *Serious games: Mechanisms and effects*. Routledge.
- Rogoff, B., Moore, L. C., Correa-Chávez, M., & Dexter, A. L. (2016). Children develop cultural repertoires through engaging in everyday routines and practices. In J. E. Grusec & P. D. Hastings (Eds.), *Handbook of socialization: Theory and research* (Second edition, pp. 472–498). The Guilford Press.

- Royal Institute of the Architects of Ireland. (2019). *Charter built environment education for children and young people*. https://www.riai.ie/public/downloads/uia_ed_guidelines.pdf
- Salen, K. (Ed.). (2008). *The ecology of games: Connecting youth, games, and learning*. MIT Press.
- Salen, K., & Zimmerman, E. (2003). *Rules of play: Game design fundamentals*. MIT Press.
- Salomon, D. (2023). Blokus: From ornament to territory. In C. Randl & D. M. Lasansky (Eds.), *Playing place: board games, popular culture, space* (pp. 57–60). MIT Press.
- Sanders, E. B.-N. (2002). From user-centered to participatory design approaches. In J. Frascara (Ed.), *Design and the social sciences: Making connections* (pp. 1–8). Taylor & Francis. <https://doi.org/10.1201/9780203301302.ch1>
- Sanders, E. B.-N., & Stappers, P. J. (2014). Probes, toolkits and prototypes: Three approaches to making in codesigning. *CoDesign*, 10(1), 5–14. <https://doi.org/10.1080/15710882.2014.888183>
- Sanoff, H. (1979). *Design games* (Experimental ed.). W. Kaufmann.
- Schatzki, T. R., Knorr-Cetina, K. D., & Savigny, E. v. (2001). *The practice turn in contemporary theory*. Routledge.
- Schell, J. (2008). *The art of game design: A book of lenses*. Elsevier/Morgan Kaufmann.
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.
- Schön, D. A. (1992). The theory of inquiry: Dewey's legacy to education. *Curriculum Inquiry*, 22(2), 119–139. <https://doi.org/10.1080/03626784.1992.11076093>
- Schrader, P. G., & McCreery, M. (2012). Are all games the same? In D. Ifenthaler, D. Eseryel, & X. Ge (Eds.), *Assessment in game-based learning: Foundations, innovations, and perspectives* (pp. 11–28). Springer.
- Scriven, M. (1967). The methodology of evaluation. In R. W. Tyler, R. M. Gagne, & M. Scriven (Eds.), *Perspectives of curriculum evaluation* (pp. 39–83). Rand McNally.
- Sebestyén, Á., & Tóth, E. (2010). *Pécs for kids*. kultúrAktív Association.
- Seligman, M. E., & Csikszentmihalyi, M. (2000). Positive psychology. An introduction. *The American Psychologist*, 55(1), 5–14. <https://doi.org/10.1037/0003-066X.55.1.5>
- Shaffer, D. W. (2004). Pedagogical praxis: The professions as models for postindustrial education. *Teachers College Record*, 106(7), 1401–1421. <https://doi.org/10.1111/j.1467-9620.2004.00383.x>
- Shaffer, D. W. (2006). Epistemic frames for epistemic games. *Computers & Education*, 46(3), 223–234. <https://doi.org/10.1016/j.compedu.2005.11.003>
- Shaffer, D. W., & Resnick, M. (1999). "Thick authenticity": New media and authentic learning. *Journal of Interactive Learning Research*, 10(2), 195–215. <https://web.media.mit.edu/~mres/papers/authenticity/authenticity.pdf>
- Silberberg, S. (Ed.). (2013). *Places in the making: How placemaking builds places and communities*. MIT Press. <https://dusp.mit.edu/sites/dusp.mit.edu/files/attachments/project/mit-dusp-places-in-the-making.pdf>
- Singhal, A. (Ed.). (2004). *Entertainment-education and social change: History, research, and practice*. Lawrence Erlbaum.
- Skelton, T., & Gough, K. V. (2013). Introduction: Young people's im/mobile urban geographies. *Urban Studies*, 50(3), 455–466. <https://doi.org/10.1177/0042098012468900>

- Sleeswijk Visser, F., Stappers, P. J., van der Lugt, R., & Sanders, E. B.-N. (2005). Contextmapping: Experiences from practice. *CoDesign*, 1(2), 119–149.
<https://doi.org/10.1080/15710880500135987>
- Sobel, D. (2004). *Place-based education: Connecting classrooms & communities*. Nature literacy series: no. 4. Orion Society.
- Squire, K. (2004). *Replaying history: Learning world history through playing Civilization III* [Dissertation, Indiana University, Bloomington, IN]. https://www.academia.edu/1317076/Replaying_history_Learning_world_history_through_playing_Civilization_III
- Stange, W., Meinhold-Henschel, S., & Schack, S. (Eds.). (2012). *Mitwirkung (er)leben: Handbuch zur Durchführung von Beteiligungsprojekten mit Kindern und Jugendlichen* (3rd ed.) Bertelsmann Stiftung.
- Strouhal, E. (2015). *Die Welt im Spiel: Atlas der spielbaren Landkarten : Reise durchs Leben, durch die Städte, in ferne Länder, über Berg und Tal, durch Zeit und Raum* (1st ed.). Christian Brandstätter Verlag.
- Surányi J., A. (2009). *Pesti Broadway - Bródvéj*. Fekete Sas Könyvkiadó Bt.
- Sutton-Smith, B. (1997). *The ambiguity of play*. Harvard University Press.
- Szabó, F., Bíró, F., F. Saági, A., & Fucskó, M. (Eds.). (1998). *Terézváros Budapest szívében*. Teréz városi Művelődési Közalapítvány.
- Tan, E. (2014). *Negotiation and design for the self-organizing city: Gaming as a method for urban design* [Doctoral dissertation, TU Delft, Faculteit Bouwkunde, Afdeling Real Estate and Housing]. https://pure.tudelft.nl/ws/portalfiles/portal/116006368/558_Book_Manuscript_329_1_10_20170717.pdf
- Tan, E. (2017). *Play the city: Games informing the urban development*. Jap Sam Books.
- Taylor, T. L. (2006). *Play between worlds: Exploring online game culture*. MIT Press.
- Tessmer, M. (1993). *Planning and conducting formative evaluations*. Kogan Page.
- Thiagarajan, S. (1991). Formative evaluation in performance technology. *Performance Improvement Quarterly*, 4(2), 22–34. <https://doi.org/10.1111/j.1937-8327.1991.tb00501.x>
- Tóth, E. (2011). *Pécs gyerekeknek angolul – megszületett az első kiértékelés* [[Pécs for kids in English – the first evaluation has been published]]. http://www.eozinmagazin.hu/cikk/Pecs_gyerekeknek_angolul_megszuletett_az_első_kiertekelés
- Trócsányi, A., & Orbán, K. (2012). Hungarian challenges of housing block regeneration: a case study of Úránváros, city of Pécs. *Revija Za Geografijo - Journal for Geography*, (2), 51–68.
- United Nations. (1992). *Agenda 21*. <https://www.un.org/esa/dsd/agenda21/>
- United Nations Human Settlements Programme. (1996). *The Habitat Agenda: Istanbul Declaration on Human Settlements*. <https://unhabitat.org/sites/default/files/2014/07/The-Habitat-Agenda-Istanbul-Declaration-on-Human-Settlements-20061.pdf>
- United Nations General Assembly. (1989). *Convention on the Rights of the Child*. <http://www.ohchr.org/EN/ProfessionalInterest/Pages/CRC.aspx>
- United Nations Department of Economic and Social Affairs/Population Division. (2015). *World urbanization prospects: The 2014 revision*. <http://esa.un.org/unpd/wup/>
- Uttke, A. (2012). Towards the future design and development of cities with built environment education. *Procedia - Social and Behavioral Sciences*, 45, 3-13.
<https://doi.org/10.1016/j.sbspro.2012.06.537>

- van den Akker, J. (Ed.). (1999a). *Design approaches and tools in education and training*. Springer Science+Business Media. <https://doi.org/10.1007/978-94-011-4255-7>
- van den Akker, J. (1999b). Principles and methods of development research. In J. van den Akker (Ed.), *Design approaches and tools in education and training* (pp. 1–14). Springer Science+Business Media. https://doi.org/10.1007/978-94-011-4255-7_1
- van den Akker, J. (2009). Curricular Development Research as a Specimen of Educational Design Research. In T. Plomp & N. M. Nieveen (Eds.), *An introduction to educational design research: Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23-26, 2007* (3rd print, pp. 52–71). SLO.
- van den Akker, J., Gravemeijer, K., McKenney, S. E., & Nieveen, N. M. (Eds.). (2006a). *Educational design research*. Routledge.
- van den Akker, J., Gravemeijer, K., McKenney, S. E., & Nieveen, N. M. (2006b). Introducing educational design research. In J. van den Akker, K. Gravemeijer, S. E. McKenney, & N. M. Nieveen (Eds.), *Educational design research* (pp. 3–8). Routledge.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Walker, D. (1992). Methodological issues in curriculum research. In P. W. Jackson (Ed.), *Handbook of research on curriculum: A project of the American Educational Research Association* (pp. 98–118). Macmillan; Collier Macmillan Canada; Maxwell Macmillan International.
- Walker, D. (2006). Toward productive design studies. In J. van den Akker, K. Gravemeijer, S. E. McKenney, & N. M. Nieveen (Eds.), *Educational design research* (pp. 8–13). Routledge.
- Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, 53(4), 5–23. <https://doi.org/10.1007/BF02504682>
- Warren, S. J., & Lin, L. (2014). Ethical considerations for learning game, simulation, and virtual world design and development. In Information Resources Management Association, IRMA (Ed.), *K-12 education: Concepts, methodologies, tools, and applications* (pp. 292–309). Information Science Reference. <https://doi.org/10.4018/978-1-4666-4502-8.ch017>
- Wenger, E. (2008). *Communities of practice: Learning, meaning, and identity. Learning in doing*. Cambridge University Press.
- Wharton, C., Rieman, J., Lewis, C [Clayton], & Polson, P. (1994). The cognitive walkthrough method: a practitioner's guide. In R. L. E. Mack & J. E. Nielsen (Eds.), *Usability inspection methods: Workshop : Conference on computer-human interaction* (pp. 105–140). Wiley.
- Wüstenrot Stiftung. (2009). *Stadtsurfer, Quartierfans & Co: Stadtkonstruktionen Jugendlicher und das Netz urbaner öffentlicher Räume*. Jovis.
- Zagal, J. P., Rick, J., & Hsi, I. (2006). Collaborative games: Lessons learned from board games. *Simulation & Gaming*, 37(1), 24–40. <https://doi.org/10.1177/1046878105282279>
- Zawojewski, J., Chamberlin, M., Hjalmarson, M. A., & Lewis, C [C.]. (2008). Developing design studies in mathematics education professional development: studying teachers' interpretive systems. In A. E. Kelly, J. Y. Baek, & R. A. Lesh (Eds.), *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics* (pp. 219–245). Routledge.

Reference list for games

- Blast Theory. (2001). Can You See Me Now? [Game]. Blast Theory.
- Cyan Worlds. (2003/2007). Uru: Ages Beyond Myst [Game]. Ubisoft.
- Duval, P. (1645). La Jeu Du Mond [Game].
- Linden Lab. (2003). Second Life [Game]. Linden Lab.
- Magie, L. (1904). The Landlord's Game [Game].
- Maxis. (1997). SimCity [Game]. Electronic Arts.
- Maxis. (2000). The Sims [Game]. Electronic Arts.
- Mind Candy. (2005). Perplex City [Game]. Mind Candy.
- Mojang. (2009). Minecraft [Game]. Mojang Studios.
- Parker Brothers. (1935). Monopoly [Game]. Parker Brothers.
- Polaine, A., & Frontier Media. (2003). Harbour Game [Game]. Australian Broadcasting Corporation.
- Shaffer, D. W. (n.d.). Urban Science [Game]. University of Wisconsin-Madison.
- Shaffer, D. W., & Squire, K. (n.d.). Madison 2200 [Game]. University of Wisconsin-Madison.
- Sony Online Entertainment. (1999). EverQuest [Game]. Sony Online Entertainment.
- University of Minnesota Design Institute. (2003). Big Urban Game [Game]. University of Minnesota.
- Wizards of the Coast. (2014). Dungeons & Dragons (5th ed.) [Role-playing game]. Wizards of the Coast.

List of Figures and Tables

List of figures

- Figure 1 The process of transformative play. Illustration by the author, 2022.
- Figure 2 Overview of the research process (adaptation of the visual model of McKenney and Reeves, 2012)
- Figure 3 Initial game design principles for transformative games that support learning to understand and act upon space. Illustration by the author, 2024.
- Figure 4 Interview participants of the final evaluation (indicating age, gender and living area). Illustration by the author, 2024.
- Figure 5 Participants of the design team. Illustration by the author, 2024.
- Figure 6 Overview of the design research process. Illustration by the author, 2024.
- Figure 7 The game *Pop-up Pest*. Top photo by Réka Katona, 2012. Bottom photo by Eszter Tóth, 2012.
- Figure 8 The game *ParticiPécs*. Photos by Júlia Lily Hegyi, 2014.
- Figure 9 The *ParticiPécs* add-on. Photos by Júlia Lily Hegyi, 2015.
- Figure 10 The exhibition of students' intervention ideas. Photos by Júlia Lily Hegyi, 2016.
- Figure 11 The chosen spatial context for the first prototype (*Pop-up Pest*). Marked map of Budapest based on Google Maps. Original markings by the author, 2012.
- Figure 12 Selected activity spaces for the game board of *Pop-up Pest*. Marked map of Budapest based on Google Maps. Original markings by the author, 2012.
- Figure 13 Draft of the *Pop-up Pest* game board showing how the routes, activity spaces, development sites, and start spaces are arranged on the map abstracted onto the grid. Illustration by the author, 2022, based on a handmade drawing from 2012.
- Figure 14 The final design of the game board of *Pop-up Pest*. Designed by Dóri Sirály, 2012.
- Figure 15 Visual signs for the activity spaces in *Pop-up Pest*. Designed by Dóri Sirály, 2012.
- Figure 16 Mental maps of the design team members
- Figure 17 Aggregated map of the mental maps drawn by the members of the design team and the selected spatial context for the second prototype (*ParticiPécs*). Illustration by the author, 2022.
- Figure 18 The chief architect's sketch of the city of Pécs. Photo by Eszter Tóth, 2014.
- Figure 19 Final game board of *ParticiPécs*. Designed by Dóri Sirály, 2014.
- Figure 20 Transformation of the "dog track" – from the idea to implementation. Photo by Eszter Tóth, 2016.
- Figure 21 Building blocks symbolizing urban interventions reconfigure the downtown of Budapest. Photo by Eszter Tóth, 2012.
- Figure 22 Participants' previous experiences in shaping their living environment. Illustration by the author, 2022.
- Figure 23 The most frequently mentioned activities that players have learned in the game. Illustration by the author, 2022.
- Figure 24 The final version of the paper-based prototype (*ParticiPécs*). Photo by Eszter Tóth, 2015.

- Figure 25 Sample cards for the action round of the *ParticiPécs* add-on. Designed by Eszter Kapitány, 2015.
- Figure 26 Birdshouse – from the idea to the implementation. Photos by Eszter Tóth, 2015 and 2016. Visualization by Réka Borbás and Renáta Borbás, 2015.
- Figure 27 Teams and individual missions in *Pop-up Pest*. Illustration by the author, 2022.
- Figure 28 Personalized game elements in *Pop-up Pest*. Photo by Anna Guba, 2013.
- Figure 29 Designs of the building blocks in *Pop-up Pest*. Designed by Dóri Sirály, 2012.
- Figure 30 A moment of sharing excitement with teammates. Photo by Eszter Tóth, 2012.
- Figure 31 Players turn their attention to another player while placing their building block on a development site. Photo by Eszter Tóth, 2012.
- Figure 32 “Romantic bench on the tunnel” conceptualized and implemented by the participants. The visual design was created by Réka Borbás and Renáta Borbás. Photos by Eszter Tóth, 2015 and 2016. Visualization by Réka Borbás and Renáta Borbás, 2015.
- Figure 33 Participants’ adaptation of urban intervention ideas. Visualization by Réka Borbás and Renáta Borbás, 2015.
- Figure 34 Participants’ innovation of urban intervention ideas. Visualization by Réka Borbás and Renáta Borbás, 2015.
- Figure 35 Design principles for creating a game world that promotes learning to understand and act upon space. Illustration by the author, 2024.
- Figure 36 Design principles for creating a gameplay that promotes learning to understand and act upon space. Illustration by the author, 2024.
- Figure 37 Design principles for creating social play that promotes learning to understand and act upon space. Illustration by the author, 2024.
- Figure 38 *Participy Veszprém*. Photos by Péter Oszkai, 2023.
- Figure A1 Description of the *Pop-up Pest* game. Illustration by the author, 2024.
- Figure A2 Description of the *ParticiPécs* game. Illustration by the author, 2024.
- Figure A3 Sample game session of the final evaluation. Illustration by the author, 2024.

List of tables

- Table 1 Overview of the research methods applied in this study. Illustration by the author, 2018.
- Table 2 Schools selected for the final evaluation. Illustration by the author, 2024.
- Table 3 First iteration drafts for the overall theme of the second prototype. Illustration by the author, 2022.
- Table 4 Developing the narrative frame for the second prototype. Illustration by the author, 2024.
- Table 5 List of interventions with their associated locations and the number of players required to complete them. Illustration by the author, 2022, graphic elements by Dóri Sirály, 2015.
- Table A1 Overview of research methods and techniques applied in each research action. Illustration by the author, 2018.

Table A2	Questionnaire 1. Illustration by the author, 2012.
Table A3	Questionnaire 2. Illustration by the author, 2012.
Table A4	Questionnaire 3. Illustration by the author, 2012.
Table A5	Overview of research participants. Illustration by the author, 2018.
Table A6	The list of situation cards in the <i>Pop-up Pest</i> game. Illustration by the author, 2022.

APPENDICES

APPENDIX A

Description of Research Actions

ANALYSIS AND EXPLORATION PHASE

RESEARCH CYCLE I – NEEDS ANALYSIS

Research action 1: Needs analysis

At the beginning of my research, I conducted an extensive literature review with a focus on games in the context of education and spatial practices. Additionally, I used more explorative techniques to uncover the discourses and knowledge gaps in current practice such as networking and exchange with experts, researchers, and practitioner communities. Through the literature review and discussions with experts, I aimed to explore the existing knowledge on games in built environment education, gaps and problems in theory and practice, and the theoretical approaches to games, space, and learning, which can provide a fundament for the research on their interplay in transformative play. The literature review concluded with the development of initial design principles, which informed the subsequent design and construction phase of my research.

Besides the literature review, I applied benchmarking at this early stage of my research in order to explore learnings and theories that games in spatial contexts can provide. Benchmarking refers here to the collection and analysis of games that had been developed for spatial contexts: I searched for publications and reports on games, exchanged with game designers, and collected and tested games in my educational practice. The practical exploration of games and the review of relevant literature helped me to clarify and properly describe the problem setting, to determine more precisely how my research should contribute to current practice and to refine the initial design principles.

RESEARCH CYCLE 2 – CONTEXT ANALYSIS

Research action 2: Context analysis

In the second cycle of the analysis and exploration phase of my research, I conducted a context analysis in order to understand the local conditions and needs in Hungary where the study was planned to be implemented, as well as to understand the needs and interests of the target group.

In this research cycle, the literature review focused on the discourse around built environment education in Hungary. Since there was a lack of literature and academic or practitioner community at the time of my early exploration phase, in the first instance I organized a conference in order to identify and map experts and practitioners of the field. The conference Built Environment Education in Schools took place in the Kunsthalle Budapest on October 13, 2011. This enabled professional exchange and discussions, which provided fundamental material for tracing

the historical development and the current position of built environment education in both the Hungarian educational system, and the field of non-formal educational practice. The foci of my investigations during the literature review and professional exchange were the main discourses and needs in the field of built environment education in Hungary, its connections to the Hungarian educational system, the important actors, and the existing tools and methods in practice.

Parallel to the literature review, I also conducted field-based investigations to better understand the needs and perspectives of the target groups. I conducted two courses about architecture and the built environment in partnership with the Zsolnay Heritage Company for secondary school students in Pécs. I used these intense workshops as a field-based investigation aiming to understand the needs and interests of the target group of my study, to explore their knowledge and their approach to the city by creating mind maps, role-plays, and discussion rounds. Trying out different urban games provided insights into the target group's attitude towards spatial contents and their gaming preferences. Thirty 12th grade students took part in five four-hour workshops.

RESEARCH CYCLE 3 – INITIAL THEORY DEVELOPMENT

Research action 3: Concept validation with the Urban Metamorphoses

Research Group

Date: July 7th, 2012

Location: HafenCity University Hamburg

Participants: 12 professors and doctoral students from the UM research group

The theoretical foundations of the study were presented to the participants of the Ph.D. Programme Urban Metamorphoses (UM) at the HafenCity University Hamburg. The UM group consisted of twelve experts from the fields of geoinformatics, urban planning, urban sociology, urban history, engineering, and architecture. Expert appraisals with the UM group took place on several occasions throughout the whole research process. I used the first concept validation to collect feedback on the theoretical considerations and supplement it with new aspects and perspectives. The group discussion reflected on the overall approach assessing the validity of the conceptual model upon which the research was based.

Research action 4: Concept validation with local experts in Budapest

Date: July 13th, 2012

Location: Budapest, Jewish Cultural Center (Bálint Ház)

Participants: Four educational experts and one graphic designer

The initial design principles and considerations were presented to a group of experts in a one-day workshop in Budapest Hungary. The aim of this workshop was on the one hand to ensure concept validity, and on the other hand, to provide information about the research and involve participants in the process of game design. The group consisted of two secondary school teachers, two museum educators, and one graphic designer, who became members of the design team of the first prototype, *Pop-up Pest*. During the workshop, the experts were encouraged to give feedback on the initial design principles and guidelines and to consider possibilities for implementation.

Research action 5: Concept validation with a game researcher

Date: July 14th, 2012

Location: Budapest, Jewish Cultural Center (Bálint Ház)

Participant: a game researcher

To refine the initial design principles, I organized an expert appraisal session with a game researcher and designer. This session took place during a design workshop in Budapest, attended by the entire design team. During the workshop, we presented the concept and objectives of the game, along with the predefined design principles and our plan for subsequent design steps. The expert was then asked to provide critical feedback, identifying any potential risks or weaknesses in the design, and offering suggestions for improvement. Additionally, we sought input from a game design perspective to enhance the overall play experience and to improve the quality of both the game and the game design process.

DESIGN AND CONSTRUCTION PHASE

RESEARCH CYCLE 4 – DEVELOPING THE GAME *POP-UP PEST*

Research action 6: Design workshop

Dates: July 14th and 25th, 2012

Location: Budapest, Jewish Cultural Center

Participants: design team of the first prototype

The design workshop was a collaborative effort aimed at developing a comprehensive game concept, building upon the theoretical groundwork established during the initial research phase. The goal was to integrate various elements into a cohesive game system. To achieve this, we conducted a designer screening session to carefully examine and discuss each of the design principles. Firstly, I presented the aims and pedagogical concept, which we discussed along with specific questions and concerns. In the second step, a museum educator and experienced downtown guide introduced the neighborhood surrounding the Ernst Museum in Budapest. Subsequently, we collectively determined the spatial boundaries and content for the game. Thirdly, based on this foundation, we conceptualized the main elements of the game mechanics. All workshop participants provided feedback and collectively brainstormed the next steps in the design process.

Research action 7: Design workshop – prototyping *Pop-up Pest*

Dates: August 5th to 16th, 2012

Location: Budapest, Jewish Cultural Center and virtual meetings

Participants: design team of the first prototype

The objective of the second design workshop was to refine the design concept by creating paper-based prototypes. The core design team focused on gathering final content elements, establishing game rules and mechanics, and defining the visual design of the game. Each aspect underwent a designer screening process to ensure that the proposed solutions aligned

with the initial design principles and met the previously outlined requirements. Through intensive and reflective collaboration, the team completed the printable version of the game, preparing it for production.

Research action 8: Playtesting *Pop-up Pest* at open-air festivals

Dates: September 15th, 16th, and 22nd, 2012

Location: Budapest, public spaces in the 6th district

Participants: 167 players from various age groups, 44 taking part in the survey

The prototype of the *Pop-up Pest* game was presented in September 2012 during the centenary celebrations of the Ernst Museum in Budapest and subsequently, during the European Mobility Week. Both events took place in public spaces in the 6th district of the Hungarian capital. Players were able to join or quit the *Pop-up Pest* game freely. At both festivals, a total of 167 players from all age groups played the game. Players had the freedom to join or leave the *Pop-up Pest* game at their convenience. A total of 167 players from various age groups participated in the game at both festivals. To gather feedback for further development, a paper-based questionnaire (Q1) was distributed voluntarily, with 44 players opting to participate.

The aim of these playtests was to assess the suitability of the game concept, relevance of its content to the target audience, and the overall enjoyment and engagement it provided. Therefore, the questionnaire focused on aspects such as players' comprehension and acceptance of the game's objectives, the overall theme, specific content elements, as well as various formative aspects including format, game mechanics, player cooperation, and the game's graphic design and aesthetics. Insights gathered from these playtests were instrumental in refining the game concept moving forward.

Research action 9: Expert appraisal with GeoGames Lab

Date: October 24th, 2012

Location: Hamburg, HafenCity University

Participants: one professor and four young researchers from the GeoGames Lab

I presented the preliminary results of the data analysis from the playtests at the GeoGames Lab at HafenCity University Hamburg. This expert appraisal involved a professor and four young researchers who specialize in participatory games for urban planning. During the workshop, I presented and discussed the theoretical background, pedagogical aims, game concept, and findings from the initial playtests. I sought feedback from the experts regarding the overall game concept and specifically on the implementation and data collection methods to enhance subsequent playtests. Through a group discussion following the presentation, valuable insights were gathered. These insights were integrated into further iterations and redesigns of the game.

Research action 10: Playtesting *Pop-up Pest* with primary school students

Date: November 10th, 2012

Location: Budapest, Jewish Cultural Center

Participants: twelve 8th-grade primary school students and one teacher

The game was tested with twelve 8th-grade primary school students. The playtest took place in the Jewish Cultural Center in the 6th District of Budapest. For this occasion, I developed a complex workshop: the game session was embedded in a two-hour workshop that contained preparatory and follow-up exercises. 12 students participated in the workshop and completed the modified questionnaire with open-ended questions (Q2). The questions inquired about the relevance of the main issues, new information and learnings, as well as previous knowledge and experience related to urban issues they had dealt with during gameplay. The observation of the game session provided useful information about in-game behavior and players' group dynamics. In addition, the teacher filled out a questionnaire (Q3) reflecting on the potential of the game in educational contexts: suitability as a learning tool, suitability for implementation in the classroom, if it meets the interest, needs, and competencies of the target group. Thus, the workshop provided also important insights into the potential of implementing the game in classroom contexts.

Research action 11: Playtesting *Pop-up Pest* with secondary school students

Date: November 21st, 2012

Location: Budapest, Jewish Cultural Center

Participants: twelve 11th-grade secondary school students and one teacher

The game underwent testing with twelve 11th-grade secondary school students at the Jewish Cultural Center in Budapest. Following the completion of the 2-hour workshop, a feedback session was held with all participants to gather their thoughts and opinions on the experience. Furthermore, the participants completed a questionnaire (Q2) to provide more structured feedback. Additionally, the teacher present during the workshop also completed a separate questionnaire (Q3) to offer their insights from an educational perspective.

Research action 12: Playtesting *Pop-up Pest* with university students

Date: November 22nd, 2012

Location: Budapest, Jewish Cultural Center

Participants: twelve university students

The final playtest with the first prototype was conducted with eight university students at the Jewish Cultural Center in Budapest. Twelve university students aged 18 to 20 played the game and gave feedback on the game content and play experience. Five participants filled out the scaling questionnaire (Q1), and three participants filled out the questionnaire with open-ended questions (Q2). The playtests with three different age groups provided insights into the acceptance and effects of the game in different target groups and settings which contributed to the fine-tuning of the game concept and user profiles during the next design and development cycle.

Research action 13: Expert appraisals at the Forum Stadtforschung and at the REALCORP Conference

Dates: April 26th and 27th, 2013; and May 20th to 23rd, 2013

Location: Hamburg, HafenCity University and Rome, House of Architecture, Acquario Romano

Participants: urban planners and architects N/A

At the end of the first cycle, the game concept and the first results were presented at two conferences with the aim to collect experts' feedback and impulses for the further development of the prototype. My aim was here to discuss the potential of the game with the communities of planners and architects and held the first presentation at the Forum Stadtforschung, a regular meeting on interdisciplinary urban studies for young researchers in Germany. The second presentation took place at the 18th International Conference on Urban Planning, Regional Development and Information Society (REALCORP) in Rome, Italy. I engaged in discussions with urban planners and architects to contextualize the game within the realm of urban development and placemaking, as well as to assess its potential within this domain. I aimed to gain a deeper understanding of how the transformative potential of games can contribute to urban development efforts and placemaking initiatives. The insights gathered from these discussions helped to contextualize the game, identify potential applications, and highlight the benefits it could offer within the broader context of urban planning and development.

RESEARCH CYCLE 5 – DEVELOPING THE GAME *PARTICIPÉCS*

Research action 14: Design workshop – creating a common ground with the new design team

Dates: September 13th and 14th, 2013

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

The two-day workshop aimed at reorganizing and establishing the new design team, which consisted of three experts from the design team of the first prototype (an educational expert, a graphic designer, and me, the researcher) and additionally, an architect, an urban planner, an engineer, a youth worker and six adolescents aged 13 to 16. Though the idea of collaborative design had been considered and pursued since the initial prototype, the need for creating a more participatory process and involving different expertise, as well as members of the target group emerged from the experiences of the first development cycle and gained in this phase particular importance. Consequently, considering the new and diverse constellation of the design team it was necessary to provide space for team building and create a trustworthy atmosphere that enables long-term collaboration and the equal participation of all team members during the entire design process. Therefore, creative, and playful techniques were implemented in order to build confidence and to set up a space for creativity. We discussed personal motivations and interests and explored participants' visions and goals in group discussions and through gameful exercises. We put an emphasis on the creation of a common ground by reflecting and discussing themes and aspects of game design connected to the initial design principles and the experiences gained with the first prototype *Pop-up Pest*. Another aim of the workshop was also to plan the further design process and to set together milestones for the co-design.

Research action 15: Expert appraisals at the Building Games Conference and at the FROG Conference

Dates: September 23rd and 24th, 2013; and September 27th and 28th, 2013

Locations: Budapest, FUGA Architecture Center and Vienna, Town Hall

Participants: architects, urban planners, game designers N/A

I presented the concept and the preliminary results of the evaluation of the *Pop-up Pest* game at the Building Games Conference hosted by the Hungarian Chamber of Architects in Budapest. The participants were mainly architects coming from academic education, public administration, professional bodies, or architectural practice and they were engaged in or interested in built environment education. Participants could try out the game and get involved in a group discussion reflecting on the following main questions: what could be the benefits of such a game in the practice of built environment education? What are possible implementation fields in the Hungarian context? What are the strengths and weaknesses of the game? In addition to providing valuable feedback on the game concept, a positive outcome of this expert appraisal was the interest shown by several experts in forming partnerships and offering opportunities to implement the game in various contexts.

Subsequently, I presented the concept of the game at the FROG – Future and Reality of Gaming conference in Vienna. The primary intention was to gather feedback on the prototype from the international game researcher community from the point of view of game design. However, since there were no discussion rounds embedded in the program, little input resulted from this event that influenced the further development of the prototype.

Research action 16: Design workshop – understanding the spatial context from children's perspectives

Dates: October 18th and 19th, 2013

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

The focus of the two-day design workshop was twofold: laying the foundation for the play experience and immersing ourselves in the spatial context. First, we employed a range of brainstorming and creative techniques to effectively capture, identify, and articulate the desired player experience for our prototype. This process enabled us to gain a more nuanced understanding of the principles of enjoyment and engagement within the context of our game. Second, we used a diverse range of techniques to evoke different perspectives and associations with the city of Pécs. This included utilizing sound effects, engaging in body sculptures and creative writing exercises. Through brainstorming sessions, mind mapping activities, and street photography, we identified key components and characteristics of the city. The results of these exercises were then compiled and discussed during a designer screening focused on content development. This led to the creation of a list of potential content elements for incorporation into the game.

An additional outcome of the workshop was the development of the card game “Pécs Story Domino”. In this game, participants’ photographs of the city were printed onto domino sheets,

providing inspiring visual cues for storytelling. This game served as both a creative exercise and a brainstorming tool, allowing participants to collaboratively weave stories based on the images they had captured. The “Pécs Story Domino” game was integrated into subsequent design workshops as a means of warming up participants and sparking creative ideas during brainstorming sessions.

**Research action 17: Concept validation at the Symposium of the Doctoral Program
Urban Metamorphoses and the Built Environment Education Conference**

Date: November 8th, 2013 and November 21st, 2013

Location: Hamburg, HafenCity University and Frankfurt, Deutsches Architekturmuseum

Participants: UM research group and professors and students from the HafenCity University; and architects and educators N/A

I presented my research concept at the Symposium of the UM Doctoral Programme. The keynote address was delivered by Dieter Läßle, whose matrix-space-theory significantly influenced my thinking. This event proved invaluable in deepening my understanding of spatial dynamics and exploring the intricate relationship between space and play. Moreover, the feedback session following my presentation sparked a lively discussion on the role and significance of participation within the context of my research. Questions emerged regarding how play can intersect with urban planning processes and what connections exist between participation and learning. The feedback provided during this session offered valuable insights and guidance, ultimately helping me to finetune my research focus.

The research concept was presented at the Built Environment Education Conference hosted at the German Architecture Museum in Frankfurt. Attendees comprised professionals from the fields of architecture and education, all actively involved in research related to built environment education. During the conference, experts were invited to provide feedback on my overall research concept, with particular emphasis on the underlying pedagogical theories. This exchange of ideas and insights was invaluable, as it allowed me to gain fresh perspectives and refine the educational approach underlying both the design process and the game itself.

**Research action 18: Design workshop – developing the overall theme
and the narrative framework**

Dates: November 22nd and 23rd, 2013

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

The fifth game design workshop delved into two primary aspects: defining the main theme and storyline of the game and profiling the target audience. While the overarching theme of the game, centered around the transformation of the built environment, had been established early on in the research process and was generally agreed upon by the design team, there was a need to further refine and develop an overall theme for our prototype. To achieve this, we employed various brainstorming techniques aimed at generating ideas and shaping the narrative of the game. The design team members collectively developed eight different ideas,

which were subsequently discussed and analyzed during a designer screening session. During the discussion, the need for an additional iteration for developing the narrative framework of the game became evident.

On the second day of the workshop, the design team embarked on defining and exploring the target audience of the game through the creation of personas. Guided by specific questions, participants were encouraged to envision, describe, and illustrate fictional members of the target group. These personas were then presented and examined during a designer screening session, where various aspects were considered. Key questions guiding the discussion included: What are the gaming preferences of these individuals? How do they engage with gameplay scenarios? What is their stance regarding the theme addressed by the prototype? How do they navigate and utilize urban spaces? What potential challenges and considerations must be taken into account when designing games for them? These discussions were instrumental in ensuring that the game's design remained aligned with the needs and interests of the identified target audience.

Research action 19: Concept validation with the Urban Metamorphoses

Research Group

Date: December 5th, 2013

Location: Hamburg, HafenCity University

Participants: UM research group

An expert appraisal was conducted at the UM group meeting at the HafenCity University Hamburg. This time I discussed the game concept from the perspective of the underlying theories of space, their relevance for game design, and the development of the gamespace. The inputs gained through the discussion endowed subsequent game design workshops when working on the spatial contents of the prototype.

Research action 20: Design workshop – refining the narrative framework and spatial contents

Date: December 13th, 2013

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

To further refine the narrative framework of the game, I organized an additional one-day design workshop, allowing for another iteration in its development process. Building upon the groundwork laid in previous sessions, the design team identified five major thematic pillars – green spaces, culture, entertainment, transport, sport –, serving as the foundation for the development of the spatial contents of the game.

A collaborative brainstorming session aimed at gathering insights, identifying challenges, and pinpointing relevant sites and issues connected to the five themes identified. Subsequently, these sites and issues were reviewed and revised through collective discussions to ensure coherence and relevance.

Next, we delved into a creative writing session, leveraging the revised content elements to determine the overall theme and craft a narrative framework for the game. These narratives then underwent collective reflection and evaluation during a developer screening session, until we arrived at a consensus on the narrative frame for the prototype.

Research action 21: Design workshop – prototyping *ParticiPécs*

Date: January 3rd, 2014

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

Once consensus was reached on the narrative framework and key content elements of the game, the design team began with crafting the first paper-based prototypes. Some participants opted to draft written descriptions of the game, while others focused on illustrating game mechanics, crafting playable prototypes, or visualizing the playing field with illustrations. During a designer screening session, the design team conducted walkthroughs of each prototype, followed by in-depth discussions and thorough analysis of each. Four key aspects—genre, goal, cooperation, and game space—were singled out for discussion. The team explored how different game genres, goals, forms of player cooperation, and arrangements of game space aligned with the initial design principles and offered solutions for the discussed game design aspects.

To further refine the paper-based prototypes, an additional one-day workshop was organized. During this session, the design team crafted three distinct prototypes, all of which incorporated the decisions made during the previous designer screening. Each prototype was carefully developed to align with the established design principles and previous decisions. Following the creation of the prototypes, walkthroughs were conducted to provide the team with a firsthand experience of each concept. Subsequently, a designer screening was conducted to facilitate in-depth discussion and analysis.

During the discussion and analysis phase, the team critically examined the extent to which the design principles and previously established decisions were reflected in the concepts of the prototypes. Through collaborative discourse, insights were gleaned regarding the integration of the overall theme and spatial contents into the game design, as well as the refinement of basic mechanics or rules.

Research action 23: Expert appraisal with the chief architect of Pécs

Date: February 1st, 2014

Location: Pécs, Normandia Lions Club

Participant: the chief architect of Pécs

The chief architect of the city of Pécs was invited for an expert appraisal. After a short presentation of the research project, we invited him to conduct a walkthrough of the prototype. Afterward, we asked him to give feedback on what (if any) potential he saw for the game in his own context, and how the visions for Pécs' future urban development could be embedded into the game design. The chief architect gave an impromptu input about Pécs' future devel-

opment plans providing important context information, which we then took into consideration in the detailed design of the game. As a result, for instance, additional content elements were added to the game concept. Further, the chief architect suggested ways to improve the prototype by adding creative elements which support players' own idea generation. The designer team discussed the difficulty of integrating both information in forms of patterns of action – which seemed to be necessary to support players in shedding their inhibitions and empowering them to develop ideas for their neighborhoods –, and open and creative space for idea generation in a narrative adventure game. Thus, we decided to continue working on our prototype and consider it the first phase of a more complex game where youngsters can get an idea of what they can do to make positive changes in their spatial environments. And subsequently, we will design a creative add-on as the second phase of the game, where players can develop ideas to implement in their neighborhoods.

The chief architect of Pécs was invited to provide expert feedback on the research project. Following a brief presentation, he was invited to conduct a walkthrough of the prototype. Subsequently, we sought his insights on the potential applicability of the game within Pécs and how the city's future urban development visions could be integrated into the game design. During the walkthrough, the chief architect offered spontaneous input on Pécs' future development plans, providing valuable context information. Furthermore, his valuable insights into the game design concept laid the groundwork for further development of the prototype in the third design cycle.

Research action 24: Design workshop – game balancing

Date: February 7th, 2014

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

At the one-day workshop focused on game balancing, the design team adjusted and refined the game's content and mechanics. Game balancing refers here to the process of adjusting game elements until they deliver the experience and the effects required. We used the ultimate version of the paper-based prototype for a walkthrough. Meanwhile, team members had to carefully pay attention to and analyze certain aspects of game balancing: the degree of challenge provided by gameplay; the length of a game session; the degree of physical and mental activities; the balance between freedom of choice and the limitations by the rules; the quality of rewards and punishments; the role of skill and luck in success; the fairness and equal opportunities; the balance of competition or cooperation; and the degree of complexity of the system of rules. During a designer screening, the team members discussed point by point all the criteria listed above. On the basis of the analysis, rules and contents were fine-tuned and adjusted to an optimal play experience and the preset design principles.

Research action 25: Design workshop – game balancing

Dates: February 28th, and March 1st, 2014

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

A second workshop dedicated to game balancing took place after having finished the visual design of the game board. The design team tested the revised and visually designed prototype for functionality, completeness, and balance. Several rounds were played and analyzed, during which the prototype steadily improved. Rules and visual elements were added and refined. At this stage, the fundamental concepts of the game were predisposed, but modifications of details such as the rules of scoring, the speed of progress, the number of rounds, or even alteration of the colors of the board could be modified in order to endorse the ultimate play experience. Additionally, character cards and situation cards were collaboratively written during a creative writing session. The contents and texts were modified and improved throughout the entire playtesting process.

Research action 26: Playtesting *ParticiPécs* with confidants

Date: March 1st, 2014

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype and two confidants

Before launching the prototype for the public, we organized a review session with confidants. We invited relatives of the design team members to test the game and uncover the strengths and weaknesses of the prototype with fresh eyes. Finally, two participants aged 58 and 11 joined the playtesting, which focused primarily on the aspects of fun and accessibility. The post-game feedback round was led by the following questions: Is it fun to play the game? Do players want to repeat playing? Which parts made more/less fun? Is it easy to understand the game? Where are confusions, ambiguities, or ruptures in gameplay? Is there a dominant strategy? What are (if any) unexpected outcomes? Is it necessary to change something? Based on participants' reflections, some smaller modifications were carried out before the final production of the game *ParticiPécs*.

Research action 27: Playtesting *ParticiPécs* at the Green Family Day Festival

Date: March 8th, 2014

Location: Pécs, Cultural Center

Participants: 20

The first public playtest of the game *ParticiPécs* took place in Pécs Cultural Center, in the frame of the "Green Family Day" festival. The event is attended by many families. We played two rounds with players of different ages. During the evaluation, our focus was on two main aspects: the functionality of the game and the effectiveness of cooperation among players. We examined how well the rules were understood, identified areas needing correction, and explored opportunities for optimizing the process and gameplay. Additionally, we assessed the quality of cooperation within random groups, considering its feasibility and enjoyment for the players. To facilitate a comprehensive evaluation, the questionnaires originally employed in the assessment of the first prototype were utilized, enabling comparisons (Q1, see questionnaire in Appendix C). After each game session, the designer team reflected on the game experiences together and collected insights and suggestions for improvement.

Research action 28: Design workshop – evaluation and reflection

Dates: May 10th and 11th, 2014

Location: Pécs, Normandia Lions Club

Participants: design team of the second prototype

During this evaluation workshop, we engaged in a comprehensive reflection on the nine months of game development, aiming to identify our key learnings and areas for improvement of the game design concept. First, we focused on our individual learning processes, allowing each team member to articulate what they had gained from the project and share significant moments they had experienced. Subsequently, we turned our attention to evaluating the game itself. To facilitate this, we transformed the traditional SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis into a creative modeling exercise. Participants were tasked with identifying the weaknesses and strengths of the game, as well as potential opportunities and threats. Using clay, each participant crafted visual representations of their feedback and placed them within the corresponding quadrant on a piece of paper. Following this exercise, we collectively discussed the insights gleaned from the SWOT modeling and explored strategies for enhancing the game design and implementation based on these findings.

On the second day of the workshop, we shifted our focus to the future of the project. We delved into a discussion about the continuation of the *ParticiPécs* game and brainstormed potential directions for the development of the creative add-on, envisioning how it could further enrich the gaming experience and align with our overarching objectives.

Research action 29: Playtesting *ParticiPécs* with educators

Date: May 31st, 2014

Location: Pécs, Cultural Center

Participants: 18 educators

ParticiPécs was presented at a symposium dedicated to built environment education in Pécs, which brought together educational experts from all over Hungary. During a workshop, participants could try out the *ParticiPécs* game. Due to the feedback of the professionals, we gained useful insights for optimizing the implementation of the game.

Research action 30: Expert appraisal at the AGILE Conference

Date: June 3rd, 2014

Location: Valencia, Spain

Participants: urban planners N/A

I presented the game *ParticiPécs* at the 17th AGILE Conference on Geographic Information Science, with a particular focus on its pedagogical theoretical foundation. During the presentation, I elucidated how cooperative learning principles were integrated into both the *Pop-up Pest* and *ParticiPécs* games. By presenting the concept within a scientific framework, I aimed to organize and consolidate the reflections and insights gained throughout the development process. Additionally, I authored a paper for the conference's proceedings, detailing the col-

laborative game design process. The feedback received on this paper, despite its eventual non-publication, proved invaluable in further refining the process and the theoretical underpinnings of my methodological approach.

Research action 31: Concept validation with the Urban Metamorphoses

Research Group

Date: July 18th, 2014

Location: Hamburg, Hafencity University

Participants: UM research group

I conducted an expert appraisal with the UM group at the HafenCity University Hamburg. For this presentation, I prepared an interactional analysis of the playtesting conducted at the Pécs Cultural Center, as outlined in Research Action 27. To conduct this analysis, I applied Habermas' Communicative Action Theory, aiming to gain a deeper understanding of the various forms of interaction that emerged during the *ParticiPécs* game. Through this methodological approach, I sought to shed light on the dynamics of communication and collaboration within the game, providing valuable insights for further refinement and development of players social interactions and collaboration.

RESEARCH CYCLE 6 – DEVELOPING THE *PARTICIPECS* ADD-ON

Research action 32: Design workshop – developing the purpose and process of the third design cycle

Dates: September 12th and 13th, 2014

Location: Pécs, Normandia Lions Club

Participants: design team of the third prototype

During the initial design workshop of the new development cycle, we strategized the continuation of the *ParticiPécs* project. We agreed on creating a *ParticiPécs* add-on, which would complement the game by allowing players to develop their own ideas for improving their living environments and formulated a plan for its implementation. A key outcome of this session was the conception of the *ParticiWeek* (*ParticiHét*) program, designed to actively engage young people in shaping the urban environment through playful and interactive means using the *ParticiPécs* game and its add-on. The core objective of the program was defined as follows: over the course of one week in March and May 2015, a series of game sessions would be held in various schools in Pécs. With this plan in mind, we proceeded to draft an application to the Municipality of Pécs, detailing the goals and structure of the *ParticiWeek* program.

Research action 33: Playtesting with students to gather ideas for the *ParticiPécs* add-on

Dates: November 25th and December 8th, 2014

Location: Pécs, Normandia Lions Club and University of Pécs

Participants: 20 students from the preparatory year of the university

We developed a tabletop version of the *ParticiPécs* game and conducted a playtest with the design team to fine-tune its mechanics. Following this, we made the necessary refinements for the tabletop version and organized a playtest with university students of the Faculty of Engineering and Information Technology at the University of Pécs. After a short introduction, the students could try the *ParticiPécs* game and subsequently, develop ideas for small-scale urban interventions. The process of idea generation was open and unstructured, participants were given only a short input, and paper and pens for planning. This experience made us clear the necessity to structure and integrate the idea generation into the the game structure and experience. It became clear that a new iteration of design was needed, in which the creative add-on was developed.

Research action 34: Expert appraisal with members of the kultúrAktív Association

Date: January 11th, 2015

Location: Budapest Architecture Center (FUGA)

Participants: 9 practitioners in built environment education

At the January meeting of the kultúrAktív Association, we presented the *ParticiPécs* project at the Budapest Architecture Center (FUGA) for built environment education experts and conducted a playtest with them. The post-demonstration feedback round provided useful input on the use and further development of the game.

Research action 35: Design workshop – developing the *ParticiPécs* add-on

Date: 21st of February 2015

Location: Pécs, Normandia Lions Club

Participants: design team of the third prototype

During the second design workshop of the third design cycle, our primary objective was to create a straightforward set of rules that would guide young people in developing ideas for improving their neighborhoods. This task involved careful consideration of how to inspire creativity while providing enough structure to ensure that the ideas generated were practical and actionable. Based on these rules, we proceeded to produce a creative add-on for the game, enhancing its capacity to engage players in shared endeavours to make a positive impact on their living environments. We developed a set of cards for the add-on, each designed to prompt participants with possible challenges, strategies, and actions that would stimulate their thinking.

To test the effectiveness of our new add-on, we invited a group of young participants for a quick playtest. This session was crucial for observing how well the new elements integrated with the existing game and whether they effectively facilitated the generation of innovative ideas. The playtest proved successful, demonstrating that the new rules and cards were intuitive and supportive for the players.

Following the positive feedback and observations from the playtest, we proceeded to finalize the prototype for the final evaluation. This involved making minor adjustments based on the playtest feedback to ensure optimal functionality and player experience. The finalized prototype was then ready for a comprehensive evaluation phase.

Research action 36: Playtesting *ParticiPécs* with teachers

Dates: 23rd, 24th and 25th of February 2015

Locations: Pécs, different secondary schools

Participants: 18 teachers from three schools

In February, we conducted playtests of the *ParticiPécs* game with teachers to gather their feedback and explore its potential integration into educational settings. Our primary objectives were to assess their impressions of the game, identify areas for improvement in terms of implementation, and encourage their participation in the final evaluation with their students.

Participants were asked to complete a detailed questionnaire (Q3) and engage in group discussions to provide in-depth insights into the game's feasibility and applicability within educational settings. These sessions took place at three different schools, each offering valuable perspectives on how the game resonated with educators and its potential for enhancing the educational experience. The feedback from these sessions was instrumental in refining the concept of the game sessions, ensuring it met the needs of both teachers and students while aligning with educational goals.

Research action 37: Pilot field test with the *ParticiPécs* game

Dates: 23rd, 24th, 26th and 27th of March, 5th of May 2015

Locations: Pécs, different educational institutions

Participants: 73 students from five different primary and secondary schools

The pilot field tests were conducted as part of the *ParticiWeek* program, aiming to assess the game in authentic educational settings and prepare for the final evaluation. These tests were held in March and May at five different educational institutions, providing valuable insights into the preparation, setting, and data collection required for the final evaluation.

The first pilot field test was held in the afternoon at a secondary school. This timing proved ineffective as few students participated, and we could not test the creative add-on. The second session took place during a double lesson at a vocational secondary school with two 14th-grade classes. This trial was highly successful, allowing us to test both the game and the creative add-on, with participants generating excellent intervention ideas. The third test at an art high school with a 9th-grade class was similarly successful. We then tested the game with 5th to 7th-grade students at a family daycare center in a less rigid context, and finally with a 7th-grade class at an educational center. The latter, conducted during a school lesson, also went well, with students providing valuable feedback.

These pilot sessions offered critical technical and organizational insights into running the game and methodological insights into facilitation and data collection, particularly interviews. I conducted pre-and post-game interviews with one participant (I1) but found the structured interview format ineffective. Consequently, I refined the interview approach for the final evaluation to be more open and episodic, allowing for a deeper understanding of how participants perceive the city, their role in shaping it, and how their perspectives changed through gameplay.

These experiences provided essential knowledge for conducting and researching game sessions, which informed the development of a timetable and methodology for the final evaluations. Moreover, through these pilot tests, 73 young people in Pécs learned about urban development, participation, and actionable strategies for improving their living environment.

Research action 38: Design workshop – preparing the final evaluation

Date: 9th of May 2015

Location: Pécs, Normandia Lions Club

Participants: design team of the third prototype, complemented by an architect in charge for designing the exhibition installations

In the final design workshop, we undertook a comprehensive review of the pilot tryouts, carefully summarizing the insights and experiences gained. This reflective exercise allowed us to identify both strengths and areas for improvement, ensuring that the upcoming final evaluation would be robust and effective.

During the workshop, we collaboratively developed a detailed plan for the final evaluation. I took the lead in designing the game sessions and outlining the data collection methodology. This involved refining the game mechanics based on pilot feedback, enhancing the facilitation approach, and developing a more effective interview structure to gather meaningful insights from participants. Meanwhile, the team of architects focused on the design of the exhibition that would showcase children's ideas.

EVALUATION AND REFLECTION PHASE

RESEARCH CYCLE 7 – FINAL EVALUATION

Research action 39: Field tests – final evaluation of the game *Participécs*

The final evaluation aimed to explore the transformative potential of the developed game. This phase was crucial for testing the functionality and effectiveness of the design principles, as well as validating the insights gained through the reflective practice of the collaborative and iterative design process. The primary focus, however, was on understanding how the game facilitates participants' learning to understand and actively shape their spatial environment. We conducted nine game sessions in schools, observing the game sessions and conducting interviews with participants (for detailed information on the schools and participants, see Section 5.1.3). Each game session lasted two hours and was scheduled during school hours to ensure maximum participation and integration into the students' regular educational activities. Given that the game is designed for up to twelve players at a time, each session required two or more sets of games to run in parallel to accommodate all participants.

To manage these parallel sessions effectively, each game required the presence of at least one assistant or game facilitator. These facilitators played a crucial role in overseeing the complex game processes, ensuring that the sessions ran smoothly, and that participants re-

mained engaged and focused. Their involvement was vital for controlling the dynamics of the game and for providing immediate support and clarification as needed.

For a detailed description and structure of a sample game session, please refer to Appendix I. This appendix provides an in-depth look at how the sessions were organized and conducted, illustrating the practical application of the game and the methodologies used to collect data and insights from the participants.

Following the conclusion of the school game sessions, we organized an exhibition to showcase a selection of young people's ideas developed during these sessions. The exhibition aimed to engage the broader community by inviting not only the participants and representatives of their schools but also residents and decision-makers. The opening ceremony attracted representatives from the participating schools and classes, as well as an interested and professional jury and audience.

APPENDIX B

Overview of Research Methods and Techniques Applied in Each Research Action

Table A1 provides an overview of the research methods and techniques in each research action. The table is organized by research actions, and the indication of research phases and cycles ease the orientation.

In the research actions grid, squares corresponding to the methods and techniques utilized in the respective research actions are shaded.

The color of the squares indicates whether the method was employed for exploration, design and construction, evaluation, or documentation purposes.

The annotations within the squares provide additional information, indicating which questionnaire was utilized.

PHASE	CYCLE	RESEARCH ACTION	METHODS AND TECHNIQUES																
			B	FI	EA	DS	MT	W	P	FT	Q	GD	I	O	A	V	PH	DL	FN
Analysis and Exploration	Needs analysis	1 Needs analysis																	
		2 Context analysis																	
	Theory development	3 Concept validation																	
		4 Concept validation																	
		5 Concept validation																	
Design and Construction	Prototype 1 (Pop-up Pest)	6 Design workshop																	
		7 Design workshop																	
		8 Playtests																	
		9 Expert appraisal																	
		10 Playtest																	
		11 Playtest																	
		12 Playtest																	
	Prototype 2 (ParticiPécs)	13 Expert appraisals																	
		14 Design workshop																	
		15 Expert appraisals																	
		16 Design workshop																	
		17 Concept validation																	
		18 Design workshop																	
		19 Concept validation																	
		20 Design workshop																	
		21 Design workshop																	
		22 Design workshop																	
		23 Expert appraisal																	
		24 Design workshop																	
		25 Design workshop																	
		26 Playtest																	
	Prototype 3 (ParticiPécs extension)	27 Playtest																	
		28 Design workshop																	
		29 Playtest																	
		30 Expert appraisal																	
		31 Concept validation																	
		32 Design workshop																	
		33 Playtest																	
Evaluation and Reflection	Final evaluation	34 Expert appraisal																	
		35 Design workshop																	
		36 Playtest																	
		37 Pilot field test																	
		38 Design workshop																	
		39 Field test																	

Legend:

- Methods for exploration
- Methods for design and construction
- Methods for evaluation
- Methods for documentation

B = Benchmarking; FI = Field-based investigation; EA = Expert appraisal; DS = Designer screening; MT = Make tools; W = Walkthrough; P = Playtesting; T = Tryout; Q = Questionnaire; GD = Group discussion; I = Interview; O = Observation; A = Audio recording; V = Video recording; PH = Photos; DL = Designer log; FN = Field notes

Table A1

Overview of research methods and techniques applied in each research action

APPENDIX C

Questionnaires Used for Formative Evaluation of the Prototypes



EVALUATION FORM POP-UP PEST GAME

(Name of the event)

(Date)

Dear player! Thank you for trying Pop-up Pest, we hope you had fun. Please help us to improve the game by answering a few short questions. Thank you!

MISSION	AGE

THE GAME

I liked the life-size format.	1	2	3	4	5
The game was the right size.	1	2	3	4	5
<i>COMMENTS:</i>					
It was good that the players had to strive for a common goal.	1	2	3	4	5
The common goal was clear to me.	1	2	3	4	5
The common goal motivated me.	1	2	3	4	5
My role in the team was clear to me.	1	2	3	4	5
I could identify with my task.	1	2	3	4	5
<i>COMMENTS:</i>					
The gameplay (rules) was understandable to me.	1	2	3	4	5
I found the game boring.	1	2	3	4	5
There was too little individual activity during the game.	1	2	3	4	5
<i>COMMENTS:</i>					
While I was playing, I wanted to win.	1	2	3	4	5
When I was playing, I was thinking less about the end result and more about fulfilling my mission.	1	2	3	4	5
It was motivating to place building blocks on the gameboard.	1	2	3	4	5

<i>COMMENTS:</i>					
TEAM					
I enjoyed to play in a team.	1	2	3	4	5
During the game I was able to help my teammates.	1	2	3	4	5
It would have been good to cooperate more with the others.	1	2	3	4	5
I was not so interested in the other players during the game.	1	2	3	4	5
It would have been nice to have more competition in the game.	1	2	3	4	5
<i>COMMENTS:</i>					

THEME					
I found the theme of the game very interesting.	1	2	3	4	5
The individual missions were exciting and complemented the three main themes well.	1	2	3	4	5
The situation cards were interesting.	1	2	3	4	5
<i>COMMENTS:</i>					

CONTENTS					
Through the game, I gained new information about what I can do for my environment.	1	2	3	4	5
I got new ideas and there are things I want to do in reality.	1	2	3	4	5
Missions reflect real problems that should be addressed more in the real world.	1	2	3	4	5
I have received new information about the neighborhood.	1	2	3	4	5
<i>COMMENTS:</i>					

VISUAL DESIGN					
I liked the visual design of the gameboard.	1	2	3	4	5
The game board was understandable and it was easy to navigate.	1	2	3	4	5
I liked the game pieces.	1	2	3	4	5
<i>COMMENTS:</i>					

THANK YOU!

Table A2
Questionnaire 1



EVALUATION FORM POP-UP PEST GAME

(Name of the event)

(Date)

Dear player! Thank you for trying Pop-up Pest, we hope you had fun. Please help us to improve the game by answering a few short questions. Thank you!

MISSION:	AGE
-----------------	------------

THE GAME

THIS IS WHAT I LIKED MOST ABOUT THE GAME:
I WOULD CHANGE THIS IN THE GAME:

CONTENTS

THIS WAS THE MOST INTERESTING PART OF THE GAME FOR ME:
THIS WAS NEW INFORMATION ABOUT THE NEIGHBORHOOD/CITY:
THESE ARE THE IDEAS I LIKED THE MOST / I WOULD LIKE TO IMPLEMENT THEM IN MY LIVING ENVIRONMENT:
I HAVE ALREADY DONE THESE THINGS FOR MY LIVING ENVIRONMENT:
I HAVE HEARD ABOUT THE PROBLEMS RAISED IN THE GAME BEFORE HERE:

THANK YOU!

Table A3

Questionnaire 2



EVALUATION FORM FOR TEACHER POP-UP PEST GAME

Class activity
(date)

Dear Colleague! Thank you for trying Pop-up Pest, we hope you had fun. Please help us to improve the game by answering a few short questions. Thank you!□

GRADE	SUBJECT

THE GAME

The life-size format was suitable for conveying pedagogical aims.	1	2	3	4	5
The rules were clear and appropriate for the age group.	1	2	3	4	5
It was good that the players strived for a common goal.	1	2	3	4	5
The common goal was clear throughout the game.	1	2	3	4	5
COMMENTS:					

THEME AND CONTENTS

I found the theme of the game very interesting.	1	2	3	4	5
The individual missions were exciting and complemented the three main themes well.	1	2	3	4	5
The situation cards contained useful information and ideas.	1	2	3	4	5
The topics complement the school curriculum well.	1	2	3	4	5
In our classes, we also often deal with the themes of this game (urban culture, urban development, local knowledge).	1	2	3	4	5
Following the game, I plan to organize school activities related to the above topics (if yes, please specify in the comments).	1	2	3	4	5
COMMENTS:					

THANK YOU!

Table A4
Questionnaire 3

APPENDIX D

Final Evaluation Interview Guideline

PRE-GAME INTERVIEW

I. Opening

My name is Eszter Tóth, I am a co-designer of the educational game *ParticiPécs*. Today, together with other members of the *ParticiPécs* group, we brought the game to your school, and I will conduct the game session with your class.

Before we start playing, I would like to ask you some questions about your personal view on the city, where you live or go to school, what places you use, how you think the city is changing and how it relates to you. You do not need factual or specialist knowledge in order to answer my questions, what I am really interested in is how you personally see and experience your hometown. I am conducting research on the game *ParticiPécs*, aiming to explore what experiences players make with it and how they perceive the city of Pécs, so I will use the information you share with me only for my research. This information will hopefully contribute to the improvement of games dealing with the urban space.

The interview should take about 20 minutes before playing, and 20 minutes after the game session. Are you available to respond to some questions?

Let me begin by asking you some questions about where you live.

II. Body

A. GENERAL DEMOGRAPHIC INFORMATION

1. How old are you?
2. Where do you live?

Let me ask you some questions about how you see the city of Pécs.

B. IMAGE OF THE CITY

1. If he or she lives in Pécs:

- a. Are you originally from Pécs? (If not, for how long do you live here?)
- b. In which part of the city do you live?
- c. Which parts of the city do you know well? Why?
- d. Which are places you often visit?
- e. Where do you meet your friends? And what do you do with them there?

1. If he or she lives somewhere else:
 - a. For how long do you come here for school?
 - b. How do you feel in Pécs?
 - c. To which extent do you feel familiar with the city?
 - d. Which parts of the city do you know well? Why?
 - e. Which are places you often visit in Pécs?
 - f. Where do you meet your friends in Pécs? And what do you do with them there?
2. How do you see the city?
3. What do you like about it and what don't you like?

Let me ask you some questions about how you see the city of Pécs.

C. TRANSFORMATION OF THE CITY

1. How do you think the city is changing over time?
2. Can you mention some examples for change?
3. What do you think, why is Pécs changing – or not changing over time?
4. Who do you think contributes to changes in the city? How?

Let me ask you some questions about how you see yourself connected to the changes of the city.

D. ROLE IN THE TRANSFORMATION OF THE CITY

1. Do you think that you could change something in the city? Why? How?
[if no, go to 3.!]
 2. Can you share some experiences? Would you give me an example?
 3. Where do you see possibilities and limitations for contribution?

III. Closing

(I summarize main statements of the interviewee)

I appreciate the time you took for this interview. Is there anything else you would share with me?

I should have all the information I need. Thanks again and let's continue the interview after the game session. I look forward to playing with you.

POST-GAME INTERVIEW

I. Opening

Now we continue our interview. You have just played *ParticiPécs* and designed an urban intervention with your classmates. I would like to ask you a few questions concerning how it was for you, what did you experience. Are you ready?

First, let me ask you some questions about how your experience with the game *ParticiPécs*.

II. Body

A. FEEDBACK ON THE GAME

1. How did you like the game? Why?
2. What did you like about it, what did you not like?
3. What was the main message of the game for you?
4. Is there anything you would change about the game? Why?

Before playing, we have talked about the city of Pécs. I would like to know, if you see things the same way as before the game, or if you have some new thoughts. Thus, sometimes I will ask you the same questions as before.

B. THE CITY AND THE TRANSFORMATION OF THE URBAN SPACES IN PÉCS

1. How do you think the city is? Do you see something different then before? Have you experienced something new about the city in the game or was it everything just as you see your town?
2. How do you think the city is changing over time?
3. Can you mention some examples for change? Can you give me some examples from the game? Which examples did you like and why? Which ones did you not like?
4. What do you think, why is Pécs changing – or not changing over time?
5. Who do you think contributes to changes in the city? How?

Let me ask you some questions about how you see yourself connected to the changes of the city.

D. ROLE IN THE TRANSFORMATION OF THE CITY

1. Do you think that you yourself could change something in the city? Why? How? Is there something you see differently now than before playing? [if no, go to 3.!]]
2. Where there some examples for interventions in the game you would try out yourself?
3. Where do you see possibilities and limitations for contribution?

III. Closing

(I summarize main statements of the interviewee)

I appreciate the time you took for this interview. Is there anything else you would share with me? I should have all the information I need. Thanks again. If you like, I will inform you about the results of the study and also about further events with *ParticiPécs*.

APPENDIX E

Overview of Research Participants

Table A5 provides an overview of the number, the type, and the role of the participants of each research action. The table is organized by research actions, and the indication of research phases and cycles ease the orientation.

The columns on the right indicate the type of participants: expert participants are differentiated according to their field of expertise, and students are grouped according to their school grades. The numbers indicate the number of participants of a certain category in a given research action. If the number of participants could not be quantified, for instance in the case of expert appraisals at conferences where several discussions and conversations took place in an informal setting, then the related boxes indicate N/A. The last column summarizes the total number of participants for each research action.

The colors reveal the role or function of participants in four categories: participants of the field investigation, participants of the design team, experts involved in expert appraisals, and participants of evaluation.

The table presents the number of participants in each research action, but it does not reveal overlappings or duplications, which occurred in the case of the design team or expert participants. If a design team member was involved in several research actions, then he or she is indicated in each of these research actions accordingly.

PHASE	CYCLE	RESEARCH ACTION	PARTICIPANTS							
			EE	EG	EAP	PS	SS	US	M	Total
Analysis and Exploration	Need analysis	1 Needs analysis	N/A		N/A					
	Context analysis	2 Context analysis					30			30
	Theory development	3 Concept validation			12					12
		4 Concept validation	3	2						5
		5 Concept validation		1						1
Design and Construction	Prototype 1 (Pop-up Pest)	6 Design workshop	3	2						5
		7 Design workshop	2	1						3
		8 Playtests						167		167
		9 Expert appraisal		5						5
		10 Playtest				12				12
		11 Playtest	2				12			12
		12 Playtest						8		8
		13 Expert appraisals			N/A					
	Prototype 2 (ParticiPécs)	14 Design workshop	2	1	3	1	5			12
		15 Expert appraisals			N/A					
		16 Design workshop	2	1	3	1	5			12
		17 Concept validation	N/A		N/A					
		18 Design workshop	2	1	3	1	5			12
		19 Concept validation			11					11
		20 Design workshop	2	1	3	1	5			12
		21 Design workshop	2	1	3	1	5			12
		22 Design workshop	2	1	3	1	5			12
		23 Expert appraisal			1					1
		24 Design workshop	2	1	3	1	5			12
		25 Design workshop	2	1	3	1	5			12
		26 Playtest	2	1	3	1	5		2	14
		27 Playtest							20	20
		28 Design workshop	2	1	3	1	5			12
		29 Playtest	18							18
		30 Expert appraisal			N/A					
		31 Concept validation			11					11
	Prototype 3 (ParticiPécs add-on)	32 Design workshop		2	4		2			8
		33 Playtest						20		20
		34 Expert appraisal			9					9
		35 Design workshop		2	4		2			8
		36 Playtest	18							18
		37 Pilot field test				24	39		10	73
		38 Design workshop	1	2	4		2			8
Evaluation and Reflection	Final evaluation	39 Field test				64	120			184

Legend:

Participants of the field investigation	EE = Expert in education; EG = Expert in game design; EAP =
Experts involved in expert appraisals	Expert in architecture and planning; PS = Primary school students
Design team	(1 st to 8 th grade); SS=Secondary school students (9 th to 12 th grade);
Participants of the evaluation	US = University Students; M = Mixed

Table A5
Overview of research participants

APPENDIX F

Description of the *Pop-up Pest* Game

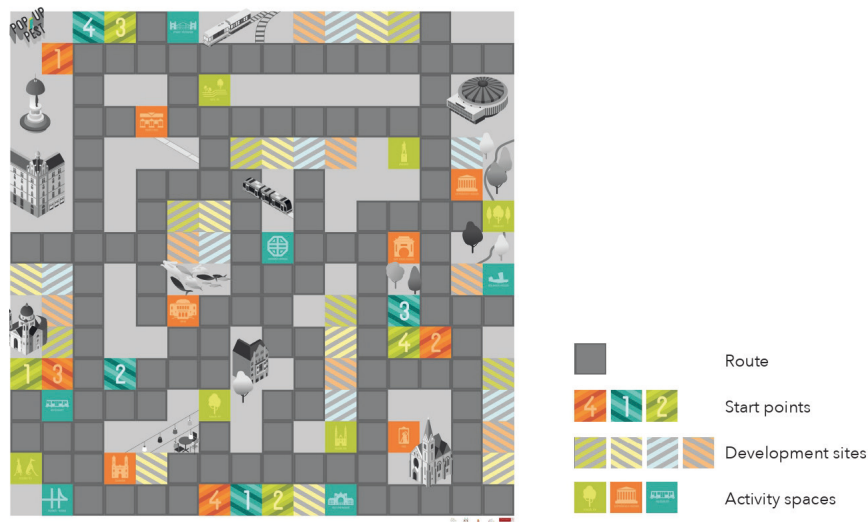


Pop-up Pest is an educational game wherein local youth have the opportunity to revitalize downtown Budapest. Within the game, participants can enhance their living environment by implementing small-scale interventions, thereby making it more appealing and livable. Much like real-life scenarios, players are presented with numerous avenues to positively influence their neighborhood: from planting trees and advocating for the preservation of historic landmarks, to leasing plots in community gardens and organizing street festivals. In the meantime, they learn about how to make positive changes in urban spaces and community life.

EQUIPMENT

Game board

The game, which can be played from 6 up to 12 persons, consists of a 25 m² large playing field representing the downtown of Budapest.



Mission cards

The game includes 12 mission cards, each detailing the individual goal of every player.

Situation cards

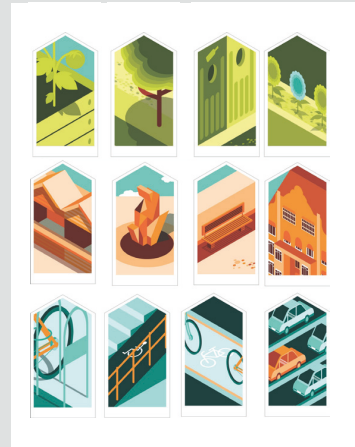
The game features 72 situation cards, with 6 cards allocated to each player, describing situations that can have either a negative or positive impact on the neighborhood.

Building blocks

The game includes 36 building blocks, with 3 blocks assigned to each player, depicting the symbol of their individual missions.

Dice

One large-size dice.



OBJECTIVES

Team objectives

Players are divided into three groups, all striving for a common goal: to improve their living environment through small-scale urban interventions. Though they share the same overall ambition, the three groups have specific interests and priorities regarding the development of the urban space.

We stand for a better, more ecological, and inclusive transportation.



Team mobility

We stand for environmental protection and urban green spaces.



Team green spaces

We stand for cultural activities and preserving local cultural values.



Team culture

The teams' objectives often clash due to limited (spatial) resources. Should players strive for tree lines, bicycle lanes, or festival promenade on the free lanes along the wide streets? Should they recycle bins, street furniture, or bicycle racks on the empty space at the corner? Should they protect a neglected building or use the space for a car park or a community garden? Every team is competing to be the first to achieve its goal. The team goal is completed when all players of the team have completed their individual missions.

Individual missions

Each player has a specific mission to accomplish to contribute to the team's overall objective. Each group can have up to four players, and each player's mission is connected to the larger goal of the group.

collaborating in cultural events



improving street furniture



protecting heritage



promoting public art





To complete an individual mission, a player must successfully place all three building blocks associated with their mission on the game board.

PREPARATIONS

Every player takes a mission card, finds his or her teammates and positions him-, or herself on the starting point as indicated the mission card.

PLAY

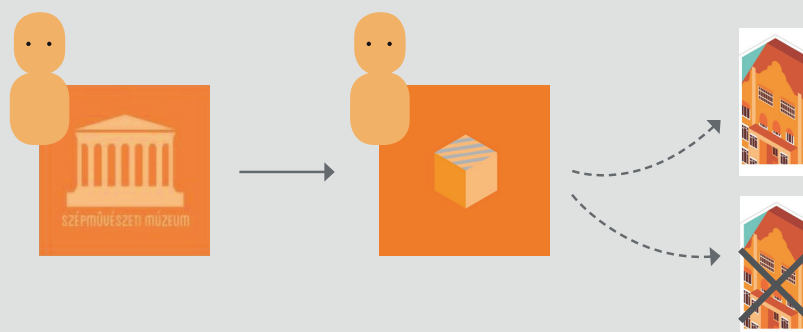
Progress

The team that rolls the highest number starts the game. Each team rolls the dice once per round. Every player of the team advances the number of squares equal to the value of their roll. Players can move in any direction on the board. It is not necessary to arrive at spots and development sites with an exact roll.

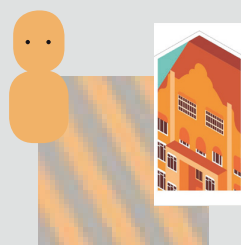
Actions

Players have to visit a spot to obtain building blocks and then deliver them to one of the development sites.

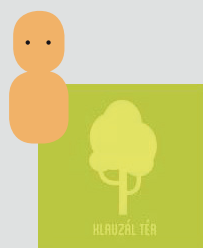
Visit: For acquiring building blocks, players have to visit activity spaces marked with their team-color. Arriving at an activity space, players receive an individualized situation card which contains a short description of an action. Individualized cards mean that each player has an own set of cards with situations related to his or her individual mission. The actions can have either positive or negative impact on the neighborhood. When players made an action with positive impact, they receive a building block, otherwise, they have to visit another activity space and take



Intervention: Each player can acquire up to three building blocks during gameplay and must position them on development sites corresponding to the color code specified on their mission card. With fewer development sites available than building blocks, players must act quickly and tactically to secure their placements.



Recreation: After each intervention, players need a rest. This means, that they have to visit one of another team's activity space. This can be both a spot as marked on the board or an implemented intervention. The teams therefore depend upon each other. The more interventions are placed on the playing field, the easier it is to perform the obligatory visits, and the faster players can accomplish their individual missions.



Cooperation: Players can help their team members in two ways: by placing the building block of another team member on a development site or by reserving a free development site for a team member.

END

Once every player on a team has successfully completed their individual mission, the game concludes, and the team won.

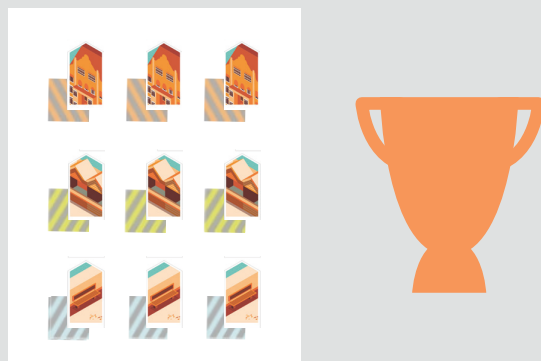


Figure A1
Description of the Pop-up Pest game

APPENDIX H

Description of the *ParticiPécs* Game

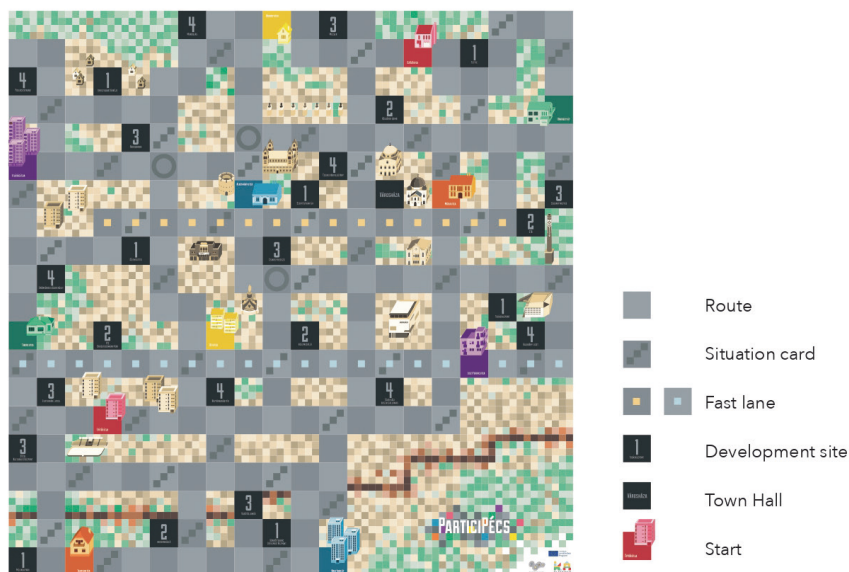


ParticiPécs unfolds on an extraordinary Saturday where young residents enhance their city through small urban interventions. Players communicate, form temporary groups, schedule appointments, and collaborate to initiate changes in the urban space. They navigate through the city of Pécs, experiencing and driving transformations, encountering both familiar and unexpected events.

EQUIPMENT

Game board

The game, which can be played from 6 up to 12 persons, consists of a 30.25 m² large playing field representing the city of Pécs.



Building blocks

There are two different kinds of building blocks players can obtain.



Brown building blocks marked with the numbers "2" and "4" can be implemented in interventions where the cooperation of two or four players is needed.



Green building blocks marked with the numbers "1" and "3" can be used for interventions made by one player or three cooperating players.

Town hall



The town hall is represented by a 50 cm high object that houses a clock. The clock features a single hand which indicates the number of rounds that have passed.

Dice

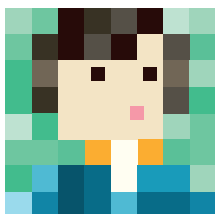
ParticiPécs is played using two dice: one six-sided die numbered from 1 to 6 and another six-sided "town hall dice". The town hall die is numbered from 1 to 4, with two additional sides featuring "situation card" symbols marked by the ParticiPécs logo.

Situation cards

A deck of 62 situation cards is used in the game. Players draw these cards when they land on the corresponding squares of the track.

Character cards

Twelve different character cards are available, each defining the profile of a player, including details such as age, school, hobbies, pets, etc., as well as their place of residence. The "home" indicated on the character card serves as the starting point for each player. Additionally, the character card determines the initial set of building blocks for players and includes a brief description of the game rules and scoring system.



PROFIL

Marci vagyok, 17 éves és a Miroslav Krleža Gimnáziumba járok. Horvátul tanulok, mert a nagypapám horvát származású, és szeretné, ha az unokái is beszélnék a nyelvet. A Tiborc utcában lakom egy családi házban a szüleimmel, az öcsémmel és a nagypapámmal. Van egy kutyám, Fűles, akivel hétvégenként az Éger-tetőre járok sétálni. Most szombaton azonban megkértem az öcsémet, hogy ő vigye sétálni Fűlest, hogy be tudjak szállni a ParticiPécs játékba és alakíthassam a várost!



JÁTÉK

Start: a Tiborc utcai otthonodból indulsz

Cél: Minden játékosnak közös célja van, mégpedig az, hogy a mai napon minél többet tegyetek a városért, és minél több pontot gyűjtsetek össze közösen. Ehhez a következőt kell tenned: el kell jutnod a kiemelt fejlesztési mezőkre és ott el kell helyezned egy fejlesztőkockát. Együtt kell működnöd a többiekkel, mert a legtöbb programot csak többen tudjátok megvalósítani. Vagyis csak akkor kaptok pontot, ha az előírt számú fejlesztőkockát sikerült elhelyezni a mezőn.



x2



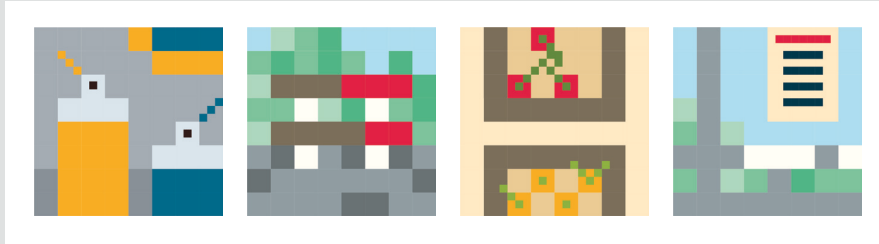
x1

Pontok:

- 1 személyesek – 1 pont
- 2 személyesek – 3 pont
- 3 személyesek – 6 pont
- 4 személyesek – 10 pont

Intervention cards

A deck of 26 intervention cards is included, each containing a brief description of a specific intervention.



OBJECTIVE

The shared goal of the players is to collectively earn as many points as possible by implementing urban interventions within 12 rounds.

PREPARATIONS

First, every player takes a character card and positions him-, or herself on the starting point indicated on his or her character card. Then every player receives combination of three building blocks as described on the character cards.

PLAY

Progress

In each round, one player is rolling the die, and every player advances the corresponding number of squares on the playing field. Players are free to move on the grey squares in every direction. There is a bus line marked with blue dots in the middle of the squares and a bicycle lane marked with yellow dots likewise. Both bus line and bicycle road accelerate progress so that players can advance the doubled number on the dice.

Actions

Take a situation card: When arriving to a square marked with diagonal dots, players have to take a situation card, containing a short story or event.

Go home: When players reach their starting space again, they receive a chosen building block.

Go to the Town Hall: In the Town Hall, players can lobby decision makers in order to get support for their ideas and influence decision making. When reaching the field of the Town Hall, the players roll the town hall dice. Depending on the results, they can earn a certain building block or a situation card. When dicing "1" or "3", the player gets a green building block. In the case of "2" or "4", he or she receives a brown building block. When the dicing the "ParticiPécs"-side, the player has to take a situation card.

Implement an intervention: Players can carry out an urban intervention by reaching a development site and placing a building block. Many interventions require collaboration with other players, who also contribute to the action by placing their building blocks on the same development area. They must also reach the intervention area themselves during the game. The number of building blocks required to complete the action is indicated on each intervention area. The more players contribute to the intervention, the more points they can earn:

1-person intervention	1 point
2-person intervention	3 points
3-person intervention	6 points
4-person intervention	10 points

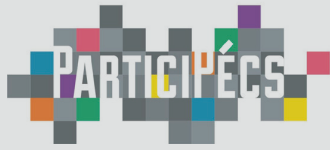
By implementing the interventions, they can achieve positive changes in public spaces through i.a. creating community gardens, painting benches, building bicycle stands or planting flowers. When the intervention is successfully fulfilled, players can read the short description about the intervention and place the intervention card on the playing field in the way that the illustration is visible. As players have only a limited number of building blocks and limited time to implement actions, they have to develop collaboratively a strategy and effectively find common goals.

END

At the end of the 12th round, the game is over, and all points achieved by the players are counted. Not fulfilled interventions does not score.

The final result of the game can be evaluated according to a special rating scale:

0 – 30 points	Unfortunately, you did not manage to improve many things in the city. There still remains a lot to be done in the future.
30 – 40 points	You set up a few exciting bottom-up initiatives, but you could still improve in collaborating with each other in order to trigger change in your environment.
40 – 50 points	You implemented some very interesting urban interventions which inhabitants can notice while walking in the town. There is still more potential for improvement, but it is a good start for transforming the city!
50 – 60 points	Due to the numerous urban interventions you have implemented, public spaces have become more inviting and city dwellers are also more willing to use them. Keep up your engagement!
60 – 70 points	You carried out lots of exemplary initiatives and made significant changes in urban spaces. Public spaces are getting more livable and attractive due to your engagement. Good work!
70 – 80 points	You succeeded to make public spaces more beautiful and attractive for young people. Moreover, you built up a community and improved also the sense for community with the collaborative actions. You launched a real movement among citizens of Pécs!
80 points or more	You took over the power in the city of Pécs this weekend and reshaped creatively the public spaces.



ADD-ON

In the second part of the game players have the chance to plan a small-scale urban intervention in small groups. In three rounds, players have to choose a place, define the problem of this specific site, define a goal and strategy for improvement, the kind of action they want to take and develop a short action plan. For each step they receive a deck of cards with different aspects to support their planning process.

1st round: Defining place and problem

What would you change in the environment? Choose a problematic site and tell me what bothers you! Select one of the problem cards!

Players must choose a specific site for improvement and define the problem they want to address. To assist, each group receives a deck of cards with possible aspects to work on.

2nd round: Defining the goal and developing a strategy

What do you want to achieve with your intervention? Which strategy fits best to your objective?

Players must define the goal of their intervention. To assist, each group receives a deck of cards with possible objectives, such as repair, create, embellish, raise awareness, and more.

3rd round: Action

What action will help you achieve your goal?

Players need to agree on the type of action they want to take. To support this decision, each group receives a deck of cards featuring possible actions introduced in level one, such as creating a community garden, making guerrilla knitting, organizing a flash mob, repairing a bench, and more. Players are also encouraged to invent their own unique actions.

Figure A2

Description of the ParticiPécs game

APPENDIX I

Description of a Sample Game Session

The game sessions of the final evaluation were designed to explore the transformative potential of the game we developed. Each session involved a team of game masters and facilitators to manage parallel sessions, accommodating the high number of students participating in each class. The playtests followed a clear structure, organizing the preparation, data collection, and ensuring a smooth game flow. Figure A3 provides an overview of a sample game session. However, each school presented different circumstances, including varying numbers of participants, time frames, setting options, and participants with different backgrounds. These factors impacted their reception of the game, meaning some groups required more or less support and time. Consequently, the playtests were not uniform; instead, they reflected a range of experiences that highlighted the adaptability and robustness of the game design in accommodating different educational environments and learner needs.

PREPARING THE SETTING

To ensure a smooth and engaging game session, our team, consisting of 1-3 game masters and myself, arrived at the school approximately half an hour before the scheduled start time. This allowed us ample time to set up the life-size game in the school lobby. We carefully arranged the gameboard, game pieces, cards, and roll-ups to create an inviting and organized playing environment. Depending on the number of participants, additional tabletop games were set up in a classroom to accommodate everyone. The presence of the life-size game in the lobby immediately sparked interest among students and teachers, who stopped by to ask questions and express their curiosity. This initial engagement set a positive tone for the session, building anticipation and excitement among the participants.



PRE-GAME INTERVIEW

Prior to the start of the game session, I conducted a pre-game interview with one of the participants. Students from the class participating in the playtest were given the opportunity to volunteer for the interview. I ensured a balanced representation of genders among the interviewees. The interview was conducted following a structured guide and was audio-recorded to capture detailed responses. Each interview lasted approximately 15 minutes, allowing for an in-depth understanding of the participant's initial thoughts on their perspective on the city, the transformation of urban spaces, and their role in these processes.



PREPARING THE GAME SESSION

We divided the players into groups for the play session, with each group consisting of a minimum of 7 and a maximum of 12 players. The game masters escorted the groups to the prepared settings and introduced the game. Each player received a character card and a name tag, then positioned themselves on the starting fields indicated on the gameboard. This part of the session was particularly enjoyable for the participants; they read aloud the descriptions of their characters, and were delighted when their in-game characters reminded them of someone they knew. Finally, the game masters distributed three building blocks to each player, as described on their character cards. These blocks were placed next to the gameboard on the floor, and the facilitators handed them to the players during gameplay as needed.



GAME SESSION

The game session typically began with a brief introduction to the rules, which the participants grasped relatively quickly, allowing us to start playing soon after. One player rolled the dice, everyone moved forward, and the game-play began to flow. The game master set the rhythm of the game, announced the next steps, observed the players, and offered support where needed. Another game facilitator assisted by overseeing the game flow and distributing building blocks and chance cards as required.



In the initial rounds, some players needed help deciding which direction to move. However, in most cases, they quickly became immersed in the game. Throughout the game, players took actions simultaneously, sometimes creating a little crowd on the playing field. They moved around, read their cards, and discussed strategies with other players. The game master observed and, when all players had completed their actions for a round, called for attention. During these breaks, players shared their achievements and listened to the stories on the situation cards. The game master also asked questions related to the stories on the cards to foster discussion.



Over twelve rounds (depending on the time, in some cases less), players developed the city, listening to and helping each other, cooperating effectively, and making joint strategies to implement many interventions. They were often more attracted to actions requiring multiple participants than simpler, individual tasks. Players enjoyed reading and listening to the chance and development cards, often engaging in discussions when encountering unfamiliar concepts, such as, for instance, an insect hotel.



Players typically did not want to finish the game and asked to extend the session to complete their developments. However, due to time constraints and the other group already waiting to start the next step with the ParticiPécs add-on, the game master counted the points to see what the participants had achieved. Notably, players often showed more interest in the ideas themselves than in the points they had collected.

ADD-ON ROUND

Following the game session, participants gathered in the classroom for the add-on round of ParticiPécs. The session began with a brief reflection, where they shared their thoughts on the game, discussed the ideas they implemented, and explored new concepts they encountered.

Participants were then divided into small groups of 3 to 5. Each group received flipchart paper and markers to develop ideas for improving their neighborhoods, guided by the ParticiPécs add-on. The process involved selecting a location, discussing its problems, and brainstorming strategies and actions to address these issues. Each step was allocated 5 minutes, with a deck of inspiration cards provided to stimulate ideas. Groups were free to draw and write about their ideas, fostering creativity and engagement. Some groups did harder in developing ideas, while others became quickly and deeply involved, creating detailed plans for transforming their chosen sites. At the end of the session, each group presented their ideas to the rest of the participants, promoting a collaborative environment where they could learn from each other's insights and creativity.



POST-GAME INTERVIEW

At the end of the game session, I conducted a post-game interview with the same participant who was interviewed before the game. I asked the same questions about their perceptions of the city, its transformation, and how they saw their role in this process. The aim was to explore how the game session had impacted their thinking and to assess any changes in their understanding and attitudes towards urban development and their potential contributions to it.

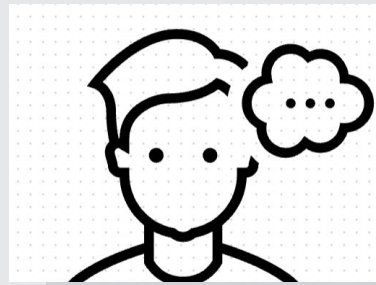


Figure A3

Sample game session of the final evaluation

APPENDIX J

Situation Cards in the *Pop-up Pest* Game

Table A6 presents the themes of situation cards developed for the game *Pop-up Pest*. In the game, each player has unique situation cards that are thematically related to the player's team and individual goal. The table illustrates the main content elements of the situation cards assigned to each player. Additional information (such as a brief definition of yarn bombing) and instructions (such as skipping the next turn) complement these content elements on the game cards.

Players participate in the game within three thematic groups (green spaces, transport, culture), as indicated in the first column and by the green, blue, and orange color codes. Within the teams, players must complete individual missions, detailed in the second column and represented by various shades of color. The main content elements of the situation cards are listed in the third column.

THEME	SUB-THEME	SITUATIONS
GREEN SPACES	PLANTING TREES	<p>You organized a tree-planting campaign for Earth Day.</p> <p>You organized a signature campaign with residents to have the trees on your street declared protected.</p> <p>You planted a tree in the yard of your house.</p> <p>You carved your sweetheart's name into the trunk of a tree.</p> <p>Your dog usually does his business at the base of the tree on the corner and you never pick it up.</p> <p>You used to chain your bike to the tree on the corner.</p>
	RECYCLING WASTE	<p>You have set up separate waste bins in your building.</p> <p>You organized a clothes collection in your street and put the unwanted clothes in a clothes collection container.</p> <p>You participated in the Cellux group workshop, where you learned how to creatively recycle household waste.</p> <p>You do not use the recycling bins on your street.</p> <p>You were lazy to sort your rubbish and put wine bottles and plastic bottles in the same bin.</p> <p>You threw the used batteries in the household waste bin.</p>
	URBAN GARDENING	<p>You decided to get into community gardening and rented a plot at Grund Garden.</p> <p>You organized a community cookout in the Grund community garden, invited other garden owners to join, and made a soup from the vegetables grown there.</p> <p>You have created a vegetable and herb garden in the yard of your house and invited your neighbors to join.</p> <p>You haven't tended your plot in the community garden and weeds grow everywhere.</p> <p>You picked your neighbor's tomatoes in the community garden because they were more mature than yours.</p> <p>While tending your garden, you sat on the watering can and it broke.</p>
	CARING FOR PARKS	<p>You took the initiative to put flower boxes on the concrete patio and convinced the residents' association.</p> <p>You organized a community program in Hunyadi Square. The one-day petanque tournament was open to children and seniors alike, and the neighbors could get to know each other.</p> <p>You have decorated the old, rusty lampposts in your street with flower boxes.</p> <p>You forgot to buy flowers for your date, so you quickly picked a few marigolds from Kodály Körönd.</p> <p>You harvested the corn from the vegetable patch in front of the 400 Bar on Kazinczy Street.</p> <p>You let your dog into the Rose Garden and the dog dug out the flowers.</p>
TRANSPORT	STRIVING FOR BICYCLE LANES	<p>You took part in the Critical Mass and joined other cyclists in a demonstration for environmentally friendly transport.</p> <p>You cycle to school/work so you can fit back into your old clothes and protect the environment.</p> <p>You organized a "residents' bicycle hire shop" with your neighbors, where anyone who needs can borrow a bicycle.</p> <p>You were riding your bike on the pavement on Rákóczi road and scared pedestrians to death.</p> <p>You were late and in the rush, you drove irregularly into Bajza Street. The car driving in the right lane was only able to brake at the last moment.</p> <p>You cycled home from Margaret Island at night without lights.</p>
	PLACING BICYCLE RACKS	<p>On your initiative, the residents' association got together and set up a bicycle stand in the courtyard.</p> <p>You collected signatures to ask the municipality to install bicycle racks in front of the entrances to cinemas in the district.</p> <p>On your way home late at night, you noticed that some rioters were about to destroy a bicycle rack. You called them out and prevented the damage.</p> <p>On Paulay Ede street, you tied your bike to an eave, and on the narrow pavement, pedestrians could not pass.</p> <p>You accidentally chained your bike to another bike and the owner of the bike was unable to take it away.</p> <p>Your car was parked illegally and you were so close to a bicycle rack that it was not possible to use it.</p>

THEME	SUB-THEME	SITUATIONS
TRANSPORT	IMPROVING PARKING SITUATION	<p>You have noticed that one of the parking meters in Wesselényi Street is broken and reported it to the operator.</p> <p>You have launched an initiative to convert the car park in your neighborhood into an ecological car park.</p> <p>You collected signatures with residents to regulate the parking of cars on your street.</p> <p>You parked in a disabled space.</p> <p>You parked on the pavement and pedestrians were unable to pass.</p> <p>You wanted to drive in the city center during Mobility Week.</p>
	IMPROVING ACCESSIBILITY	<p>When your building was renovated, the residents' association had a ramp built in front of the entrance, so that wheelchairs and pushchairs can now easily enter the building.</p> <p>You persuaded the residents' association to replace the doorbell. The new doorbell has Braille names and bell numbers so that blind and partially sighted people can use it.</p> <p>At an event, you tried out how to get around in a wheelchair and what difficulties people with disabilities have to overcome.</p> <p>You have parked in a disabled space.</p> <p>You carelessly tied your bike to the handrail lift, so the disabled could not use it.</p> <p>You hadn't cleared the snow in front of your apartment building and an elderly lady slipped on the sidewalk.</p>
CULTURE	COLLABORATING IN CULTURAL EVENTS	<p>You performed with the fire jugglers at the Erzsébetváros Days.</p> <p>You organized a neighborhood activity in your street. As part of the mini-festival, the residents of the street had a picnic in one of the courtyards.</p> <p>You won the Terézváros quiz at the Terézváros Festival.</p> <p>You organized a house party, but the music was so loud that the neighbors couldn't sleep all night.</p> <p>You drank too much at the Pálinka (Spirit) Festival.</p> <p>There was a craft fair in the City Park, but you scribbled all over the new wooden festival stands.</p>
	IMPROVING STREET FURNITURE	<p>You have initiated a petition with residents to put benches in your street.</p> <p>You decorated the rusty lampposts in your street with colorful crocheted yarn.</p> <p>Together with the neighbors, you painted the old, worn benches in the playground.</p> <p>In your district, free dog waste bags are placed on the streets, but you still leave your dog's chores on the pavement.</p> <p>You tied your bike to the bin, so it could not be emptied.</p> <p>You damaged the benches in the playground.</p> <p>Your house participated in Cultural Heritage Day.</p>
	PROTECTING LOCAL HERITAGE	<p>Happy birthday! Your house was built just over a hundred years ago, and to celebrate, you took part in the Budapest 100 program.</p> <p>In Dob Street, a monument building is being demolished. The Óvás! Association organized a human chain to save the building and you were part of the action.</p> <p>You made a tag at the newly renovated facade of the Paris department store.</p> <p>You have replaced the windows of your old listed building, but you have ignored the regulations and destroyed the stucco ornaments on the façade.</p> <p>Your apartment building had an old, ornate, wrought-iron staircase. During the renovation, the residents' association replaced it with a new, less valuable aluminum handrail, and the original was transported to the local scrapyards.</p>
	PROMOTING PUBLIC ART	<p>You have collected signatures for the Municipality of Erzsébetváros to erect a statue of Frigyes Karinthy, born in the district.</p> <p>You made graffiti in a legal place. You painted a chariot caravan on the slate row of the under-construction metro line 4 on Népszínház Street.</p> <p>You decorated the courtyard of your house with colorful lanterns made from waste materials.</p> <p>You climbed up the Liszt Ferenc statue and broke the index finger of it.</p> <p>You were very warm and took a bath in the fountain of the Terézváros Maiden.</p> <p>You have tagged the graffiti on the Nyugati Square overpass.</p>

Table A6

The list of situation cards in the Pop-up Pest game

