



PROCEEDINGS

DRS LEARN X DESIGN 2019

insider knowledge

Fifth International Conference for
Design Education Researchers
9-12 July 2019
Middle East Technical University
Ankara, TURKEY

Editors
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ISBN 978-1-912294-00-8

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Cover and conference identity design

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Publisher

METU Department of Industrial Design
Middle East Technical University
Faculty of Architecture
Department of Industrial Design
Universiteler Mahallesi
Dumlupınar Bulvarı No:1
06800 Çankaya, Ankara, Turkey
<http://id.metu.edu.tr/>

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METU Department of Industrial Design

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Game-Design-Driven Knowledge: When Prototypes Unpack and Reframe Conventions

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doi: 10.21606/learnxdesign.2019.14060

Abstract: This paper explores the implications of conceiving, designing and prototyping location-based mobile games (LBMGs) that bridge the real and the digital into fascinating and unexpected hybrid worlds. The distinguishing traits of these games make them pop up as a compelling contemporary field for design research and practices, where design knowledge is informed in multiple ways: from posing the questions of relating to/embedding technology, to addressing design issues, from ruminating and dealing with UX and UI, to assessing communicative aspects. Moreover, being situated in a specific context and addressing unpleasant topics in the meanwhile, these games prove to be further challenging. The result from our study is that especially when the design activity pushes the line beyond playing within a formal structure, becoming a way to play with structures and a way to celebrate experimentation, prototyping has a crucial role in nurturing awareness and knowledge. In the light of this reasoning, designing, prototyping and testing of LBMGs are framed from a design perspective, exploring their potential in terms of design education.

Keywords: *location-based mobile games; prototyping; learning; meaning-making; hands-on experimentation*

1 Introducing LBMGs: A Controlled, Complex Space for Design Experimentation

The topics of design research and education, as well as their methodological framework are still open matters of investigation at the centre of many discussions. Nevertheless, contemporary literature agrees on the necessity to encourage innovative learning/educational environments able to nurture knowledge about learning or/and teaching (Edelson, 2002; Cobb, Confrey, di Sessa, Lehrer & Schauble, 2003; Sandoval 2014). In the light of this reasoning, we identified games as a meaningful and inclusive context where design students can experiment and apply the design process in its entirety. Hence, we approached location-based mobile games (LBMGs) because of their interdisciplinary nature. Their being comprehensive of different degrees of complexity make them an ideal space for exploring the various stages and multiple challenges of design education. LBMGs are popular and flourishing typology of games that, in addition to be recognised as means of entertainment, prove to be an interesting and rather challenging field for investigation (De Souza e Silva & Sutko, 2009; De Souza e Silva & Hjorth, 2009; Montola et al., 2009; Ackermann, 2014;



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Leorke, 2015). Allowing informal situated learning and favouring hands-on learning and practices, they provide a powerful space where exploratory processes can be tested, analysed and implemented (Spallazzo & Mariani, 2018).

We ruminate on games as structured systems of interactions that imply a dialogue with the game system, but also with other players, and spaces. The latter in particular can be seen as environments as well as social contexts, where physical objects can be spread in order to activate interactions. Bridging the real and the digital into fascinating and unexpected hybrid worlds, such games require certain abilities that surf from sense to sensibility. Acknowledging the state of the art in the field, and the potentialities coming from mobile technology, we decided to deal with a confined but complete design process, that of designing LBMGs, which quite nimbly allows to go from conceiving the idea to its prototyping and testing. We started our study as an empirical research conducted in the Politecnico di Milano, School of Design educational context, analysing the design processes that led to create 44 LBMGs, outcome of the elective BSc course *Augmented Reality and Mobile Experience*.

The distinguishing and peculiar traits of LBMGs make their creation a compelling contemporary field for design research and practices, where design knowledge is informed in multiple ways. Design issues are addressed in a broad sense: from understanding the relation with the environment – and hence problematizing the interaction with the surroundings – to the potential engaging uses of mobile technologies; from examining and dealing with UX and UI, to assessing communicative aspects. Indeed, they can include meaningful persuasive aspects that stem either from a significant narrative dimension and/or from informed, considerate, attentive uses of procedural rhetorics (Bogost, 2007; Sicart, 2011a). Narratives and mechanics can indeed nurture engaging and captivating experiences that prompt into critical reasonings (Mariani, 2016). From covering uncommon topics to employing unusual gameplays, a growing amount of games and play practices questions and sometimes even breaks our ordinary conventions to trigger different/novel perspectives. As a result, it is key to focus on the meanings and implications that lie on the ground of designing games that frequently prompt unusual experiences leading to unexpected and meaningful play activities. Echoing and expanding Sicart's reasoning on procedurality (Bogost, 2007; Sicart, 2011a), we challenged our students to design LBMGs exploring transgressive topics and gameplays, from unconventional matters to taboos and subjects that none would like to talk (or play) about (Mariani & Spallazzo, 2016).

This design brief presents several implications that go transversally to the design fields, as the designer interprets complex topics while dealing with games that are situated in the space. In consequence, for those who design such games, meaning-making as well as the definition of significant interactions are far from being second-order problems. To handle such a complexity, prototypes are needed. That said, in the following, we open the reasoning about how prototypes can play a key role in triggering learning at different levels and design moments.

Prototypes are clearly a way to empower designers, even more when the discourse implies playing with meanings and meaning-making. It follows that the design activity at the basis of such games pushes the line from playing within a formal structure to a way of playing with structures (Zimmerman, 2008), turning the game design activity itself into a way to celebrate experimentation. In so doing, prototyping is far beyond from being in service to knowledge. It is rather key, since it plays a first-line role in advancing understanding and awareness. Our educational aim was to challenge students to follow the entire design process when designing LBMGs, from their conception to their testing; a process that relied on early prototyping and hands-on experimentation aimed at activating a virtuous circle of iterations that goes through progressive implementation and improvement. Here, prototypes serve both as a way to materialize and test concepts, and as a moment of discussion with peers. The course was indeed structured to exploit prototyping at different stages: depending on the design phases, they allowed designers to discuss about topics, or to enable a collective critical discussion within the classroom triggered by feedback from peers.

In the light of this reasoning, this paper frames location-based mobile games from a design perspective, exploring prototypes potentiality in terms of both design and design education.

LBMGs in the Educational Context

Relying on a well-established literature by authors such as Salen (2008), Flanagan (2009; Nissenbaum, 2014), Gee (2003; 2004), Squire (2005; 2007; 2008; Klopfer & Squire, 2008), Bogost (2006; 2007; 2011), Sicart (2011b), Frasca (2001) and Stokes (2005; 2014; et al., 2006), we intend games as successful means to address sensitive topics and suggest different point of views.

Discussing the potentials of LBMGs in an informal or formal education context means touching diversified and broad fields of research such as mobile learning (m-learning), situated learning, and game-based learning (GBL), since

games—and LBMGs in particular—are sophisticated communication systems that establish multidimensional relationships between players, the game context, technology and other players.

Intending LBMGs as mobile-supported systems means referring to the field of mobile learning. The potentials of mobile devices in terms of learning have been addressed by several authors who list the main characteristics that make these devices compelling tools for learning: social interactivity and individuality (Klopfer, Squire & Jenkins, 2002); context, mobility, learning overtime, informality and ownership (Naismith, Lonsdale, Vavoula & Sharples, 2004). Therefore, mobile learning appears as a process of knowledge acquisition, experience and awareness while in mobility, enhanced by personal and public technology (Kukulska-Hulme et al., 2009).

Looking at LBMGs as games, we can highlight how they are progressively emerging as educational media (Squire, 2006; Paraskeva et al., 2010; Girard et al., 2013; De Freitas, 2018) that find their strengths in the ability to involve players utterly and completely, sometimes also taking particular advantage of the space in which they are situated. Learning by playing digital games could signify acquiring specific skills (Gee, 2003; 2004) but also being educated about the topics the games deal with (Bogost, 2007; 2011). LBMGs in particular, for their ability to foster playfulness (Sicart, 2014; Mariani & Ackermann, 2016) and mix an engaging play activity with the richness of the contingent world, can be seen as valuable tools to trigger both active engagement and situated learning (Lave & Wenger, 1991). LBMGs, indeed, may embed learning in authentic environments thanks to the mobile technologies ability to locate players and provide contextual contents (Huizenga, Admiraal, Akkerman & Dam, 2009). A potential that has been highlighted also by Klopfer (2008) as essential to augment the learning experience, be it in a formal or informal context.

Learning and engagement are seen by Avouris and Yannoutsou (2012) as inherent to LBMGs and the balance between these two poles is at the basis of the classification of educative LBMGs they propose, structured in three categories: (i) ludic which includes games aimed to enjoy players; (ii) pedagogic that regards LBMGs specifically developed for players' learning and (iii) hybrid that looks for a balance between the aforementioned aims. Therefore, mixing interactive entertainment with learning is at the very core of game-based learning and a novel way of dealing with contemporary learners both in formal and informal education settings (Prensky, 2001; Papastergiou, 2009).

The experience we ran for three consecutive years took place in a formal education setting and focused on sensitive topics, looking at LBMGs as means to look at our society, both from player's and designer's point of view. Students were asked to realize working prototypes of LBMGs, games as media to communicate meaning, ways to translate multifaceted perspectives, controversial themes and wicked issues into gaming experiences. In so doing, games also emerge as tools of enquiry. Not only the games designed, but already the considerations and reflections that led to the prototyping—as well as the prototyping itself—have been source of knowledge, emerging as fundamental moments of learning. Indeed, addressing sensitive topics frequently involves seeking for transgressive ways—gameplays—of dealing with moral arguments. In particular, we focused on topics of questionable playful interest, usually steeped in negative value and avoided in daily conversations (Kaufman, Flanagan & Seidman, 2016): we asked our students to explore the game and its dark side (Mortensen, Linderoth & Brown, 2015), deliberately investigating morally defensible choices and giving rise to negative emotions and feelings (Juul, 2013). Designing, prototyping and testing these games prompted rumination between meanings shared and transferred through the gameplay and the experience they trigger (Sicart, 2011a). Meanings that reflect the message that students, in the role of game designers and senders, intend to convey but emerge as a result of the player's interpretation and understanding.

Our academic interest was in the analysis of the relevance of LBMGs prototypes, on the one side as activators of reflection and on the other as triggers of learning experiences in a formal educational context. The discussion here proposed aims at framing LBMGs prototypes as valuable tools to stimulate through-design learning for students, where learning is multi-layered and rely on how early prototyping and an iterative process of test and correction resulted in terms of educational outcomes.

2 Methodology

Thanks to direct (participant) observation of the design (first) and play activity (later), we dug into the learning dynamics and processes activated by designing LBMGs. The enquiry has been supported by post-game questionnaires and informal interviews aimed at grasping knowledge about how players received the game, its mechanics and message (Mariani, 2016). While recognizing that the understanding of the message in itself is not the core of this article, it plays a key role in providing students clear feedback on what they prototyped. Acknowledging that game-playing and game-designing can work as relevant models for learning, becoming powerful calls for action and reflection in the real world (echoing Mezirow's (1996) *transformative learning*), the education results have been

analysed and unpacked examining how learning can be informed by hands-on experience. As a matter of fact, subjective understanding is nurtured through design practice (Frayling, 1993). Thus, this is both a review and a critical discussion about how prototyping games can serve for constructing design knowledge. The approach framed as “design as research” (Schön, 1983; Laurel, 2003; Cross, 2006) lays on the ground of a study that sees (game) design as a way to conduct enquire and encourage reflective insight about the creative process. That said, in a through-design perspective (Frayling, 1993), conceiving, designing and prototyping LBMGs become ways to gain expertise and awareness.

The analysis has been conducted on 180 students, informed since the beginning of the course that their design activity as well as results would be subject of analysis. The study focuses on the outcomes of three assessments in the BS course “Augmented Reality and Mobile Experience” that ran in the academic years 2013/2014, 2014/2015 and 2015/2016, and employs a mixed approach based on a triangulation of different research methods aiming at lessening intrinsic biases and weaknesses (Denzin, 1978). To cross-validate the study, participant observation has been combined with interpretative ethnography and questionnaires. In particular, questionnaires were built to assess the play(er) experience and some of its aspects as the feelings elicited, the ability to understand the message conveyed and the perceived overall quality. The data gleaned from the questionnaires and the ones of the ethnography provided important insights into the way the game answered the initial aims and expectations as well as on the role played by prototypes in allowing designers to grasp such knowledge through a hands-on activity.

The ethnographic study covered the entire design process over a six-months span for each academic year, while the questionnaires were handed out at the end of each playtest cycle. When students cross-played and cross-evaluated their working prototypes they were asked to provide feedback about the games’ playability to their peers, assessing the relevance and pleasantness of the interaction with the game and its elements, as well as their ability to convey meanings.

3 Unpacking Learning Through LBMGs Design and Play

The formal educational setting wherein the experimentation here described took place is that of a School of Design and the main goal of the didactic activity was therefore to teach students how to design for mobile experiences, taking into account not only the mere interaction with mobile devices but also its development over time, the context in which it occurs and, above all, its meaning. Furthermore, the course aimed to shift future designers’ attention from the implementation of new technologies to the design of the resulting experience (Hassenzahl et al., 2013). Based on such premises, we examined how designing LBMGs—that are known for being engaging tools—can transform a higher education class into a space where knowledge is gained by conducting iterative on-field experimentations.

Therefore, learning is mainly intended as the result of a formal didactic activity that mixes theoretical knowledge with hands-on experimentation, ranging from creating proof-of-concepts and low fidelity prototypes to deploying working prototypes then tested and evaluated in a peer activity. Nevertheless, our study revealed that learning emerged as multi-layered across the entire course for the three consecutive years. Students, indeed, learned to design for meaningful and engaging mobile gaming experiences, but at the same time, by designing games on specific topics and by playing those games, they could gain knowledge about the argument covered.

Consequently, we may highlight three learning forms: (L1) **learning to design** for mobile experiences (formal learning within design practice); (L2) **learning by designing** games (formal learning about the design objective of the course and informal learning about specific topics covered by each game); (L3) **learning by playing** games (informal learning about specific topics) (Figure 1).

The first layer (L1) considers LBMGs as significant mobile experiences, whose design is subject of the course during which the mobile games have been conceived and tested. This level portrays the expected outcomes of a formal educational activity in the design field. As stated above, it is the result of a teaching activity that relies on theoretical lectures as well as on hands-on activities and looks at prototyping and testing phases as the main means to gain skills, competences and knowledge (L1). Therefore, learning to design LBMGs can be considered, first of all, a formal educational activity (L1) that can be targeted as **learning to design**, since students acquire skills to conceive meaningful mobile experiences by taking part to the course. Eventually, another level (L2) is necessarily intertwined, since the didactic activity passes through the actual design of LBMGs and an iterative design process intended as an on-field practice for advancing understanding.

Students were asked to develop functioning systems in an operational environment—working LBMG prototypes ready to be tested—going through a set of given steps: definition of the game narrative and of the game mechanics, user experience design, low-fidelity and, finally, hi-fidelity prototyping. It is evident that prototyping acquires here a key role in the iteration that usually characterizes the design process, and Interaction Design in particular (Saffer, 2009). Rather than incurring in the common translation of theoretical principles into concrete design, learning to design (L1) and by designing (L2) induced students to derive such principles from the experimentation, allowing to develop direct, experiential knowledge. Moreover, the assessment of the games designed via mutual playtest encouraged to gain awareness. By feeding learning, although in different ways, these activities can produce evident benefits in terms of design curriculum. Through trials and errors, students directly experienced the entire process of conceiving, developing, testing and releasing of a LBMG, getting continuous feedback on several issues connected to their games: mechanics, graphics and user interface, narrative, usability, user experience, involvement, just to name a few.

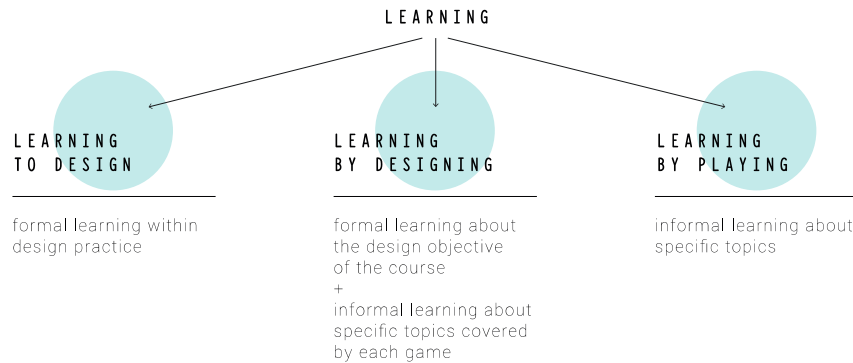


Figure 1. Three forms of learning emerging from the study

Designing a game requires specific knowledge in the discipline of game studies and game design, that we provided to students in the form of short lectures. Therefore, the act of designing games also became a means of formal education about the gaming field and its fundamentals, since students were asked to master the basics of the discipline to design coherent, working and engaging games. **Learning by designing** (L2) is therefore the second level of formal learning achieved by “getting the hands dirty” with prototypes, being them rough or refined. But designing a game necessarily involves a good command of the subject matter of the game, in order to create a meaningful fictional world, relevant tasks and consistent game mechanics. Hence, learning by designing means learning how to design—learning by doing—but also having both a wide and narrow knowledge about the topic. In other words, it means also an informal acquisition of notions about specific topics covered by each game, a kind of learning (L2) that affects mainly the design team. It uses design skills to pass on knowledge gained in the form of gaming experience to players who, hopefully, will learn by playing (L3).

If the use of prototyping skill is helpful to learn how to design for meaningful interactive experiences, it is also true that the need to create a working and complete prototype forced students to deepen the subject matter of the game, in order to create a coherent fictional words, quests and game mechanics. Gaining this knowledge can be considered as a productive side effect of the formal activity and triggered by the task of creating an operative prototype. An example is the game *The Lost Papyrus* (Benedetti, De Marco, Franco Conesa & Piatti, 2015), which deals with Alzheimer's disease, aiming to inform players about its effects and implications, on the daily activities of patients and those who live with them (Figure 2). This complex and delicate topic is addressed through a metaphoric narration, and through the transposition of the disease symptoms into game mechanics in order to create awareness and provide information. The metaphor is the Ancient Egypt of the first heroic archaeological expeditions. The four players are dropped in the early 20th century wearing the roles of an expert archaeologist of Egyptian culture and his three assistants. Their objective is to explore a still undiscovered tomb to find a renowned papyrus. The relevant number of documents read and discussed, and information filtered by the students, resulted in an unintentional but thoughtful knowledge of the disease, and the continuous confrontation within the design team led to an emotional involvement towards ill people and their relatives.

Therefore, informal learning can happen while designing LBMGs but the working prototypes of LBMGs are at the basis of the third level of learning we identified in our study, defined **learning by playing** (L3). Each game underwent an iterative process consisting of several testing by peers, namely by classroom mates as players who are in the meanwhile designers of other games. In this case, the focus is on the ability of games to transfer the embedded

meaning and raise awareness about delicate topics, affect some mindsets and affect the position of designers/players about the represented issues.



Figure 2. *The Lost Papyrus* (Benedetti, De Marco, Franco Conesa & Piatti, 2015)

The translation of information, processes, concepts and knowledge into a story, the definition of a fictional world and of game mechanics are evidences of the informal learning process that happened within the design team. However, quantifying the learning outcome of a mobile-supported experience is not an easy task, since the employed methodology cannot account on real transformation of players' attitude towards the subject. Nevertheless, we observed that frequently players, during the play activity, were led to think and act according to the role they were assigned, and, in so doing, to discuss the point of view proposed by the design team. Often, players reported that the game experiences triggered reflection on their morality and ethics and acted as a stimulus to discuss and question delicate issues.



Figure 3. *The 10 Commandments* (Culla, Di Filippo, Frisia & Golan, 2014)

An indicative case of this attitude, as well as sharp example of how the three typologies of learning unfold during the prototyping process and inform the game design is *The 10 Commandments* (Culla, Di Filippo, Frisia & Golan, 2014), a game conceived to dive players into the daily life routines of a person struggling with anorexia (Figure 3). To design its

narrative and mechanics students conducted a significant desk research, identifying some real online blogs that openly sustain and promote Pro-Ana behaviours, and the renowned *Ana's 10 commandments*, that means seeing anorexia as a philosophy of life to be followed in order to have a “perfect slim body”. Such resources and testimonies (L1 and L2), were exploited to drive the game design. The story goes that players are in the shoes of a young girl who has to face nine stages to successfully attend a photographic shooting. Players are asked to go through different moments of the day, coping with a series of dilemmas that are indirect references (Kaufman & Flanagan, 2015) to the commandments. However, this game has been structured in order to make the player fail. Indeed, whatever the choice, the result is a game over. By respecting the commandments, players lose energy and cannot make it to the end, while by disobeying their sense of guiltiness increases, preventing them from reaching the final stage. In this case study, the informal learning that happens through playing (L3) is singular and noteworthy. The gameplay is indeed thought to make players feel progressively more doubtful and suspicious about the validity of their in-game behaviours. By following a linear, distributed narrative, players are indeed led to question the logic and soundness of *Ana's 10 commandments* as rules to trustfully follow. Dealing with the topic addressed (L2), students decided to structure *The 10 Commandments* as an unwinnable game (Ruggiero & Becker, 2015). No player can reach the eagerly awaited shooting, since they will not have enough energy to open the ultimate door that brings to the photo studio, or they will be lacking the self-esteem needed to participate in the casting. Struggling with anorexia, the player is led to play from the losing side, experiencing failure and frustration. As a matter of fact, these feelings, gathered through participant observation, informal interviews and questionnaire, are the eventual objective of those who designed the game. As to mirror the dynamics of the disease, the game is not giving any chance of winning, stressing the fact that this eating disorder cannot be solved by continuing to follow harmful practices and behaviours. According to the interviews conducted, the final disclosure was rarely perceived as a total epiphany. During the game, players frequently started to debate about the inconsistency of the Pro-Ana behaviours.

This case study represents in an explanatory way the learning processes object of this article. It is already recognized that games are constructive systems able to encourage *transformative learning* (Mezirow, 1996; Mitgutsch, 2011). However, the topic is generally covered from the players' perspective, drawing attention on how design patterns can challenge players and lead them to rethink their expectations, but also reframe their positions and knowledge by making them conscious of their own bias and prejudgments. Instead, the point we intend to stress is how creating games, and the stages of prototyping and testing, in particular, are sources of significant knowledge. The initial stages of research and analysis that bring to the idea and its prototype are the first trigger for consideration and reflections. However, deeper pondering, awareness and consciousness can only come afterwards, from the very fact of prototyping and conducting on-field experimentation as fundamental moments of learning. Collecting information about how their own game shaped as completely working prototypes were played by others created awareness about the effectiveness or flaws of certain game mechanics, as well as of the storytelling (narrative part) of the game. The moment of comparison between designers and player is key since it offers a unique perspective with those who made a direct experience of the game. By playing games designed by peers, the students were also encouraged to assess their own games through comparison, and the gained insights were then enforced by the feedback of those who tested the game. This happens at a design stage when designers are prepared to question their work, as variations and implementations do not require a total revision of the system, but of progressive improvements and adjustments. In this sense, learning by playing (L3) can be intended also as a way to test the design skills acquired during the class activities (L1 and L2). The working prototypes were therefore key to activate the levels of learning here discussed since they allowed to: directly verify how the designed system was used and perceived (L1); improve the design skills by actually realizing a working system (L2); get a wide and narrow view on the topics addressed by the games (L2) and, finally, to be sensitized about those topics by playing the LBMGs (L3).

4 Reframing Knowledge via Prototyping: Discussion and Conclusions

The course clearly had multiple objectives. Designers were asked to author arguments and topics through processes (L1), with the given objective of turning them (L1+L2) into a kind of knowledge that players could grasp by playing thanks to working prototypes (L3). Relying on Bogost's (2007) and Sicart's (2011a) reasonings, through their procedural rhetoric, these games have been conceived and developed aiming at becoming a way to show or expose how the represented systems and topics work. In this sense prototyping played a paramount role since the very early stages. The early prototyping phases of the game provided hands-on knowledge of the topic and about how to translate it into game mechanics and narrative. This required students to face several levels of complexity. First it comes the fact of identifying a controversial, problematic topic of social interest to conscientiously address through a game. Hence the research and strategic articulation of this topic into a narrative (with its fictional world) and game processes showed how games can be used persuasively, namely as ways to provide a first-hand experimentation by including persuasive contents. From a design perspective, learning to conceive entertaining games and master

persuasive communication means able to impact on players—changing their opinion or even affecting their behaviours—has several implications. Indeed, designing and prototyping artefacts able to both engage and induce change through experience and interpretation requires iterated tests and validations to assess the artefacts' usability as well as their communicative-persuasive effectiveness on players.

The aim of designing games that trigger learning processes on players is not new, and the virtuous circle of learning by (L2) designing and (L3) playing games has been a matter of analysis for several researchers. In particular, Flanagan and the colleagues involved in the Tiltfactor team look at digital games as a medium to express and incorporate moral and political values. During formal educational activities such as workshops, Flanagan and Nissenbaum (2014) investigated how game-based systems can communicate ideas and integrate human values. We extended this educational approach to LBMGs and their design process, further challenging our students to cope with the constraints of mobile technology and the real world. In this articulated and challenging process, the role of prototyping covers a pivotal role, and both designing and playing games acquire a twofold role and function, as ways to question and understand design knowledge and practices given for granted (L1+L2), and as sources of broader understanding (L3). Cycles of prototyping and assessment lead to recognize the presence of repeated issues attributable to the difficulty of transmitting concepts and soliciting critical reflection, as well as to deal with a game situated in the real space where the gameplay is located, and the narrative is often distributed. In addition, substantial benefits derive from interacting with a prototype since the early stages of the game design, allowing progressive implementations.

A large proportion of our students approached the design with clear and definite ideas about what kind of gameplay they wanted to create. However, until the prototype was tested, we noticed that students struggled to envision the players' experience as a design outcome, and in particular to frame how players would have grasped and interpreted the topic addressed by the game. In this sense, we encouraged them to reconsider their starting assumptions in order to adopt a more personal perspective. A perspective that was less predictable and subject to conventions, but rather based on fresh or unexpected narratives and game mechanics, striving for experiences that can stimulate significant reflections on the subject (L2). Only through direct experience and especially testing, designers understood that the best way to trigger reflections and support arguments goes far beyond the construction of rules of behaviours that emerges from the game experience. On the contrary, they realize that comprehension and knowledge rely on more complex dynamic models, which include coherent and consistent narratives (Wolf, 2012), as well as unexpected gameplays (Mortensen et al., 2015). As a result, most of the time failure and narrative turning points started to play a central role in the gameplay, becoming in-game sources of meaning-making.

To further point out the contribution of this research in our communities of reference, we want to underline that this study regards on the one hand an enquiry on the role of prototyping, applying design methods and practices to a limited but complex context, that of designing LBMGs, wherein multiple design issues and levels of complexity are entailed (L1); from this perspective, prototyping also pops up as a way to test and question practices, enquire processes and gain consequent knowledge (L2). On the other hand, it refers to the way in which the playtest phase via prototyping informed designers. They benefit from investigating how players have reacted to the experience of the game as a source of understanding and activator of change (L3).

Acknowledging that just going through prototyping and assessment students can learn that what has been designed on a theoretical level can encounter failure when translated into practice, we decided to exploit the trial-and-error process as an educational method. Designing games has become an opportunity for experimentation in which students had the opportunity to test themselves and fail, as a planned part of their learning activities and outcomes. A situation made even more sensitive because of the arguments addressed: social issues. This led students to think conscientiously through the practice of designing, prototyping and playing on topics as delicate as they are complicated. Ultimately, this design activity gave them the opportunity to reframe their own conventions in terms of topic covered, while providing novel insights on the overall design process.

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