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n. 260/2005 - 18th July 2005

ISSN: 1826-9745

e-ISSN: 2283-2998

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Empowering Games. Meaning Making by Designing and Playing Location Based Mobile Games.

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Abstract. The article analyses and discusses the use of Location Based Mobile Games to raise awareness on sensitive issues connected to illness and disability. We report on a study grounded on higher education didactic experiences. By means of a multi-methodological approach we analysed the experience of designing and playing games and their fallouts in terms of learning and awareness about the topics addressed. The study is conducted from a design perspective and aims to understand whether designing and playing LBMGs can sensitise designers and players on sensitive topic.

Keywords: location based mobile games, game based learning, mobile learning, game design, persuasive games, sensitive issues, sense making, play experience, immersion, identification.

1 Introduction

The contribution analyses and discusses the use of Location Based Mobile Games (LBMGs henceforth) in an informal education setting, to sensitise young users and raise awareness on sensitive issues connected with illness and disability. The study is grounded on two didactic experiences with third year students of the Bachelor Degree of the Design Course of Politecnico di Milano, here discussed through four relevant case studies. It addresses the mobile frontier for LBMGs covering special issues of interest through a design perspective that includes the applied domains of (i) learning, (ii) play and performance, and (iii) games for social change addressing special needs and topics related to illness and disabilities. The focus is on LBMGs, games played in hybrid spaces [1] where the real world and the digital one are bridged through context-aware mobile devices. Thanks to the ability of smartphones and tablets to locate players and to provide them with contextual digital inputs, the physical sphere has become part of the mobile game. By playing these games, users are often invited to follow uncommon paths and access a novel space, layered with the fictional world and with the game mechanics [2]. The key role that LBMGs confer to location and to its layering with narrative and gameplay motivates the interest of the study here presented towards this typology of game and its possible fallouts in terms of learning outcomes. In the paper, the topic of mobile-supported special education is approached from a peculiar point of view, because we do not focus on experiences of education

for learners with special needs but instead on novel ways of sensitising and raising “ordinary people’s” awareness on related topics, such as illness and disability. The approach is not strictly educational but rather focused on the potentiality of games for introducing players with specific perspectives to affect their perception and position about the issue represented. Entailing common stereotypes, misunderstandings and even prejudices among the public opinion they are meant to raise awareness for changing existing mindset. These games are intended to elicit significant learning via highly involving bodily experiences. Grounded on the concept of transferring knowledge through an experiential approach rather than a didactic one, they can push some unusual perspectives and attitudes enough to persuade people in behaving in a different way [3,4,5]. Because of their hybrid nature, LBMGs particularly well suit this aspect: they facilitate and include immersion, and they stimulate pro-active participation. Participant observation of designers crafting LBMGs and the evaluation of the resulting games are here presented as a means to verify the learning outcomes of both designing and playing games.

This said, a discussion about the potentials of LBMGs in an informal education setting calls into play two broad fields of research, those of mobile learning (m-learning), and game-based learning (GBL), here intended as a process of making meaning out of mobile supported game experiences.

2 Location based mobile games and learning. An overview

The field of mobile learning is very diversified, multidisciplinary and almost consequentially still in need of a unique, shared definition. An early attempt by Sharples et al. to define m-learning focuses on dialogue as the main process involved in a learning activity, allowing the negotiation of meanings and the construction of a stable even if transient interpretation of the world [6]. The authors intend conversation as something that happens *with* and *through* technology, making no distinction between humans and interactive systems, but noticing that their definition lacks in recognizing the moral and social worth of human beings in respect to technology [6]. Per contra, the social dimension is central to Klopfer and colleagues who suggest four key factors of mobile and context aware technology: portability, social interactivity, context sensitivity and individuality [7]. By listing individuality and social interactivity as central aspects, the authors recognise the apparently contradictory nature of mobile technology, which is at the same time strictly personal and able to foster social interaction. Naismith et al. keep a similar approach in listing the five key issues to be considered in designing mobile learning technologies: context, mobility, learning over time, informality and *ownership* [8].

Looking at the definitions above, m-learning is portrayed as an informal process that happens in mobility and overtime: it is context-related with no precise temporal constraints. Not by chance the mobile technology motto is *anytime, anywhere*.

By interpreting mobility as a property of the interaction between people and technology, Kukulska-Hulme et al. [9] define m-learning as a combined experience of retrieving data through different media – be them a desktop computer, a mobile phone

or an interactive application. The authors propose an extended notion of mobility, developed through five interrelated aspects: (i) mobility in *physical space* that refers to people on the move; (ii) mobility of technology that means both the *portability* of the devices and the possibility to transfer attention across devices; (iii) mobility in *conceptual space* that is the movement from a concept or a topic to another one; (iv) mobility in *social space* that refers to the different social contexts in which the learners perform; (v) *learning* dispersed over time that describes learning as a combined experience that happens through different media and across time. Mobile learning emerges therefore as a process of acquisition of new knowledge, experience and skills while in mobility, and augmented by personal and public technology [9].

The idea of technology, and mobile technology in particular, as a tool able to augment the learning experience is at the basis of Klopfer's essay *Augmented Learning* [10] that discusses the potential of mobile-supported learning in real-world contexts. He matches the possibility of embedding learning in authentic environments through location-based technologies [11] with the potential of mobile games to enhance engagement and learning out of formal education activities. The hybridisation of fun and interactive entertainment with serious learning is set also by Prensky at the basis of digital game-based learning, pointed by the author as a novel way of addressing contemporary learners both in formal and informal settings [12].

In this context, *learning by playing* digital games could mean not only acquiring ever-increasing skills, as suggested by Gee [13,14], but also being acknowledged and educated about the specific topics that are subjects of these games. Moving from this perspective, LBMGs can be intended as effective tools for stimulating active engagement and situated learning [15], because of their ability to match the playfulness of a game with the richness of contextual contents and to transport players/learners into a hybrid world, between reality and virtuality [10,7]. The balance between engagement and learning is on the ground of the LBMGs classification proposed by Avouris and Yiannoutsou [16] who distinguish three categories on the basis of the game final aim: (i) *ludic* which encompasses games aimed to enjoy players; (ii) *pedagogic* that includes LBMGs overtly developed for learning and (iii) *hybrid* that collects games with both the aforementioned aims – entertain educating. According to the authors, learning can happen by playing games that pertain to each of these categories, but it is an explicit aim for two categories – that we could define *serious games* [17] – and a side effect for those games designed to entertain [16].

These games can cover a variety of topics and transfer specific knowledge. For two consecutive years we focused on sensible issues, studying and vetting LBMGs as lenses to look at the world, both from the designer's and player's perspective. With students, we investigated games as (i) systems to transfer meanings, as (ii) methods to mirror complex issues and multifaceted perspectives into in-context experiences, and as (iii) tools of enquiry to better understand the translation from theory to practice. Games became triggers of conversation and debate between us and our students, as well as between sender and receiver, inasmuch as they are activators of negotiations between meanings that are shared and conveyed through the game and the play experience it provokes [18]. The meaning corresponds to the message that students as game designers, as senders, intend to transmit, and it emerges as a result of the player's interpretation. Challenging unfriendly issues, as socio-cultural taboos, societal wicked problems [18], we asked our students to explore the game and its dark

side [19]. We focused on subjects of questionable ludic interest, usually imbued with negative valence, and a spread tendency to be avoided in daily conversations. Our academic interest has shifted towards analysing the game relevance as activators of reflection. According to Juul [20] certain games enable players to deliberately explore morally defensible choices and make negative emotions and feelings arise. The aim is endorsing reflection. Discussing or reflecting on topics considered harsh, pressing, acute may be considered unpleasant but through games players are *enabled* to deal with such arguments throughout a novel and unexpected lens.

We employed LBMGs to reflect on labile borders, challenging and sometimes provoking the fact of learning by designing/playing/experiencing. LBMGs are well suited to involve players in meaningful and engaging learning activities, and how to foster significant mobile experience is matter of the course during which the games here analysed have been conceived and tested.

The four case studies described in the following are the result of a formal didactic activity whose aim is to teach students how to design for mobile experiences, taking into account not only the sole interaction with the mobile devices but also its development over time, the context in which it happens and, above all, its meaning. One of the aims of the course is to shift the attention of future designers from the implementation of new technologies towards the design of the resulting experiences [21].

The design practice is indeed the academic field wherein the experimentation portrayed in the following took place. There is no need to remind that *design* has many meanings and even its definition depends on whether design is considered as an idea, a knowledge, a practice, a process, a product, or even a way-of-being [22]. We recall Simon's definition since it emphasises on the aspect of *action*: «Everyone designs who devises courses of action aimed at changing existing situations into preferred ones» [23, p. 55]. Learning is therefore the result of a formal education activity carried out by mixing theoretical lessons and practical experiences. Students learn how to design for meaningful mobile gaming experiences, but at the same time, by designing games about specific topics and by playing them, they can acquire knowledge about the issues portrayed. Hence learning emerges in three 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).

The first approach (L1) is out of the aims of this study, which focuses on the last two (L2) (L3), analysing if and how designing and playing games can raise awareness about sensitive topics related to special needs, change some mindset and affect the position of designers/players about the represented issues. Albeit simultaneously focusing on L2 and L3 entails an increased complexity, we consider the two approaches entangled since the study is grounded into the design discipline. As a matter of fact our practice implies both translating topics into games (L2) and analysing how players make meaning out of them (L3).

Designing a game necessarily requires a good knowledge of the issue the game deals with in order to create a meaningful fictional world, relevant tasks and coherent game mechanics. Learning by designing means therefore learning how to design – learning

by doing – but also having both a wide and narrow knowledge about the topic, thinking-through practice. This kind of learning (L2) affects mainly the design team that makes use of design skills to convey the acquired knowledge in the shape of a game experience to players that will – hopefully – learn by playing (L3).

The approach of learning by (L2) designing and (L3) playing games has been also addressed by Flanagan and Nissenbaum [24] referring to digital games as means for expressing and incorporating moral and political values. Explicative are their workshops within the Values at Play project, as well the *Grow-a-Game*, an avant-grade brainstorming tool that proposes one of the design method developed by the researchers to investigate how game-based systems communicate ideas and integrate human values. Concurring with the authors we extended this systematic approach to LBMGs and their design process, challenging design students with the constraints of mobile technology and real world. We particularly focused on the aspect of meaning making as a consequence of the design and play activity of these games that constantly walk through the boundaries between real and digital.

3 Methodology

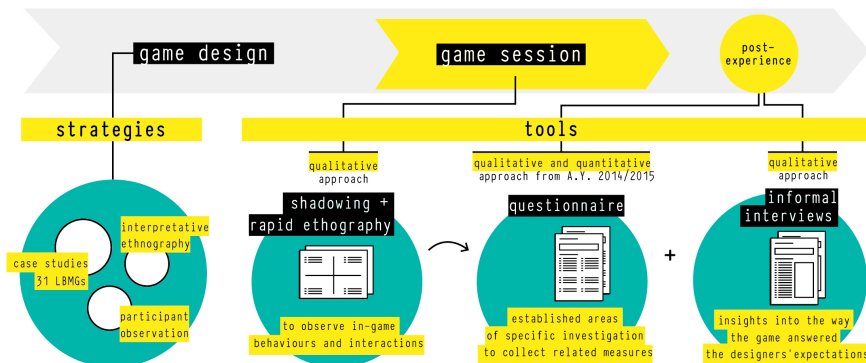


Fig. 1. Strategies and tools adopted to observe the game design process, and the game sessions.

The methodology of this study is desumed by [25] and grounded on the approach framed as “design as research” [26,27,28], where design acts as a means of knowledge construction to built results through reflective insights on the creative process. Recalling Frayling's research categories [29], this study is a *through-design* research, based on LBMGs as case studies conceived, designed and prototyped at Politecnico di Milano, School of Design. In our perspective, the act of conceiving, designing and crafting games has a key function in the process of gaining awareness and understanding, rather than being a mere source of competences for mastering design tools and processes. According to Koskinen et al. this study enters the domain of *constructive design research* because design «becomes the key means in constructing knowledge» [30, p. 5].

Each game comes from and explores actual societal problems and taboos, and evolves through an iterative process of design. However the main interest of this contribution ranges from *designing* as a process of enquiry, to *playing* as a practice that contributes to players' knowledge. As explained below, recognising the tendency of the existent theoretical and practical contributions on special needs education and inclusive practices to cover the topic from the learner and teacher perspective, we decided to focus on the less explored realms of the topic, engaging players in games that put them into the shoes of people with special needs and impairments. To investigate and understand both the player's experience and the effects of designing LBMGs with a social, special intent, we defined a set of complementary strategies with integrated specific tools able to return general knowledge and specific relevant insights of the practice enquired. Acknowledging that all methods have limits [31], we employed both sociological and design strategies, applying a triangulation of different methods of research. Our enquiry is developed through case studies (31 LBMGs), interpretative ethnography and participant observation (fig. 1). These activities were run in parallel in order to lessen the biases/weakness of one method by using another one that is different but supportive and complementing. These strategies were selected taking into account that games are artefacts that (i) require designers to consider a broad amount of elements and interplays, and (ii) lead players to have hands-on experiences of *play*. Whereas players and their play experience are complex, articulated subjects of enquiry, their understanding requires a mixed strategy with a combination of qualitative and quantitative tools: rapid ethnographies, shadowing, questionnaires and informal interviews conducted with students.

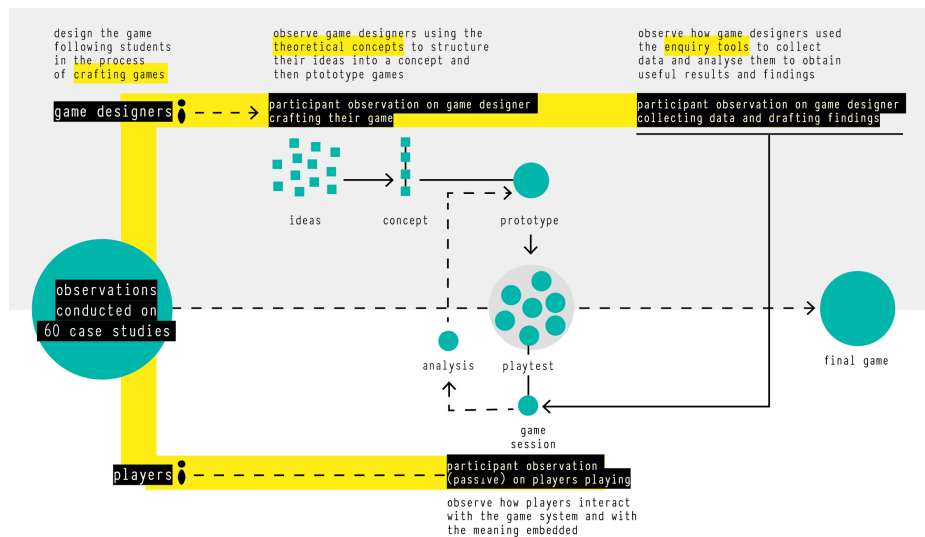


Fig. 2. Participant observation: moderate participation on game designers and passive participation on players. Adapted from [25, p. 224].

The insight of this study lies in the process of both designing and playtesting 31 persuasive LBMGs. They are the outcomes of two assessments in the BS course “Augmented Reality and Mobile Experience” that ran in the academic years

2013/2014 and 2014/2015, involving a total amount of 125 students. We investigated how these LBMGs function as engaging tools able to transform a higher education class into a space of meaningful experimentation where meaning can be translated into games in the process of design and included in the act of playing. The principal approach we used belongs to ethnographic research, and is participant observation [32]. It took place in a period of six months: three for each academic year. We mainly conducted moderate participation [33]. Between 2013/2014 and 2014/2015 the two courses were observed running ethnographies to understand how player made sense of their game and the play experiences it creates. However, after the first year we combined the aforementioned qualitative research with a quantitative research conducted providing players/students with specific tools to cross-check the results gleaned by the qualitative observation, and provide direct feedback of the game effectiveness. Since the second year of experimentation we equipped students with questionnaires [25] built to evaluate the play(er) experience and some of its aspects as the feelings perceived, the relevance/pleasantness of the interactions with the game objects, the ability to understand the message conveyed, the quality of the overall experience. The results gleaned from the questionnaires and the ones of the ethnography provided important insights into the way the game answered the initial/designers' aims and expectations. The qualitative enquiry in particular served as an important source of interpretations and considerations advancing the comprehension (and qualitative reading) of the quantitative data collected through questionnaires. In the following we report the results of a process that included the identification and framing of an issue to enquire, the game hypotheses, the theoretical concepts applied and challenged by means of our qualitative observation (cases 1 and 2) and with the complementary combination of relevant data collected by students themselves (in the role of players) (cases 3 and 4).

4 Framing the case studies: LBMGs as didactic results

The four case studies described in the following have been conceived and designed in the “Augmented Reality and Mobile Experience” BS course during the A.Y. 2013/2014 and 2014/2015. For three months 125 (65 in 2013/2014 and 60 in 2014/2015) students explored the general topic of mobile technology with the assignment of designing a LBMG on social issues or social taboos, using the Mobile Learning Academy platform. Each game was required to be composed of a digital and non-digital part: the use of the MLA app had to be supported or sustained by material components placed in the urban space and/or provided to players as game kit. Given these premises, grouped in teams of 4 to 5, students dealt for the first time with the topic as designers, endeavouring to structure a persuasive LBMG in a month and a half. Each game has been designed by one team (from 4 to 5 students) and played at least by other two teams (from 8 to 10 students) during the playtest, providing designers with relevant feedback and researchers with data. The 31 LBMGs designed covered a large variety of sensitive topics such as drugs, ageing, immigration, mental health, anorexia, vandalism, depression, homosexuality, stalking, suicide, sexual diseases, and more. Students investigated play as a form of conflict, as a temporary

detachment from the real world, as a safe space of experimentation, as a means of expressing identity and belongings to a group [34]. Playing between reductions and amplifications [35], each game arose from the identification of the topic and the definition of a fictional world that was an original representation of a social issue. We observed that students, by analysing and investigating the topics of their games, went through a process of learning that started from understanding the issue and its elements in order to mirror, reduce and transport them into game elements. In particular, through participant observation we noticed that in the process of including and transferring the most significant or unknown aspects of the diseases into games, students seemed to have modified their awareness of the topics, and their attitudes and beliefs on special needs and diseases, as well as their knowledge about the symptoms and conditions of those who are affected (L2).

In this study we focus on four games selected for their relevance to the topics of illness and disability (handicap, anorexia, depression, Alzheimer's disease) and analysed in order to understand if and how (i) designing and (ii) playing LBMGs can sensitise and raise people awareness on sensitive topics.

Our lens of investigation and analysis of the cases is therefore that of informal learning, intended in the double meaning of learning by designing (L2) and learning by playing (L3). Acknowledging the existent literature on special needs education [36] and inclusive practices [37,38], and their tendency to address individual differences and needs from the learner or teacher perspective, we decided to enlarge the reasoning and challenge our students to investigate the topic from unusual perspectives. In spite of designing *for* special needs, they designed *about* special needs. The game design practice and the resulting play experience supported by mobile technology becomes a way to systematically cover a sensitive topic. Transposing its features on a diverse level, games can provide a key of access to an experience that reduces a broader, more complex situation by putting players in new, unexpected roles [35,3,25]. The following games are not designed to help learners with special needs achieve a higher level of personal self-sufficiency, or to success in school or in their community. Relying on design as a way of enquiry, they approach the topic from another point of view, intending to create awareness and knowledge through a hands-on, first-perspective and moving experience. Accordingly, in the following each game is described, analysed and discussed to highlight its ability to foster reflection on the topic it deals with: the first two examples have been enquired through rapid ethnographies, shadowing and informal interviews conducted with students, while the last two are enriched by quantitative data collected via questionnaires.

Social games usually engage players with serious, overt real-life scenarios that present information and features of social concern. In this regard, the Tiltfactor researchers Flanagan and Kaufman [24] denounced that such a plain, direct approach could activate psychological defences that limitate the game impact and its ability to produce outcomes with a certain societal benefit. According to [24], the use and most of all the declaration of the game design(er) intent can indeed provoke a more or less conscious reduction of the players' receptiveness towards the issue and a decrease of the transformative power embedded in the game experience.

Through the task assigned to students, and lying on the existent literature, we looked at games as interactive representations and simulations [39] with their narrative [40] and

hybrid worlds, able to embed and convey the designer' perspective. We intended games not only as instrumental tools of communication, but as systems able to question, disrupt and affect players' attitudes and knowledge about the world, through their mechanics and the experiences they engender. As a matter of fact, they empower the player to have active roles [41,42], asking her to move to action, live the story told, explore the fictional world represented, and synthesise her own ideas on the ground of the experience made. In particular, we referred to Flanagan and Kaufman researches [42] about the persuasive limits of the explicit communication and direct approach that certain pro-social games adopt to engage players with issues of social concern. According to [42], this approach can impact on the game ability to prompt reflection and change, whereas it can raise the player's psychological barriers or lessen her engagement. Metaphors and rhetoric served as the main elements of a *stealth approach* able to tackle serious issues, increasing players' receptiveness and conveying messages in a more effective way.

4.1 *The Fellowship of the Umbrella: different abilities*

The game (Bianchini, Mor, Princigalli & Sciannamé, 2014) exposes the physical disability issue, abstracting and creating a fictional world that is a metaphoric transposition of some traits of the obstacles persons with disabilities daily face. Relying on the famous Einstein' sentence «If you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid», students crafted a game about immersion, comprehension, empathy. Designing *The Fellowship of the Umbrella*, they decided to immerse players in a fairy-tale world where a rickety group of four gifted individuals is asked to cooperate and complete the mission of accessing a mysterious spring. Set in Middle-earth, the game tells the story of an extraordinary magician, a wise dwarf, a powerful beech and a sharp elf, and their adventures to recover some keys and reach a treasure. It is not a coincidence that “exceptional” is the term traditionally used to refer to people with disabilities as well as to those who are gifted [36].

The aim is to make players experience visual, motoric, auditive and expressive impairments (L3). As a consequence who plays is equipped with specific material and is introduced to its features, by way of an ancient book that presents the fictional world of the game, the story, the characters and their specific attributes (fig. 3). In so doing the game designers provided players with limits and behaviour rules to which strictly attain during the game. The roles players covered demonstrate to be coherent and in tune with the characters and their features as they are introduced by the book. Despite after the last challenge the initial narrative metaphor is overturned, they maintain their sense, even gaining added values. The peculiarities that characterise the diverse roles, preventing or favouring in turn some of them to perform certain actions, turn out to be representations of real handicaps.



Fig. 3. The diverse roles and their specific features.

Following the stealth approach proposed by Kaufman and Flanagan [42], designers shake players with an unexpected revelation: the magician who cannot speak because he is “in a water world” actually is dumb, the beech tree has a motor disability, the elf is visually impaired and the dwarf is deaf. Designers used the narrative immersion and its power to dive players in specific, other roles [43,44], making doubly sense of their actions. Meaningfully, the key [35] applied to the part of the game that precedes the final discovery works at both the levels of the narrative. In spite of undermining the sense of the experience, the final discovery itself and the comprehension of the keying used lead to reinforce its entire sense, unveiling important meaning and deep first-hand awareness. Players commented indeed the experience as moving and tough because it required a deep and constant physical effort; this fact increased their understanding of the real meaning revealed at the end. As a consequence, for a while, they gained awareness of the daily efforts that low-incidence and high-incidence disabilities entail.

In addition, we suggest to draw the attention on the spatial immersion. We consider *The Fellowship of the Umbrella* a meaningful example in terms of consistency in the presentation of the game world and its spaces as a layer on the urban tissue. The designers decided to translate the symptoms and consequences of the diverse disabilities into physical elements that prevent or hinder players’ progress by using symbolism and rhetorical forms as metaphors. As a matter of fact, in consequence of their background research on the main problems connected to the disabilities addressed, they decided to use the urban space and its features to mirror physical, cognitive, mental and sensory impairments (L2). They identified diverse game-obstacles and a series of minor but meaningful situations able to trigger reflections on how disabled are forced to live their everyday life, taking advantage of the fact that their game is situated. Several architectural barriers are used to interfere with the game, asking players to make further efforts and understand the importance of cooperating and put their trust on the others. According to players, the fact of being “there”, moving for real, in the urban space increases the meaningfulness of the overall interaction, extending the concept of spatial immersion to what Wolf [45], speaking of digital games, described as spatial consistency. The game kit and clothing (fig. 3) as well as the consistent links with the real space supported mobile technology

in its essential role of translating players into the fictional world overlapped to the actual one. Throughout the game, the mobile device is employed at the same time as source of fictional immersion and as a magic object coherently integrated in the story. Hence, mobile technology, with its potentialities such as context awareness, is perceived as whimsical and so perfectly fitting within the game story. By means of the mobile device, handled by the magician who leads the expedition, players are guided towards the points of interest (henceforth PoIs). The mobile device tells him how to proceed, but the help of everybody is needed to understand its information and move forward. Players described the mere fact of reaching a place tough and tricky: who has access to the information can't clearly speak, and the rest of the group is composed of someone who can't see, someone else who can't hear and then the last who can't nimbly move. In this case, the fact of being a LBMG stresses the point that moving in the space requires physical efforts: walking in the game space means stepping in the real one, and the task is even harder if the game kit adds a level of difficulty.

What emerged from the observation is that players immediately understood their role in the fictional world, as well as the way the designer overlapped the game space with the real one. During the game players realise that exchanging their tasks they can easily handle and overcome obstacles apparently insurmountable: the concept that a task hard and harsh for someone can be effortlessly accomplished by another or through collaboration strongly emerges (L3). Each mission asks players to strive and fatigue to physically reach some game spaces. Since the beginning they attested a successful ability to translate and see the ludic sense in the diverse situations; for example jumping up on a long and arduous car ramp was transposed into the strenuous climbing up a rise. Players are constantly challenged to look at things from unusual perspectives, and in so doing perceiving the world in a different way: a world in which differences are a value and not a reason for alienation.

4.2 *The 10 Commandments: understanding anorexia*

The 10 Commandments (Culla, Di Filippo, Frisia and Golan, 2014) purposes to immerse players in the daily life of a person struggling with anorexia, stressing both the mental and physical discomfort, to inform and raise awareness on eating disorders as a present and widespread reality. The game is based on real online blogs which claim the so-called Pro-Ana behaviour, presenting anorexia as a philosophy of life and giving advices on how to behave for having a "perfect slim body" and feeling good about themselves (L2).

Equipped with a smartphone and a game kit (fig. 4) containing dilemma cards, instructions and a table of commandments, players retrace the day of a girl who has to attend a casting. The game metaphorically projects the player in the shoes of a girl who has to succeed in 9 stages, going from the before-breakfast to the shooting time in a photographic studio. Each stage presents the players with a dilemma to be solved that makes a direct or indirect reference to Ana's 10 commandments. However, whatever the choice the result keeps the same, namely a defeat. By choosing to respect the commandments, players lose energy; by not obeying it is fomented the

sense of guiltiness. In both cases players lose confidence in their own worth, and their positive mood consequently.



Fig. 4. Game materials and players' interaction with them, during the game session.

The progression of the game is designed to make players feel more and more doubtful of the validity of the behaviour of the character in which they identified; in so doing, Ana's 10 commandments presented at the beginning of the game as rules to be followed are step by step questioned. The game narrative plot is strict, linear and designed to pose specific questions in a specific order that comes to a climax. In this sense mobile technology revealed to be essential, since it guides players throughout the different geolocated PoIs and in so doing through the sequential steps of the story.

Researching on the topic, designers realised the extent of the issue, as well as a still diffused difficulty to recognise anorexia as an illness (L2). For this reason *The 10 Commandments* has been designed as an *unwinnable game* [46]. No players can ultimately reach the eagerly awaited casting: at the end of the day they simply do not have enough energy to open the door of the photo studio or sufficient self-esteem to participate in a casting. The player is asked by designers to take an important shift, embodying the perspective of the character and acting in her behalf, focusing on the interaction with the game, its spaces and elements. By wearing the shoes of a girl struggling with anorexia, the game is always played from the losing side. A deep sense of failure is exactly the result designers aimed to achieve: anorexia is a disease, not a sane behaviour, hence anyone who chooses it is doomed to fail. Informal interviews with players underlined the sense of failure as the most common feeling experienced. Furthermore, the final disclosure, the epiphany, was pointed as not completely unexpected: during the game, the debate among players made the inconsistency of the Pro-Ana behaviour emerge. Designers wanted players to progressively acknowledge the insanity of this life-style, translated into the journey of a day (L3). Unlike *The Fellowship of the Umbrella* that aims to keep an high level of immersion of players in a fancy world, in order to make the final disclosure really astonishing, *The 10 Commandments* dove players in a realistic fictional world and puts into question the previous knowledge and personal history of each player. Speaking of personal immersion [25], it clearly follows how deeply and meaningfully the game challenges the player's experience depending on her specific subjectivity and her connection with the situations proposed. The individual knowledge is evidently a factor able to create each time and to each player a particular discernment: the game world challenges the player ability to question the rules of the game itself, to grasp how the decisions taken following the rules/commandments are meant to make the player fail; since the entire game is based on spending energies, almost avoiding every food assumption, the character is going to be unable to conclude the day, failing

the objective to attend the shooting casting. Players can understand and interpret the game world and some of its absurdities counting on previous knowledge and personal backdrop. *The 10 Commandments* works on personal immersion to communicate an actual, important issue, raising awareness on its insane practices through a simulated and situated first-hand experience (L3).

4.3 *The Treasures of Captain Torment: struggling with depression*

The Treasures of Captain Torment (Boni, Frizzi & Taccola, 2015) deals with the very common, but often ignored, mental condition of depressed people. The game aims to raise awareness of the plight of individuals struggling with depression, who are very often affected by feelings of inadequacy, melancholy and hopelessness, and consequently progressively marginalized by relatives, friends and acquaintances (L3). As the title suggests, the game is structured as a treasure hunt. The purpose is to find the legendary treasure of Captain Torment by succeeding in a series of assessments masterminded by the Captain himself to let players prove their valour and bravery.



Fig. 5. Players wearing or carrying the game materials during a game session.

In the shoes of pirates, the crew of four players is dove into the imaginary world of the Bovisa Sea, a fancy marine world populated with bays, islands, sharks, eddies and harbours, and superimposed over the garden of Bovisa Campus of Politecnico. Equipped with a smartphone, swords, a hat, pirate flags, a treasure map and a mop, the pirates follow the instruction of the ghost of Captain Torment who communicates with them through the mobile device and several hints spread in the playground. The smartphone acts as a storyteller: it embodies the ghost who tells the story, guides players towards his treasure and asks questions. The device helps players to interpret the map, locating and contextualising the POIs to reach, and it increases the immersion by playing pirate-like musics.

The tone of the narrative and the game kit are deliberately entertaining, and even facetious in order to foster players' unawareness regarding the insidious disease of dejection and to distract them from understanding the real issue covered. By progressing in the game, players collect extra elements that increase their immersion in the fictional world and the identification with the character they play — a two-meter long cardboard boat, two hooks and a blindfold. Most of these game objects are highly metaphorical in the designers' interpretation, and in the light of the topic covered they assume a second, revealing meaning. The two hooks are designed to be representation of painful mutilations, which mirror adverse events that may drag a person into depression; at the same time, being impediments that prevent players from

easily completing tasks, they symbolise the loss of the will to act that often affects people with depression. The eye patch deprives the player of the stereoscopic sight, providing the experience of a distorted view of reality as it usually happens to people struggling with depression, who have the tendency to see everything as negative and insurmountable. On the contrary, the boat is a positive metaphor and represents the encouraging condition of being all together, sharing difficulties and helping each other to sail the sea.

During the game each player is struck by mishaps, but the player impersonating the vice-captain is victim of a climax of events that drag him into a condition of loss of self-awareness and inability of finding a way out. A few steps from the treasure the crew is set by designers at a crossroads: they can follow a longer way, wasting precious time and maybe losing the treasure but keeping the crew together, or they can sacrifice the vice-captain as bait for the sharks in order to follow a shorter route and reach the treasure in time. The game has two endings, according to the choice taken. The longest way represents the inclusion of the depressed person, and implies the loss of the material treasure in favour of another type of treasure, that of friendship and camaraderie. The shortest way is the one usually taken by people that alienate depressed people to “travel light” and quickly reach their goal, no matter if the aim is an empty chest and if a friend will be devoured by sharks. This game is quite an unwinnable game: whatever the players chose, something is lost. In this regard a player stated: *«Having to find the final “treasure” and learn what the game is about is really interesting. I would play again to try to find the second treasure».*

According to the data gathered via questionnaire, it emerges a strong intertwining between entertainment and acquisition of awareness. 86% of players identified the story and its fictional world as one of the most relevant aspects. Considering the entire amount of players, the pleasantness emerges as high-ranked: 86% of players assigned to pleasantness the maximum value of 3 in a scale from 0 to 3; the remaining rated 2. It is notable that in parallel to such an overt appreciation, the game managed to transfer its contents in a clear and stimulating way: 43% of players judged the game ability to communicate the topic with a value of 3 in a scale from 0 to 3; the remaining 56% rated 2 (L3). According to these results the game succeeded in matching engagement and learning: echoing Avouris and Yiannoutsou [16], this game belongs to the third category, named *hybrid games*, since it successfully pursues both entertainment and meaning making. This result may rely on a *conscientious design* of the game and its mechanics [24,25]: the data gathered validates this assumption with high-ranked values that players assigned to mechanics (100% high-medium – i.e., 3 or 2 on a 0 to 3 scale). In addition, it emerges the benefit of merging digital and non-digital elements, that results from a prominent appreciation of the game objects (86% high, 14% medium on a 0 to 3 scale), and the game tasks (57% high, 43% medium on a 0 to 3 scale). Relying on comments, it emerges a strong link between the perceived quality of the game material and the ability of the game to immerse players in the fictional world: *«I was very caught by the experience, its story and storytelling. The game material made the experience very alive and real».* The efficacy of bridging digital and non-digital is further confirmed by a player who relates the objects and the social interaction they fostered: *«[The game dynamics] prompted social engagement among the crew members: moving the boat and having a random mutilation/handicap added the necessary difficulties to make the challenge compelling».* Informal

interviews show that being on the same boat made players experience a sense of social engagement and share a common goal. The immersion, the involvement and engagement, as well as the awakened sense of community made it very hard for players to take a decision at the last challenge – whether to sacrifice or not the weak player in order to reach the treasure – and largely contributed to transfer the meaning embedded in the game. The fictional world chosen, the performance built, and the scenic material play a crucial role in facilitating the exploration of the message, and albeit the immediacy with which they communicate, the process of design required recognition, acquisition and realisation. To build the game designers analysed the physical and mental features that characterise depression translating and reducing them into game elements. In particular they identified certain minor situations that meaningfully characterise depression but are generally little known or underestimated by “normal people”. To transform these situations into experiences of reduction/identification, able to offer players a series of significant and sense-making activities, students expanded and deepened their own knowledge. They conceived ways to shape the interaction among players, the structure of the urban space and even its architectures to rhetorically represent conditions and mirror feelings of severe despondency and dejection (L2).

4.4 *The Lost Papyrus: Alzheimer’s disease*

The Lost Papyrus (Benedetti, Conesa, De Marco & Piatti, 2015) is a LBMG about Alzheimer's disease to inform players about the impact this illness has on the everyday activity of sick people and of those who live with them (L3). The entire game is structured as a metaphor of the disease and its degeneration. The aim of the design team is to transpose some of its usual symptoms, from the well known to the little known, to create awareness and increase the knowledge about the plights connected to the disease. The metaphor chosen by designer comes from the Ancient Egypt: the four players are dropped in the early XX century, in the heroic era of the first archaeological expeditions and wear the roles of an expert archaeologist of Egyptian culture and his three brave assistants. Their objective is to explore a still undiscovered tomb to find a renowned papyrus.

The archaeologist is in charge of the expedition and leads his assistants through several challenging situations with the help of a powerful technological tool – the smartphone – and a game kit. The smartphone acts as a storyteller, provides hints on the proper location of the clues and proposes dilemmas to be solved.

Players are gradually led to think that something unusual is happening, recognising that the archaeologist acts progressively awkwardly. The leader of the expedition is indeed affected by Alzheimer's disease and until the final shocking disclosure his assistants are unaware witnesses of his progressive mental deterioration. While the archaeologist is stacked and unable to reach his assistants, increasing his sense of isolation, they discover he has Alzheimer's. This fact triggers players to recall to memory the adventures accomplished and the processes experienced. It comes to light that all the obstacles faced, once read from the new perspective, acquire a second meaning, as metaphors of the different symptoms that occur during the progression of the Alzheimer's mental deterioration (L3). As a matter of fact, each challenge is

designed to make players experience the condition of sick people: (i) translating and encrypting hieroglyphics symbolises problems with language; (ii) difficulties in finding the right way in the exploration phase make players experience disorientation; (iii) moving with each leg bond to another player's leg stands for the reduced mobility and the need to be assisted. To be solved, all the challenges require an interaction among the real world, the players, the smartphone and the game elements.

The observation showed that the fictional world students chose as the game setting and the metaphors they created to transfer meanings resulted to be particularly efficient and effective in transposing the disease and its effects (L3). The relevant role of the involvement, as well as of the immersion it suggested, is confirmed by data gathered via questionnaire. Players highly appreciated the fictional world and the story (100% high-medium – i.e., 3 or 2 on a 0 to 3 scale) as suggested by some students: «*The game was very enjoying because of the game material and its objects that created involvement and made me empathise and feel identification with the character*», «*The aspect of the game I liked most was the story and the coherence of the challenges with it*», and to conclude that «*The game tasks were compelling [...] and the entire metaphor was beautiful*».

A key aspect of the game resulted to be its ability to involve players both in compelling mental and bodily activities that make them experience first-hand symptoms of the disease and in so doing they make personal meaning out of the experience (L3). Crafting *The Lost Papyrus*, designers decided to convey the issue by favouring a metaphorical approach in parallel to a physical one: Alzheimer's disease affects indeed both body and mind. Even if reduced, the situations experienced are abstractions and simulations that provide an idea of the every-day reality of people affected by this progressive deterioration.

To grasp the meaning behind the game, players are asked to distance from their ordinary roles and wear the shoes of someone else. A mechanic particularly appreciated: 37% of players rated it high and 63% medium. We observed that playing other roles (archaeologist and his assistants) with coherent tasks and objectives facilitates identification, increasing the awareness of what it means to acquire special needs with worsening symptoms, and how it considerably affects the daily life (L3). We can state that designers encouraged players to have a condition that Kaufman and Libby described as *experience-taking* [48]. Extending their reasoning that is grounded on narrative, through game mechanics, story, elements, and objects players increase their sense of immersion. The set of game objects (fig. 6) was perceived as functional to increase immersion and well crafted: 62% of players rated them 3 and the remaining 38% rated 2. Informal interviews attest that the use of cross references between the physical materials of the game kit, the surrounding space and the information available on the smartphone contributed to create a flowing game experience.



Fig. 6. Game materials and players' interaction with them during the game session.

To design tasks and elicit experiences that serve to put the player in the shoes of an ill person and familiars/acquaintances, students had to explore the tensions and matters that daily characterise their lives. In so doing they realised that a part from language and memory symptoms, disorientation and behavioural issues, a central problem to underline and stress is the modification of social interactions that progressively increases the isolation of the ill person, creating a vicious circle that brings to be withdrawn from family and society (L2).

5 Discussion

Among the others, Bateson [48] states that the term learning intrinsically incorporates an experience-based process of *change*. People primarily think and learn through former experiences they had, stored in their memory. This collected experience is used to run simulations to prepare for problem solving in new situations [49]. In this sense it is noticeable that the practice of designing games for expressing what it means to have special needs or disabilities includes the comprehension of certain conditions of impairment. This knowledge is necessary to structure games as first-hand experimentations. Echoing Bogost [3], these games become a way to show how things work. However, the role and function of playing games and their design is dual. The article depicted on the one hand our enquiry on the practice of designing games (LBMGs) as a way to *ask questions*, enquire processes and gain consequent knowledge (L2), on the other hand it reported on the parallel investigation we conducted with students during the playtest phase on the game experience as a source of *understanding and activator of change* (L3).

Most of our students came with strong ideas about the gameplay they wanted to create. However we encouraged students to review their original assumptions in order to adopt an experience-perspective, and think in a personal, generative and unconventional way processes and mechanics able to suggest meaningful reflections on the topic addressed (L2). Also failure has been designed as a point of their games fraught with meanings and sense. The entire game design activity has been used as a didactic practice that allows to conscientiously think through the practice of designing and playing games about social issues, and in this particular case, about special needs, disabilities and illness (L2+L3).

The cases discussed in the previous section as well as the considerations that emerged from their analysis show that LBMGs can play a relevant role in fostering reflection on sensitive issues and raising awareness about little known, but significant social issues. This result is in line with what the literature about mobile learning and game-based learning affirms, as discussed in the opening of this paper. LBMGs are indeed

the result of a synergic bound between (i) the potential of mobile technology for providing users with contextual relevant information and superimposing an alternate reality on the actual one, and (ii) the ability of games to promote engaging, moving and unusual experiences. Designing (L2) and playing (L3) these games contribute to acquire knowledge, to obtain influential learning outcomes and to create sense, resulting as challenging as demanding from the double perspective of designers and players.

During the entire period of participant observation we noticed a growing interest for the argument to depict. Along with a burgeoning attentiveness to the game details, students thoroughly laid the foundations for *inspiring* players (L2): the entire activity has been built as a sort of performance that players should stage, as a first-person play (drama) to experience and nurture with their own actions and decisions (L3).

The games here discussed were designed with the double aim of entertaining players and making them reflect on sensitive topics, taking full advantage of the opportunities given by mobile technology, by the urban setting and by the freedom to augment the experience adding physical elements/objects fraught with meanings. Echoing Avouris and Yiannoutsou's classification [16], these LBMGs can be considered *hybrid*, because they pursue both entertainment and learning, which is not seen as a side effect of engaging and amusing experiences, an added value that can or cannot happen depending on the willingness of players. On the contrary, learning is crucial. Although not stated as an overt goal for players, it permeates every aspects of the games. What emerges is an extreme contrast between the sense of fun and cheerfulness that characterises some of the game activities, and the seriousness of the subjects portrayed.

The study of data as well as the direct observation show a direct relation between the ability of games to immerse players utterly in the story and their ability to convey the main message. In this regard, a point that is worth noting is that the analysis of data highlights a correlation between the level of immersion players experienced and the pleasantness of the graphics of both the physical materials and of the visual of the smartphone app. Coherence and consistency of all the game aspects also played a relevant role: from the stories and their fictional worlds, to the game dynamics and mechanics, as well as the game kits. The linguistic constancy, aesthetic pleasure and semantic consistency of the supporting material – as well as its perceived quality – with the fictional world fostered immersion and enjoyment. In so doing it was favoured the communication of the messages embedded in the game.

The role of physical objects as well as the strict correlation between the fictional world and the urban setting in which the game took place demonstrated to be crucial in prompting immersion. In LBMGs the meaningfulness of the rich interaction among players, the environment and the mobile device is indeed increased by being there and by performing actions in the real space that have fallouts in the digital one and vice versa [10,11]. Adding to the current literature, this study shows that interacting and playing with tangible, pleasant objects adds a sense of physicality to the sole digital experience usually provided by mobile games; as a matter of fact by being augmented embedding physical interactions, the mobile experience becomes more memorable and thus more effective in communicating the message of designers (L3).

Data show that the development of fictional layers overlapped with the common environment empowered players to access original and unique perspectives

characterised by a high degree of immersion. Designers' aim was indeed to dove players in involving stories to develop a sense of empathy, feed understanding and prompt comprehension, stimulating in the meanwhile critical reflections on the actual topics addressed.

The data we gleaned from playtests via rapid-ethnography, shadowing and then questionnaire showed that well crafted and coherent fictional worlds can facilitate a condition of separation and openness in the meanwhile, stimulating players to temporarily detach from their usual way to behave, increasing their receptivity toward the issue staged in the game (L3). Especially the fact of being – and for a while walking – in the shoes of someone else empowered players to think and act differently, frequently getting aligned with the way they thought their characters would act. In so doing, they were provocatively invited to question their morality and ethics.

Crucial in this sense are the sensations of make believe and mimicry, the acceptance of the illusion (in-lusio) of being in a space that is conceptually *other* and safe, and the identification with the character. All these aspects, were further implemented and reinforced by means of the game kit, and its strict relation with the world superimposed on the actual one. The act of wearing fictional elements not only created a detachment from the real world, defining the entrance into the fictional one, but also allowed to exteriorise it, stating that “this is play”, to quote Bateson [50]. By being immersed in an other, safe and hybrid fictional world superimposed on the tangible one, players could experience unhappy feelings and unpleasant conditions without being distressed and, on the contrary, getting involved in a cheerful activity.

Data show that challenging and even amusing tasks are in direct relation with the ability of games to involve players utterly and ultimately to convey the message embedded. In this sense the stealth mechanic, shared by the four games, highly contributed to keep an high level of amusement during the entire play experience, and to activate players' reflection at the end by astonishing them and overturning their convictions and beliefs. This result is in line with what Ruggiero and Becker affirm: «A game is only an effective learning tool if it helps learners to make sense of their experiences in a game once the game has ended» [46, p. 15].

The end of the game assumed a crucial role in all the case studies discussed. It forced players to read the play experience back from a diverse point of view, and to reflect on the topic embedded and concealed until that moment. Furthermore, the end of a game can be neither a win nor a loss. We challenged the assumptions that games must end with a win or a loss, with the winning condition as the ideal one [46], especially when educational and serious games are involved. The results show that failure and the possibility of lost as the game outcome can be the very means of meaning making, especially speaking of learning about sensitive topics. Extending the concept of productive failure introduced by Kapur [51] designers employed failure and loss as a way of communicating the underlying message and to foster reflection.

The study shows how the practice of designing games can result in a learning activity for both designers and players (L2). This statement acknowledges on its basis a shift of paradigm: not only the act of playing contributes to create meaning and provide knowledge; also the act of crafting activates important learning processes. In this sense designing LBMGs becomes an activity of mediation of contents as well as activators of change in terms of information acquired. To conceive and structure a

game intended for transferring meanings, the designer is required to research on the topic, collect existent experiences and transpose them into game mechanics, dynamics and meanings embedded. In this study, the approach of learning about social issues by designing games proposed by Tiltfactor [24] for digital games is extended to LBMGs, thus adding a layer of reality to the digital world, and in so doing increasing both the difficulties and the opportunities (L2).

Games are more than instrumental tools for institutional goals intended to make unpleasant things enjoyable. Through their gameplay, in-game choices, activities, communication objects and compelling narratives these games move players to develop an understanding of arguments and situations, learn and consider perspectives that can be different from their usual ones. In essence, they provide a motivation to dig into sensitive and problematic issues and potentially change point of view. Players are actively involved in the creation of a story that is a representation (simulation) of a bigger and more meaningful picture. Players are also asked to grasp the sense of the game and of the in-game actions, effectively contributing to puzzle out and build the message. The meaning is initiated by an active experiential approach based on learning rather than education.

The study here discussed proposes a different point of view on mobile-supported special education, discussing novel ways of sensitising and raising awareness on related topics, such as illness and disability. The activity of designing (L2) and playing (L3) LBMGs is pointed as an effective means to reflect on sensitive issues and to affect the position of designers and players about the issues represented.

Generalising, the results here shown seem promising and suggest that this approach could be potentially brought out of the academia to citizens as well as to younger students, involving schools, cultural and support associations. The didactic model based on both crafting and playing LBMGs during an undergraduate course, could be indeed transalted, with necessary modifications, into workshops involving small groups of participants.

The research is still in progress and some limits – that will inform the prosecution of the work – can be outlined. Firstly we miss quantitative data able to sharply depict the progressive acquisition of knowledge and awareness by the design teams about the topic dealt that we perceived during the months of participant observation. Secondly the study suffers of lack of pre-play questionnaires to be confronted with post-play ones in order to measure and highlight potential changes in the mindset of players as well as an increased knowledge about the issues covered. This point is particularly problematic since the way games have been designed till now, with a final overturn and epiphany, prevented us from revealing the topic they deal with before the play. Furthermore the research, to be extended out of the academia and of the design field, needs the involvement of researchers and professionals in psychology, sociology and related field in order to fully understand its potentials.

Acknowledgments. A special thank goes to the BS students of the course “Augmented Reality and Mobile Experience”, A.Y. 2013/2014 and 2014/2015. They put themselves to test by participating in the design and assessment activities, critically analysing their own projects and giving us constant, precious feedback. We are grateful to the anonymous reviewers for their constructive comments and valuable suggestions.

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