# DELIVERABLE REPORT
# D7.4.2
# "Playful Cultural Learning"

collaborative project
MASELTOV
Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services
Grant Agreement No. 288587 / ICT for Inclusion
project co-funded by the
European Commission
Information Society and Media Directorate-General
Information and Communication Technologies
Seventh Framework Programme (2007-2013)

| | |
|---|---|
| Due date of deliverable: | September 30, 2014 (month 33) |
| Actual submission date: | October 8, 2014 |
| Start date of project: | Jan 1, 2012 |
| Duration: | 39 months |

| | |
|---|---|
| **Work package** | **WP 07 – PERSUASIVE LEARNING SERVICES** |
| **Task** | **Task 7.4-<br>PLAYFUL CULTURAL LEARNING** |
| **Lead contractor for this deliverable** | **COV** |
| **Editor** | **Ian Dunwell (COV)** |
| **Authors** | **Ian Dunwell (COV), Kate Torrens (COV)** |
| **Quality reviewer** | **Lucas Paletta (JR)** |

| Project co-funded by the European Commission within the Seventh Framework Programme (2007–2013) | | |
|---|---|---|
| Dissemination Level | | |
| **PU** | Public | X |
| **PP** | Restricted to other programme participants (including the Commission Services) | |
| **RE** | Restricted to a group specified by the consortium (including the Commission Services) | |
| **CO** | Confidential, only for members of the consortium (including the Commission Services) | |

**VERSION HISTORY**

## Acknowledgements

Contact for feedback on this report to the project coordinator:

lucas.paletta@joanneum.at
Lucas Paletta
DIGITAL – Institute for Information and Communication Technology
JOANNEUM RESEARCH Forschungsgesellschaft mbH
Steyrergasse 17
8010 Graz, Austria

Contact for feedback on this report to the editor:

idunwell@cad.coventry.ac.uk
Ian Dunwell
Serious Games Institute
Coventry University,
Coventry,
CV12TL, United Kingdom

| MASELTOV partner | | | organisation name | country code |
|---|---|---|---|---|
| 01 | JR | | JOANNEUM RESEARCH FORSCHUNGSGESELLSCHAFT MBH | AT |
| 02 | CUR | | CURE CENTRUM FUR DIE UNTERSUCHUNG UND REALISIERUNG ENDBENUTZER-ORIENTIERTER INTERAKTIVER SYSTEME | AT |
| 03 | AIT | | RESEARCH AND EDUCATION LABORATORY IN INFORMATION TECHNOLOGIES | EL |
| 04 | UOC | | FUNDACIO PER A LA UNIVERSITAT OBERTA DE CATALUNYA | ES |
| 05 | OU | | THE OPEN UNIVERSITY | UK |
| 06 | COV | | COVENTRY UNIVERSITY | UK |
| 07 | CTU | | CESKE VYSOKE UCENI TECHNICKE V PRAZE | CZ |
| 08 | FHJ | | FH JOANNEUM GESELLSCHAFT M.B.H. | AT |
| 09 | TI | | TELECOM ITALIA S.p.A | IT |
| 10 | FLU | | FLUIDTIME DATA SERVICES GMBH | AT |
| 11 | BUS | | BUSUU ONLINE S.L | ES |
| 12 | BUS_UK | | BUSUU ONLINE Ltd. | UK |
| 13 | FUN | | FUNDACION DESARROLLO SOSTENIDO | ES |
| 14 | DAN | | VEREIN DANAIDA | AT |
| 15 | MRC | | THE MIGRANTS' RESOURCE CENTRE | UK |
| 16 | PP | | PEARSON PUBLISHING | UK |
| 17 | ATE | | AUSTRIAN INSTITUTE OF TECHNOLOGY | AT |

CONTENTS

# 1 EXECUTIVE SUMMARY

This deliverable focuses on the final implementation of playful cultural learning within MASELTOV, through work done on T7.3 (Persuasive Learning Services) and T7.4 (Playful Cultural Learning). It describes and documents the creation of the serious game within the MASELTOV platform, and its integration with other services. This work builds on previous deliverables D7.3 and D7.4.1, which provided the concept behind initial prototypes, to discuss changes made in response to field trials and the implementation of the themes of empowerment, abstraction, experience, and narrative, towards the goal of cultural learning. With respect to the integration of services, the concept of a currency system is also detailed (refer also to D3.3.3 for the role of the game in the overall system integration). Annexes included in this deliverable illustrate the visual content for the game from the concept to final stage, and include peer-reviewed academic outputs on the serious game's design and implementation.

# 2 INTRODUCTION

In D7.4.1, we posed two high-level research questions driving the development of the serious game within MASELTOV:

- How can we provide and evidence 'playful' cultural learning in a serious game?
- Can virtual currency be used as social capital in a "free to play" serious game?

Within the deliverable, elements of gameplay relevant to cultural learning were identified, including empowerment, abstraction, experience, and narrative (D7.4.1 pp. 13-17). The initial game design sought to bring these elements together, providing a fictional, abstract narrative, though one sufficiently grounded in real-world challenges faced by immigrants for awareness of cross-cultural challenges to translate to the real world. Field trials in the first two years of the MASELTOV project have provided an opportunity to reflect on, and refine, individual game elements towards these goals. Hence, in Section 3, we document the changes and additions to the serious game as well as the overall narrative, framing them under the identified themes of empowerment, abstraction, experience, and narrative. A key component of the game is interactive, multiple-choice dialogues with characters. Similar to "point-and-click" adventure games for entertainment, these characters frequently have problems, and the player is required to use a unique ability to move between two realities to solve them. These two realities have strong and differing cultures, and thus character interactions correspondingly change, requiring the player apply an understanding of culture to progress successfully through the puzzles. Section 4 lists the various characters in the games, whose dialogues have been developed from D7.3 to emphasize cultural differences, and scaffold the problems and puzzles faced by the player around the theme of cultural learning and competency.

Section 6 notes some observations from field trials, and discusses how they impacted the game's development. A particular challenge for the game in field trials is that the target user base is principally immigrants who are gamers - a large audience, as identified by several reports (ISFE, 2014), though not necessarily one present in the field trial. This leads to

discussion of the deployment of the game on Google Play as part of the project's exploitation strategy. Providing a summary and conclusions, Section 6 also reflects on the outcomes of T7.3 and T7.4, and suggests avenues for future work.

## 3 GAME OVERVIEW

Games have recognised potential to reach large audiences (ISFE, 2014), and can provide a means to raise awareness or stimulate learning in groups who may not engage with more formal resources. Within MASELTOV, T7.3 and T7.4 have sought to explore how playful and persuasive cultural learning can be realised in a game for use by immigrants. However, noting that the stigma of being an "immigrant" can itself be a problem for integration, the game has been designed to be accessible first and foremost as an engaging game, rather than an educational tool. This approach is supported by a wide range of literature and opinions on serious gaming, which tends towards a consensus that in a context similar to MASELTOV, a serious game should engage first, and educate second (Prensky, 2003; Zyda, 2005). To this end, the game was designed with eventual deployment to Google Play in mind. The game is integrated into the MApp dashboard, and can be downloaded as part of the MASELTOV suite of services. Due to the unique nature of the game in the mApp as an engaging medium, rather than a practical tool or learning resource, it aims to reach users who may not be aware of potential cultural challenges in integration, as well as those unaware of the tools and services on offer both through the MApp, and services such as NGOs.

A wide range of screenshots from the game are provided in Annex II. The key scenarios in the game are under the following themes, experienced largely sequentially though with an element of non-linearity as a result of player choices:

- **Introduction.** A video opens the game to set the scene for the player as a scientist in an experiment-gone-wrong, which has split reality into two dimensions ("worlds"). These are visually similar, though with some key distinctions, primarily that the characters the player encounters have culturally different backgrounds depending on the world in which the player interacts with them. Hence, for each character they meet, the player can switch worlds and experience meeting the same character, but with a different cultural aspect to their dialogue. This is explained further in Section 4.
- **Travel.** The first task the player has is to travel from the airport to the city centre. This is used as a tutorial scenario, with more scaffolding and pop-up help for the player to help them get through some simple puzzles and familiarise themselves with the mechanics.
- **Jobseeking**. This starts with some interactions in the hotel the player is staying at, which present an opportunity to help a businessman. The problems vary between worlds, a result of the difference in culture (in one world the player must help them formalise and document an agreement; in the other, the agreement is far less formal). The player is rewarded with either a "glowing reference" or "list of useful contacts", to again reinforce the differences in the level of formality and networking in jobseeking between cultures. These are used at the job centre to acquire an interview, which allows the player to attempt to answer some interview questions. They can then undertake jobs, in the form of playable platform levels within the game. Rewards

given bring them closer to undoing the damage caused by their scientific experiment in the introduction.

- **Healthcare** occurs around the fictional narrative, which suggests the player is ill as a result of their inter-dimensional travel, and needs to seek a cure. The point at which this occurs in the game depends on their behaviour in an earlier puzzle at the airport which may or may not result in their medicine being confiscated. Cultural themes explored here include patient confidentiality, state versus individual responsibility for healthcare, and the process of referral versus directly seeking a relevant expert. As the player needs to find a "cure" in both worlds, they experience these differences as they play through the scenarios.
- **Shopping** was suggested in earlier deliverables, though NGO discussion suggested it is not a major barrier area for immigrants. However, it is included in the game and provides a backdrop for character customisation through the currency system detailed in D3.3.3 and Section 3.1 below.

In the remainder of this Section, we provide a more detailed overview of the game in terms of five key components. With reference to the descriptions of these components in D7.4.1, their expansion in the final game is documented in terms of mechanics and content.

## 3.1 CURRENCY

### 3.1.1 CONCEPT

The concept of virtual currency is widely explored and applied in entertainment gaming, allowing users to purchase credits which they can spend on additional content. The key differentiator for MASELTOV is the exploration of the use of this currency to incentivise behaviour (i.e. the use of other MApp services), rather than purchases. As the integrative approach within the MApp promotes information and profile sharing between services, a gamified aspect of the platform was implemented in terms of a virtual currency, spent within the game and earned through the use of other services. As the game is only one part of this MApp-wide system, further detail on the implementation across the system can be found in D3.3.3; however, elements specifically relevant to the game are explored in more detail in the following section.

### 3.1.2 IMPLEMENTATION

One challenge in a currency-based system particularly relevant to serious games is the impact of purchased items earned through actions outside of the game on its difficulty. If users can trivialise tasks related to learning objectives, then it stands to reason these objectives may not be as well-fulfilled. This is parallel to entertainment gaming, where the need to incentivise purchases is offset with the need for the game to remain challenging and, in a multiplayer scenario, retain a level playing field for all competitors. Cosmetic upgrades, therefore, are commonly used as a means to create content which is visually engaging and allows a player to develop a more unique identity or status, without impacting the gameplay or game mechanics themselves. Adopting this approach for MASELTOV, a range of costumes and cosmetic options were developed for the player's character, which can be adjusted in the in-game store through spending currency as illustrated in Figure 1.


**Figure 1: Interfaces to spend currency in-game**

## 3.2 EMPOWERMENT

### 3.2.1 INITIAL CONCEPT (D7.4.1)

Empowerment has been shown to play a role in participation, for example increasing likelihood of engagement with democratic processes (Alathur, Ilavarasan, & Gupta, 2011), in turn linked to the inclusion objectives of the MASELTOV project. Technology such as the mobile internet is in itself a tool for empowerment (Alathur, et al., 2011), though understanding how to best use technology for a given context and situation remains a topic of research. One perspective argues that context, communication and identification are the key underpinnings of the successful use of mobile devices for empowerment (Leikas, Stromberg, Ikonen, Suomela, & Heinila, 2006). Games have rich potential for realising these concepts in novel forms. Context can be translated from real to virtual space, removing the consequences of failure or social difficulties; communication can be achieved and supported through gaming and online communities, or realised in synthetic forms with autonomous characters; and the use of avatars allows for a player to experiment with their identity.

This potential has been reflected in a number of studies seeking to utilise and understand the role a game might play in empowering an individual or community. An example of their use to empower hospital patients showed efficacy in a real-world context (Caldwell et al., 2013), supporting the view that games can empower the player through a range of mechanisms.

Narrative is one means by which to achieve this (Mallon & Webb, 2005), as characterization and identification can be utilised as tools by which to transpose real-world problems arising from lack of empowerment, to ones which have identical traits, but are viewed from a different perspective. Consider, for example, the case of an immigrant seeking work - in a real-world context, they may feel disempowered, with little control over whether they achieve success. In a game, however, success may be granted when pedagogical objectives have been achieved, and the simplification of the process itself to focus on key learning objectives lends itself to a format in which the individual has greater control over the outcome.

Utilising narrative in games to achieve empowerment typically draws on a back-story which adds gravitas to an otherwise mundane situation. Returning to the example of the job-seeking task, what if the player must get the job in order to save the world (or a similar 'epic' objective)? The fundamental task may remain grounded in reality, and learning outcomes therefore remain transferable to real-world tasks; however, the motivation and sense of empowerment from which the player approaches the task can be profoundly adjusted. This approach is common to game narratives (Jimenez, 2012), reflected in entertainment as well as serious gaming genres. Given the benefits of empowerment for inclusion, and the issues tackled by the MASELTOV project, there is a sound basis on which to build on a narrative approach faciliting empowerment as a component of the game. This in part allows us to progress the research question outlined in the previous section regarding how best to realise playful cultural learning: we propose empowerment as a suggested component, and its validation would contribute to the understanding of how it might be achieved through narrative in this context.

### 3.2.2 IMPLEMENTATION IN FINAL GAME

We empower the player through two core mechanisms:

1. The introductory cutscene for the game illustrates their role as a scientist in an "experiment gone wrong", which has split reality into two culturally-distinct worlds. They are empowered from the start through the common gaming narrative of needing to save the world; to achieve this they need to travel to the world's Capital City and gain the resources they need (though jobseeking), to rebuild their device and reconcile the culture. A side effect of the experiment is an additional need to seek healthcare. Hence, the player is cast as a cultural immigrant, though one with a world-saving goal.
2. Interactions with characters require the player to puzzle solve, helping these characters out. This contrasts with the disempowered nature of some immigrant support, which casts them as needing help, to place them in a role as the one providing help, despite cultural barriers. An early example has the player meeting a passer-by having lost their watch, of great value as a family heirloom. By changing worlds, the player meets their more individualistic alter-ego, who is happy to trade their watch for an upgrade from the player. The player can then transition back and return the watch to its owner. In this simple example high-level cultural differences (individualist/collectivist) scaffold a narrative which sees the player innovate to solve a problem.

## 3.3 ABSTRACTION

### 3.3.1 INITIAL CONCEPT (D7.4.1)

Given the task of developing a playful cultural learning environment, abstraction also appears to hold a high degree of relevance. It is possible to argue that all games incorporate abstraction to some extent (Fernandez-Vara, 2011), a necessary process when seeking to translate the complexity of a real or fictional world to a game-based interaction context. Yet serious games have the opportunity to consider this abstraction in pedagogical as well as pragmatic terms, exploring how solving abstract problems can translate to concrete learning outcomes. Literature identifies the need to "scaffold" learners in translating abstract learning outcomes to real-world problems (Annetta, Murray, Laird, Bohr, & Park, 2006), otherwise the risk exists that no learning transfer will be observable. Logically, the greater the degree of abstraction, the greater the risk - simulation-based approaches to training have long striven to minimise the level of abstraction between real and virtual worlds. Serious games, however, differ from simulations, in that they seek to educate through engagement and play, rather than by simply recreating a situation with as high a degree of fidelity as possible. This approach has been shown more effective than simulation in a range of contexts, including aircrew training (Mautone et al., 2010), suggesting deviating from reality to provide a more abstract, game based learning environment can have pedagogical as well as practical benefits.

In the case of MASELTOV, a need for a certain degree of fidelity exists, as we seek to provide a game from which individuals can transfer outcomes to real-world situations with scaffolding provided only by the game itself. However, as detailed in Section 5, the breadth of other MASELTOV services have the potential to support and further scaffold learning. An example of this in practice would be the use of the in-game journal to prompt the player to consider a range of formal learning and practical resources, sourced from the Wiki or learning content provider(s), after completing a particular task, e.g. jobseeking, finding healthcare, or shopping. For abstraction, a key component is how well we 'scaffold' the transition between in-game learning (see our report on Code of Everand[1] for more details and our qualitative and quantitative findings on this), and formation of learnt concepts and real-world behaviours. Games can be powerful tools to prompt reflection through abstraction, but require the learner make the link to the real world. User testing is therefore central in establishing how well users make this observation, and its subsequent impact.

Of course, simply observing the cultural theme of the game is of little relevance if it does not have subsequent impact. Behavioural change is not a straightforward (or necessarily ethical) goal to achieve, rather, we must message the user to enable them to make more informed decisions. In the case of an immigrant, this might be making them less anxious about social interaction as they are aware of how differences might occur and that behaviour that might appear offensive or dismissive is not necessarily intended as such. It might also prompt them to identify issues before facing them in the real world, allowing them to arrive at situations such as healthcare forewarned and hence forearmed with a knowledge specific to their host country's system achieved through contacting NGOs or using other MASELTOV services.

[1] http://www.roadsafetyobservatory.com/Evidence/Details/10663

### 3.3.2 IMPLEMENTATION IN FINAL GAME

The central use of abstraction in the final game is to allow for culturally-difficult situations to be reframed in an engaging and entertaining way. Attempting to simulate two cultures or a cultural interaction is prone to many pitfalls; immigrants may feel their culture is poorly is misrepresented, as might natives. Furthermore, the individual nature of any interaction, and the complexity of personality traits, means simulating an event such as a job interview risk creating a situation unrepresentative of a typical interaction. In fact, it could be argued that a "typical" interpersonal interaction is impossible to define. By making both cultures in the game fictitious, it becomes more possible to play with extremes along Hofstede's framework.

For abstract learning to function well, however, the learner must be scaffolded in taking the concepts learnt in an abstract form, and translating these to real-world application. The in-game journal thus includes a tab on the player character's observations, which is more concretely defined in terms of learning outcomes. By reviewing their character's perspective on events, the player can gain more formal insight into how cultural differences manifest and their real-world implications. The second element of scaffolding is the integration into the wider MApp; players can only earn coins to spend in the game by using other services, which include GeoRadar or Forums. Final field trials will explore the value of this approach in getting players to transition from playing the game, to taking part in real-world activities, such as GeoRadar assistances, motivated in part by currency gain to spend within the game.

## 3.4 EXPERIENCE

### 3.4.1 INITIAL CONCEPT (D7.4.1)

Kolb's theory of learning through experience (Kolb & Fry, 1975) has seen much attention from game- and simulation-based learning communities (Liu, Jiao, & Liu, 2009; Naismith, Blanchard, Ranellucci, & Lajoie, 2009; Siang & Rao, 2004). It has clear parallels related to how games can allow players to explore problems, devise solutions, and observe the consequences of their actions. By allowing the player to experience situations in which cultural differences present themselves as difficulties, and guiding them towards solutions, a platform for experiential learning might be created. Some cautions arising from Kolb's theory are required, however: firstly, the notion of the "intuitive" learner put forward by Kolb and intrinsically related to the experiential cycle has consequences in terms of how we might assess and feed-back to learners. The intuitive learner, by this definition, takes an exploratory approach to learning, exploring worst as well as best cases: for example, when confronted by a dialogue choice, they may deliberately answer incorrectly or inappropriately to explore the outcome. This in turn means attempting to assess competence by the "correctness" of actions in game has limited value, and consequently seeking to feed-back to a learner their errors may be met with resistance or negation.

Rather, the effective application of the experiential cycle in-game requires the development of branching or open-ended scenarios, that allow the intuitive learner to play-through and explore multiple outcomes and possibilities. Another trait of this form of learner is their tendency to return to scenarios multiple times to observe different outcomes, and games can support this through additional play-thoughs. Ensuring effective learning in this context requires, as noted for Abstraction, a suitable scaffold by which to support reflection and concept formation. In Section 4.4.3 we introduce the concept of the player's journal, in which the character controlled by the player makes notes on their own reflections and concept

formations. The intent here is to harmonise the cultural learning of the in-game character, over which the player has control, with their own cultural learning. As abstraction, empowerment, and experiential learning seem well-suited to MASELTOV for the reasons noted above, the game's design seeks to build on the literature and current understanding of how these work (and fail) in a game-based context. There is an exploratory aspect to the work undertaken here, reflective of the fact a generalized pedagogical approach remains elusive for serious games, due to the wide variations in usage context, target audience, and technical platform between projects.

Experiential learning is commonly used in serious games, as Kolb's cyclic model of experience > reflection > concept formation > application > experience is well suited to the rich and dynamic experiences games can allow. We have noted in previous work evolving Kolb's model towards a less linear 'Exploratory' cycle, that a rift can occur between virtual action and real world application, again related to the extent to which this transfer of concept formation is scaffolded and supported (see D7.1). In the exploratory and experiential case, feedback plays a central role within this scaffold. By relating feedback to real-world events and situations, we can start to bridge the gap between, for example, high scores in game and the development of real-world competencies. However, feedback is also a central component of effective game design - consider, for example, the omnipresence of scores, rewards, upgrades, and experience points across many genres of entertainment gaming. These serve to provide feedback at both micro (single action - e.g. in *Call of Duty* shooting someone gives experience points), and macro (again in *Call of Duty*, these points can later be spent on character upgrades allowing for strategic choices by the player).

If we are to translate to serious games, we need to achieve balance between a feedback model which supports sufficient frequency and depth to create an engaging game, but also has adequate pedagogical value to direct learners towards positive serious outcomes. Extremes on either end of this scale are undesirable - simply adding points for meaningless actions is unlikely to yield a change in behaviour. Similarly, at the other extreme, an overly 'gamified' approach can result in something which people enjoy, but fails to achieve its pedagogical goal - for example, with early games of MathBlaster, children quickly learnt that shooting balloons quickly was a better way to score than carefully selecting the right ones with the numbers to the puzzle (Wong et al., 2007). Exergaming also suffers from a similar problem, where the user learns to beat the game by minimizing their physical activity to beat the game, rather than performing actions as rigorously as possible . There is evidencing gaming elicits a certain 'win at all costs' mentality in a significant proportion of players, and these players will bypass or circumvent serious objectives if the feedback system allows it (Raybourn & Bos, 2005).

That said, there is a danger in trying to cater in pedagogical and entertainment terms to all audiences. Despite evidence suggesting the majority of the European population play games, a significant proportion do not (ISFE 2012 - a consequence of both choice and availability). Much as it would be folly to attempt to make any social intervention appeal to everyone, so serious games have a predisposition to reach a certain demographic, and attempting to broaden this appeal excessively can result in compromises that alienate the core audience, for example pushing educational content to the forefront, or trivializing the game's challenge level. Again user testing must play a central role in establishing how well a game reaches various audiences, and the developer must remain flexible and adaptive to user feedback,

something we're keen to do in MASELTOV. One notion of feedback described in  is that of 'flow'; a description of an optimal mental state for learning achieved by careful balance of task difficulty with learner ability. This relates well to games which often engage users well through an adaptive and user-centric approach to this balance. It is for this reason we intend to support multiple difficulty levels within the game, allowing the user (though the 'jobseeking' theme) control over the challenge and reward level.

#### 3.4.2 IMPLEMENTATION IN FINAL GAME

Highly frequent "flow" feedback is difficult to achieve in story-driven and dialogue-heavy games, though given the goals of the game in MASELTOV to promote cultural learning, and consideration of the other three mechanisms in this section, a high flow game (for example, a block puzzle solver or action context), is difficult to reconcile against the objectives. We therefore scaffold learner feedback predominantly through the journal, and sense of progression through the game's environment. Solving puzzles with non-player characters allows the player to gain access to new areas of the game to experience the content. The journal provides positive feedback against objectives, and has also been structured to make the current objective clear to the player. This responds to field trial feedback that players struggled to gain a sense of purpose or objective in earlier versions of the game.

### 3.5 NARRATIVE

#### 3.5.1 INITIAL CONCEPT (D7.4.1)

As described, empowerment is a common and demonstrably effective approach used in games seeking to influence behaviour (Caldwell, et al., 2013). It appears particularly suited to the case of a game for immigrants, as cultural exclusion can be seen to be linked to disempowerment: excluded immigrants feel they have no role in influencing their host country's attitudes, policies, and systems. Following the theme of empowerment, we adopt an approach taken by other serious games, which combines a partially-abstracted narrative together with an overarching story seeking to both reflect common challenges faced by immigrants, whilst presenting this from a position of empowerment. Hence, the player is cast as the role of a scientist in an "experiment gone wrong" scenario. The introductory cutscene of the game (viewable in the current prototype) describes events prior to gameplay: The player was at the centre of an experiment which, unintentionally, split reality into two diverse cultures, and was consequently the only individual empowered with the ability to traverse these two "dimensions" of reality and interact with both cultures. Reflecting Ghandi's remark that "no culture can survive if it attempts to be exclusive", these diverse cultures are struggling to survive and the player is tasked with recreating the experiment to reconcile the cultures. This is no straightforward task: to do so, the player requires key components only available in the capital city. Gameplay starts with his/her arrival at the airport terminal, and gameplay is introduced through a travel scenario that requires basic differences in cultures during travel be observed. For example, an information desk clerk at the airport behaves differently in the more formal dimension when compared to the less formal one. As they arrive, the player's journal automatically updates with their observations of how cultural interactions differ, reinforcing learning outcomes. They transition from the airport to the train station, interact with a ticket machine, and travel to the centre of the city.

The open square in the centre of the city allows the player a degree of freedom in their next course of action. They need to fulfil basic needs: shopping, accommodation, healthcare, and finding a job, in order to generate the income they need to collect the key components to rebuild the experiment. Accommodation requires they understand the differences in culture when seeking to find a place to stay; in finding healthcare they observe how cultures differ in their approach to finding care and communicating with doctors. Jobseeking - identified as one of the principal areas for game-based learning - consists of four "interviews", each duplicated between the two cultures. Differences in process and practice emerge, for example formal approaches to application requiring transferable skills be identified and documented, versus an informal networking-based approach to securing employment. Again, the player's journal automatically updates with their notes reinforcing the learning objectives and outcomes.

### 3.5.2 IMPLEMENTATION IN FINAL GAME

An introductory video was developed to clearly communicate the narrative and context on starting a new game. The overall design remains in line with that provided in D7.4.1, however refinements have been made to how the narrative is communicated to the player, particularly through a revised journal structure, which now has tabs on "help", for a guide on basic interaction (e.g. character movement), "objectives", on their current goal, and "outcomes", a progressively updated and expanded section on their learnt observations on culture.

# 4 CHARACTERS AND DIALOGUES

The previous section outlined the overall design of the game under several themes. Particularly important in the case of persuasive learning are character interactions between the player, other characters, and their culturally-distinct counterparts. Hence, this section reviews the original character concepts provided by D7.3, noting additions or amendments, and illustrates the 2D portraits created in addition to the 3D characters to increase their sense of character. Under the theme of "empowerment", most of the characters have a problem the player must solve, and this is typically achieved by moving between the two worlds and interacting with the same character from different cultures. The goal here is to give insight into how processes and interactions might vary between these cultures, scaffolding through the currency system a route back into the MApp to address real-world problems anticipated through the awareness raised by the game.

One of the most challenging aspects of character design in MASELTOV is the need to balance the entertaining aspect of games - characters may frequently be unusual, or have personality quirks to add to humour or engagement - with the need to support cultural learning through dialogues. Considerable effort has been invested in T7.3 and T7.4 in exploring this balance through iteration and field trial, with native Turkish and Spanish speakers with cultures relevant to MASELTOV (e.g. Latin American Spanish-speaking), recruited to assist not only in literal translation, but also cultural adaptation of text to ensure aspects such as humour are culturally repurposed. This is in addition to the recruitment of artists to create the concept and character art illustrated in this section and Annexes I-II. The visual art also sought to create a distinction in characters between worlds, allowing for a visual and well as textual reference point for the player.

The following sections (4.1-11) present each character, with their underlying role as defined by T7.3 coupled with the visual aspect of their design, and amendments made in response to field trials and internal testing feedback.

| 4.1 NPC01 INFORMATION DESK OFFICER | | |
|---|---|---|
| Overview | This is the first NPC the player has the opportunity to talk to. Their primary role is to provide introductory background on their respective culture. This is conveyed either formally, with the player asking direct questions on how certain things are accomplished (in the case of the scenario, travelling and finding accommodation), or indirectly, with the character either keen to avoid uncertainty in their information or open to it; being more or less formal; and framing their responses to the player in a high vs low context form (i.e. focusing less on what is said than how it is said in one culture, and vice versa). | |
| | Dimension One (D1) | Dimension Two (D2) |
| Dialogue Traits | The character in D1 is more sensitive to being asked personal questions, and shows resistance if the player attempts this. More formal questioning reveals some first insights into D1's culture: it is individualistic, masculine, and with high uncertainty avoidance. The player can receive practical information, which follows these paradigms, for example, directing the player to the hotel in a route with the least uncertainty. Furthermore, this culture exhibits a high power-distance, meaning an understanding of the various strata of society is assumed by the NPC - but unknown by the player. This presents a challenge in this dialogue, and can result in a negative outcome, with a note added to the journal. | In contrast to D1, D2's culture is collectivist, feminine, and with a lower uncertainty avoidance. In this particular dialogue, this manifests itself through an NPC who is more open to giving informal information to the player, but is also less prone to recommending a "best option" or clear process, due to the lower uncertainty avoidance. Society is not as stratified in D2, an outcome learnt by the player in this first dialogue, and this can present more of a challenge when the player is required to be more sensitive to informal cues and the need to appear more friendly and social by using relevant language. |
| Dialogue Outcomes | Journal update follows the dialogue with regards to the D1 culture. | Journal update follows the dialogue with regards to the D2 culture. |
| Notes | This is a repeatable dialogue - the player can return to the NPC and ask for further background as needed. It is also optional, and the player can walk past the information desk without requesting help, however, the journal will | |

| | |
|---|---|
| | update recommending they ask for information. |
| **Updates** | This NPC has been altered to provide some information on the currency system within the MApp. Their characteristics and dialogue aim to give a clear introduction to the dimensional differences. |

**Dimension One Portrait**

**Dimension Two Portrait**

### 4.2 NPC02 PASSER-BY

| | | |
|---|---|---|
| Overview | In addition to the information desk officer, the player can also adopt the less formal approach of asking a passer-by for help. Differences in casual conversation are intended to emerge depending on the dimension the player is currently in, allowing some insight into how first social contacts may differ between cultures. The context for this dialogue is a simple progression puzzle, with the player needing to find the key code for a gate. This serves the purpose of making interaction with the NPC mandatory, whilst the simplicity of the puzzle reflects the fact the player has just arrived in the game, and may still be familiarizing themselves with the two dimension mechanic. | |
| | Dimension One | Dimension Two |

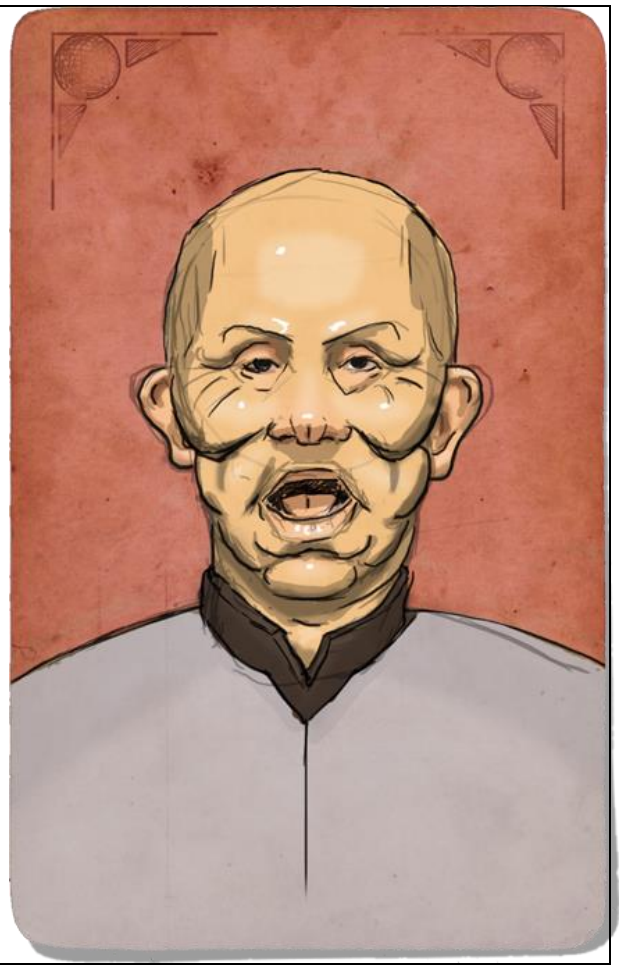
| | | |
|---|---|---|
| Dialogue Traits | We exemplify the more stratified society in D1 by making the character far less open to being approached by a stranger. This makes progressing past the first few stages of the dialogue more challenging, encouraging the player to return to NPC01 for additional cultural information. Effectively, succeeding in this dimension requires and understanding of formal process and societal hierarchy. | In the collectivist setting, members the player is rewarded for understanding and allegiance to group norms. By demonstrating this understanding, they can gain the assistance of the NPC. This takes a more social discussion format with the NPC, with the player having opportunities to show their understanding and subscription to the societal norm. |
| Dialogue Outcomes | The first half of the key code to the gate. | The second half of the key code to the gate. |
| Notes | Providing the key code in two halves mandates that the player will have to traverse the two dimensions to solve the problem. To ensure this isn't a sticking point, with the player unsure of how to progress, a journal update coupled with highlighting of the dimension flip button at the relevant time reinforces the process of changing dimensions. | |
| **Updates** | The role of this passer-by NPC has been changed from a source of information to the first puzzle of the game. As the player is given an introduction to the dimensional differences in the airport, this NPC serves as an introduction to the "combining" element of gameplay, and again encourages the player to use the switch dimensions to complete tasks. In Dimension One, the player can ask the NPC for directions to the train station and note the NPC's old watch. In Dimension Two, the player notices the NPC has lost their watch, the player can offer to help or move on. The player will be prompted by the Journal to try combining items already in their inventory, and in doing so they will create a Shiny New Watch to give to the NPC in Dimension One, who will trade this for their Old Watch. The player may then give the NPC in Dimension Two the Old Watch, for which they will be rewarded with a Travel Card. The player will not be able to get past the train station without completing this task, as the station has sold out of Travel Cards and so the player is forced to explore switching dimensions and item combining.<br>**New Dialogue Outcomes:** Obtaining a Travel Card to travel by train to the next part of the game | |
| **Dimension One Portrait** | | **Dimension Two Portrait** |

| 4.3 NPC03 TICKET CLERK | | |
|---|---|---|
| Overview | This character outlines the process of travel in their respective culture. Drawing on Hofstede's framework, concepts such as power-distance differences between cultures can be expressed through classes of travel and freedom of movement for citizens. This leads to the second puzzle in the game - the player must obtain a train ticket to travel to the centre of the game's city (the Hub area). | |
| | Dimension One | Dimension Two |
| Dialogue Traits | Building on the stratified, high power-distance culture in D1, a wide range of classes of travel exist in this dimension. Freedom of movement is also less straightforward, with the player expected to provide relevant documentation to the NPC. As | In D2, the greater degree of uncertainty presents the player with a problem, as whilst the ticket clerk is available, he cannot issue tickets due to a fault, and therefore the player is required to use a ticket machine, which presents a mini-game based on the challenges of |

| | | |
|---|---|---|
| | the player does not possess this documentation, they must utilise the dimension flip ability to transition to D2. The NPC also has an informational element similar to NPC01, allowing the player to ask more general questions about the culture and locations in the game, and receive information which is preserved in their journal as notes. | purchasing travel tickets in a foreign language. As with D1, this character also supplies background information on the game world and culture within D2, noted by the player in their journal. |
| Dialogue Outcomes | After exhausting all options, the player's journal updates suggesting they try to purchase a ticket in D2. | The player is directed to the ticket machine within the station and initiates the mini-game to obtain a ticket. |
| Notes | Discussion with the NPC in either dimension is non-mandatory, however, the intent is to make the ticket machine puzzle sufficiently non-straightforward that asking the character for advice is a logical step for the player. The journal system is used to reinforce this, by updating with the recommendation to speak to the NPC after a failed attempt to use the ticket machine. | |
| **Updates** | As the player is rewarded for completing the puzzle with the Passerby NPC with a Travel Card, the player no longer needs to buy one from this NPC. The NPC in Dimension Two will suggest the player asks for help in obtaining a Travel Card if they have not already. This NPC will still provide information for travel, further defining differences between the dimension (i.e. in Dimension One the NPC is less willing to offer help, as there are machines and signage for this. In Dimension Two the NPC is willing to answer questions about travel, and is uncomfortable with changes in Travel Card scanning process).<br>**New Dialogue Outcomes:** The player can learn about travelling in each dimension, and is encouraged to complete the combination puzzle with the Passerby. | |
| **Dimension One Portrait** | | **Dimension Two Portrait** |


| 4.4 NPC04 PROTESTORS | | |
|---|---|---|
| Overview | This additional character can be approached in the central hub area of the game, differing between dimensions in their openness in conversation and reflecting again Hofstede's dimensions: masculinist vs feminist, low vs high uncertainty avoidance, and low vs high power distance. In both dimensions, the NPCs are protesting a societal issue unique to their dimension. This allows for an interesting "counterpoint" character to be implemented in each dimension who is critical of their own culture. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | As with the NPC02 passer-by, the player is expected to take a more formal approach to initiating a conversation, and appreciate the various levels of the high power-distance society. Through discussion, it | Whilst this character is similarly protesting against a societal issue, the nature of the issue and the context of the protest differs from D1. In this case, it is the uncertainty and need to conform to the social norm which is the key point of |

| | | |
|---|---|---|
| | emerges this NPC is protesting against the society's rigidity and hierarchic structure. This allows the player an opportunity to discuss these issues with the NPC, and identify key problem areas in individualist, high-power distance cultures. | contention. Through discussion with this character, the player gains insight into the internal challenges faced by collectivist, high uncertainty cultures, and has the opportunity to reflect their understanding in the dialogues. |
| Dialogue Outcomes | This dialogue is currently being iterated, as several ideas - such as a currency reward for reflecting cultural understanding - may deliver an inappropriate learning outcome. Central to understanding this is researching how users perceive and react to game content. The target learning outcomes specified in D7.4.1 require reflection from the learner on the abstract nature of play, and how and why lessons learnt may translate to real-world situations. It may be the case with sufficient scaffolding and links to external resources, that the introspective nature of these dialogues with respect to their host cultures can provide a means to review how individuals in different cultures express issues. | |
| Notes | Discussion with neither NPC is mandatory to progress the plot of the game, but a journal update can suggest to interact with the character. | |
| **Update**s | A protesting passerby has been improved with a group of **Protestors**. Conversation with this group in each dimension will reinforce the differences, i.e. in Dimension One protesting is happening because the people do not want to be forced to eat fruit – they want to control their own diets. In Dimension Two, they believe that the government should supply them with fruit for a healthy diet. This provides another puzzle for the player, whereby changing dimensions and switching the fruit dispensers fixes the issue for each group. Helping the Protestors rewards the player with the code for the hotel room safe, which is noted in the Journal for later use. The player is encouraged to seek out the protestors by the Hotel Receptionist, and the safes in each dimension have items necessary to move on in the game.<br>**New Dialogue Outcomes:** Code for the hotel room safe. | |
| **Dimension One Portrait** | | **Dimension Two Portrait** |



| 4.5 NPC05 HOTEL RECEPTIONIST | | |
|---|---|---|
| Overview | One of the first tasks of the player is finding accommodation. Whilst cultural variance in hospitality is less predominant, the receptionist provides further background on their respective cultural dimension and progresses the game's narrative. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | The character behaves formally and expresses surprise that someone dressed as the player character (as they have just arrived in-game, and not yet had time to acquire new items) might expect, and be able to afford, accommodation. The NPC also serves in an informational role, allowing the player to identify their next | Whilst as with other NPCs, the collectivist, low-power distance culture is reflected through the NPCs idioms, There is comparatively little distinction between D1 and D2 in this case; this serves to contrast the differences between NPCs through the remainder of the game, and serves as a note that cultural differences do not ubiquitously |

| | | |
|---|---|---|
| | course of action - finding a job. Fitting in with the narrative of the game, this requires the player begin to ask about the critical items they need to reconstruct their experiment, and where they might be found. This NPC provides some information towards this end, but notes that for the player to acquire the items, they will require currency, and hence a job. | impact interactions. That said, the informational aspects of this character draw on a less formal approach, suggesting that a job might be found in the player is able to network effectively and collaborate within the societal structure. |
| Dialogue Outcomes | The player receives a room key, provided they have found sufficient coins to afford the room. | |
| Notes | One discussion here was whether it was more appropriate to include a hotel or rental / temporary accommodation. Whilst the latter may feed-in better to a learning scenario on finding accommodation, the early-stage decision in the project was to focus on healthcare, travel, jobseeking and shopping scenarios. The hotel has the advantage in requiring less content be developed, allowing for resources to be focussed on these key areas. It also provides a social backdrop against which to introduce more social conversations through NPC06. | |
| **Updates** | As in-game coins have been abolished, the subject of the player "affording" a room is extraneous. The dialogue with this NPC further explores the differences between dimensions. The player finds out in Dimension One that the NPC is proud of being awarded Employee of the Month, and wants to inform the player of this as well as ensure the player knows theirs is the best hotel because they are working there. Also, if the player tries to leave the NPC will use guilt to force them to stay, as the individualist may use guilt to get what they want. In Dimension Two, the NPC makes the player aware that they have been voted Team Leader of the Month, that they hotel could not run without them. If the player tries to leave, the NPC reminds them this is the only hotel because there is no competition. In both dialogues the player will be able to book a hotel room, as the safes in each room have items necessary to proceed in the game. Also, the NPC will mention Protestors if asked what is causing them to be distracted, or will directly inform the player of Protestors if they ask for the safe code. Finally, it is noted in the Journal that booking in to the hotel in each dimension is similar, proving that some processes are the same across cultures.<br>**New Outcomes:** Provide access to the hotel rooms, where the safe | |

| | |
|---|---|
| | with items is located. Suggests player talks to protestors about obtaining the code in order to open said safe. |
| **Dimension One Portrait**  | **Dimension Two Portrait**  |

### 4.6 NPC06 SOCIAL CHARACTER

| | | |
|---|---|---|
| Overview | NGOs raised that general social etiquette and ways to join social activities was relevant to integration. This characters seeks to allow some observation of cultural differences in a social context. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | Adopting a high-context culture, in which information is predominantly in the physical context or situation, communication is expected to be more indirect and less informational. Monochronism - tendency to undertake a single task at a time - can also be conveyed, by placing this NPC as an employee off-work. | We contrast D1 with a low-context culture, in which information is principally conveyed through the communication. Rules and expectations are discussed, allowing for further insight into the social norms of the culture in D2. The theme of polychromism is also explored, with the character seeing time in a more holistic fashion. |

| | |
|---|---|
| Dialogue Outcomes | We initiate a puzzle here through small-talk - the wall safe in the player's hotel room has been locked by the previous occupant, and the hotel staff cannot reopen it. Successful discussion with both NPCs reveals parts of the puzzle required to unlock it. |
| Notes | Whilst socialising with different cultures, and understanding how this might impact social interactions, is a key step towards integration, it is also one of the most difficult to model effectively. This is largely a result of the uniqueness of individuals, and the difficulty in saying how a social interaction functions for a given culture in a plausible, generalizable fashion. However, inclusion of this NPC allows for this to be explored to a limited degree, as well as the cultural distinction between cultures which tend to be mono- or polychromatic. |
| **Updates** | Remaining a character who defines the dimensional difference through small-talk and a puzzle, this NPC is now defined as a **Business Person**, who needs help with their work.<br>In Dimension One the NPC is reluctant to accept help, as an individualist is more comfortable working alone and not sharing accomplishments, but through conversation provides the player with a puzzle to bring a printer to them. If the player has not already gained access to the hotel safe, the NPC will hint that objects are sometimes misplaced in hotel safes. Once the player obtains the safe code, they can find an object in the safe in each dimension, which can be combined to create a printer. In Dimension Two the NPC is seeking help, stating they are nervous about making a phone call to an unknown person, again reinforcing the collectivist practice of working in teams with less confidence in trying new tactics. Here the player must convince the NPC to make the phone call alone.<br>The rewards from these NPCs are necessary to move forward in the game and search for jobs. The reward from Dimension One is a Glowing Reference, an item which proves the player has thought outside the box and worked hard, emphasising the culture of individualism. Conversely, the reward in Dimension Two is a List of Contacts, which proves the player has made connections within the community as would be expected in a collectivist culture. Both the process of helping the NPC and the respective rewards further reinforce the cultural differences between dimensions.<br>**New Outcomes:** Obtaining Glowing Reference and List of Contacts in order to proceed to jobseeking scenario. |
| **Dimension One Portrait** | **Dimension Two Portrait** |

| 4.7 NPC07 JOB CENTRE CLERK | | |
|---|---|---|
| Overview | Discussions with NGOs provided some useful input into the jobseeking dialogues. Principally, misperceptions from migrants surround the value of networking vs formal application, and the difference between concise applications which identify transferrable skills, and ones which value more volume of experience. Through discussion with the clerk, the player can gain some insight into which approach is most appropriate, and use this knowledge for the job interviews. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | We accentuate the need for a formal approach to the jobseeking process, with the player required to register and document their skill set then send the application to the interviewer (NPC08). The player can also received some advice about | The networking aspects of finding employment are emphasised, with the clerk informally recommending the player to the interviewers, provided their responses demonstrate understanding on the collectivist culture. Paperwork created by the player takes more of a holistic |

| | | |
|---|---|---|
| | how to be successful in interviews; discussion with NGOs suggested the approach of distilling down a skill-set to relevant skills, rather than presenting all skills and certifications, as well as understanding the need to follow a clear procedure was a common misunderstanding. Hence, in D1, these skills are recommended and discussed with NPC08. | approach to reporting their skills and competencies than in D1. |
| Dialogue Outcomes | The player creates a "stack of paperwork" which they need to take to the employer. | The player in informally referred to the employer, with a letter of recommendation. |
| Notes | This NPC serves as an informational aid, providing the player with guidance notes for their respective dimension. These are recorded as journal entries, which the player can refer to during interview with NPC08. | |
| **Updates** | The purpose of this NPC remains as a formal approach to jobseeking, as the player must approach the clerk to apply for work. As the player can now obtain a Glowing Reference and List of Contacts from the Business Person, this NPC will request to see those items before the application can be made. If the player has not yet been awarded with the appropriate item, the NPC will suggest they ask around the community.<br>This NPC also provides the player with a dialogue based puzzle, where the NPC gives dimension relevant definitions and the player must chose the correct word, as if completing a crossword puzzle. The appropriate answers are hints and tips for the interview process, and if they player chooses the wrong word they will be allowed to try again until the correct selection is made. The clues given further reinforce the cultural differences between dimensions (particularly the jobseeking process), allowing the player to prove their understanding of these differences. In allowing the player to chose again if they make a mistake, the puzzle also makes cultural differences clear if the player had not already noticed them.<br>Upon completion, the player will be able to move forward with the jobseeking scenario and approach the interviewer.<br>**New Outcomes:** Forces the player to help citizens of each dimension, if they have not already done so. Successful navigation of puzzle unlocks respective job interviews. | |
| **Dimension One Portrait** | | **Dimension Two Portrait** |

| 4.8 NPC08 JOB INTERVIEWER | | |
|---|---|---|
| Overview | NGO discussion highlighted that understanding how job interviews may differ between cultures appeared a common challenge for immigrants, and has been given some emphasis within the game. In each interview, the questions posed are similar, but the player must demonstrate cultural understanding in their responses. Jobs reflect some real-world grounding, though the resulting tasks require a degree of "gamification" to fit the overall narrative arc, and the need for these jobs to result in engaging gameplay. The four "jobs" therefore, are:<br>• Repair: the player must navigate a platform level to repair broken devices;<br>• Delivery: the player must navigate a level to deliver packages;<br>• Retrieval: the player must search a level for a collection of lost items;<br>• Engineering: the player must navigate a level to place components to construct a device | |
| | Dimension One | Dimension Two |
| | | |

| | | |
|---|---|---|
| Dialogue Traits | In D1, we accentuate the more formal approach to the interview process, with paperwork being required to have been completed and forwarded by NPC08 prior to each interview. Each interview takes the form of 5-10 questions about competencies and experience, with an emphasis on the player being able to identify transferrable skills. | Success in part depends on the strength of the recommendation from the job centre clerk, which varies depending on the discussion of the player with NPC08 prior to speaking with the relevant interviewer. |
| Dialogue Outcomes | In either dimension, interviews can be passed or failed. The journal scaffolds this process with recommendations on next actions: for a successful interview, the player may either undertake the job immediately, or complete the interview in the 2nd dimension to double their reward. On fail, they may apply for any of the uncompleted jobs remaining in the game. If jobs for which failed interviews are the only ones which remain, the player may "re-apply" and undertake the interview again. | |
| Notes | After completing two of the four jobs successfully, the player develops an illness which prevents them from continuing work. At this point the interviewers will be unresponsive until the healthcare scenario is completed. | |
| **Updates** | In order to refine the job interview process, the game now has one **Interviewer** per dimension, who has one job which the player can apply for. The player may not approach the Interviewer without first successfully completing the application process at the Job Centre.<br>Based on dialogues with citizens and the tips given by the Job Centre Clerk in both dimensions, the interview has a multiple choice format. This format implements a scoring system, and the player is made aware that the better their score, the higher their wage will be. There is no fail scenario, as the player must complete the jobs in order to proceed to the Healthcare scenario.<br>The job on offer in Dimension One is “detective work”, for Dimension Two, the player applies for the role of “data collector”. Both roles fit into the retrieval job criteria, which suit the mini-games the user completes which represent the jobs.<br>Using real world interview style, the Interviewer asks the players biggest achievement, if they prefer to work in teams or alone, how they might react in an abnormal scenario at work, and to explain how their experience suits the role. The player is given a choice of answers, with a key word in brackets before each answer, and must select the one they think would impress the Interviewer in each dimension. For each question, there is a neutral answer (no points), a positive/correct answer (plus one point), and a negative/incorrect answer (minus one point). Based on their final score, the Interviewer will summarise the sort of employee they were looking for (further reinforcing the dimensional differences) and give a comment on their success (or lack thereof). The player will then be able to proceed to the mini-game. | |

| | |
|---|---|
| | **New Outcomes:** Interview completion will unlock the mini-game, after which the Healthcare scenario will occur. |

| **Dimension One Portrait** | **Dimension Two Portrait** |
|---|---|
|  |  |

### 4.9 NPC09 GENERAL PRACTITIONER

| | | |
|---|---|---|
| Overview | Another theme from NGO discussions was the need to understand how access to healthcare can vary between cultures. An example would be the difference between systems where a general practitioner (GP) serves as a first point of contact in all non-emergency instances, versus systems where the patient seeks a relevant specialist. The need for registration, communication with doctors, and access to information were also raised. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | The player speaks to the doctor for an initial assessment. Healthcare is freely available in this culture, though the player needs to register with the doctor prior to examination. The doctor then refers them to NPC14 following completion of the dialogue. | The doctor is surprised the player did not immediately seek out a specialist. He asks if cost is an issue, as a private healthcare system is implemented in this dimension. |
| | | |

| | | |
|---|---|---|
| Dialogue Outcomes | Referral notes, allowing the player to initiate a dialogue with NPC10. | This dialogue is informational and optional. |
| Notes | This character and environment is scheduled for implementation in M24-30 of MASELTOV. | |
| **Updates** | The game now has two healthcare environments, one GPs office and one Specialists office. The NPC who was originally set to be a Doctor at the hospital is now a **GP**. The purpose of this NPC remains as one who, in Dimension One, makes an initial assessment and refers the player to a Specialist and, in Dimension Two, believes it unnecessary to see a GP when a Specialist would be suitable, thus dismisses the player. As the player no longer uses coins as a currency, the private healthcare system of Dimension Two has been removed, and the differences remain in procedure only.<br>As before, in order to see a Specialist in Dimension One, and to receive treatment, the player must first talk to the GP. Only then will the Specialist be unlocked. It is not necessary to speak to the GP in Dimension Two to receive treatment, but opening dialogue with this NPC will allow the player to learn of the dimensional differences in healthcare.<br>The reason for requiring healthcare has been further defined, as the main character will suffer "Dimension Sickness" from switching dimensions. A new NPC, the Luggage Inspector, has been created to introduce the player to this sickness. They will try to pass through the airport with medicine for the sickness, but will find the Inspector in Dimension One will need to confiscate it (see NPC11 – Luggage Inspector). Switching dimensions will inevitably make the main character suffer Dimension Sickness, and require the player to seek healthcare.<br>**New Outcomes:** Completion of dialogue in Dimension One unlocks the Specialist in the same dimension, allowing the player to progress through the Healthcare scenario. | |
| **Dimension One Portrait** | | **Dimension Two Portrait** |

| 4.10 NPC10 HOSPITAL SPECIALIST | | |
|---|---|---|
| Overview | To support the differences in healthcare noted above for NPC09, the way this character is approached and communicated with varies between dimensions. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | If the player attempts to approach this NPC before following the formal process through NPC09, they are refused access. | The player may directly approach this NPC, however, healthcare in this dimension requires currency. |
| Dialogue Outcomes | On completing the dialogue successfully, the player is "cured". However, the journal updates with the fact they are only half-cured, as their illness persists in the other dimension, therefore they must also complete the healthcare scenario in D2. | |
| Notes | This character and environment is scheduled for implementation in M24-30 of | |

| | |
|---|---|
| | MASELTOV. |
| **Updates** | Much like the GP, the purpose the **Specialist** remains as such that, in Dimension One, a practitioner to whom the patient is referred to via a GP and, in Dimension Two, one who the player can approach without first speaking to the GP. Again, as currency has been removed from the game, the private healthcare system has been abolished.<br>In Dimension One, the player must first speak to a GP and be referred to the Specialist. If the player approaches this NPC without having done so, they will be refused access and so unable to complete the healthcare scenario in this dimension. By being forced to speak to a GP before receiving specialist care in Dimension One only, the player will understand the dimensional differences in healthcare.<br>**New Outcomes:** In both dimensions, the Specialist "cures" the player, completing the Healthcare scenario. |
| **Dimension One Portrait**<br>  | **Dimension Two Portrait**<br>  |

### 4.11 NPC11 LUGGAGE INSPECTOR

| | |
|---|---|
| Overview | This NPC is a new addition to the non-player characters, and has been created to support the differences in both travel and healthcare between dimensions. This |

| | | |
|---|---|---|
| | NPC will prevent the player from proceeding beyond the airport, much like one may experience when travelling. This NPC is also used to introduce the game mechanic of "dimension switching" to achieve their goals. | |
| | Dimension One | Dimension Two |
| Dialogue Traits | If the player attempts to pass through the airport, the NPC will ask to check their baggage. The player can chose to leave the dialogue, question why, or allow the check to occur. The player will have medicine in their inventory, required to heal "Dimension Sickness" where the NPC will reveal that in this dimension healthcare is not for the individual to handle, and medicine can only be prescribed and administered by a doctor. The player can give the medicine and continue, or switch dimensions. | The NPC will ask to check the baggage of the main character, but will allow them to proceed with the medicine. The player can question this, and the NPC will explain that healthcare is down to the individual, and they may purchase and administer their own. Inevitably, the character will become sick from switching dimensions and require specialist care. |
| Dialogue Outcomes | If the player does not want to hand their medicine over in the Dimension One and switches to Dimension Two in order to pass the luggage inspection, this will be their first introduction to using dimension switching as a tool to achieve their goals. This NPC makes the player aware of differences in both travel and healthcare between dimensions. | |
| Notes | | |
| **Dimension One Portrait** | | **Dimension Two Portrait** |

## 5 SUMMARY AND CONCLUSIONS

In this deliverable, we have detailed the outcomes of the merged Tasks 7.3 and 7.4 to deliver a serious game supporting immigrants in gaining insight into cultural issues through a game which seeks to empower and engage them through narrative, abstraction, and experience. The following Annexes show images from the game in addition to peer-reviewed outputs of T7.3-4 within MASELTOV. This deliverable accompanies the technical prototype of the game itself, delivered for final field trial. Responding to the outcomes of this final field trial and further refining the game will be a key element of the work plan for the remainder of the project, including through the additional 3 months of extension. With implementation complete, this refinement is expected to primarily involve the continued adaptation and evolution of journal entries and character dialogues, which can be edited in XML form, to further reinforce learning outcomes, and convey a sense of purpose and engagement to the player.

The game has been developed to use a downloader app on Google Play, to overcome the file size limit (the game APK is approximately 150MB including images, introductory video, audio, and support for English, Spanish, and Turkish versions). Whilst the game capitalises on the close integration with the MApp to provide the currency system as described in Section 3.1, it is also capable of being played in a standalone fashion. Exploitation work will, therefore, explore how the game might serve as a route in to the wider suite of tools and services for immigrants who may not be aware of their availability, or the benefits they can provide. The game could, for example, be deployed on Google Play as a standalone version, with players wishing to purchase content through coins guided into the wider suite of MApp services to earn them through their use.

## 6 REFERENCES

Alathur, S., Ilavarasan, P. V., & Gupta, M. P. (2011). *Citizen empowerment and participation in e-democracy: Indian context*. Paper presented at the Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance, Tallinn, Estonia.

Annetta, L. A., Murray, M. R., Laird, S. G., Bohr, S. C., & Park, J. C. (2006). Serious Games: Incorporating Video Games in the Classroom. *EDUCAUSE Quarterly, 29*(3).

Caldwell, C., Bruggers, C., Altizer, R., Bulaj, G., D'Ambrosio, T., Kessler, R., & Christiansen, B. (2013). *The intersection of video games and patient empowerment: case study of a real world application*. Paper presented at the Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death, Melbourne, Australia.

Fernandez-Vara, C. (2011). *From "open mailbox" to context mechanics: shifting levels of abstraction in adventure games*. Paper presented at the Proceedings of the 6th International Conference on Foundations of Digital Games, Bordeaux, France.

ISFE. (2014). GameTrack Quarterly Digest: Q1 2014. doi: Available online at: http://www.isfe.eu/industry-facts/statistics

Jimenez, M. P. (2012). *Reviews on the narrative status of video games*. Paper presented at the Proceedings of the Second international conference on Human-Computer Interaction, Tourism and Cultural Heritage, Córdoba, Argentina.

Kolb, D. A., & Fry, R. (Eds.). (1975). *Toward an applied theory of experiential learning.* London: John Wiley.

Leikas, J., Stromberg, H., Ikonen, V., Suomela, R., & Heinila, J. (2006). *Multi-User Mobile Applications and a Public Display: Novel Ways for Social Interaction*. Paper presented at the Proceedings of the Fourth Annual IEEE International Conference on Pervasive Computing and Communications.

Liu, G., Jiao, Z., & Liu, S. (2009). *Tutoring Strategy Study on Game-Based Experiential Learning in Vocational School*. Paper presented at the Proceedings of the 2009 First International Workshop on Education Technology and Computer Science - Volume 03.

Mallon, B., & Webb, B. (2005). Stand up and take your place: identifying narrative elements in narrative adventure and role-play games. *Comput. Entertain., 3*(1), 6-6. doi: 10.1145/1057270.1057285

Mautone, T., Spiker, V. A., Karp, M. R., Conkey, C., , & (2010). *Using Games to Accelerate Aircrew Cognitive Training*. Paper presented at the The Interservice/Industry Training, Simulation & Education Conference (I/ITSEC).

Naismith, L., Blanchard, E. G., Ranellucci, J., & Lajoie, S. P. (2009). *EAGLE: An Intelligent Tutoring System to Support Experiential Learning Through Video Games*. Paper presented at the Proceedings of the 2009 conference on Artificial Intelligence in Education: Building Learning Systems that Care: From Knowledge Representation to Affective Modelling.

Prensky, M. (2003). Digital game-based learning. *Computers in Entertainment – Theoretical and Practical Computer Applications in Entertainment 1*(1).

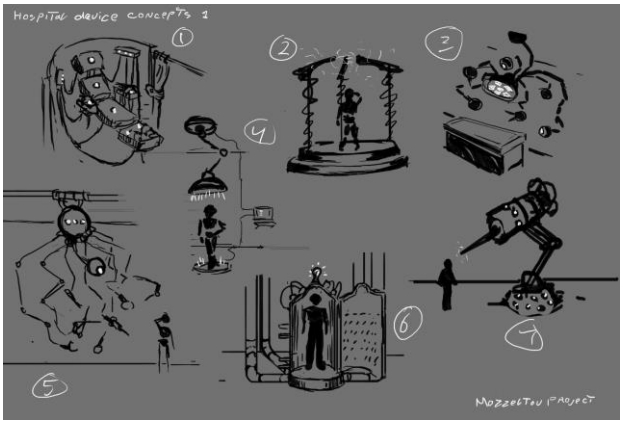
Raybourn, E. M., & Bos, N. (2005). *Design and evaluation challenges of serious games*. Paper presented at the CHI '05 Extended Abstracts on Human Factors in Computing Systems, Portland, OR, USA.

Siang, A. C., & Rao, G. S. V. R. K. (2004). *E-learning as computer games: designing immersive and experiential learning*. Paper presented at the Proceedings of the 5th Pacific Rim Conference on Advances in Multimedia Information Processing - Volume Part II, Tokyo, Japan.

Wong, W. L., Shen, C., Nocera, L., Carriazo, E., Tang, F., Bugga, S., . . . Ritterfeld, U. (2007). *Serious video game effectiveness*. Paper presented at the Proceedings of the international conference on Advances in computer entertainment technology, Salzburg, Austria.

Zyda, M. (2005). From Visual Simulation to Virtual Reality to Games. *Computer, 38*(9), 25-32. doi: 10.1109/mc.2005.297

## ANNEX I - 2D AND CONCEPT ART


**World concept:** Prior to 3D modelling, a range of 2D concepts were illustrated to create a "feel" for the world - above are several concepts from the healthcare scenario.

**Character concept:** Various designs for characters, based on the fictional narrative and need to provide visual distinctions between cultures, were sketched with some examples shown above.

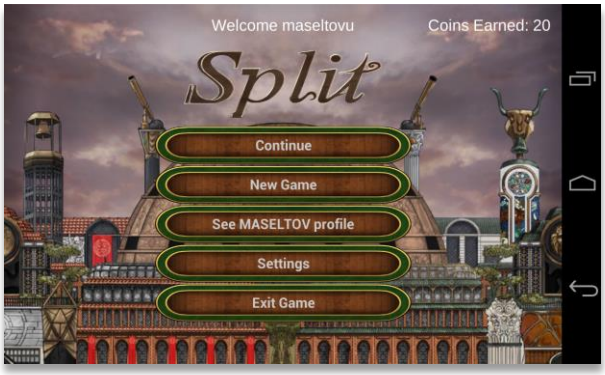





**From concept to character:** Concept art such as that on the previous page was used to create "skins" for characters, and applied to character models in-game. The player character has a range of purchasable outfits and hairstyles they can change in the shopping area.

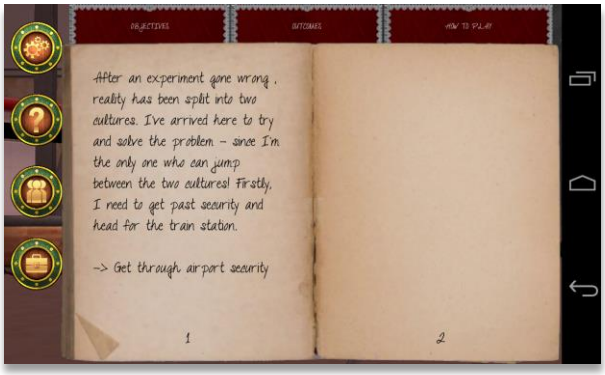

**Responding to field trial**: the original version of the user interface and journal (left, D7.4.1), was revised and expanded (right) from usability feedback on the game.

## ANNEX II - GAME SCREENSHOTS




Title screen


New player help

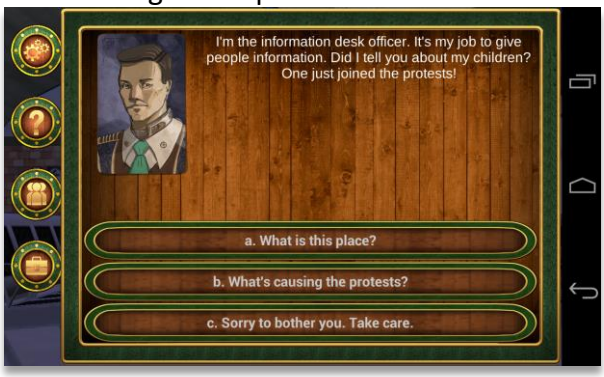



Initial journal update

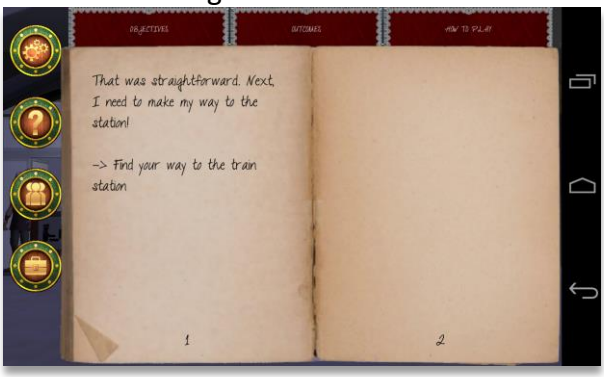

Airport information desk


Asking for help in dimension one


Reinforcing the dimension switch




Asking for help in dimension two




Journal update

Leaving the airport


First puzzle


Culturally-based problem scenarios


Item combine guidance


Combining items

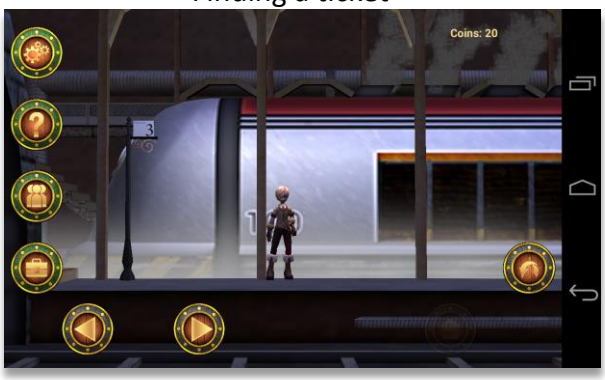

Changing dimension


Problem solving

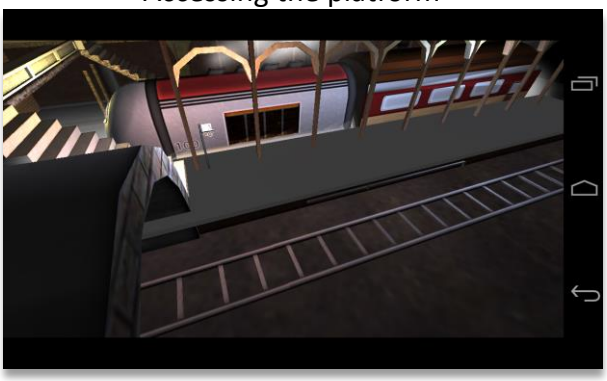
Station exterior


Finding a ticket

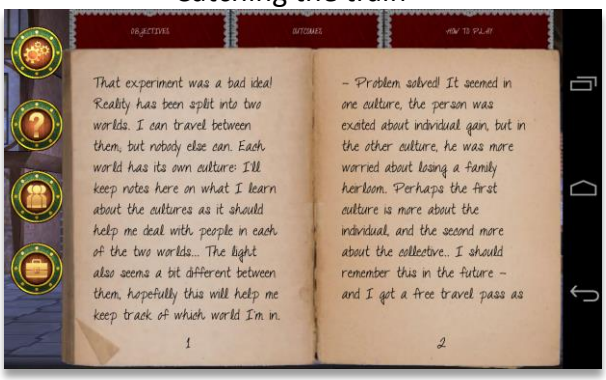

Accessing the platform




Catching the train

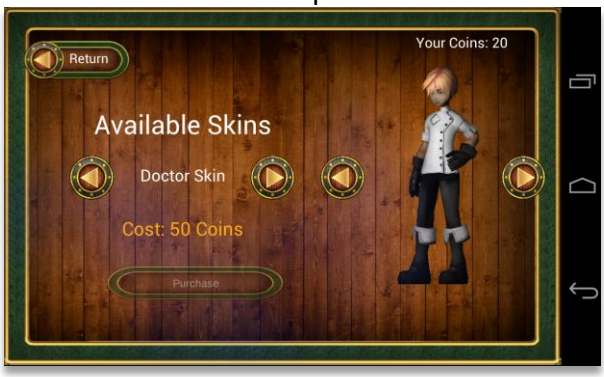


Rail travel




Journal update


Shopping area




Spending MApp credits


Items purchased


Finding accommodation


Getting a room

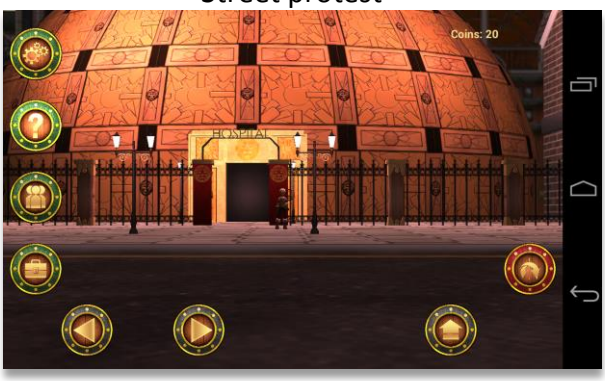

Dimension differences in NPCs


Hotel room


Puzzle solving


Street protest


Interacting with protesters




Hospital exterior


Hospital interior


Finding a cure


General practitioner


Waiting room


Meeting the GP


Puzzle solving


Job centre


Finding a job

## ANNEX III - ACADEMIC OUTPUTS

The following pages contain peer-reviewed academic outputs published from work in T7.3 and T7.4.

# Conducting ethical research with a game-based intervention for groups at risk of social exclusion

Ian Dunwell

Serious Games Institute, Coventry University
United Kingdom
i.dunwell@cad.coventry.ac.uk

**Abstract.** With developers of entertainment games increasingly exploiting the potential the platform affords for capturing rich data on user behaviour, adopting similar paradigms for "serious" purposes such as positive social change or public health intervention is a tempting prospect. However, exploitation of this potential must be tempered by a careful consideration of how ethical principles can be adhered to and applied to foster and sustain trust amongst end-users. This is particularly the case for at-risk groups, who may be particularly vulnerable to misunderstanding or misinterpreting requests to participate in research activities. In this paper, several key areas in which serious games present unique ethical considerations are presented and discussed: the unique nature of play as a source of data for analysis, the motivating role of the game and its use as an incentive for participation, and the impact of the entertainment gaming industry and its conventions user expectations. A case is presented based on preliminary work in developing a serious game for European migrants, and a number of key areas for consideration described. Through discussion of the emergence of methods and techniques for the analysis of data arising through play, the technological urgency for development of mechanisms to support ethical capture and processing of data from game-based learning environments is noted. To conclude the paper, future ethical dilemmas brought by success in achieving technological platforms capable of stimulating and managing behavioural changes are discussed.

## 1 Introduction

Entertainment games, and their serious counterparts, have attracted a wide range of attention from various sectors of the research community. With a little over a quarter of 13,000 Europeans surveyed in 2010 agreeing they considered themselves "gamers" [1], the pervasiveness and widespread appeal of this emerging medium is apparent. Attempts to demonstrate the impact and value of these serious outcomes often seek to utilize data captured from interactions between user and game, however, as an emergent medium, how users perceive and trust games requires careful consideration to ensure both an ethical and methodologically-sound approach to research. Since the early 1990s, the potential negative impact of emerging technology on exclusion

through a "digital divide" has been well documented [2]. However, as technology has matured and become increasingly pervasive, interventions seeking to harness this same technology to promote inclusion and empower groups at-risk of social exclusion have equally been observed to emerge [3-5]. In this article, we refer to "at-risk" groups specifically in terms of their risk of social exclusion; itself a concept lacking a ubiquitous definition, though broadly described as a state in which individuals fail to contribute economically, socially, and politically to the society in which they live [6]. In Section 2, this paper presents from a pragmatic perspective a number of ethical considerations specific to serious games intended for these at-risk groups, reflecting on the unique case of game-based interventions, leading to discussion of both the need for trust, and routes towards obtaining it. Section 3 then reflects upon these considerations in light of the European Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services (MASELTOV). The paper concludes by considering the broader ethical questions that must be confronted in the drive to create effective game-based methods for social, societal, and behavioural change.

## 2 Fostering trust in at-risk groups through an ethical approach

The challenges posed in ethically assessing the impact of technology with at-risk groups have been explored in general terms in a wide range of frameworks [7]. What, then, makes serious games worthy of special consideration? Interesting is the ease with which games are labeled as either "serious" or "entertainment" when few other media are defined in such absolute terms (consider, for example, the notion of "serious television"). Yet does this distinction extend to the end-user? It is not uncommon for serious games to adopt a stealthy approach to their learning objectives [8], and in doing so particular care must be taken in ensuring fundamental ethical processes such as informed consent are adhered to. However, the issue here is self-evident: if the user is informed of the objectives of the game, the pedagogical method is compromised, and a study of users in a naturalistic context becomes impossible. The lack of immediate solutions to this problem is no doubt a contributory factor to the paucity of conclusive, generalizable and objective studies showing the impact of game-based learning in a natural usage context. Whilst a range of studies have demonstrated the situational benefits of such approaches [9-11], a need still exists for a fuller understanding of how the indirect nature of learning through play is best selected and applied to meet a given learning requirement.

The depth of interaction, and possibility games afford for increased connection and emotional investment from users [12] can be argued as one of the primary mechanisms through which they sustain engagement and foster intrinsic motivation to play [13]. In the case where the rationale behind the selection of a game-based approach stems from its perceived ability to reach at-risk groups outside of formal or structured contact, adhering to ethical principles can be particularly challenging when seeking to compete for screen-time in a leisure context. Commercial games such as Farmville achieve success by adapting to the user [14], based on data capture methods that have been argued as unethical [15]. We may seek to implement our ethical

approach, yet can we reasonably expect to attract users when we actively obstruct their access to ensure they are informed? Similarly, without the ability to customize and adapt our games without the express consent of the user, we should expect to provide an inferior service to those users who opt-out. If we allow users to opt-out of research activity, what incentive do we offer for them to participate, and if none, can we reasonably expect sufficient participants to ascertain whether our serious game achieves serious impact? Shifting context to a classroom, trial, or other environment where extrinsic motivation can be relied upon is an obvious solution, though if this is unrepresentative of the actual usage context, findings may be of limited value.

Fostering trust is therefore essential in guiding the decisions of participants to allow researchers access to their data, as well as allowing serious games to exploit the adaptive and iterative approaches shown to improve their efficacy [16]. In entertainment gaming, and more generally software development, an End User Licensing Agreement (EULA) commonly accompanies the process for installation and first access. Increasingly, these agreements include consent to have data analyzed and kept for marketing purposes. A study of 80,000 users found that 50% of users took less than 8 seconds to read the agreement. Such was the extent of over-familiarity with the EULA process, users were observed to be more inclined to blindly accept terms if the presented screen resembled an EULA [17]. In short, the majority of users have become accustomed to accepting these agreements without review; an unsurprising finding when considering that, in terms of perceivable impact on the user, the EULA is hard to recognize as more consequential than any other confirmation dialogue during an installation or startup process. Yet does this lack of attention from the user stem from a lack of understanding of what they are consenting to, or is it that these users understand the implications of a standard EULA and are happy to consent? Even presented with research addressing this question, it would be unlikely to apply to broader or generalized usage contexts.

An EULA is typically deployed with provision of service as an incentive: users unwilling to consent cannot typically access the software or game, therefore should we also consider the ethical implications of using a serious game as a vehicle to incentivize consent? For any intervention with intrinsic appeal, particular attention needs to be paid to the impact incentivisation may have on decisions to opt-out. A participant eager to play the game may not be a willing test subject; yet they may be willing to disregard this concern to gain continued access to the game. The extent to which this effect needs to be considered and planned for does, as with any other intervention, depend highly on the ability to ensure the participant makes the decision to participate in an informed manner, with the capacity to play the game whilst opting-out of the associated research activity. Thus, care should be taken when conducting research alongside users who are intrinsically motivated to play the game, but not necessarily to participate within the research programme. The title of this section acknowledges that an ethical approach is central in developing the trust required amongst end-users to perform effective evaluations. Important is not only the need to adopt an ethical approach, but how to communicate it effectively to the end-users without compromising the pedagogic or behavioural model at the core of the intervention's design. In the next section, we discuss how these principles might be applied in the specific case of a game-based intervention seeking to lower the risk of social exclusion amongst migrants entering the EU.

## 3 Game-based intervention for European migrants

We consider specifically in this section the case of a serious game currently being developed to support migrants entering the European Union (EU) from non-EU states as part of the MASELTOV project. The audience, therefore, is typified by the need to develop an understanding of the language and culture of the host country, as well as form social ties which lead to inclusion. In such a case, it is suggested games can form an effective basis for cultural learning through playful scenarios, and the gamification of existing resources. In this case the ethical approach builds upon the established principles of informed consent, though also notes the difficulties that can be posed in achieving this with an audience whose linguistic and cultural skill-set is defined by their country of origin rather than destination. Key, then, is to limit the requirements for these skills within the game, and to make the consent process highly transparent and accessible, as well as giving reference to the cultural context of the user. Technology is increasingly allowing data from users to be monitored and assessed. As the game developed for MASELTOV will be employed through a mobile device, technological methods for gaining consent for tools such as location awareness can be capitalized upon. However, again consideration must be afforded to the evidence given in the previous section, which suggests consent achieved through user agreements may not be fully informed. To address this, secondary mechanisms for ethical validation and information must be fully explored.

In addressing the general problem of social exclusion, the game must also be considered in its wider context as a single tool amongst a broader set of applications. The motivation games can stimulate, as outlined in the previous section, must be carefully considered with respect to its implications for how users might interact with the broader MASELTOV platform. A technological need to ensure users retain ownership of the data the system generates on their behaviour therefore emerges; a complex challenge when considering the interactions between multiple applications as well as the social context of the platform. Work within the MASELTOV project will therefore explore the role the game can play as both a conveyor of content and stimulus of intrinsic motivation, and central to this work will be an understanding of how trust can be sustained through a transparent, accessible, and integrated approach to data capture.

## 4 Conclusions

This paper has focused primarily on the pragmatic aspects of implementing a game-based solution or intervention to a problem. Indeed, serious games are commonly put forth as a medium with high potential as a means of behavioural change in a public audience. Many games already exist seeking to shift behaviour to certain ends; for example stimulating healthier eating [18], treatment adherence [10], and behavioural science frequently underpins their design [19]. Taking the general goal of these approaches to be games capable of changing behaviour to any stated set of parameters, and ethical questions immediately emerge, particularly when one of the largest scale serious games to-date has functioned as a military recruiting tool [20].

More to the point, can, or should, we expect users to "trust" interventions which seek to covertly, or even insidiously, change their behaviour? Whilst games are by no means the sole technology for which these concerns must be raised, they are, based upon the above cited examples, one of the most powerful.

A future where these approaches are effective enough to require these questions to be answered fully is perhaps not as far away as we might like to think. Approaches to understanding "big data" [21] are increasingly allowing us to interpret meaning and models from complex systems and behaviours. Significant future investiture will undoubtedly enable research that explores how these techniques to be applied to iterate and adjust these complex systems to our own ends. Yet in the context of platforms for social, societal, or behavioural change, the ethical dilemmas these systems may raise cannot be understated. In fact, there can be little doubt that an information-driven approach capable of adjusting societies and behaviours on a large-scale is no less of an ethical conundrum, or, indeed, as potentially devastating, as Oppenheimer's bomb. We might, as well-meaning researchers, seek to shift behaviour for short term public health gain, such as promotion of healthier lifestyles, but we cannot truly understand the "butterfly effect" our actions might stimulate. Though digital technologies and other emerging media only constitute individual parts of the complex structures underlying changes in behaviour, it is important to be mindful of this wider picture. In doing so, we must ask ourselves not only how we achieve our goals of change, but how we can expect to understand fully their consequences.

## Acknowledgements

This work has been supported by the European Commission under the Collaborative Project MASELTOV ("Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services") funded by the European Commission under the eInclusion theme, project FP7-ICT-7 Grant agreement n. 288587.

## References

1. ISFE, *Video Gamers in Europe*, in *ISFE Consumer Survey*2010, Interactive Software Federation of Europe.
2. Norris, P., *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*2001: Cambridge University Press.
3. Adams, A., A. Blandford, and P. Lunt, *Social empowerment and exclusion: A case study on digital libraries.* ACM Trans. Comput.-Hum. Interact., 2005. **12**(2): p. 174-200.
4. David, M., *The politics of communication: information technology, local knowledge and social exclusion.* Telemat. Inf., 2003. **20**(3): p. 235-253.
5. Ureta, S., *Mobilising Poverty?: Mobile Phone Use and Everyday Spatial Mobility Among Low-Income Families in Santiago, Chile.* The Information Society, 2008. **24**(2): p. 83-92.

6. Glenister, D. and S. Tilley, *Discourse, social exclusion and empowerment.* J Psychiatr Ment Health Nurs, 1996. **3**(1): p. 3-5.
7. Wright, D., *A framework for the ethical impact assessment of information technology.* Ethics and Inf. Technol., 2011. **13**(3): p. 199-226.
8. Davis, L., *Liemandt Foundation launches hidden agenda contest: university students vie for a $25,000 prize by building video games that secretly teach middle school subjects.* Comput. Entertain., 2003. **1**(1): p. 4-4.
9. Knight, J.F., et al., *Serious gaming technology in major incident triage training: a pragmatic controlled trial.* Resuscitation, 2010. **81**(9): p. 1175-9.
10. Kato, P.M., et al., *A Video Game Improves Behavioral Outcomes in Adolescents and Young Adults With Cancer: A Randomized Trial.* Pediatrics, 2008. **122**(2): p. 305-317.
11. Rebolledo-Mendez, G., et al., *Societal impact of a serious game on raising public awareness: the case of FloodSim*, in *Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games*2009, ACM: New Orleans, Louisiana. p. 15-22.
12. Dormann, C. and R. Biddle, *Understanding game design for affective learning*, in *Proceedings of the 2008 Conference on Future Play: Research, Play, Share*2008, ACM: Toronto, Ontario, Canada. p. 41-48.
13. Tychsen, A., M. Hitchens, and T. Brolund, *Motivations for play in computer role-playing games*, in *Proceedings of the 2008 Conference on Future Play: Research, Play, Share*2008, ACM: Toronto, Ontario, Canada. p. 57-64.
14. Cikic, S., et al., *What FarmVille can teach us about cooperative workflows and architectures.* SIGCAS Comput. Soc., 2011. **41**(2): p. 18-31.
15. Zimmer, M., *"But the data is already public": on the ethics of research in Facebook.* Ethics and Inf. Technol., 2010. **12**(4): p. 313-325.
16. Kam, M., et al., *Designing e-learning games for rural children in India: a format for balancing learning with fun*, in *Proceedings of the 7th ACM conference on Designing interactive systems*2008, ACM: Cape Town, South Africa. p. 58-67.
17. Böhme, R. and S. Köpsell, *Trained to accept?: a field experiment on consent dialogs*, in *Proceedings of the 28th international conference on Human factors in computing systems*2010, ACM: Atlanta, Georgia, USA. p. 2403-2406.
18. Baranowski, T., et al., *Squire's Quest! Dietary outcome evaluation of a multimedia game.* Am J Prev Med, 2003. **24**(1): p. 52-61.
19. Thompson, D., et al., *Serious Video Games for Health How Behavioral Science Guided the Development of a Serious Video Game.* Simulation & gaming, 2010. **41**(4): p. 587-606.
20. Zyda, M., et al., *The MOVES institute's America's army operations game*, in *Proceedings of the 2003 symposium on Interactive 3D graphics*2003, ACM: Monterey, California. p. 219-220.
21. Cuzzocrea, A., I.-Y. Song, and K.C. Davis, *Analytics over large-scale multidimensional data: the big data revolution!*, in *Proceedings of the ACM 14th international workshop on Data Warehousing and OLAP*2011, ACM: Glasgow, Scotland, UK. p. 101-104.

# Developing a Digital Game to Support Cultural Learning amongst Immigrants

Ian Dunwell, Petros Lameras, Craig Stewart, Pangiotis Petridis, Sylvester Arnab, Maurice Hendrix, and Sara de Freitas
Serious Games Institute
Coventry University
United Kingdom
+44(0)2476887688
idunwell@cad.coventry.ac.uk

Mark Gaved
Institute of Educational Technology
The Open University
United Kingdom
2nd line of address
+44 (0)1908654821
mark.gaved@open.ac.uk

Lucas Paletta
DIGITAL – Institute for Communication and Information Technologies
JOANNEUM RESEARCH FgesmbH
Austria
+43(0)3168761769
lucas.paletta@joanneum.at

## ABSTRACT
Immigrants entering the European Community face a range of challenges in adapting to and understanding the culture of their host nation. Failure to address these challenges can lead to isolation and difficulties integrating into the society of the host country, leading to fragmented communities and a range of social issues. Formal methods of education have limitations, particularly in reaching vulnerable groups who may not readily engage with opt-in programmes. As part of a comprehensive suite of services for immigrants, the European-funded Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services (MASELTOV) project seeks to provide both practical tools and learning services via mobile devices, providing a readily usable resource for immigrants. In this workshop paper, the game-based learning aspect of the MASELTOV project is introduced, with the rationale behind its design presented. In doing so, the benefits and implications of mobile platforms and emergent data capture techniques for game-based learning are discussed, as are methods for putting engaging gameplay at the forefront of the experience whilst relying on rich data capture and analysis to provide an effective learning solution. Through comparison to several other projects, a number of recommendations are put forward for games deployed in contexts similar to that of MASELTOV: a focus on establishing a significant audience with which to conduct ethical research into efficacy, the need for robust pedagogical frameworks suited to the learning context, and the evolution of methods for data capture and analysis of player activity, analogous to that undertaken by entertainment game developers but made specifically relevant to the serious objectives of the game.

## Categories and Subject Descriptors
I.3.8 [Computer Graphics]: Applications; K.3 [Computers and Education]: Computer Uses in Education—Computer-assisted instruction; K.4 [Computers and Society]: Social Issues—Employment

## General Terms
Design, Human Factors

## Keywords
Game-based learning; Serious Games; Inclusivity; Cultural learning; Mobile learning

## 1. INTRODUCTION
Game-based components of education have been widely used in pedagogical approaches such as those of Vygotsky [1] as a means for allowing learners to develop their understanding through abstraction; however, the emergence of digital technologies has played a key role in defining the notion of "serious" games, a term which broadly recognizes the use of digital technologies and parallels to digital gaming for entertainment purposes as having educational potential when aligned with a set of pedagogical goals. Context is of central relevance when seeking to deploy game-based learning [2], as it can drive decisions regarding how much intrinsic motivation can be expected on the part of the learner, and in turn how much the game must foster the desire amongst learners to engage with the game as a recreational activity rather than a formal educational pursuit.

In the particular case of cultural learning amongst immigrants, the MASELTOV project (http://www.maseltov.eu) addresses the particular challenge of providing mobile services to immigrants via a suite of Android applications, on the one hand providing immediate support in addressing day-to-day challenges, whilst simultaneously allowing immigrants to learn key skills so these immediate supports become less required over time: “scaffolding” to learning that can fade into the background when no longer required [3]. The role of game-based learning in such a context must be carefully considered; the suite of MASELTOV services will provide on-demand educational content, and therefore caution must be taken to prevent game-based learning services simply presenting a more obtuse representation of this educational context. Section 2 provides more background into the target audience, and existing games targeted at raising cultural awareness or conveying cultural learning content.

Rather, in the case of game-based learning within MASELTOV, it is suggested that a game may provide a resource which allows users to identify though analogy areas in which cultural differences are most prominent, the form these differences might take, and strategies to address them. A game-based resource might also have appeal to audiences with little willingness to engage with more formal forms of educational content, such as structured language lessons. This synergizes with the gamified, social approach to language learning presented by other services within MASELTOV such as those provided by the Busuu language learning community (http://www.busuu.com/), though also presents challenges in developing a game design suitable for this usage context and target audience. In Section 3, these challenges

and the design approaches taken to address them are outlined. Sections 4 and 5 then present an early prototype design of the MASELTOV game, and discuss how it aims to synergise with the other MASELTOV services whilst providing a playful environment for cultural learning.

## 2. BACKGROUND

In a broader context, the changes in attitudes, expectations, and subsequent behaviours which might be anticipated from a cultural learning aid can be seen to be relevant to a wide range of other educational objectives. Game-based learning has frequently been employed in attempts to induce attitudinal and/or behavioural change, in part due to the potential games might have to effect such changes through the significant time and social investment of players [4], and in-part as these objectives often remain difficult to achieve with more conventional methods such as direct messaging [5].

In an effort to demonstrate the disparity of the cultural definitions Hofstede [6] provided a narrow view that is commonly perceived in Western countries: "civilisation or refinement of the mind and in particular the results of the refinement including education, art, and literature". Biggs and Moore [7] define culture as the 'the sum of total ways of living built up by a group of human beings which is transmitted from one generation to another. Wild and Henderson [8] and Hofstede added the element of adaptation in the definition of culture in a sense that culture is a demonstration of ways in which an identifiable group adapts to its changing environment. In this view people may belong to more than one cultural group and therefore, possess a subset of a culture's total identifiable characteristics. Finally, individuals may not remain totally committed to their birth culture and exhibit aspects of other cultures.

Culture should be distinguished from human nature [6]. Human nature encompasses the common characteristics of all human beings, like the ability to feel fear, the need to associate with others, and the facility to observe the environment and to communicate it with other humans. However, what one does with these feelings and how one expresses them is modified by culture. The individual's personality includes the individual's unique personal set of patterns of thinking, feeling and acting that need not to be shared with other individuals [6]. Individual personality patterns are partly inherited within the individual's unique set of genes and partly modified by the influence of culture as well as by unique social experiences [8].

Collis [9] defined several cultural levels that should be taken into account when implementing learning environments. These levels are: societal, personal, organisational, disciplinary. These cultural levels as argued by Seufert [10] are influencing the acceptance, use and impact of online learning environments. Moreover it appears to be a general consensus that 'culture has a definite and very strong influence on the design and use of information, communication and learning systems, as well as on their management, despite the lack of identifiable research in these areas' [8]. Several educational researchers [11-13] highlighted the influence of culture on different learning styles. The cultural learning styles approach arose from an attempt to achieve a transition from surface approaches (e.g. rote learning) to deep approaches (e.g. constructive learning through learning communities). Although surface approaches to learning are still prevalent [14], the cultural style approach offers a way to characterize cultural groups without suggesting hierarchies in cultural practices [11].

It is apparent therefore that socio-cultural insights in conjunction to understanding how individuals learn may assist game and educational designers to develop more culturally sensitive games by balancing play with pedagogically-driven cultural learning processes. However, caution should be placed on over-generalising such balance as different combinations between pedagogical approaches and game mechanics may have certain implications when establishing learning activities aimed at culturally diverse groups of individuals. This impact will ultimately result of either success or failure of the group dynamics and therefore of the learning activity itself [15].

The European MASELTOV project recognizes the major risks for social exclusion of immigrants from the local information society and identifies the huge potential of mobile services for promoting integration and cultural diversity: Everywhere/everytime – pervasive assistance is crucial for more efficient and sustainable support of immigrants. Language understanding, local community building, and consciousness and knowledge for the bridging of cultural differences shall be fostered via the development of innovative social computing services that motivate and support informal learning for the appropriation of highly relevant daily skills.

**Figure 1. Immigrant using a smartphone for dialogue enhancement and mixed reality gaming at the market.**

A mobile service based assistant embeds these novel information and learning services such as ubiquitous language translation, navigation, administrative and emergency health services that address activities towards the social inclusion of immigrants in a pervasive and playful manner: Besides a virtual world, MASELTOV develops a mixed reality game (cf. Figure 1) in which the user is applying her language skills in various, critical situations, such as, in dialogues during shopping, and for navigation in the urban environment. The mobile service supports her in the situation as well as receives feedback from the user in order to measure and estimate performance success.

Multisensory context awareness is an important functionality in MASELTOV that feeds into the information and learning services (Figure 2); together these cooperate to feed into the community building services. The complete interplay of components develops an activity and information flow from the user's behaviour to - eventually - the community building which represents the key

objective of the project: to prevent social exclusion using assistance, mobile learning and social networking.

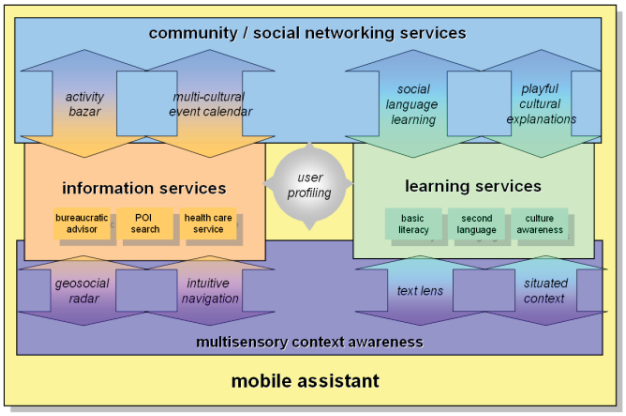



**Figure 2. Schematic sketch of MASELTOV services and functional components.**

As a component of the overall suite of MASELTOV services shown in Figure 2, the game-based learning elements must reflect upon the nature of culture and cultural learning, as outlined briefly in this Section, as well as integrate effectively with a broad range of complementary and diverse services including both practical tools, and educational packages. Presenting the overall approach taken in this context, and the prototype game, is the aim of Sections 3 and 4.

# 3. DESIGNING A GAME FOR CULTURAL LEARNING

In this Section, a number of principles for game-based cultural learning using mobile devices are introduced, based upon the background in Section 2 and other previous research. Section 3.1 introduces some core principles for consideration when developing digital games for learning on a mobile platform, regarding how to best exploit the advantages of a mobile platform (3.1.1), the need for ethical data capture (3.1.2), how to integrate and gamify other services and content (3.1.3) and supporting translation, localization, and support for repurposing (3.1.4). To support the pedagogical design of the game, as well as combine effectively research and development, Sections 3.2 addresses cultural frameworks relevant to games for cultural learning, and how they might be applied.

## 3.1 Core Principles for Mobile Game-based Learning

Previous research has highlighted a number of principal considerations when developing game-based learning interventions. Amongst the most common are the need for careful balance between game-based 'fun' content and pedagogical objectives [16], and the need for broad involvement from stakeholders alongside a robust research methodology for ascertaining and refining the efficacy of the developed solution [17]. Other analyses have noted the importance of factors such as inter-team communication, particularly between different domains of expertise [18], a significant challenge when these experts are not commonly co-located. Mobile learning brings its own challenges and opportunities that must be accounted for (e.g. Klopfer 2002, Glahn et al. 2010) and the "mobility" may refer to learning while on the move, or being able to access learning resources in different places (Brown, 2010). Learning in context has been argued to be highly motivational for learners (Jones et al., 2006). Mobile gaming has distinct characteristics from desktop gaming, such as taking advantage of fragments of 'dead time' while waiting at a bus stop, or travelling for brief interactions with the game while out and about, and the challenge of intermittent connectivity which demands game play and data transfer must be at best occasional.

In this Section, a range of design concepts are presented with a view towards addressing these difficult issues of balancing engagement with pedagogical value, and supporting participatory and iterative design whilst also reflecting on the pragmatic concerns that often limit the ability to develop a game-based learning solution in a highly iterative and participatory fashion. To this end, this paper considers in Section 3.1.1 how ethical data capture and analysis might be used to generate an understanding of pedagogical impact through analysis of data from end-users, promoting a development paradigm which seeks to make a game accessible at an early stage and build on data from actual users to refine and validate it. Furthermore, Section 3.1.2 argues emerging platforms for content distribution are making it increasingly practical for developers to respond to this data and the outcomes of analysis to adapt and improve a serious game.

With specific regard to the context of the MASELTOV project, Sections 3.1.3 and 3.1.4 present considerations particular relevant to a immigrant audience: how the game might be integrated effectively with a suite of other immigrant services, and how a game might be effectively repurposed to support a range of cultures and languages. These considerations lead to the presentation in Section 4 of an early prototype of the MASELTOV game, and discussion in Section 5 of its implementation and key areas for future work.

### *3.1.1 Exploiting the benefits of Mobile Platforms for Game-based Learning*

Mobile platforms such as Apple's iPhone or Google's Android present both a distinct format for game design, as well as methods for deployment which support developers in providing frequent updates to their games (distribution and updating content via the web). This is attractive to learners and educators (because…)This increasing prevalence of this digital form of distribution has seen rise to metric-driven approaches to game design, whereby variants of games can be presented to players and decisions made on future development through analysis of player behaviour [16; 19].

For serious games, these methods of deployment present a broad range of potential benefits. The careful balance between entertainment and education can be managed over a series of incremental changes, rather than requiring the initial version of the game fully satisfy the objectives of both domains. Given the need for a substantive user base to fully take advantage of a metric-driven approach to game design and development, the logical approach is to first develop a game which establishes a user base through predominance of engaging, fun aspects, then works with this audience over time to introduce and validate pedagogical aspects. This in itself represents a step-change away from the off-the-shelf model of deployment, and towards a model on which a serious game can be seen as constantly evolving both in terms of its content and community.

Presenting stakeholders with such a model can be challenging, with expectations commonly reflecting expectations of educational games to provide simulations driven by experiential pedagogy, rather than more abstract forms of learning [insert - Kato ref]. However, in the case of games that cannot rely on deployment context to provide extrinsic motivation to play, awareness of the challenges in competing for screen-time with other entertainment media is essential. The abstract serious game for road safety *Code of Everand*, for example, attracted 100,000 players with a mean playtime of 91 minutes, In this case, the entertainment and narrative aspects of the game were developed in depth, presenting the user with a massively-multiplayer online (MMO) environment. Given the substantial reach of this game when compared to other educational games, an argument can be made for adopting this "entertainment first" approach, supported by other serious games with audiences over 100,000 such as *America's Army* [20].

### *3.1.2 Ethical Data Capture and Analysis*

In order to apply metrics of player behaviour to the ongoing development of a serious game, ethical methods for data capture and analysis are essential. The basic principles of ethical data capture, such as informed consent and the right to opt-out, must be adhered to through the implementation of technologies which provide both richness of data capture and transparency to end-users [21]. This is particularly relevant to serious games when compared to entertainment games, as pedagogical objectives may require the collation and analysis of significantly more sensitive or personal forms of data to analyze when compared to the simpler objectives of entertainment games, which can often be evaluated solely in financial terms. Serious games tend to adopt a more diverse range of business models [22], and consequently objective assessment of impact can be more relevant than simpler metrics such as reach in terms of numbers of players [23].

The precise elements of data required to validate a serious game against pedagogical goals depend heavily on the nature of these objectives; in MASELTOV's case these are: cultural awareness and sensitizing of differences, social inclusion, and language learning.. However, recurrent areas in which data capture for game-based learning approaches tend to differ from entertainment gaming include the requirement for personal or sensitive data relating to attitudinal or behavioural change, alongside the need to identify the demographics of the target audience [24]. Ethical considerations surrounding data capture are of particular significance within the MASELTOV project given that the audience (recent immigrants to Europe) may be highly cautious of sharing personal data, given their past or current personal circumstances and relationship with authorities.

### *3.1.3 Integration and Gamification of Related Services and Learning Content*

Specific to the case of the MASELTOV is the deployment of the game as one of a suite of mobile applications. These applications include:

**Geo-social radar:** A volunteer helper service allowing learners to find out if there are any nearby volunteers who can help them with a problem, for example acting as a translator at a doctor's appointment, negotiating local bureaucracy, or simply interested in social conversational practice.

**TextLens:** a text conversion tool that allows a learner to take a photo of a sign, and have it translated into another language. These can be uploaded into social forum areas for help when the meaning is ambiguous, and if the learner wishes to discuss their cultural or legal implications.

**Peer reviewed language learning:** a collection of language exercises focusing around everyday tasks. These will offer learning set at the Common European Framework of Reference for Languages (CEFR) A1 and A2 standard, but also some more elementary material to help very recent immigrants with their immediate needs, and those whose language skills are more limited. Like the current busuu.com online learning tools, when an exercise is completed, it will be assessed by a peer learner, and feedback offered. Further discussion of the work will be possible via the linked social forums held within the MASELTOV system and accessible to all learners. Progress will be recorded to a user profile system, and may trigger further content depending on the learner's progress.

**Mobile navigation tool:** a navigation tool helping with directions, indicating places of interest, and local services. The navigation tool will function like a 'pedestrian sat-nav' giving orientation information, directions, distance to location and best route. Information about important services in the nearby environment will be shown (e.g. pharmacy, doctors, public transport stops). This will be integrated into the other services, so signs found outside public transport can be translated, and may help with meeting up with other learners or volunteers via the geo-social radar. If selected by the learner, proximity to particular locations or types of buildings may trigger learning exercises or in context language support.

**Profile system:** the user's details and learning progress will be held to allow personalized learning, with the system recommending particular types of content or learning exercises to support each learner's particular needs. Learners can personalize their learning journey by indicating what is important to them, and mentors can identify where particular support can be offered.

**Social networking and game-based learning**: users will be able to join a community of fellow learners, and share their experiences. Game-based approaches to increase engagement in learning are an emerging focus in informal learning and we will be exploring how game-based elements may stimulate learner participation.

In particular, the MASELTOV project seeks to explore the benefits of integration between these services. By integrating educational content with service provision, the platform seeks to support both tools for immediate assistance, and deeper learning over time to lessen reliance on these tools, and promote integration. There are several roles a game could play which capitalize on the strengths of game-based learning: a game might reach a wider audience than purely pedagogical or service-based content; it may offer a means to provide feedback and rewards to learners and hence stimulate certain actions; and it may allow for a different perspective on cultural learning than that provided by more conventional forms of education such as text-based content. Effective integration, therefore, demands the ability to capitalize on these advantages, whilst similarly leveraging the strengths of the other services to provide a comprehensive and integrated mobile solution. In Section 4, some ways in which this may be achieved are discussed, such as using the game to incentivize the use of other services through rewards, and providing a means for the player to observe areas in which cultural differences arise in a engaging, game-based format.

## 3.2 Cultural Framework

To enable robust cultural adaptation in the MASELTOV programme, a series of cultural indexing values is required. It is using these values that cultural personalisation within MASELTOV would be created and monitored.

There have been several cultural studies that have each developed their own cultural classification system, their own framework. One of the most popular is the Value Survey Module created by Hofstede [6]. The original study included over 100,000 responses and this has been the most quoted and used survey of its type. This study originally identified four indices by which a culture could be measured:

- Power-distance index (PDI)
- Collectivism vs. individualism index (IDV)
- Femininity vs. masculinity index (MAS)
- Uncertainty avoidance index (UAI)

The early VSM versions contained questions specific to the business populations (for example one concerning the behaviour of the 'boss') and as such were invalid for the general population. A later study corrected this by adapting to respondents without a paid job – however, it was still employment focused.

There are other studies, such as Schwartz's Value Inventory [25] and Inglehart's World Values Survey[1], though Smith, after a detailed examination of these theories concluded that all of them have produced convergent results:

*"The three major surveys of values published since the time of Hofstede's project have thus sustained and amplified his conclusions rather than contradicted them."* [26]

However as the VSM research has often focused on the employment sector this means that these findings are not readily applicable for adoption and use in other areas such as serious games and eLearning.

### *3.2.1 Cultural Artefacts in Education*

The CAE study [CAE, 2010], on the other hand, builds on the work of Hofstede and Marcus & Gould [27] whilst focusing on the educational sector, to determine the intercultural differences before most people enter the job market. The CAE framework is a semantic framework around which learning materials could be personalized for a user from a specific culture. as well as building on the Hofstede indices, this framework adds a further two indices:

**Cultural Education Index** (CEI, deals with issues such as: the learner's acceptance of being taught in another language; acceptance of presence/availability to access other languages; and access or separation of cultures different to the learner's own.)

**Adaptive Education Index** (AEI, deals with issues such as: do the learners actively desire a personalized learning experience; should personalized materials always be noticeably approved by an authority figure?)

The selection of the cultural framework for use in the MASELTOV game must be robust and easily extensible, as this will underpin any personalization.

[1] http://www.worldvaluessurvey.org/statistics/some_findings.html

### *3.2.2 Applying Cultural Frameworks to Game-based Learning*

A key challenge, given the diversity of these cultural frameworks and their broad applications, is how to translate effective methods for promoting cultural learning to a game-based format. Whilst Section 4 outlines the specific approach taken in MASELTOV, more general rationale behind the approach taken stem from the need to converge general principles of persuasive game design (e.g. Khaled [5]), with the principles put forward in these cultural frameworks. A benefit of the rich media approach used by many games is the ability to create simulative content and approaches which build on an experiential model of learning to provide or gamify a simulation of a particular activity. Thus, for example, a game could provide simulations of common areas in which cultural differences or difficulties arise, such as travel, healthcare, or job applications and interviews. However, a simulation-driven approach might struggle in practice to reflect an individual immigrant's situation - consider, for example, the difference in scenarios faced by a North African migrant entering Spain, versus those faced by an Asian migrant entering Austria; before even considering how common tasks might vary with age, experience, and gender, the diverse range of European cultures makes a ubiquitous simulation-driven solution difficult to envisage.

However, games also provide a fertile ground for developing methods of learning through analogy or abstraction. By focusing on the commonalities in terms of themes and factors defined by the cultural frameworks presented in this Section, it is possible to suggest central themes around which a game may be derived without requiring a realistic simulation at its core. This in itself requires some review of the role a game might play in this form of cultural learning: abstract, fictitious cultures and their differences could provide a basis for the learner to experience and interact with a game whilst learning areas in which cultural differences are likely to occur. In turn, the motivated learner who has identified that they themselves are likely to face these situations, can be directed from the game to other forms of learning resources designed for direct instruction or education. Similarly, a game with an associated social network might utilize this to deliver cultural learning along social principles. To this end, Section 4 describes how an abstract approach to cultural learning, coupled with complementary services and capitalizing on the advantages of a mobile platform has the potential to support both the cultural considerations described by this paper, alongside the need to provide an engaging and entertaining game.

## 3.3 Summary

In this Section, some general considerations in the development of mobile gaming for cultural learning have been presented, with particular regard to the context of the MASELTOV project. In particular, the benefits of integration with other services, as well as maximum use of the mobile platform in terms of its capacity to capture data on player behaviour, and the ease with which context can be updated, have been presented as key areas for design consideration. Similarly, the pedagogical framework underlying the MASELTOV project, which builds upon the notion of incidental learning, as well as the overall research framework within which the game will be developed has been outlined. The following section hence goes on to present the first iteration of the game's design, in advance of the first stage of user testing and feedback. Future work will emphasize the need to validate not only the specific design of the game itself, but also the principles

presented in Section 3, relevant to any mobile game which seeks to achieve cultural learning objectives.

# 4. THE MASELTOV GAME

In this Section, the overall game design created for MASELTOV and its underlying rationale are presented, as well as several key considerations for future development, including the integration path for other services, and the need to provide a pragmatic yet iterative and user-centric approach to development.

## 4.1 Conceptual outline

Noting the need to avoid excessive simulation based on the rationale presented in Section 3.2.2, the game itself builds upon a mechanic with dual relevance in both gameplay and pedagogical terms: the player can 'jump' between two dimensions as they play. In doing so, they can observe cultural differences between dimensions, and by following the narrative of the game, learn by analogy areas in which cultural differences are likely to arise, and how they might best be tackled. Topics currently under consideration include negotiating transport, health, and local bureaucracies. However, the game must also play a role as an incentive to use, or integrated component of, the diverse range of other MASELTOV services. To achieve this, a second mechanic with clear parallels to entertainment gaming is introduced: an online 'store' in which the player can purchase both cosmetic and practical upgrades for their character using a combination of credits earned in-game, and though the use of other MASELTOV services. As such, the game provides an interface for the developers of other MASELTOV services to reward players within the game for specific actions outside of it, such as using the context-aware services to assist, or request assistance in a real-world interaction.

**Figure 3: Look and feel of the prototype game. This mirrors the 'platform game' design common in entertainment gaming.**

To accomplish this design, an iterative and participatory approach has been adopted, again reflecting the outcomes of studies which have indicated the efficacy of these methods [28]. In practice, these ideals are offset against the pragmatic need to develop with finite resources, whereby iteration and end-user involvement carry associated costs. Hence, whilst small-scale focus groups are used in early stage development to provide direction on decisions such as the user interface, visual look-and-feel (Figures 3 and 4), and initial pedagogical impact, making the game available at the earliest stage and reflecting on data from end-users as part of the participatory, iterative cycle, is made possible by the use of a mobile platform and associated content distribution method.

Effective integration with other components is a central issue in the design of game-based learning within MASELTOV. Section 4.2 outlines one such service, the context recognition framework [30]. Sections 4.3 and 4.4 then go on to discuss how this game design might complement the use of such services, whilst proving relevant to immigrants lifestyle.

**Figure 4: Several player avatar types are being used in early-stage user testing. Upgrading the avatar provides an integration path for other services, allowing developers of these services to provide in-game rewards.**

## 4.2 Context aware progress indicators

MASELTOV embeds an easily scalable context recognition framework [30] that receives contributions from various context feature generating services; it evaluates the user behavior and from this maps to appropriately motivating actions in the form of recommendations. The user behavior is evaluated in MASELTOV in terms of progress indicators in the frame of the various independent services. An important progress indicator for language learning is the capability in leading a dialogue for a specific purpose, and the capability to memorize vocabulary and apply it at the spot of interest. Activities such as successful interaction in geosocial radar, effectively finding the point of interest in the urban environment (job application, doctor, shop, sight), or the visiting of a local event are further indicators for progress.

In MASELTOV we consider long-term dialogue assessments with multimodal mobile context awareness on the basis of affect and attention sensitive services in order to classify the language learning behavior of the recent immigrant. The recommender system then instantiates – according to the individual human factors profile and the measured performance – personalized motivating games, in order to change the behavior of the user. For example, to reinforce the training on interaction with local citizen, the rewarding of dialogue supporting activities will be increased, such as, by doubling virtual credits in return for dialogue specific language learning and measured communication in shopping scenarios. The success of an applied dialogue in terms of the emotion and frustration of the user is sensed with the smartphone in situ, using recent computational audio-based affective computing. Advanced human factors studies with wearable

interfaces are further applied to extract the decisive parameters of affective and attention oriented content in audio. Next, wearable eye-tracking glasses data are interpreted with semantic 3D mapping of attention [29], bio-signal sensing, and classification to automatically extract from a huge data analysis the decisive parameters for dialogue evaluation.

An important aspect in short dialogues is attention as manifested by eye-contact between subjects. In a first study we provided quantitative evidence that visual attention is evident in the acoustic properties of a speaker's voice (Figure 5), and extracting a significant relation between the acoustic features and the distance between the point of view and the eye region of the dialogue partner.

(a) (b)

**Figure 5. Typical progress indicator underlying the mobile game based language learning. The dialogue is evaluated under examination of voice (waveform at bottom,) and its support of eye contact which is itself one parameter to characterize the successful engagement in the application of language knowledge in a dialogue.**

Mobile service components detecting eye contact, speaker's capability in controlling the host language, and user's satisfaction will become available to evaluate the progress of applying language knowledge in-situ. In the following Section, we discuss how this service might be related to the game-based components of MASELTOV.

## 4.3 Reward mechanisms

For the provider of any learning or practical service for immigrants, the ability to incentivize particular forms of usage offers benefits, particularly in terms of fostering communities and encouraging users to collaborate and interact. From a research perspective, a gamified user experience may also encourage participation and engagement with both the platform itself, and the research aspects. The mobile game environment illustrated in Figures 3 and 4 uses an avatar-centric design in which the player is represented in the game as an "upgradable" avatar, which can be cosmetically (e.g. clothing), and functionally (e.g. run speed) upgraded through purchases, analogous to the free-to-play model increasingly common in entertainment gaming. However, in the case of MASELTOV, these rewards will be provided through credits awarded by the developers of individual services. Hence, the providers of these individual services can integrate and gamify the service by defining these rewards and assigning them to specific uses of the tool, or actions by the end-user.

# 5. DISCUSSION

The approach taken to game-based learning development in MASELTOV intends to capitalize on both the strengths of the mobile platform, in terms of the ability to capture data on users and adapt the game accordingly. In this paper, we have suggested that such an approach could benefit from focusing first on entertainment and engagement aspects, and then work with the resultant user base to implement and assess pedagogical goals. Validating this approach will be a central goal of future work, as will comparing the efficacy of the resultant solution to approaches which place pedagogical design at the forefront. Such an approach can be particularly challenging to communicate to stakeholders with expectations of a game which "appears" immediately educational at the earliest stage, such as a simulation-driven approach. However, for the reasons outlined in Section 3.2.2, it is difficult to define how a ubiquitous simulation-driven solution might be achieved. The more abstract approach proposed by this paper reflects on the context of mobile gaming for cultural learning alongside, and blended with, a wide range of other educational and practical tools for immigrants. Achieving this integration effectively requires reflection on the limitations of game-based learning as well as its strengths: in contexts where information is needed urgently, a game is likely to prove a cumbersome means of transferring this information. However, in contexts in which mobile games are commonly played, for example during travel, a chance to reflect upon cultural differences in a gamified form, with immediate access to educational resources if requested, may prove an effective combination.

Defining the means by which efficacy can be established and measured is another central topic of research. The nature of learning, which includes a temporal component as well as multiple levels of comprehension, can only be assessed to a limited degree by existing instruments such as surveys. In this paper, it has also been posited that game-based learning deployed on a mobile platform represents an ideal opportunity to move the evaluation process away from smaller-scale trials, and towards a larger community of active players. Provided ethical requirements can be met, interesting future potential exists in understanding the rich volume of data these communities might generate in their online interactions, both in-game and in the wider context of the MASELTOV services and social network.

# 6. ACKNOWLEDGMENTS

This work has been supported by the European Commission under the Collaborative Project MASELTOV ("Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services") funded by the European Commission under the eInclusion theme, project FP7-ICT-7 Grant agreement n. 288587.

# 7. REFERENCES

[1] Vygotsky, L., 1970. Mind in Society. Routledge, London.

[2] Muratet, M., Delozanne, E., Torguet, P., and Viallet, F., 2012. Serious game and students' learning motivation: effect of context using prog-play. In Proceedings of the Proceedings of the 11th international conference on Intelligent Tutoring Systems (Chania, Crete, Greece) Springer-Verlag, 2345859, 123-128. DOI= http://dx.doi.org/10.1007/978-3-642-30950-2_16.

[3] Foley, J., 1994. Key concepts in ELT: scaffolding. ELT Journal 48, 1, 101-102.

[4] Stenros, J., Paavilainen, J., M, F., #228, and Yr, 2009. The many faces of sociability and social play in games. In Proceedings of the Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era (Tampere, Finland2009), ACM, 1621857, 82-89. DOI= http://dx.doi.org/10.1145/1621841.1621857.

[5] Khaled, R., Barr, P., Biddle, R., Fischer, R., and Noble, J., 2009. Game design strategies for collectivist persuasion. In Proceedings of the Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games (New Orleans, Louisiana2009), ACM, 1581078, 31-38. DOI= http://dx.doi.org/10.1145/1581073.1581078.

[6] Hofstede, G., Hofstede, J., G. , 2005. Cultures and Organisations: Software of the Mind. McGraw Hill, London.

[7] Biggs, J., Moore, P, 1993. The Process of Learning. Prentice Hall

[8] Wild, M., Henderson, L. , 1997. Contextualising learning in the World Wide Web: accounting for the impact of culture. Education and Information Technologies 2, 179-192.

[9] Collis, B., 1999. Designing for differences: Cultural issues in the design of WWW-based course support sites. British Journal of Educational Technology 30, 3, 201-215.

[10] Seufert, S., 2002. Cultural Perspectives. . In Handbook of Information Technlogies for Education and Training, H. H. Adelsferger, Collis, B., Pawlowski, J., M. Berlin Ed. Springer, New York, 22-35.

[11] Gutierrez, K., Rogoff, B, 2003. Cultural ways of learning: Individual traits or repertoires of practice. Educational Researcher 32, 5, 19-25.

[12] Howard, A., Scott, R, 1981. The Study of Minority Groups in Complex Societies. In Handbook of cross-cultural human development, R.L.M. R. H. Munroe, & B. B. Whiting Ed. National Association for the Education of Young Children, Washington DC, 175-189.

[13] Mcshane, D., Berry, J. W, 1986. Native North Americans: Indian and Inuit abilities. In Human abilities in cultural context, J.W. Berr Ed. Cambridge University Press, Cambridge, UK.

[14] Trigwell, K., Shale, S, 2004. Student Learning and the Scholarship of University Teaching Studies in Higher Education 29, 4, 523-536.

[15] Katakalos, G., Nunes, J. M. B., & Ketikidis, P, 2008. Conflicts Arising from Communication, Collaboration and Cooperation of Students in Multicultural Groups Engaged in e-Learning Activities. In Proceedings of the In Proceedings of EDEN Annual Conference, 2008. (Lisbon, Portugal), 132-140.

[16] Zyda, M., 2007. A Look at the Future of Networked and Mobile Entertainment. In Proceedings of the Proceedings of the 21st International Workshop on Principles of Advanced and Distributed Simulation (2007), IEEE Computer Society, 1249005, 3. DOI= http://dx.doi.org/10.1109/pads.2007.8.

[17] Mitgutsch, K. and Alvarado, N., 2012. Purposeful by design?: a serious game design assessment framework. In Proceedings of the Proceedings of the International Conference on the Foundations of Digital Games (Raleigh, North Carolina), ACM, 2282364, 121-128. DOI= http://dx.doi.org/10.1145/2282338.2282364.

[18] Khaled, R. and Ingram, G., 2012. Tales from the front lines of a large-scale serious game project. In Proceedings of the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Austin, Texas), ACM, 2207688, 69-78. DOI= http://dx.doi.org/10.1145/2207676.2207688.

[19] Serrano-Santoyo, A. and Organista-Sandoval, J., 2010. Challenges and opportunities to support learning with mobile devices. In Proceedings of the Proceedings of the 3rd Mexican Workshop on Human Computer Interaction (San Luis Potosí;, Mexico), Universidad Politécnica de San Luis Potosí; 1978720, 85-87.

[20] Zyda, M., Mayberry, A., Wardynski, C., Shilling, R., and Davis, M., 2003. The MOVES institute's America's army operations game. In Proceedings of the Proceedings of the 2003 symposium on Interactive 3D graphics (Monterey, California), ACM, 641523, 219-220. DOI= http://dx.doi.org/10.1145/641480.641523.

[21] Dunwell, I., 2012. Conducting ethical research with a game-based intervention for groups at risk of social exclusion. In Proceedings of the Proceedings of the 11th international conference on Entertainment Computing (Bremen, Germany), Springer-Verlag, 2405675, 594-599. DOI= http://dx.doi.org/10.1007/978-3-642-33542-6_79.

[22] Derryberry, A., 2007. Serious games: online games for learning (technical white paper). Adobe Ltd.

[23] Raybourn, E.M. and Bos, N., 2005. Design and evaluation challenges of serious games. In Proceedings of the CHI '05 Extended Abstracts on Human Factors in Computing Systems (Portland, OR, USA)

[24] Khaled, R., Barr, P., Noble, J., Fischer, R., and Biddle, R., 2007. Fine tuning the persuasion in persuasive games. In Proceedings of the Proceedings of the 2nd international conference on Persuasive technology (Palo Alto, CA, USA), Springer-Verlag, 1780409, 36-47.

[25] Schwartz, S.H., 1992. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In Advances in experimental psychology, Vol. 25, M.P. Zanna Ed. Academic Press, New York, 1-65.

[26] Smith, P.B. and Bond, M.H., 1998. Social psychology across cultures. Prentice-Hall.

[27] Marcus, A. and Gould, E.W., 2000. Cultural Dimensions and Global Web User-Interface Design: What? So What? Now What? In Proceedings of the 6th Conference on Human Factors and the Web, Texas.

[28] Lukosch, H., Ruijven, T.V., and Verbraeck, A., 2012. The participatory design of a simulation training game. In Proceedings of the Proceedings of the Winter Simulation Conference (Berlin, Germany), Winter Simulation Conference, 2429950, 1-11.

[29] Paletta, L., Santner, K., Fritz, G., Mayer, H., and Schrammel, J., 2013. 3D Attention: Measurement of Visual Saliency Using Eye Tracking Glasses. In Proc. ACM SIGCHI Conference on Human Factors in Computing Systems, Paris.

# Assessing the Reach and Impact of Game-Based Learning Approaches to Cultural Competency and Behavioural Change

Ian Dunwell, Panagiotis Petridis, Petros Lameras, Maurice Hendrix, and Stella Doukianou
Serious Games Institute
Coventry University
United Kingdom
+44(0)2476887688
idunwell@cad.coventry.ac.uk

Mark Gaved
Institute of Educational Technology
The Open University
United Kingdom
2nd line of address
+44(0)1908654821
mark.gaved@open.ac.uk

## ABSTRACT
As digital games continue to be explored as solutions to educational and behavioural challenges, the need for evaluation methodologies which support both the unique nature of the format and the need for comparison with other approaches continues to increase. In this workshop paper, a range of challenges are described related specifically to the case of cultural learning using digital games, in terms of how it may best be assessed, understood, and sustained through an iterative process supported by research. An evaluation framework is proposed, identifying metrics for reach and impact and their associated challenges, as well as presenting ethical considerations and the means to utilize evaluation outcomes within an iterative cycle, and to provide feedback to learners. Presenting as a case study a serious game from the Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Networks (MASELTOV) project, the use of the framework in the context of an integrative project is discussed, with emphasis on the need to view game-based learning as a blended component of the cultural learning process, rather than a standalone solution. The particular case of mobile gaming is also considered within this case study, providing a platform by which to deliver and update content in response to evaluation outcomes. Discussion reflects upon the general challenges related to the assessment of cultural learning, and behavioural change in more general terms, suggesting future work should address the need to provide sustainable, research-driven platforms for game-based learning content.

## Categories and Subject Descriptors
I.3.8 [Computer Graphics]: Applications; K.3 [Computers and Education]: Computer Uses in Education—Computer-assisted instruction; K.4 [Computers and Society]: Social Issues—Employment

## General Terms
Design, Human Factors

## Keywords
Game-based learning; Serious Games; Inclusivity; Cultural learning; Mobile learning

## 1. INTRODUCTION
Game-based learning has been shown to be effective in a wide range of contexts, including cultural learning [1]. However, as with any instructional medium, differences in audience, context, and representational medium each demand individual design considerations. This in turn creates a challenge in translating research outcomes, which typically analyze the efficacy of an individual game, into generalisable findings capable of feeding in to future designs. In Section 2, a range of evaluation methods applied to digital games for learning are described, alongside the challenges specific to cultural competency development. This forms the basis for the framework proposed in Section 3, which seeks to reconcile the unique nature of gameplay as a form of data capture with the need to provide validated research outcomes which allow for comparison to other forms of education. An application of this framework to the MASELTOV project is described in Section 4, alongside an overview of the developed serious game and its role within the project. An important observation is the need to consider the game both as a standalone entity with measurable learning outcomes, and as part of a wider learning process supported by resources and tools across the project.

## 2. BACKGROUND
Assessment of the overall efficacy of an intervention can prove challenging in a cultural learning context. If we seek to simply transfer knowledge, then summative assessment may provide a metric against which to evaluate the efficacy of an intervention. However, factual knowledge in itself does not necessarily equate to attitudinal or behavioural change. Attempts to incorporate competency assessment in a game-based context have noted the high resource demands in creating competency metrics, though their reusability is of value [2]. Such metrics for cultural learning frequently focus on specific cultures and contexts, rather than providing a ubiquitous solution; however, generalizable themes exist: cultural competence is not about an individual being able to emulate another culture, rather, it is about their capability to recognize cultural differences and respond effectively. Knowledge is an important first step in this process, but this knowledge must also be translated to behaviour. This can be perceived as a three-step process in education: knowledge gain results in attitudinal change, which subsequently influences behaviour. Each step

poses both educational and evaluative challenges, since the causal chain includes many cofactors. Consider, for example, the case of road crossing safety: knowledge in this case is a simple rule set of actions required to cross safely, and can be directly assessed. Attitude presents a more complex challenge, as self-reporting of intended safe behaviour may not necessarily equate to safe behaviour in practice [3]. Similarly, cultural competence may be translated into a set of transferrable understandings, though this requires the individual be motivated to apply these in practice.

A systematic review of literature on the efficacy of serious games noted the diverse range of evaluation methodologies and techniques used, in part a consequence of the diverse range of topic areas and fields to which games have been applied [4]. It noted the need for objective, quantitative evidence, such as that generated by randomized control trials, to gain an ideal metric of efficacy. The challenge in practice, however, is that generating such evidence as part of an iterative development cycle is seldom viable, due to the time and costs involved. Furthermore, whilst an approach which utilizes a randomized-control trial may show efficacy when comparing game and control, it generates less insight into how the design might be refined. Consequently, smaller-scale qualitative studies are frequently applied at the design stage to gain this insight in a pragmatic fashion. A further approach to quantitative evaluation specific to the mobile context is presented through Quantitative Evaluation Framework (QEF) [5]. The QEF emphasizes factors in evaluation such as the individual who conducts it, its timing relative to the project, and the purpose of the evaluation. This purpose is a particularly important consideration; as noted an evaluation seeking to feed-in to design may benefit less from a quantitative approach than an overall evaluation of efficacy.

Mobile devices have advantages as platforms for game-based learning, being able, with consent, to report a users location alongside other data which may have relevance at the evaluation stage. Another quantitative evaluation approach considers the technology acceptance model as its basis [6], building upon the notion of uptake resulting from a combination of perceived usefulness and usability. "Usefulness" in the case of game-based learning can prove challenging to define, as a game may be perceived as both a useful form of entertainment, or useful educational resource. Interpreting users' self-reporting, therefore, requires caution in understanding the distinction between these two perceptions, and their implications for game design. Provided this can be ascertained, this can prove a useful tool for establishing the required balance between entertainment and educational aspects.

Considering qualitative aspects in more detail, understanding learner experience can also be of value, with an experience design standpoint having been applied to guide the balance between "positive" and "serious" aspects of a game [7]. Given the need to balance education and entertainment carefully during the development of a game-based learning solution [8], experience design can offer an approach to understanding both the engaging and educational aspects of a game from an end-user perspective. Bocconi et al. [9] note the significance of the "threshold concept" in competency learning, suggesting key transformative points can be defined which result in a step-change in understanding or behaviour for the learner. If such concepts can be identified, then the evaluation process can be simplified by focusing on assessing the learner's understanding of these key concepts, rather than attempting a broader assessment of knowledge. From an educational perspective, evaluation frameworks have noted the need to understand the serious gaming experience from the learner's standpoint, in order to gain a perspective on learning outcomes not immediately relatable to assessment metrics [10].

Pandeliev and Becker propose a framework for online evaluation [11], noting the difficulties in applying in-person experimental protocols. This leads to a significant challenge in the assessment of any online tool seeking to achieve attitudinal or behavioural change, including serious games: Assessment in an online context may allow us to work directly with end-users, though it is unlikely it will facilitate the in-depth understanding which could be achieved through qualitative techniques such as interview or case study. However, it does hold advantages: we are no longer constrained to working out-of-context to evaluate serious games in a laboratory, rather, we are doing research "in the wild" with an online audience. However, numerous considerations emerge when shifting from laboratory evaluation to a real end-user base. Firstly, research is contingent on participants, and this implies the game be capable of attracting and retaining an audience. In any case, this would be the first metric of success, however, assuming an iterative approach is adopted, it has a fundamental consequence for game-based learning: games must get the fun, engaging aspects correct, before researchers can iteratively evaluate instructional efficacy and progress the game's design. Without the capacity to attract and retain users, assessing the educational impact in the wild is impossible.

Given the potential of community formation as a basis for social learning, an argument exists from this perspective to focus firstly on creating an entertainment game and fostering a user-base, then working with this user base through a process such as participatory design to create an effective learning experience. A review of assessment techniques in serious games [12] notes key future research goals to be characterization of players' activity, and better integration of assessment within games. When working with an active end-user base, assessment can provide useful feedback to both the developer of the game, and the learner themselves. In both cases, data from the same source can be collected, and it is the interpretation and presentation of this information that defines it as design input or feedback to the learner.

The application of technologies such as gaze-tracking have shown themselves to be promising metrics for evaluation. A study examining gaze in the specific case of a serious game showed not only a difference between genders, but also the ability to correlate the metric to overall performance within the game [13]. Admittedly, the serious task in this case was not related to behavioural or attitudinal change, and applying this or similar biometrics has limitations in terms of the type of learning a game is seeking to convey, though it remains an interesting area for future work.

An recurrent theme in serious game development is the need for collaboration between a wide range of stakeholders through the development process. Developing digital games requires a game and pedagogical designer: rarely does a single individual possess both skill-sets, and the "tension" [14] between game and instruction requires careful negotiation between the two fields. Furthermore, stakeholders include members of the target audience, subject matter experts, and researchers, as well as the individuals responsible for translating a design concept into a functional prototype, which requires both artistic and technical skills. Participatory design is often advocated, but difficult to

implement [15], in particular as individuals can often report subjectively if a game is "fun", though self-reporting of learning, and in particular impact on attitude, can deviate significantly from objective observations of resultant behaviour [16].

In summary, the challenge in evaluating the efficacy of a digital game seeking to teach cultural competencies is analogous to any other game-based approach seeking attitudinal and behavioural change: simply transferring knowledge does not guarantee this change, and therefore a risk exists in using knowledge alone as a proxy for impact. Cultural competency development also poses some unique questions for researchers and developers of game-based solutions: as we cannot hope to represent the breadth and depth of real-world cultures within the confines of a digital game, how can we distil key principles and identify the "thresholds" [9] at which competencies develop? Can we rely on self-reporting of competences and participatory techniques when seeking to engage in an iterative design process, given the differences in perceptions of usefulness - as game or educational tool - which might emerge from the target audience? This section has presented a range of quantitative and qualitative frameworks. In the following section, we relate these to the specific case of cultural competence development, proposing an evaluation framework applied within the case study presented in Section 4.

# 3. ASSESSMENT FRAMEWORK

Reflecting on the background of the previous section, this Section proposes an assessment approach for digital games applied for the development of cultural competences. Firstly, the two key objectives common to interventions of reach and impact are described. Reach is considered in terms of game deployment and uptake, whilst Impact seeks to consolidate the diverse range of techniques identified in the previous section to form a basis on which to propose clear avenues suited to both the development process of serious games, and the need to demonstrate efficacy. In doing so, we consider two key evaluation contexts: laboratory study, and deployment with end-users. The latter raises a number of important ethical considerations, principally surrounding informed consent, noted in Section 3.3. The subsequent question, given that metrics of reach and impact can be established, is how to best feed the outcomes of research back to both game designers, to support iterative development, and learners themselves, in the form of feedback and progress indicators, discussed through case study and conclusions in Section 5.

## 3.1 Reach

When deployed in an online marketplace, uptake can be measured in terms of number of users, with techniques such as IP geolocation or location awareness applied to gain high-level insight into the demographic. For games targeting general awareness raising this may be sufficient; however, in many cases games seek to target excluded or disengaged demographics. Evaluation in a laboratory context is unlikely to be representative of these groups, as they are less likely to engage with the research process or opt-in to studies. Survey of the player-base is a potential route to gain further understanding of reach, and can be incentivized through in-game rewards such as content or collectables. Correlation, for example, of reported postcode to indices of multiple deprivation can offer a means to gain an understanding of the socioeconomic background of players without requiring explicitly surveying, though must be conducted in an ethical fashion following the principles outlined in Section 3.3. In the case of a game seeking to enable immigrants to develop their cultural competences, such as that described in Section 4, it may also be possible to correlate overall population statistics to total numbers of users, allowing for approximations of reach to target audiences.

## 3.2 Impact

Section 2 illustrates the diverse range of methods by which the impact of digital games for learning has been assessed. Common to many of these methods is a clear distinction between evaluations performed at the development stage, which seek to gain understanding into how the impact of the game might be improved or refined, and those undertaken post-hoc to assess the overall impact in-depth. In the case of the former, qualitative studies using methodologies such as focus groups or case studies have been shown to provide a sound basis for eliciting user-feedback and providing feed-in to the design process. Participatory design is equally valuable, though an objective view of participants' contributions is essential, as individuals willing to form part of a participatory game-design process many not be representative of the target end-user base.

Two differing design-phase approaches to sourcing participants exist: either laboratory-based evaluations, which recruit participants through standard experimental protocols, or research with the emerging player community for the game. The latter has potential benefits; involvement in the development of the game itself can stimulate engagement, and result in learning amongst participants through the process of making, as well as playing the developing game. Returning to the need for balance between entertainment and education noted in Section 2, this does, however, place pre-requisites on the game's design and development: it must be developed in a form suitable for engaging and retaining a community in the participatory development process, and therefore requires the entertainment aspect be brought to the forefront in early stages of development. During the development stage, assessment of impact may be broken down into a subset of requirements for the game. This is advantageous for a game's designer, as feedback from user testing can be transposed more easily to adaptations of individual game elements, rather than reporting on the game as a whole.

Following the iterative development process, a clear point should be defined at which to progress to a more detailed assessment of efficacy using a methodology such as a randomized control trial. This need not serve as an end-point to the development process, rather, it should be made explicit - in view of the impact of purpose on study design noted in Section 2 - that the goal of the evaluation is to provide a clear assessment of the overall efficacy of the game-based approach. Again, the comparison here is between performing this evaluation using an active end-user base of the game, or working within a laboratory context. Previous meta-analyses have advocated the use of randomized control trials as post-hoc evaluations [4], though challenges exist in their implementation. What, for example, can serve as a control for a serious game? Comparing versus no intervention can have limited value, unless clear quantitative metrics can demonstrate the extent of impact, or the methodology allows for clear and direct comparison to other interventions or training programmes. One option is to compare differing versions of the game, which may generate useful information for subsequent development. Though games make be a unique case in some respects, as part of an overall learning programme, methods used to validate and evaluate previous learning approaches may also hold merit.

Developed metrics for cultural competencies can be applied to create a comparable assessment of impact.

The final consideration, therefore, is how these metrics might be applied in both the real-world and laboratory context. Self-reporting of competency, for example, may vary between these two contexts, as participants directly communicating with the research develop bias towards positive reporting when compared with online users detached from the research process. Where practical, therefore, a combined approach seeking to gain in-depth insight in a laboratory context, coupled to larger-scale data collection from the game's playerbase, has obvious merit.

## 3.3 Ethical Considerations

Whilst ethical principles and practices can be adhered to in a laboratory setting with relative ease, as the researcher has direct contact with participants to ensure informed consent, research with online audiences can prove a more complex issue. Consent information can be overlooked or "clicked-through" in the desire for the player to experience the game, thus, a design requirement is that consent should be given in an opt-in fashion, with the player able to fully review the implications of their consent. As games may be intrinsically incentivizing to play, a risk also exists of players consenting to gain access to the game, rather than in an informed and ethical manner. Hence, a further advocation is that access to the game should be provided irrespective of a player's consent to participate in the research process. In the case of cultural learning and competency development, members of the target audience may also possess limited language skills, and consent approaches should demonstrate awareness of, and support for, communication of research objectives and the implications of participation to these players.

## 3.4 Implementation

Some final consideration should be afforded to how the nature of a game's design and deployment can contribute to the application of the metrics identified in Sections 3.1 and 3.2. Content distribution platforms, such as Google Play, are increasingly allowing developers to not only reach wide audiences, but also gain insight into their behaviour through the integration of metrics within the game engine. Noting the ethical considerations in Section 3.3, care should be taken to ensure informed consent is sought, but with such mechanisms in place it becomes possible to quickly ascertain metrics of reach, such as the geographical distribution of players, and impact, through measures such as playtime. However, a more concrete demonstration of impact in educational or behavioural terms can also require participants self-report or agree for their performance to be monitored. Here in particular mobile platforms can serve a useful purpose in allowing participants to self-report data on the move, and games can provide a means for incentivizing and sustaining involvement in the research process, for example rewarding participation in surveys with in-game items.

# 4. CASE STUDY I: MASELTOV

The Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Networks (MASELTOV) project seeks to apply a range of services to support the integration of immigrants entering Europe. Game-based learning is deployed within the project with the aim of reaching audiences who may not respond to more formal learning resources, and to convey cultural learning in an engaging and immersive form. The use of mobile technologies within the MASELTOV project is reflected in the game's use of the Android platform as a basis for deployment.

To address the challenge of providing cultural learning both within the context of the project, and in a form suitable for deployment on Google Play, several themes have been considered. The game seeks to empower the user through a fictional narrative which places them as a hero seeking to reconcile a "dimensional split", in which reality has divided into two discrete dimensions, each with a distinct culture. Hence, they are required to traverse the two dimensions as they move through the game world, experiencing cultural differences first-hand. Dialogic interactions are used extensively, with users having the freedom to choose a variety of responses to situations and experience the consequences. Success requires they develop their understanding of each of the two cultures, and apply this understanding to problem-solve. The narrative of the game takes the player through themes including travel, jobseeking, healthcare, and shopping, with problems faced derived from discussion with non-governmental organizations (NGOs) working with immigrants on a daily basis.

Empowerment is a common and demonstrably effective approach used in games seeking to influence behaviour [17]. It appears particularly suited to the case of a game for immigrants, as cultural exclusion can be seen to be linked to disempowerment: excluded immigrants feel they have no role in influencing their host country's attitudes, policies, and systems. Following the theme of empowerment, we adopt an approach taken by other serious games, which combines a partially-abstracted narrative together with an overarching story seeking to both reflect common challenges faced by immigrants, whilst presenting this from a position of empowerment.


**Figure 1: Screenshot from the MASELTOV game. Avatars and dialogues are used to convey cultural learning content.**

This potential has been reflected in a number of studies seeking to utilise and understand the role a game might play in empowering an individual or community. An example of their use to empower hospital patients showed efficacy in a real-world context [17], supporting the view that games can empower the player through a range of mechanisms. Narrative is one means by which to achieve this [18], as characterization and identification can be utilised as tools by which to transpose real-world problems arising from lack of empowerment, to ones which have identical traits, but are viewed from a different perspective. Consider, for example, the case of an immigrant seeking work - in a real-world context, they may feel disempowered, with little control over whether they achieve success. In a game, however, success may be granted when pedagogical objectives have been achieved, and the

simplification of the process itself to focus on key learning objectives lends itself to a format in which the individual has greater control over the outcome.

Abstraction is used within the game to allow a degree of separation from real-world simulation. The world itself is fictional, as are the two distinct cultures, however, the themes and problems faced by the player are grounded in reality. This circumvents the difficulty in accurately simulating intercultural interactions, as well as criticisms arising from attempts to describe the behaviour of an individual real-world culture in specific or superficial terms.

Finally, the game seeks to apply an experiential learning paradigm, a common approach in game-based solutions [19, 20]. Coupled with abstraction and empowerment, the game seeks to allow the user to experience situations and learn through their actions and responses. An in-game journal system scaffolds the reflection process by updating the player with their characters observations and conclusions regarding cultural differences and how best to approach situations. This in turn seeks to link to additional resources within the project which provide more formal or specific learning materials. Kolb's theory of learning through experience [21] has seen much attention from game- and simulation-based learning communities [19, 20, 22]. It has clear parallels related to how games can allow players to explore problems, devise solutions, and observe the consequences of their actions.

**Figure 2: Areas such as the job centre allow players to observe the differences between cultures in the job application process.**

By allowing the player to experience situations in which cultural differences present themselves as difficulties, and guiding them towards solutions, a platform for experiential learning might be created. Some cautions arising from Kolb's theory are required, however: firstly, the notion of the "intuitive" learner put forward by Kolb and intrinsically related to the experiential cycle has consequences in terms of how we might assess and feed-back to learners. The intuitive learner, by this definition, takes an exploratory approach to learning, exploring worst as well as best cases: for example, when confronted by a dialogue choice, they may deliberately answer incorrectly or inappropriately to explore the outcome. This in turn means attempting to assess competence by the "correctness" of actions in game has limited value, and consequently seeking to feed-back to a learner their errors may be met with resistance or negation.

Hence, the effective application of the experiential cycle in-game requires the development of branching or open-ended scenarios, that allow the intuitive learner to play-through and explore multiple outcomes and possibilities. Another trait of this form of learner is their tendency to return to scenarios multiple times to observe different outcomes, and games can support this through additional play-thoughs. End-user testing on-site at NGOs has been utilized to gain early qualitative insight into the design of the game and immigrants' responses. Usability has been a key focus of this study, particularly as the immersive environment delivered by the game must be coupled with an interaction paradigm which is sufficiently intuitive for a wide range of levels of gaming experience. Feedback identified themes such as navigation to be central considerations in development, with the need to be able to intuitively and rapidly negotiate the game world having implications for the interface design.

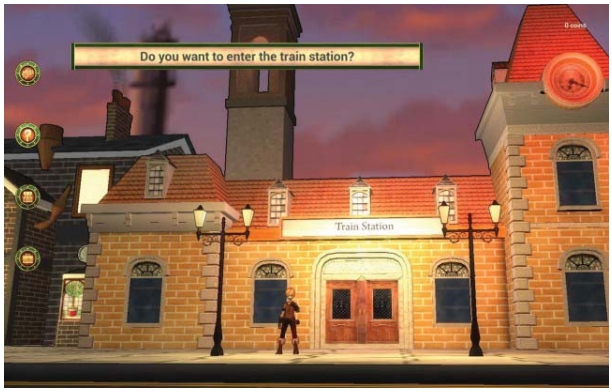



**Figure 3: Environments in the game reflect the real world, though in an abstracted form.**

A limitation of this on-site testing, however, is that the users are self-selecting and already engaged with NGOs. As the game seeks to reach a wider audience, in particular immigrants who may not be aware of or utilize NGO or online cultural learning resources, gaining representative insight into this segment of the target demographic is a key goal of future research. Deployment of the game via Google Play will be coupled with the considerations presented in Section 3, towards providing a means for understanding the audience responding to the game, and its subsequent impact. This impact may either be in direct terms of cultural learning outcomes, self-reported by players through survey incentivized via in-game reward, or objective metrics such as the proportion of players who transition to using other MASELTOV services and learning content.

## 5. CASE STUDY II: THE BEHAVIOURAL ECONOMICS OF ENERGY USE

The challenge of shaping individuals' behaviours is vital in tackling many social problems, including environmental concerns. Citizens may, for example, find it difficult to think that their individual behaviour has a meaningful impact on large-scale problems such as loss of energy sources and carbon emissions. Even though people may express environmental awareness, this is not always translated to environmentally-friendly way of life. Human behaviour is multifaceted, and driven by innumerable factors such as genetic predisposition, socioeconomic status and education. These factors interact, giving rise to vast amount of different traits. Nevertheless, social scientists have proposed various behavioural Theories and models that can take into account these factors and predict how they can influence behaviour. Hildebrand Technology Ltd, a consultancy company is currently working on a project which will help citizens compare and reduce their energy, incorporating these behavioural theories

in serious games. The purpose is to shape consumers' attitude towards environmentally-conscious behaviour, through comparison, education and feedback. The project *Game Mechanics as Motivators: The Behavioural Economics of Energy Use* proposes to link a serious game with energy sensors within the participants' houses. Games driven by real-time data seek to offer a simulating environment where users will complete challenges and goals towards a positive impact on their behaviour. The game will allow users not only to stay informed about their own energy consumption, but also to see if they are high, medium or low energy users, compared to others in the same category.

A serious game which targets the general public about a change of energy usage needs to be based on predictive models. These predictive models enable the designer to create different scenarios inside the game, adapted to human's attributes and hence increasing their influence on behaviour. Serious games can become an easy and effective method of collecting the data so as to create these models. Thus far within the project, two games are being created, prior to the game for energy, in order to examine two aspects of human behaviour: risk tolerance and patience. Risk tolerance has concerned psychologists, economists, social scientists and marketers a long time ago, since people's attitude towards risk can be used potentially to encourage them to eat healthier, exercise more and even consume less energy [23]. The game related to risk-taking is based on a Lottery Behavioural Task [24] and will classify people according to their perception towards the changes in probability. This classification will allow us to measure the degree of risk aversion. Regarding the second important personality trait, patience, is more complex than risk tolerance since it consists of multiple dimensions [25]. There are different kinds of patience. In this project, patience will be referred as the perception of the immediate pay offs to larger more distant ones. The tendency of people to choose smaller immediate rewards to larger but more delayed is connected not only with the proneness to addiction [26] but also with environmental action.

A foremost challenge in this project is understanding the reach and impact of game-based intervention on end-users' behaviours. Hence, the project seeks to foster engagement with participants that will follow up and commit to the experiments, in an "in the wild" context, as described in Section 3.2. The games for patience and risk measure two traits that are notoriously difficult to capture in small-scale experiments and no matter the quality of them there is always the possibility to misinterpret the results. Moreover, risk and patience are general traits that sometimes are coupled with certain activities and it can become complex to design an ideal behavioural task that will not include bias. Consequently, a sufficient sample of real-world end users is required to gain insight into the impact of interventions.

# 6. CONCLUSIONS

Games provide a rich source of data on user interaction. Their use as research instruments is well-documented [27], though the need described in Section 2 to better integrate the assessment process into the game [12] represents only one potential approach. An alternate technique is to record information in a form suitable for externalized analysis. This requires rich data capture be implemented into the game, recording in detail user interactions ranging from individual touch interactions on a mobile device, though to higher-level information such as content preferences and engagement times. This has appeal from a research perspective, as it has the potential to open up access to data captured during gameplay to a wide range of analysis tools and techniques. In such an approach, the requirement is not that the assessment is incorporated into the game as a whole, rather, that the externalized data can be used to generate feedback communicated either through the game itself, or a wider, blended learning approach.

In the case of integrative approaches combining multiple tools, such as that of MASELTOV presented in Section 4, a blended approach to learning which seeks to support learners in traversing a wide range of tools and resources requires that the impact of the game be consider and evaluable in wider terms. Games may provide a valuable starting point for learners, particularly where desired learning outcomes require they first engage and acquire intrinsic motivation to learn, rather than requiring extrinsic motivators. Whilst evaluating and understanding individual components of a blended learning experience can guide development, assessing the joint impact of these components and their interplay is also frequently required.

In conclusion, a clear need exists for two distinctions in the evaluation process for game based learning approaches to cultural competence development. The first is the distinction between evaluations which seek to gain insight into the behaviour of the players of the deployed game (or prototype), compared to evaluations which take place in a laboratory context. Both have merits; the former consists of a representative sample, and can provide valuable information into the impact of the game on its target audience, the latter allows researchers greater access to participants and hence more qualitative insight.

# 7. ACKNOWLEDGMENTS

This work has been supported by the European Commission under the Collaborative Project MASELTOV ("Mobile Assistance for Social Inclusion and Empowerment of Immigrants with Persuasive Learning Technologies and Social Network Services") funded by the European Commission under the eInclusion theme, project FP7-ICT-7 Grant agreement n. 288587.

# 8. REFERENCES

1. W. L. Johnson, "Developing intercultural competence through videogames," in Proceedings of the 2009 international workshop on Intercultural collaboration, Palo Alto, California, USA, 2009.
2. S. A. Petersen and M. A. Bedek, "Challenges and opportunities in evaluating learning in serious games: a look at behavioural aspects," in Proceedings of the Third international conference on Serious Games Development and Applications, Bremen, Germany, 2012.
3. M. A. Elliott and C. J. Baughan, Adolescent road user behaviour: A survey of 11-16 year olds. . Crowthorne, UK: Transport Research Laboratory Ltd., 2003.
4. T. M. Connolly, E. A. Boyle, E. MacArthur, T. Hainey, and J. M. Boyle, "A systematic literature review of empirical evidence on computer games and serious games," Comput. Educ., vol. 59, pp. 661-686, 2012.
5. P. Escudeiro and N. Escudeiro, "Evaluation of Serious Games in Mobile Platforms with QEF: QEF (Quantitative Evaluation Framework)," in Proceedings of the 2012 IEEE Seventh International Conference on Wireless, Mobile and Ubiquitous Technology in Education, 2012.

6. A. Yusoff, R. Crowder, and L. Gilbert, "Validation of Serious Games Attributes Using the Technology Acceptance Model," in Proceedings of the 2010 Second International Conference on Games and Virtual Worlds for Serious Applications, 2010.
7. T. Marsh and B. Costello, "Experience in serious games" in Proceedings of the Third international conference on Serious Games Development and Applications, Bremen, Germany, 2012.
8. M. Zyda, "From Visual Simulation to Virtual Reality to Games," Computer, vol. 38, pp. 25-32, 2005.
9. S. Bocconi, Y. Bachvarova, M. Ruskov, and M. F. Oliveira, "Dealing with threshold concepts in serious games for competence development," in Proceedings of the Third international conference on Serious Games Development and Applications, Bremen, Germany, 2012.
10. S. d. Freitas, G. Rebolledo-Mendez, F. Liarokapis, G. Magoulas, and A. Poulovassilis, "Developing an Evaluation Methodology for Immersive Learning Experiences in a Virtual World," in Proceedings of the 2009 Conference in Games and Virtual Worlds for Serious Applications, 2009.
11. V. T. Pandeliev and R. M. Baecker, "A framework for the online evaluation of serious games," in Proceedings of the International Academic Conference on the Future of Game Design and Technology, Vancouver, British Columbia, Canada, 2010.
12. F. Bellotti, B. Kapralos, K. Lee, P. Moreno-Ger, and R. Berta, "Assessment in and of serious games: an overview" Adv. in Hum.-Comp. Int., 2013.
13. M. D. Kickmeier-Rust, E. Hillemann, and D. Albert, "Tracking the UFO's paths: using eye-tracking for the evaluation of serious games," in Proceedings of the 2011 international conference on Virtual and mixed reality: new trends - Part I, Orlando, FL, USA, 2011.
14. K. Isbister, M. Flanagan, and C. Hash, "Designing games for learning: insights from conversations with designers," in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Atlanta, Georgia, USA, 2010.
15. H. Lukosch, T. v. Ruijven, and A. Verbraeck, "The participatory design of a simulation training game," in Proceedings of the Winter Simulation Conference, Berlin, Germany, 2012.
16. E. M. Raybourn and N. Bos, "Design and evaluation challenges of serious games," in CHI '05 Extended Abstracts on Human Factors in Computing Systems, Portland, OR, USA, 2005.
17. C. Caldwell, C. Bruggers, R. Altizer, G. Bulaj, T. D'Ambrosio, R. Kessler, and B. Christiansen, "The intersection of video games and patient empowerment: case study of a real world application," in Proceedings of The 9th Australasian Conference on Interactive Entertainment: Matters of Life and Death, Melbourne, Australia, 2013.
18. B. Mallon and B. Webb, "Stand up and take your place: identifying narrative elements in narrative adventure and role-play games," Comput. Entertain., vol. 3, pp. 6-11, 2005.
19. L. Naismith, E. G. Blanchard, J. Ranellucci, and S. P. Lajoie, "EAGLE: An Intelligent Tutoring System to Support Experiential Learning Through Video Games,"in Proceedings of the 2009 conference on Artificial Intelligence in Education: Building Learning Systems that Care: From Knowledge Representation to Affective Modelling, 2009.
20. A. C. Siang and G. S. V. R. K. Rao, "E-learning as computer games: designing immersive and experiential learning," in Proceedings of the 5th Pacific Rim Conference on Advances in Multimedia Information Processing - Part II, Tokyo, Japan, 2004.
21. D. A. Kolb and R. Fry, Eds., Toward an applied theory of experiential learning. (Theories of Group Process. London: John Wiley, 1975.
22. G. Liu, Z. Jiao, and S. Liu, "Tutoring Strategy Study on Game-Based Experiential Learning in Vocational School," in Proceedings of the 2009 First International Workshop on Education Technology and Computer Science - Volume 03, 2009.
23. P. Dolan, M. Hallsworth, D. Halpern, D. King, R. Metcalfe, and I. Vlaev, "Influencing Behaviour: The Mindspace Way'." Journal of Economic Psychology, vol. 33, pp. 264-277, 2012.
24. C. A. Holt and S. K. Laury, "Risk Aversion and Incentive Effects'. American Economic Review no. 92, vol. 5, pp. 1644-1655, 2002.
25. M. Luengo, M. Carrillo-De-La-Pena, and J. Otero, "The Components of Impulsiveness: A Comparison of the I. 7 Impulsiveness Questionnaire and the Barratt Impulsiveness Scale," Personality and Individual Differences, vol. 12, pp. 657-667, 1991.
26. Y. Ohmura, T. Takahashi, and N. Kitamura, "Discounting Delayed and Probabilistic Monetary Gains and Losses by Smokers of Cigarettes," Psychopharmacology, vol. 182, pp. 508-515, 2005.
27. E. H. C. Gámez, P. Cairns, J. Gow, J. Back, and E. Capstick, "Video games as research instruments," in Proceedings of the 28th of the international conference extended abstracts on Human factors in computing systems, Atlanta, Georgia, USA, 2010, pp. 4493-4496.