

# Design Thinking Process for a Gamified Mobile App to Improve Migrants' Well-Being and Inclusion

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**Keywords:** Mobile Health App, Multiculturalism, Gamification and Game-Based Learning, Mobile-Assisted Learning.

**Abstract:** An app with digital storytelling and gamification represents a key element in promoting the learning of the typical terminology of the socio-health context that aims to ensure the psychophysical well-being and inclusion of migrants by removing language and cultural barriers, improving access to essential Italian health and social services by using sports as a vehicle for learning and socialization. The application could be integrated as an educational tool in integration centres or schools to encourage understanding of health concepts in an interactive and engaging way. The research study conducted the iterative user-centred "Design Thinking Process", which includes the phases of empathy, definition, ideation, prototyping, and testing. In the living labs, we have gathered feedback from ten adolescent migrants who were co-designers of the iterative development, which enabled us to collect data to evaluate the app's usability, effectiveness, and social impact on migrant quality of life. Analysis of the feedback revealed that the app's usability and intuitiveness have the potential to be effective and well-accepted, as they enable language skills about social and health terms simply and pleasantly and consequently facilitate access to social and health services by improving migrants' mental-physical health and social integration.

## 1 INTRODUCTION

The ability to understand and speak the language of the host country is a fundamental key to the social inclusion and psychophysical well-being of migrants. However, this ability may turn into an insurmountable obstacle when a migrant tries to access health services.

As stated by (Harsch and Bittlingmayer, 2018) Health literacy (HL) is important for migrants' health as they often have difficulties interacting with the host health system and HL is not only about learning words and procedures but also about developing skills and confidence. This study states that different approaches help migrants to acquire the necessary language skills, but traditional language courses are only partially useful for learning health literacy.

Tangible evidence is provided by (Peguero, 2024) in which language acquisition was considered a key pillar for the successful integration of refugees and immigrants into host societies.

Furthermore, an important issue is the lack of inclusivity dimensions in traditional language teaching methods. The context of migrants requires the alignment of the language teaching process with the cultural background of both the target migrants and the host country. In addition, the intersection of migrants' different personalities and caregivers including ethnicity, religion and economic status influences the experience and treatment in society of these people, which further illustrates the need to design training programs tailored to the target learners. In this perspective, this study (Peguero, 2024) highlights how innovative language learning approaches that consider social integration and multiculturalism have a positive effect on migrants' well-being.

Moreover, it is essential to realize that cultural differences between doctors and migrants may influence their perception and understanding of healthcare concepts. Therefore, it must be ensured that their cultural knowledge is enhanced and

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gradually integrated with the new healthcare practices of the host country. A strategic point is precisely the health domain where migrants' needs are met, paying attention to cultural differences starting with greetings, then physical contact, and, finally in the description of symptomatology. The last is very much influenced by the migrant's concept of illness as this very often comes from the theories of his/her religion and superstitions that are different from Western medical culture as pointed out by data collected by Italian Government (Italian Government, 2024). This cultural influence may compromise the understanding of pathology and its therapeutic plan. Therefore, it is crucial to compare migrants' conceptions of health with those of Western medical culture to successfully deal with relational and communication problems with physicians to achieve an inclusive and respectful health service.

For the protection of migrants' health and integration in Italy and in Europe, regulations and guidelines have been defined with the aim of promoting equal access to the various services offered to migrants.

Indeed, the Italian Constitution (art. 32) declares as fundamental the right to health of all human beings regardless of socio-economic status. In fact, this is how the Action Plan for Integration Inclusion 2021-2027 (European Commission, 2021) presented by the European Commission opens: "The European way of life is inclusive. Integration and inclusion are the key for people coming to Europe, for local communities, for the long-term well-being of our societies and for the stability of our economies" and this underlines that "Integration and inclusion are the key for people coming to Europe, for local communities, for the long-term well-being of our societies and for the stability of our economies because integration is a right and a duty for all.

Consistent with the objectives of sustainable development, these directives contribute to the physical, mental and social wellbeing of migrants but also to the economic development of host communities. In fact, there are international organizations such as (Rocca, 2017) the International Organization for Migration (IOM) that collaborate with the Italian government to improve the living and health conditions of migrants, promoting inclusive health policies and programs to ensure a growing awareness of the state of health and a greater cultural sensitivity in the prevention, diagnosis and treatment paths of the Italian and European health system.

Within this political and humanitarian scenario, day by day there are more and more migrants in Italy (Italian Government, 2024) and this phenomenon

contributes to the increase in the diversity of society which raises new challenges not only for the inclusion of newcomers but for the removal of barriers to access to Italian social and health services. One significant obstacle is communication in a new language, which in social and health care environments could be a risk to migrants' psychological and physical well-being as they often find it difficult to understand clinical terms essential to understanding how they can use Italian health services useful for managing their physical and mental health status.

In this context the research within the project PG4I, Persuasive games for Integration, have designed and developed a mobile app to support learning of Italian language. The app is addressed to unaccompanied foreign minors who needs to learn Italian to communicate with doctors who take care of them.

## 2 BACKGROUND

In a world where communication is central, the inability to communicate represents a significant obstacle to the integration of newcomers into local society. An increasing number of studies, as reported also in this literature (Ahmad et al., 2013), have addressed this problem in order to overcome social exclusion, or at least support individuals in their learning path through innovation and non-formal learning approach. According to (Peguero, 2024), which describes a case study on a 'Mobile Language Learning App' for young refugees, the positive impact of mobile apps, which offer interactive and always-accessible resources to improve their language skills, is highlighted.

Therefore, to enable migrants to adapt to new contexts with greater confidence, facilitating language proficiency, social connections and a sense of belonging, the European Council piloted the (Rocca, 2017) in Italy from February to April 2017, a tool consisting of 80 resources, including guidelines, tips, evaluation tools, teaching materials and activities to support language learning as a tool for health. It was shown that around 80 per cent of the participants found these mobile devices and activities to be easy to use and understand.

In fact, several mobile learning apps have already been developed to teach Italian language such as Atatya, Presente and Fare parole 1/2, and particularly Migreat, Rebuild, Workeen and Drops, which are among the most used by migrants (Torsani and Ravicchio, 2021) (Buono et al., 2019).

In addition, the site of the Ministry of Work and Social Policy has set up the Portal Integration Migrants, which offers a collection of freely accessible courses, apps and online games to learn Italian (Torsani and Ravicchio, 2021).

However, these solutions do not focus specifically on sociosanitary terms by using a playful approach to facilitate the social inclusion and mental and physical well-being of migrants. Given that the digital revolution plays an essential role in improving the quality of life of migrants and the potential of mobile apps is important and enables the integration of migrants within the social network of our cities, our project wants to distinguish itself from existing state of the art solutions, as it innovatively involves migrants actively in the application design process by combining the use of storytelling and gamification setting the game in the football scenario an environment familiar to them.

This development methodology will allow us to identify and meet the needs of migrants, aligning the process of teaching the new language with the cultural diversity of the target users of our project.

### 3 DESIGN THINKING PROCESS

Design Thinking (Denning, 2013) (Figure 1) is an iterative, nonlinear process designed to understand users, their needs, and the context in which they will use the application. This method is based on five main phases: Empathize, Define, Ideate, Prototype, and Test. Through this approach we were able to introduce an innovation in this research: putting migrants at the center of the design and development process of the gamified app. This involvement allowed us to develop an innovative, intuitive, and easily usable solution for the target users in a way that truly meets the health needs of migrants as also highlighted by Eriksson (2005).

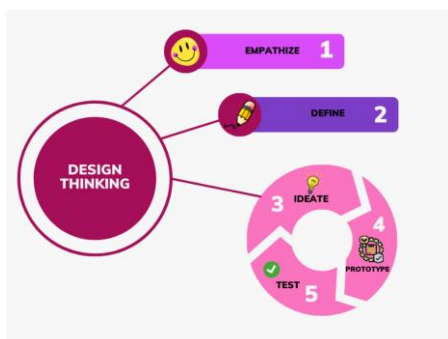


Figure 1: Design thinking process.

The first phase is useful to empathize with targeted people to understand their needs, expectations, motivations, and interest in the IT solution. In this project studying the target users was essential since their cultural background and experiences were starkly different from those of the researchers.

The second phase aims at defining the core problem to be tackled, the third phase is focused on the ideation of the solution, which will be prototyped and tested in the other two phases.

#### 3.1 Empathize

The design of the application required some meetings with the target group to create a collaborative and constructive atmosphere in order to gather some information about their interests and to create an empathetic connection with young adolescents in fact, as pointed out by (Zipfel et al., 2022), co-design is valuable for developing effective health solutions.

The first meeting was focused on outlining the goals of the PG4I project and gathering desired outcomes from the ten young migrants: three English-speaking, four French-speaking, and three Arabic-speaking, with a cultural mediator facilitating translations.

It is important to emphasize that, due to the vulnerability of the unaccompanied minors involved and the legal regulations in force (Art.8 GDPR, 2016), it was not possible to collect further detailed personal data.

Moreover, as they were diffident children, they were not inclined to share their personal data, also in view of the legal procedures for the protection of minors.

In fact, during the presentation, they expressed concerns about participating in the project, as their previous involvement had been superficial, and they had never seen a project come to completion.

To solve this problem, additional meetings were scheduled to motivate and engage them.

The first additional meeting included Michele Salomone, a radio commentator who follows the Bari football team, who told interesting stories about football and famous players from their home countries. In addition, another meeting included the participation of Walid Cheddira, a player of Moroccan origin who played for the Bari football team.

### 3.2 Define

Based on opinions gathered from both migrants and center workers, the content of the mobile app was focused on the main interest of the young migrants: the football and the healthcare issue that was the focus of the research project, as the title suggests “Pervasive games for a healthy integration”. In addition, the screen prototype of the mobile app was presented, and some feedback were collected about the content and the app interface.

### 3.3 Ideate

To support the acquisition of a basic Italian vocabulary, the content has been organized into mini games to train listening, reading, and writing skills.

The approach of using mini games is well-documented in literature to foster micro-content and specific skills (Smith and Snchez, 2010) (Anonymised). The mini games might include tasks such as correctly composing an Italian sentence to enhance writing skills, recording a voice response to a question about a football scene or a conversation with doctors to improve speaking abilities, as well as strengthening listening and reading skills (Figure 2).

Additionally, simulations of themed dialogues in the football and healthcare domains could be very beneficial. For example, a user might take on the role of a player who must score a goal or explain typical football-related injuries to a doctor.

Multilingual exercises with pronunciations of various phrases and words, also available in French and English, would facilitate understanding the activity requirements, particularly since most of the minors are illiterate.

These exercises should be of short duration to avoid boring or tiring the user, aiming to keep the minor's attention high. The app leverages the self-explanatory nature of images and feedback to support learning.



Figure 2: An example of mini games to train listening, reading, writing skills.

### 3.4 Prototype

This idea has led to the development of the first prototype of Play4Health (Figure 3), an app that transforms a simple dictionary for learning medical terminology of the Italian language into a gamified application set in the football scenario, with the purpose of addressing an innovative perspective using the design thinking process, combining digital storytelling and gamification.

Specifically, the user interacts through his or her cell phone, solving mini puzzles during the narrative and receiving rewards that encourage him or her to continue playing, in line with the objectives of gamification as mentioned by (Kiryakova et al., 2014). This playful approach makes learning complicated concepts in healthcare more enjoyable, simple, and engaging.

To enable users to use vocabulary in more complete linguistic contexts, a storytelling section was developed to propose possible dialogue scenarios. Again, the content relates to the two topics identified during the empathy phase: football and healthcare.

To maintain the minigame approach, the structure of each story is structured with multiple paths, each consisting of three episodes made up of four or five steps that require the user to interact to advance the story. From the home screen, the user chooses the story to immerse themselves in each story features an avatar that engages them in a dialogue. To progress in the story, the user must provide responses and is guided by positive and negative audio and visual feedback, using colors and animations to ensure the message is clear.

An example of storytelling is depicted in Figure 3. It involves a coach welcoming the user and inviting him or her to play. The first thing is to introduce the basic rules of football, such as the number of players in a typical match, the players' roles, and the correct positioning of players on the field. The user interacts with his device, responding to the avatar by choosing the correct answers. After, the avatar invites the user to step onto the field and apply the rules just reviewed in the next episode's match.

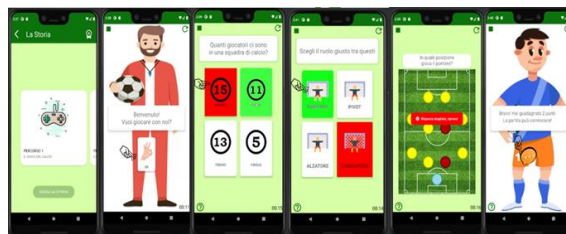


Figure 3: An example of storytelling.

Solving the mini-games by interacting through his or her device, the young migrant understands the story that evolves as he or she completes the paths but it is important to make use of game elements (Figure 4), such as levels, scores, and rewards that once unlocked will always be viewable in specific sections of the app, to motivate and engage the user in learning non-minor concepts such as “social-sanitary” topics in a playful context, such as the game of football.

The use of storytelling makes the learning process more fun and challenging, but the idea of awarding stars as rewards at the end of each path consolidates the achievement of the goal of the serious game encouraging users to continue playing and following the various paths designed to improve language skills in a personalized way and with various levels of difficulty.



Figure 4: An example of gamification.

### 3.5 Test

The testing phase of the iterative "design thinking process" was carried out by performing the following sequence of tests:

- **Debug Test:** system test to detect and fix bugs in the application. Since the development of the Play4Health app software is written in Java 17, built with the Gradle 7.2 tools and Android SDK 31, all accessible with the Android IDE Studio Bumblebee 2021.1.1, for the app's debugging tasks, both the virtual device Pixel 3 XL, known as Android Virtual Device (AVD), available in the development environment among emulators, and a physical Android device, the phone LG K30 were used.
- **Alpha Test:** an informal usability test with the support of the IT department's help desk users, teachers and students involved in the PG4I project who interacted with the application to identify malfunctions that needed to be

corrected and some terms and non-intuitive interactions that needed further simplification.

- **Beta Test:** usability testing with target users has proven to be very useful to identify further misalignments between the requirements defined in the early stages of the iterative process such as empathizing, ideation and prototyping than implementation. The aim is to assess the usability and effectiveness of the research result, and to collect feedback from the target users of the project with a view to identifying areas for improvement. In this regard we have set up a further and final meeting with the target group of the design thinking process to which the final app was made available and they were immediately ready and eager to try the app born from their needs and for which they themselves have been co-designers.

From the analysis of the tests carried out, it was immediately evident that the familiar and social influence of mobile devices have in our lives, as they are accessible, effective and interactive. It made easy for users to understand how to use the various functionalities of the application without any particular problems in interacting with the device.

Users found the app's interface easy to navigate and therefore the main features were accessible and understandable for everyone.

In addition, game elements such as challenges, levels and awards made learning fun and engaging, allowing teenagers to maintain a high degree of interest and participation. During the test it was immediately evident how the interactive and playful methodology facilitated the memorization of non-minor concepts such as those of the "socio-medical" context in fact users have shown a significant improvement in understanding and use of these new terms during the completion of mini-games.

Digital storytelling was particularly appreciated by the migrants as the stories and scenarios with the medical avatars and footballers during football matches were perceived to be realistic and relevant. The users have pointed out the clarity and simplicity of the terms used during short and natural conversations with avatars in the narrative.

Many of the target users have unexpectedly appreciated how the playful value has made learning these daily but complex concepts less stressful and more enjoyable, thus considering as strengths the simplicity and clarity of the functionalities that the application offers them.

## 4 CONCLUSIONS

This research study has illustrated how the innovative use of the "design thinking process" approach centered to the young migrant led to the creation of an effective and engaging educational application for adolescents who need to learn complex social and health concepts.

The app combines digital storytelling and gamification to make learning about health concepts less stressful and more enjoyable. In fact, the application not only allows to improve skills and Italian language understanding, with particular attention to the essential medical terminology to know, but it allows to remove the barriers to access to Italian health services, thus facilitating social inclusion and promoting the psycho-physical well-being of migrants through an interactive application that uses football as a vehicle for playful and engaging learning.

In view of further developments, based on the target users' feedback, co-designers of the app, to reach a wider set of users, a common idea was to adapt interface to different types of screens and device resolutions, perhaps the most used by migrants. In this regard, the app's activities could also be designed for young migrant women as it is primarily health-centered in a more male-dominated context.

Instead, to ensure a better user experience, we could also make the storytelling narrative multilingual (possibly in French and English) so that it can be used in different medical and educational contexts. Many target users have also suggested that additional in-depth functionality could be added on some social health services or the possibility of introducing more personalized medical avatar conversation activities. To achieve this, a future proposal could involve having probands independent testers evaluate the application during the beta testing phase, in addition to the migrants co-designers.

Furthermore, it would be advantageous to monitor the app's usage in real-time to obtain more interesting data about the app's influence for future research studies.

In conclusion, this study demonstrates that technological innovation combined with an iterative approach that puts users at the center by considering them as co-designers overcame one of the initial limitations of Living Lab's inclusive design thinking: the participants showed great enthusiasm for the active involvement and the final result obtained.

This approach not only increases the involvement and satisfaction of the end-users, as it allows their

opinions to be valued, but also enables the creation of a solution that effectively meets essential psychophysical needs by creating a real and meaningful solution for access to health services and inclusion.

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