

STREAM
Strategic Development of Flood Management
Project id 10249186

D.4.4.1. Innovative games and training tools

Partner in Charge	PP8
Partners involved	PP9
Status	Final
Distribution	Public
Date	26/04/2023

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Executive summary

The STREAM project deals with the issue of training on hydrogeological-hydraulic risk. Specifically, this study focused on the education of primary and secondary school students. In this context, new technologies are already part of the school syllabus and are helping to improve learning and teaching processes. The aim was to develop an interactive game to train on the topics of natural risk, alert procedures, civil protection systems and the right behavior to adopt. The result was the creation of a Memory Game through the development of a web application.

D.4.4.1. Innovative Games

In this study, an educational game was developed based on innovative tools.

The idea was to use a simple and popular game like the Memory Game. In particular, a Memory Game digital version has been very useful, because this game is already widely used by civil protection to train primary and secondary school students.

The use of interactive games in children education and the use of digital tools allows to increase attention through visual and auditory stimuli. A typical client-server architecture has been implemented, the client accesses the application located on the remote server through the network.

Multiple clients can access it from various locations, and the application is independent from the hardware and the operating system. In fact, the application is cross-platform, and the client can play using normal web browsers or can view the web pages directly with smartphone or tablet through the use of WebView APIs. In this way, children can play the Memory Game in a simple, intuitive, and fun way.

The developed architecture has several advantages such as: ease of distribution and updating; cross-platform access; and scalability. The application is found on the remote server and is made

available to students through the creation of highly interactive user interfaces. The used programming languages are:

- HTML, standard markup language, used to designed Memory Game can be displayed in a web browser;
- CSS: style sheet language, used to adequately format a web page, it allows to design a web page, such as font, size, and the color;
- Javascript: used both to manage requests to the server to access the resources stored in the database, and to make the page interactive without having to involve the server when not necessary.

We can simply summarize the running process as follows. Through the web browser, by URL of the application, the student can connect to start playing the Memory Game. The server processes the requested page and returns the data that make up the page to the browser. The browser receives data from the server and displays it to the user. This is the process underlying web applications, a continuous data exchange between the client (browser web) and the server.

For optimal viewing, it was decided to use 300 dpi as image resolution, and 1920*1117 pixel as image size. Moreover, Web Content Accessibility Guidelines (WCAG) 2.1 have been followed. The WCAG 2.1 are web content accessibility guidelines that apply to desktop, laptop, tablet, and mobile devices. These guidelines define technical specifications to make web content more accessible to people with disabilities.

While these guidelines address many issues, they are unable to address the needs of people with all types, degrees, and combinations of disabilities, and therefore cannot be considered comprehensive for all needs of users with such disabilities. These guidelines also make web content more usable by users in general, improving usability for all users.

In particular, the guidelines relating to color have been followed, as it must not be used as the only visual way to represent information, making sure that the information conveyed by color can be

used through an alternative medium. Furthermore, attention was paid to the contrast between the texts and the background color.

As for the audio content, features have been provided to pause or stop it, thus providing a way to control the audio itself.

In the current version of the game, the cards are divided into four main categories: man-made and natural risks, hydrogeological and hydraulic risks, river monitoring and equipment for carrying out riverbed measurements (Fig. 1).

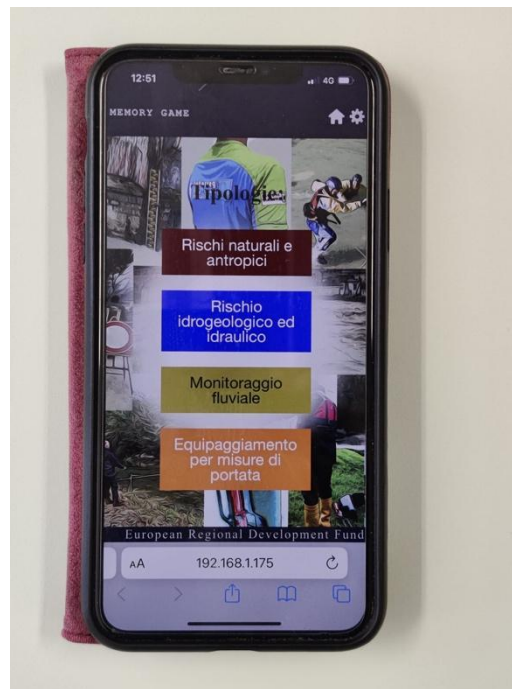
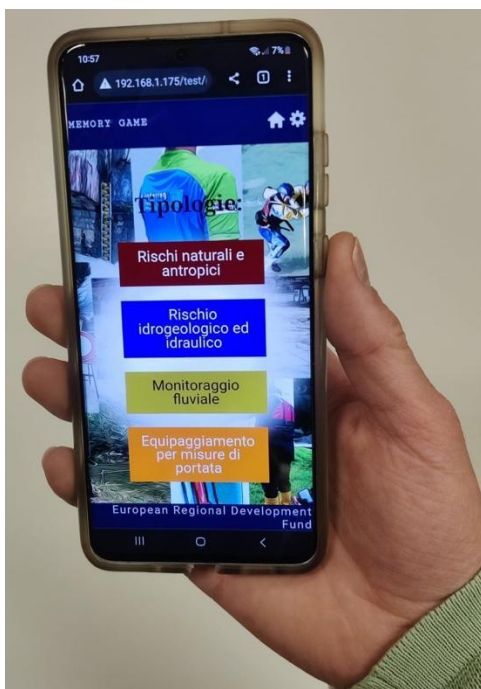
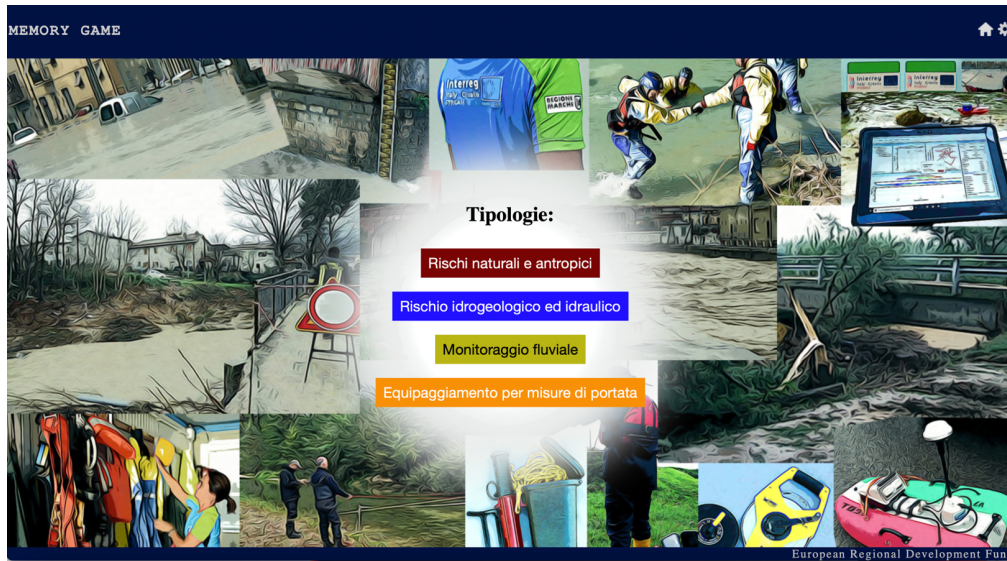


Figure 1. The first interface of the Memory Game, choice of the game's category

Each category of game is characterized by a color, the cards reverse recalls the color of the selected game category (Fig. 2).



Figure 2. The four categories of game are each characterized by a color

In total, for each category of game (man-made and natural risks, hydrogeological and hydraulic risks, river monitoring and equipment for carrying out riverbed measurements) various cards were

designed in jpg format, both cartooned and drawn by the children. It was possible to create, for each game category, four difficulty levels, from easy to impossible (Fig. 3).

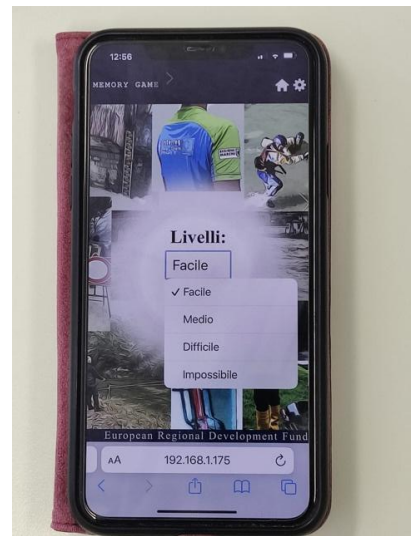
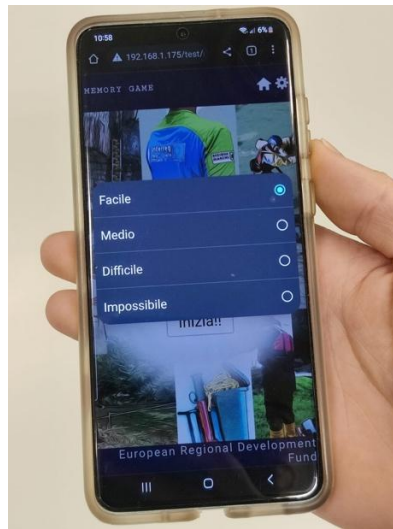
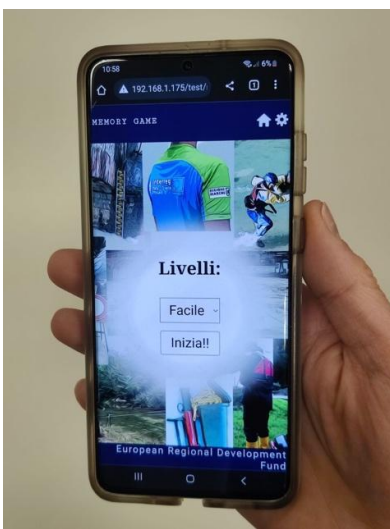


Figure 3. The second interface of the game, choice of difficulty level

By selecting one level rather than another, 6 to 16 cards will be displayed on the interface (Fig. 4).

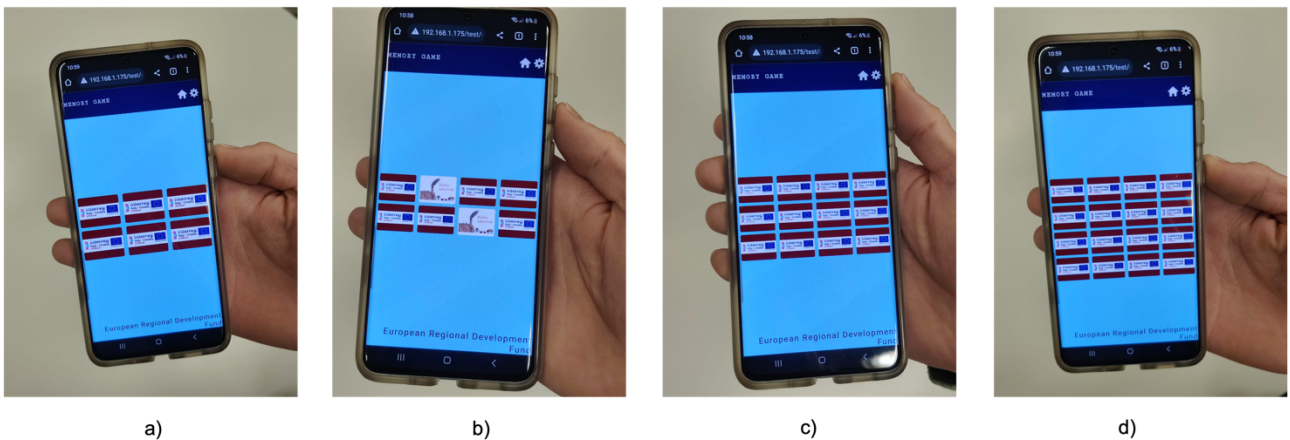
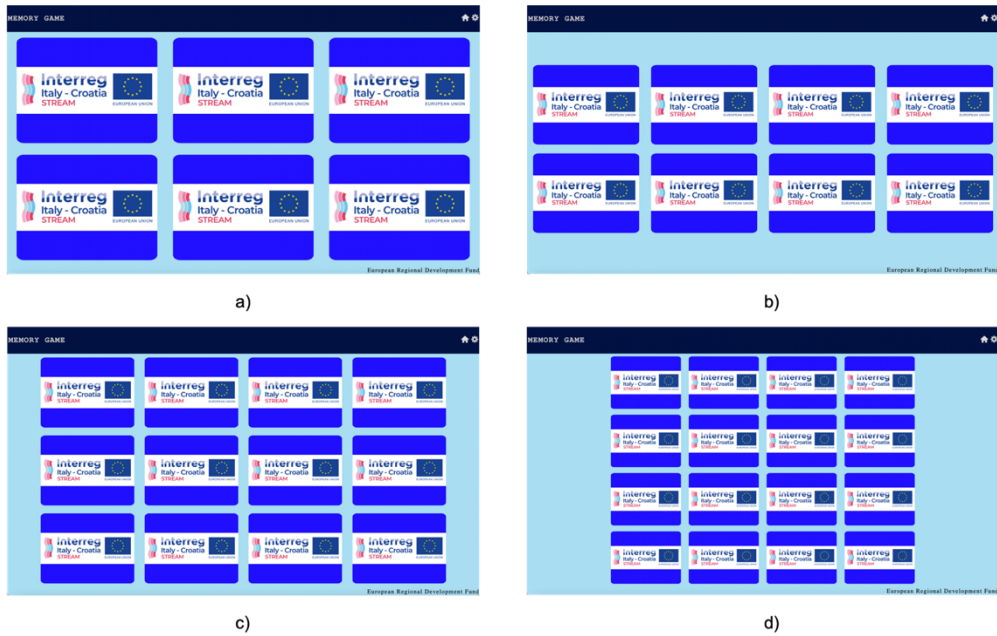


Figure 4. The four difficulty levels: a) easy level with 6 cards; b) medium level with 8 cards; c) difficult level with 12 cards; d) impossible level with 16 cards

By replaying the same type of game and the same difficulty level, different cards will be randomly selected each time.

The use of digital tools stimulates learning not only visually, but also audibly. In fact, the Memory Game was developed in collaboration with some primary school classes with the aim of developing a game for children together with the children. In this way, m4a format audio was recorded by the children themselves describing the cards used in the Memory Game. With each match, the audio is played as an additional support to training and learning (Fig. 5).

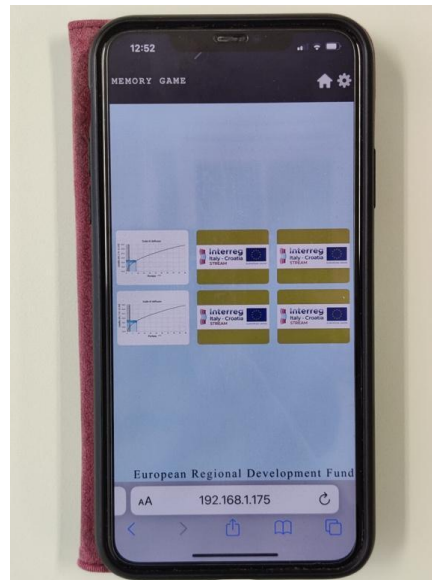
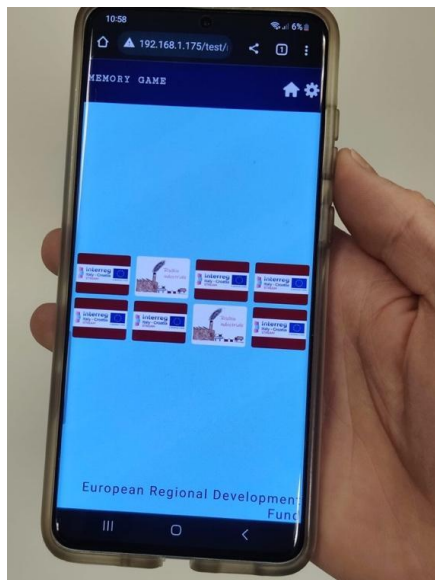


Figure 5. Correct match of the cards

Finally, at the end of the game, when all matches have been found, it is possible to play a video that describes all the cards present in that typology (Fig. 6).

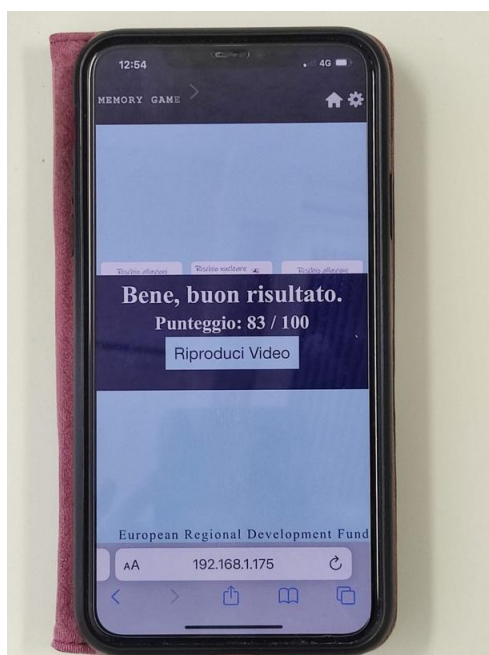
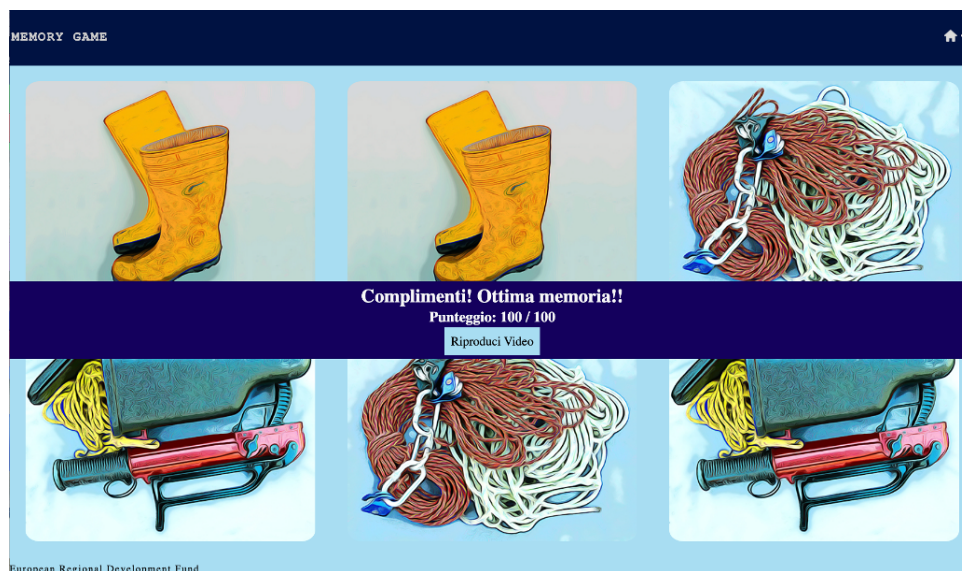


Figure 6. At the end of the game, score display and possibility to play the summary video

This time the video will be supported by an adult narrator who describes the category played in a simple and fun way (Fig.7) and it is recorded in mp4 format.



Figure 7. Video playback.

Conclusions

This innovative game allows to train children in schools in a fun way. Moreover, the digital Memory Game and using modern technology helped deliver the online distance trainings during the project, in particular during the Covid period.

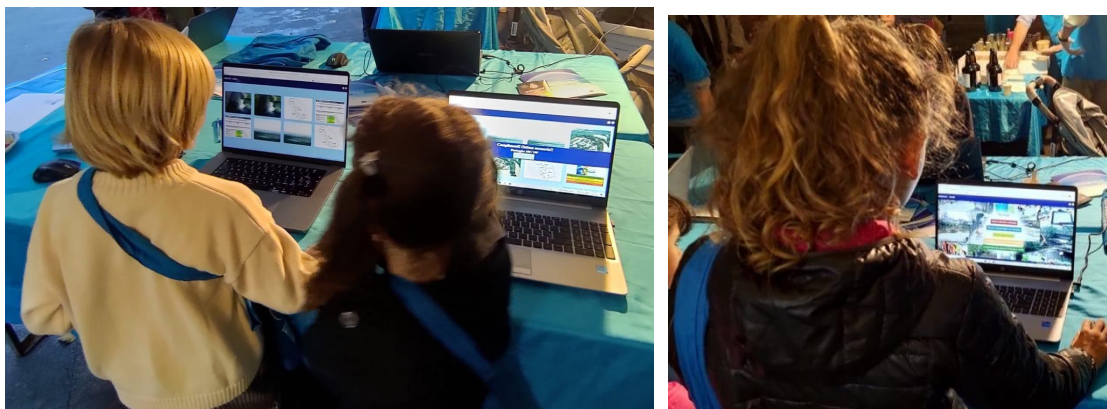


Figure 8. Info Day

In addition, thanks to Info Days and training days it was possible to test in the schools the Memory Game during the project in collaboration with PP8.