Adapting the PREHealth education tools for use in secondary schools
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## Contents

- Introduction .................................................................................................................. 3
- PREHealth course for secondary education ................................................................. 4
- Pilot-testing the PREHealth course for secondary education ......................................... 15
  - Stage 0 .......................................................................................................................... 15
  - Stage 1 .......................................................................................................................... 16
  - Stage 2 .......................................................................................................................... 22
  - Stage 3 .......................................................................................................................... 25
  - Stage 4 .......................................................................................................................... 28
  - Stage 5 .......................................................................................................................... 29
  - Stage 6 .......................................................................................................................... 34
- Evaluation of the PREHealth course for secondary education ........................................ 38
- Annex 1 .......................................................................................................................... 44
- Annex 2 .......................................................................................................................... 45
- Annex 3 .......................................................................................................................... 46
Introduction

The present report was compiled in the framework of the project **PREHealth: Promoting education and jobs to enhance the use of urban blue and green infrastructure for health and fitness**, under the Erasmus+ programme of the European Commission. The aim of the report is to present the process of the adaptation of the PREHealth conceptual model and related Augmented Reality (AR) tools for educational purposes within the framework of secondary education. The adaptation process included the following activities that are presented in detail in following parts of the report:

- **The formulation of a PREHealth course** for application in a secondary education framework, integrating the PREHealth conceptual model and the use of the proposed AR tools, i.e. the development of a Location-Based Game and the use of other AR tools for mapping and awareness raising.

- **The pilot-testing of the PREHealth course** in a secondary school in Athens, Greece, resulting in the development of a Location-Based Game and other AR tools, based on the Health and Fitness Itinerary designed in Athens.

- **The evaluation of the PREHealth course** in terms of achieving the learning objectives set, through distributing an evaluation questionnaire to the students who participated in the course.
PREHealth course for secondary education

The learning course is based on a cooperative interdisciplinary approach. It exploits the cooperative design and development of Location-Based Games (LBGs) and interactive Augmented Reality (AR) applications for mobile devices (smartphones and tablets) by students, in order to stimulate and promote physical activity in urban public open spaces. The games are developed by teams of students, guided by teachers/trainers.

The course integrates a wide range of disciplines and school subjects as follows:

- **Environmental education**: Introduction to the local environment: natural, built, social, economic; inter-relationship between the natural/built environment and quality of life. Learning to “read” the urban environment and public open spaces; observe the human geography of the city, familiarize oneself with mapping and orientation.

- **Information and Communication Technology**: Introduction to applications for file-sharing (e.g. Google Drive), communication (e-mail), and office applications (word processing, presentation software). Use of mobile device applications (camera, maps, geo-locating photos). Use of AR applications and platforms for designing location-based games.

- **Physical education**: Team games: rules, scoring and mechanics.

- **Health education**: Physical exercise as a component of health improvement, wellbeing; healthy lifestyles, free time.

- **Arts and creative writing**: Production by students of original visual artwork, processing image and video, creative writing, scenario development, development of original characters and dialogues.

The learning course targets teachers and students of secondary education. Depending on the structure of secondary education in the country and the type of secondary school targeted (e.g. general education school, experimental/model school, science school etc.), the course may be implemented as part of environmental education, research work (i.e. project work), health education, or science education.

The duration of the course is estimated at 30 didactical hours in class and 9-12 hours of fieldwork.

Regarding the learners’ background:

- **Knowledge**: Students do not need to have a knowledge background in relation to the theme. They need knowledge on the use of computers and mobile devices and this is enough to familiarize themselves with the tools and software used in the learning process.
• **Attitudes**: Students are expected to have already developed concepts and attitudes about the use of public open spaces in relation to health benefits, given that healthy lifestyle and the integration of physical exercise in everyday life is a particular concern for modern society. However, students may also have misconceptions about the use of public places and their role in promoting physical exercise and overall health and wellbeing, which need to be revised.

• **Age and gender**: The course is targeted at students of both genders, aged 14-17 years old.

Regarding the necessary equipment, it is important to have in the classroom:

- Computers with internet connection.
- Projector.
- Mobile devices (smartphones, tablets) with internet connection.
- Post-it, coloured cardboards.

And in the field:

- Mobile devices (smartphones, tablets) with internet connection.
- Cameras - camcorders (optional).
- GPS devices (optional).
- Audio recording devices (optional).

Regarding the teachers’ skills, it is necessary to have:

- IT skills (optionally, gaming software knowledge),
- creative writing skills,
- art skills,
- physical education skills, and
- optionally, game design skills. This type of skills can be best brought into the team by inviting an external expert to cooperate with the class.

**Learning objectives**

During the course, the aim is to develop the students’ self-motivation through discovery/exploratory learning; exercise their creative imagination through game-based learning techniques and design thinking; and develop collaborative learning skills through a project-centred approach. Moreover, regarding the use of digital technology, the aim is to
develop the students’ digital literacy skills in the direction of developing games for mobile devices and effectively using GIS applications, as well as skills related to the research, selection, analysis and management of information.

The course’s learning objectives can be grouped as follows:

**Knowledge**

The students, upon completing the course, will be able to:

- Identify the structural elements of public space.
- Understand the relationship / interaction with the urban environment (natural, built and social) for a healthier lifestyle.
- Organize the material they collect in the field.
- Select appropriate apps for collecting and editing material for game content.

**Skills**

The students, upon completing the course, will be able to:

- Research, collect and analyse data, and carry out assessment and synthesis work through exploring the issue of exercise in the public spaces.
- Draw information about the public space through field and desk research and relate these to the content of the game storytelling.
- Possess teamwork skills.
- Engage in creative writing and build a simple scenario for a Location-Based Game.
- Design a digital game for mobile devices using ICT tools.

**Attitudes and mentalities**

The students, upon completing the course, will be able to:

- Discuss and debate a variety of issues, showing respect for different views.
- Develop a research mentality, as well as critical and creative thinking about the use of public spaces in promoting health and physical exercise.
- Develop a spirit of co-operation and responsibility.
- Raise their awareness on the issue of health and physical exercise in the city, as well as the issue of active civic participation.
- Adopt good practices with regard to the use of mobile devices.
• Encourage others (friends, family, neighbours) to actively use urban public spaces and encourage the improvement of their design and function.

• Propose solutions to improve urban open spaces and promote opportunities for physical exercise in them.

**The 5 Stages of design-thinking**

- **Empathise**
- **Define**
- **Ideate**
- **Prototype**
- **Test**

**Outline of the course**

The theme: Create your own neighbourhood Olympics!

An "Olympics" theme is chosen, where people compete in different imaginary Olympic sports, exploiting opportunities to exercise their creativity and imagination as well as their body and mind.

The structure of the course

The proposed structure can be adapted to the needs and the available time of the student group participating in the course. The sessions foreseen are 15, lasting 2 teaching hours each, of which 3 are field visits (longer than classroom sessions). The learning course is structured in 6 Stages, with an additional preparatory start-up Stage for the teachers who will participate in the course. The course stages are:

Stage 0 – Preparation, setting the course framework

Stage 1 – Introduction to Location-Based Games, selection of the health and fitness itinerary and familiarization/collecting material

Stage 2 – Organising the collected material, learning about AR tools for recording the health and fitness itinerary

Stage 3 – Introduction to the LBG digital design environments of different platforms, developing the core game scenario
Stage 4 – Location-Based Game development

Stage 5 – Game testing and adaptation

Stage 6 – Game evaluation and dissemination/promotion to the local community

The course stages are presented in detail in the following table, outlining the aim of each stage, as well as a description of the main activities included.
<table>
<thead>
<tr>
<th>Outline of Course Stages, objectives</th>
<th>Summary of main activities</th>
<th>Description of activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 0</strong></td>
<td>Integration of the course in the school’s programme.</td>
<td>Meeting between the implementing teachers and the school director. Discussion of the course, the objectives and the theme. Decision regarding how the course will be integrated in the school curriculum or optional classes (e.g. environmental education, optional afternoon courses).</td>
</tr>
<tr>
<td>The &quot;start-up&quot; phase of the programme concerns the integration of the course in the school programme and the preparation of the participating teachers. The purpose of this stage is to consolidate the learning objectives of the course, to agree on the course’s structure and to identify the software to be used. Moreover, this stage aims to provide teachers with the basic skills they need in order to supervise the creation of a LBG. Upon completion of this stage, it is advisable that the participating teachers will have become acquainted with a very simple mobile location-based game, which they will demonstrate with students at school as an LBG example.</td>
<td>Teachers’ preparation</td>
<td>Participating teachers study the present manual regarding the course activities in and outside the classroom, key elements of game design, as well as the proposed AR tools and LBG development platforms. Ensure familiarisation of the teachers with the Siftr tool and the proposed LBG platforms.</td>
</tr>
<tr>
<td><strong>Stage 1</strong></td>
<td>Preparation and organization of the students’ group (2 sessions)</td>
<td>Presentation of the course and introduction to the concept of the health and fitness itinerary.</td>
</tr>
<tr>
<td>This stage of the course begins with the set up of the learning group and subgroups (depending on the number of group participants). A central objective is to make students familiar with digital experiences in real space, introduce them to LBGs and demonstrate the potential of LBGs as a learning resource. Moreover, students will be</td>
<td></td>
<td>Presentation of examples of existing Location-Based Games. e.g. play “Name-Animal-Thing” on the urban space categories, using smartphones</td>
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<td></td>
<td></td>
<td>Introduction to LBG software. An open source platform, such as TaleBlazer, ARIS or Enigmapp may be selected and presented by the teacher.</td>
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<td></td>
<td>Physical and Digital creation of working groups: Creation of e-mails and wider working group through file-sharing arrangements. Selection of</td>
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</table>
Promoting Education and Jobs to enhance the Use of Urban Blue and Green Infrastructure for Health and Fitness

<table>
<thead>
<tr>
<th>Encouraged to conduct an analysis of the urban space and learn to “read” its components and constituent features.</th>
<th>Mobile devices to be used.</th>
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</thead>
<tbody>
<tr>
<td>As a next step, the group prepares intuitive games that are tested in the field, aiming to demonstrate the structural elements and mechanisms of game architecture. Outdoors work is highly recommended, where students would be invited to interpret the space through their experience and explore the transfer of a game from paper to real space.</td>
<td>Introduction to Siftr.</td>
</tr>
<tr>
<td>Students undertake to design a “health and fitness itinerary” in the vicinity of the school, using Siftr. In doing so, they become aware of the various features of open space (trees, pedestrian routes, furniture, water, low vegetation etc) and are guided to identify those features that can be used for physical exercise. They take photographs of all points of interest, to compose the Itinerary on Siftr. You may use the design criteria of Annex 1.</td>
<td></td>
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<tr>
<td>Learning the internal structure of a game in the school yard (1 session)</td>
<td>Students are provided with very simple equipment (e.g. a long piece of string, plastic cups, hanging hooks, hula hoops, chalk, small balls, small round stones) and are introduced to one or more simple games (see for example <a href="https://www.weareteachers.com/recess-games/">https://www.weareteachers.com/recess-games/</a> and similar sites for ideas) The students discuss after each game session how the game can become more competitive, how the rules can become more meaningful, whether they can increase the number of players and so on. The students understand the importance of the rules, the necessary cooperation between players, the challenge posed by the game, the winning of rewards.</td>
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<tr>
<td>Learning to create new games by “hacking” known games (2 sessions)</td>
<td>Students are introduced to game “hacking”. “Hacking” games is making new games by modifying already known games through changing the rules, the scoring and the context, or mixing elements from different types of games, using equipment found in urban open spaces. Examples may include. monopoly, football, tennis, hide and seek, relay race, and many more.</td>
</tr>
</tbody>
</table>
Students are given the task to select games that can be hacked and played along the health and fitness itinerary, based on the scenario of the Neighbourhood Olympics.

Students undertake research on stories and careers of popular Olympic athletes, drawing material from history and current events.

As a result, they create a number of hacked games (5-6) making sure that they define the basic elements of game architecture (what is the rationale of the game? how is it played and where? Who wins and how? What is allowed and what is not?). They may use Annex 1 for to describe on paper the games.

Field visit in the Health and Fitness Itinerary and playtesting the hacked games (1 session)

The students walk along the Health and Fitness Itinerary which they created and select locations to playtest the hacked games they developed. They are guided to make a good photographic record of these locations, using mobile phones.

The students playtest the games, discuss whether and how they can be improved, find out what works and what does not work. They also select locations that can host the improved games or locations that offer ideas for other fitness games; and make a photographic record of them.

**Stage 2**

The objective of this Stage is for students to organize and discuss about the material gathered with the appropriate tools, to learn about the digital tools for recording the route and to correspond digital material to

Discussion in the classroom, familiarization with maps (1 session)

Students discuss in the classroom about the field visit experience and the worksheets. Th session includes printing of the area map (e.g. using google maps), familiarization with maps; and identifying the selected points of interest on the map, as well as defining the game area around each point of interest.

Students discuss the opportunities offered by the Itinerary in relation to physical exercise and the
### Stage 3

The objective of this Stage is to introduce pupils to the digital design environment of a LBG (e.g. by using the reference-game designed by the teacher and through which they have already acquired the experience of playing). At the same time, students are invited according to the features of the selected platform to draw on the scenario of their game by deciding the type of game, the plot structure, the scoring, movement in space depending on the story, and the characters that may appear in the game.

<table>
<thead>
<tr>
<th>Introduction to game design components, preparation of backstory and scenario</th>
</tr>
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<tbody>
<tr>
<td>Introduction to the design platforms</td>
</tr>
<tr>
<td>Preparation for the scenario development (1 session)</td>
</tr>
<tr>
<td>Game structure in the design platforms (1 session)</td>
</tr>
<tr>
<td>Game structure and content</td>
</tr>
<tr>
<td>Download digital applications on mobile devices (2 sessions)</td>
</tr>
<tr>
<td>Presentation of the game development platform selected.</td>
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</tbody>
</table>

**Start developing the Location-Based Game:**

- Brainstorming for the game scenario and the mini-games to be included in it using post-it stickers.
- Putting the ideas in order and selecting roles for the students.
- Creation of subgroups of students.
- Creative writing of scenario and mini-games in sub-groups.

Students work further on the scenario and the mini-games. Develop the storyboard (logical steps of the scenario) and present an overall game plan document.

| Shared digital working folders amongst the team members are created.         |
| Media like audio, photographs, video, cartoons, drawings etc are introduced in the mini games and the other parts of the game (introduction, dialogues with non-playing characters, instructions, scoring rules etc). |
| Siftr, Geotagging, recording the itinerary, installing the necessary applications (LBG platform) in the mobile devices. Testing in the |
### Stage 4

This stage is at the core of game development, has the greatest organizational significance and is allocated more time in the course programme. The objective is to place the original material inspired by students in a digital experience format using the selected platform. Emphasis is placed on choosing the appropriate gaming mechanisms in relation to how it can be reproduced through player interactions with the mobile device (e.g. instructions, missions, team selection, individual platform features).

| Game development on the selected platform (2 sessions) | Students work on the platform and connect the scenario with the game’s core elements - i.e. introductory and mini-game texts, dialogues with the game characters, imaging, video, artwork, making clear the aim of the missions (mini-games) and the scoring. Remote testing in the classroom and solving problems through re-designing and modifications are recommended. Feedback by the teachers. |

### Stage 5

The purpose of this Stage is to practically test the game, to identify problems that may arise in the physical space and to regulate its parameters in order to have a better flow as an experience on the field.

| Playtesting visit (1 session) | Students undertake to playtest the game on the field, along the Itinerary they have defined during the initial sessions of the course. Features that need attention: - Mini-games’ timing, - Game mechanics, - Players’ motivation, - Suitability of the mini-games’ environment, - Obstacles (natural, manmade, technological etc). |

| Game adaptation | Students adapting the content, core game elements, game mechanics and the ways of |
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<th>Stage 6</th>
</tr>
</thead>
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<tr>
<td>The objective of this Stage is to communicate pupils' work to the local community in order to promote the game to the public.</td>
</tr>
</tbody>
</table>

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<tr>
<th>Evaluation of the course and the game (1 session)</th>
<th>Assessment by the students and other players (e.g. other students who had not taken part in the course) of the game experience through evaluation questionnaires. Fine-tuning of the game if necessary.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation of the game (1 session)</td>
<td>Final presentation of the game to the school community and the local community</td>
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</tbody>
</table>
Pilot-testing the PREHealth course for secondary education

The PREHealth course for secondary education was pilot-tested at the Experimental Model Lyceum (Upper High School) of Agii Anargyri in Athens. It was integrated in the educational framework of the students’ educational clubs, specifically the club dedicated to “health”. Student educational clubs are project-based courses open to students of the first and second grades of the Greek Lyceum, i.e. students aged 16-17 years old. Clubs are a unique opportunity for high school students to engage in cognitive subjects and themes related to their own interests and highlight their particular inclinations. Clubs are compulsory and take place throughout the school year. The students are invited to choose among clubs that are dedicated to different general themes, like for example foreign languages, literature, experimental Sciences, arts, information technology, sports and health, etc.

The pilot-testing of the course followed the course stages outlined above and implemented thus:

**Stage 0**
At this preparatory stage, it was important to set the course’s implementation framework, i.e. to discuss ways in which the course would be integrated into the school curriculum, agree on the course’s structure and the number and duration of the sessions necessary both in the classroom and outdoors, prepare the participating teachers and decide on the LBG platform to be used.

A meeting was organized with the school director who was introduced to the project and the course, and decided to integrate it into the educational club dedicated to the thematic of health for one school trimester, headed by her. The sessions of the educational club would take place every Tuesday and Thursday for an hour after the end of the official school hours. The school director was informed about the Athens Health and Fitness Itinerary designed in the framework of the project, on which the course itinerary would be based. The platform chosen for the design and development of the Location Based Game was TaleBlazer, because the school director with a background as a teacher in IT was already familiar with the platform and it is available on both Android and IOs operating systems.

It was also agreed that the group of students would be supported by expert staff of the PREHealth partner in Athens, PRISMA Centre for Development Studies. The PRISMA experts contributed in a total of 9 sessions with the group of students, as follows:

- Game design expert. The game design expert’s contribution was supporting the group of students through 4 sessions:
  - 2 sessions in Stage 1 of the course in the class and on the school yard and aiming in introducing the students to the concept of game development and training them in the game design process
  - 1 session in Stage 3 of the course, where the game design expert supports the group of students define the game structure and the game components
Promoting Education and Jobs to enhance the Use of Urban Blue and Green Infrastructure for Health and Fitness

- 1 session in Stage 5 of the course, supporting the group of students through the playtesting visit on-site at the itinerary and offering feedback on improvements to the game.

- Expert in mapping and location based games for education. The expert’s contribution was supporting the students through 6 sessions:
  - 1 session in Stage 1 of the course in class supporting the students in the hacking process (session led by the game design expert)
  - 1 session in Stage 2 of the course in class aiming to train the group of students in using the Siftr AR tool for collecting material related to the HFI and mapping the stops and interactions of the game
  - 1 session in Stage 2 of the course during a field visit on-site at the Health and Fitness Itinerary (HFI), supporting the students in using Siftr to map their original games on the game itinerary and record material (photos, text) related to the game activities.
  - 2 sessions in Stage 3 of the course in class and in the school yard, supporting the students in developing and testing new original games promoting physical exercise and wellbeing
  - 1 session in Stage 3 of the course in class, supporting the students in building the game components (i.e. scenario, main characters and interactions)
  - 1 session in Stage 5 of the course, supporting the group of students through the playtesting visit on-site at the itinerary and offering feedback on improvements to the game.

- Expert in game scenario building. The expert’s contribution was supporting the group of students in one session in Stage 3 of the course, dedicated to brainstorming and building the game scenario.

Following a communication about the available educational club themes at that trimester, a total of 10 students 16-17 years old registered in the club and participated in the course.

Stage 1
The objective of this stage of the course was to introduce the students to the course and to the Athens Health and Fitness Itinerary already designed in the framework of the project, introduce the main components and the internal structure of a game, train the students in developing new and original games based on physical exercise and wellbeing by “hacking” known games, and organize a field visit to the itinerary where the students could playtest their new games and record/map the components of the open urban spaces that could assist or obstruct the smooth play of these games.

Following the introduction of the students to the course and the Health and Fitness Itinerary (HFI) in class, the students decided to focus the course on the part of the itinerary starting from the Panathenian Stadium and concluding at the Philopappou hill, an itinerary in the historic centre of Athens all students are familiar with (See Map 1). At this first session the
students were introduced into the game design mentality. They were introduced to the whole process of developing an original game played outdoors, from the original game idea, to the playtesting of the first prototype and the evolution through very fast playtesting cycles. They worked on the playtesting logic, as well as the fast cycles of prototype development and testing. They played different versions of a game played outdoors. They actually saw what works, and discussed and identified possible improvements. They added or modified game mechanisms on-site and tested versions of the game until it is balanced and works.

At the school yard with the game design expert explaining the concept of outdoors games.
Playtesting an outdoors game and adjusting the game rules so that it works.

At the second session, students were introduced to the concept of “hacking” known games in order to create new original games. They were trained in “hacking” as an important mechanism for developing their own games. Students started from well-known outdoors games like “hide and seek”, “petangue” etc., and created original games by changing the original rules, space where the game can be played, number of players or the original equipment. They modified rules or mechanisms and identified the basic building blocks of the games, i.e. name of the game, purpose, rules, game field, group of players and necessary materials or equipment, using a worksheet provided by the game design expert (Annex 2). These first ideas resulted in original games, ready for testing.
Testing a hacked version of the game “thumb wars” – Group thumb wars.
Students using the worksheets to brainstorm and propose new original games by hacking well-known outdoors games or sports.
Map 1: The PREHealth course itinerary in Athens, part of the Athens Health and Fitness Itinerary (HFI)
Stage 2

The objective of this stage of the course was to introduce the students to the concept of mapping as an integral component of Location Based Games, training them in using the Siftr platform as an AR tool for collecting data on a physical space and mapping the information – designing a Siftr, developing the desirable settings, managing a Siftr, as well as using Siftr on mobile devices in order to gather data on-site.

The first session at this stage of the course took place in the classroom where computers were available, and was led by an expert in mapping and using the Siftr platform. Students were seated in front of computers (2 or 3 students per computer) and were guided in accessing the Siftr website, creating a Siftr account and logging in, generating a simple Siftr focusing on their school yard, and publishing it. Students were then guided in downloading and installing the Siftr application on their smartphones and were take outside at the school yard in order to test their Siftrs. The students accessed Siftr in their smartphones and used it to collect data (through photos and text input) related to certain areas of the school yard. The students were then taken back into their class, where using their computers they accessed their generated Siftrs updated with the data they had collected in the form of “pins” on their Siftr’s map. Finally, students were guided in managing this information input and the material collected.

The students accessing Siftr at www.siftr.org
The second session was a field trip to the actual area of the game itinerary (part of the Athens Health and Fitness Itinerary), where the students, supported by the PRISMA expert, used Siftr to identify and map the game areas for each of the new original games they had developed, while at the same time collecting material to be used in the actual game development (photos of important places in the itinerary, possible game characters, possible interactions and dialogues, etc.). This was a very important session because it helped the students identify important elements of the urban space along the itinerary that they could use in the game, i.e. elements of the green and open spaces along the itinerary (e.g. trees, pedestrian ways, sitting areas, areas covered in grass, etc.), landmarks (e.g. buildings, statues etc.) and historical sites related to sports and famous athletes, and place the various game activities they had developed in the actual space. The Siftr instructions set for the students were as follows:

“We use this Siftr to set our game in its real world realm. As we walk along our route we add to our siftr map points that we can use in our TaleBlazer game. Points can include:

- Points of the game’s itinerary where a character will appear or there will be some interaction with the players.
- Places where we will invite players to play one of our games.
- Landmarks or historic sites that we would like to include in our game.

At each point we add, the application will invite you to take photos, select a point category (i.e. point where a character appears, point where the player is invited to play one of our games, point where a new game can be proposed), and a description that will help us set up the game scenario and players experience.”
Promoting Education and Jobs to enhance the Use of Urban Blue and Green Infrastructure for Health and Fitness

The Siftr map including the pins created by the students during their field visit (accessed at https://siftr.org/AthensGame/)

Surveying the area of the National Garden for the optimum areas to introduce a game activity
Stage 3
The objective of this Stage was to introduce students to the digital design environment of the selected LBG development platform, TaleBlazer; and to invite students to create the narrative and the scenario of the game, define the game structure and the game components and create the content of the game.

At the first session in this Stage of the course, with the support of the expert for building the scenario, the students were encouraged to brainstorm for the game scenario including the physical
exercise and fitness activities to be included in the game, using post-it stickers. The students then put their ideas in order and divided the group into subgroups responsible for different aspects of the game development, according to the students’ personal interests and inclinations. The sub-groups of students were set as follows:

- Scenario building group, responsible for building the game scenario, generating the profile of the game non-playing characters (i.e. game characters that appear in certain points in the game and interact with the player in order to guide him/her or offer information, assisting in the smooth development of the game story), and the game text (i.e. dialogues, information, description and rules of game activities promoting health and fitness).
- Media and artwork group, responsible for producing the necessary original artwork and media (images, audio, video) that will appear in the game.
- Digital development group, responsible for the digital development aspect of the game in the TaleBlazer platform.

The subgroups worked in the classroom and from home, cooperating where necessary and reporting back to the school teacher leading the activities (in our case the school director). The participants shared their e-mails and a group e-mail was created, as well as a file-sharing space on Google Drive, to facilitate the sharing of ideas, material and work progress.
During the 2 sessions that followed under Stage 3, with the support of an expert/facilitator, the students further developed their storyboard (i.e. steps in the game narrative). The main game character would be “Leonidas of Rhodes”, a famous Olympics athlete who lived in the 2nd century B.C. and was named a “triastes” because he managed to win in all three running sports on the same day: the *stadion* (200 metres sprint running), *diavlos* (400 metres running) and *hoplitodromos* (running race where athletes competed wearing heavy armor and carrying the shield of the infantry man “hoplite”). The players would meet Leonidas at the Panathenian Stadium and he would guide them around Athens, placing certain fitness challenges for them along the way. Apart from the activities the players would have to complete, the game would also guide them through important landmarks of the historical centre, related to sports and the history of Athens.
The students also had the chance to further develop their original games (from Stage 1) through playtesting them themselves at the school yard and making the necessary adjustments and modifications (game rules, instructions, hints) in order to make sure they are easy to understand, fun to play and engaging the players to physical exercise and activities promoting the players’ overall wellbeing. During these sessions two more original games were created through brainstorming exercises. All the original games were finalized and documented in terms of their core components using the worksheets of Annex 2. These games were going to be included as the main game activities in the LGB, promoting physical exercise and wellbeing. The group decided to include only games that can be played with company, i.e. by at least two players who play against each other or by teams of players.

The 6 original games devised by the students are briefly presented here:

- **Listen to the music**: The players are invited to walk or jog to the rhythm of the music they can hear through their smartphones or tablets. Players are not allowed to stop or walk/jog faster or slower than the rhythm dictates.
- **Run for your time**: The players have to set a time in which they can run along a circular route with obstacles, and manage to complete the route within the set time.
- **Yogalicious**: The players have to faithfully follow the instructions offered and perform a set of Yoga exercises. Players need to pay attention to the posture shown and the breathing instructions, and can only look at the instructions for 2 minutes before executing them.
- **Relay race on one leg**: Players are invited to take part in a relay race by moving exclusively on one leg, using as baton any object they can find on the spot (a twig, a rock, etc.). Players are only allowed to run using both legs if their opponents drop their baton, and until they pick it up.
- **Walking hide-and-seek**: Players are invited to play hide-and-seek with a twist – players can only walk, not run (players must have a foot on the ground at all times). Also players are not allowed to obstruct or hold their opponents.
- **Rock throw**: Players have to set a stable object in their surroundings (a tree, a bench, etc.) as the target, and a line behind which all players are allowed to throw their rocks (small rocks or pebbles they can find in their surrounding area). The winner is the player who will manage to throw his/her rock closer to the target, but without touching it.

Finally, in a session in the classroom, the school teacher made a detailed presentation of the TaleBlazer platform for the development of the LBG, introducing the students to the TaleBlazer Editor’s UI (User Interface), the features offered by the platform and basic steps in the game development. The group discussed possible ways in which the scenario and the original games developed would best be presented through the platform.
order to create a location-based gaming experience. The subgroup for digital development coordinated the work on this stage with assistance, where necessary, by the school teacher. The emphasis, at this stage, was placed in employing the appropriate game mechanisms (i.e. game instructions, interactions with the game characters, game missions and special platform features) in order to facilitate the smooth unfolding of the game scenario and the optimal integration of the game activities with the physical elements of the game itinerary.

Students engaged in remote testing of the game in the classroom and solving problems through redesigning and modifications in the TaleBlazer platform. For completing this stage of the course, i.e. producing a version of the location-based game to be playtested on the actual itinerary, 2 sessions were needed in the classroom, while the students worked also from home.

Stage 5
At this stage of the course, the objective was to playtest the LBG at the physical space of the game itinerary identified at the initial Stage 1 of the course, and make any adaptations that are considered necessary. The students needed to focus on issues such as the time actually needed to play the game and perform the individual mini-games/activities, the game mechanics (i.e. making sure that the game runs smoothly and the scenario unfolds gradually), maintaining the players’ motivation, the suitability of the physical environment in order to accommodate the proposed game activities (mini-games), and possible obstacles the players may run into while playing (natural, man-made or technological obstacles).

The playtesting of the LBG developed by the students took place on Saturday the 6th of June 2019 with the participation of 6 students representing all 3 subgroups having contributed to the game development, their teacher (the school director) and 2 of the experts/facilitators who supported the students throughout the course. The session took place on the actual game itinerary and lasted 3 hours in the afternoon to make sure the temperature is not at its highest in the day and it is not too hot for the participants to engage in physical exercise. The group tested the game by playing it, actually performing the game activities for physical exercise and wellbeing, and trying out alternative versions of the activities in order to maintain a moderate difficulty and make the best use of physical elements of the urban environment along the itinerary. Moreover, students identified parts of the game instructions and interactions with the game characters they needed to adapt to the physical location or make clearer for the players.
The group gathered at the game starting point, outside the Panathenian Stadium (the stadium that hosted the first modern Olympic Games in Athens, in 1896).

After loading the game on the group’s smartphones, the game commences.
Playing “Relay race on one leg” on a pedestrian way along the Health and Fitness Itinerary
Promoting Education and Jobs to enhance the Use of Urban Blue and Green Infrastructure for Health and Fitness

Playing “Yogalicious” in the National Garden

Preparing to play “Run for your time” around a pond in the National Garden
Walking to the rhythm of “Listen to the music” at Philopappou Hill
A group selfie after the end of the game playtesting

Following the playtesting field visit, the students participated in a classroom session where they worked on finalizing the game in the TaleBlazer platform, by integrating improvements in the texts, media and location of the game activities and interaction with the game characters, identified in the playtesting visit.

Stage 6
The objective of this stage was to conduct an evaluation of the course by the participating students, and communicate the developed Location-Based Game to the rest of the school community (teachers and students who did not participate in the course) inviting them to play the game and offer further feedback.

The evaluation of the course was implemented through a specially designed online questionnaire (Annex 3) and a focus group that took place after the playtesting session with the participation of the 6 participating students, the school director and the 2 experts/facilitators. The evaluation findings are presented in the next part of the present report.

The school director disseminated the information regarding the Location-Based Game to the teachers and students of the school and encouraged them to visit the historical centre of Athens at their own time with their friends, play the game and offer their feedback.

Finally, the school director and the participating students in the course declared their interest in continuing to work on the game they created during the next school year (commencing in September 2019) by adding more activities promoting health and wellbeing, enriching the available media and extending the itinerary. Moreover, they also declared their interest in creating an English version of the game (currently available in Greek) in order to enable foreign visitors of the Athens historical centre to play and experience the historical centre through the health and fitness itinerary. The City of Athens, a partner in the PREHealth project, plans on promoting the Location-Based Game created through the course to the Athens citizens and visitors, encouraging them to play and engage in activities promoting health and wellbeing as an alternative way to experience the green infrastructure of the city.

The Location-Based Game created is entitled “Athens Health and Fitness Itinerary” and can be accessed through the TaleBlazer application for smartphones and tablets using the code “gkbngwv”.

34
The first screen of the game welcomes the players to Athens and urges them to follow the health and fitness route. The players can find information regarding the game (duration, itinerary, etc.) by clicking on the buttons below.
The game includes information about the character guiding the players along the route, the famous athlete of the ancient Olympics “Leonidas of Rhodes”
By clicking on the game Map, the players can see the health and fitness itinerary, starting from the Panathenian Stadium and passing through green and open spaces of the historical centre of Athens.
Evaluation of the PREHealth course for secondary education

The course evaluation was conducted through a survey using an anonymous online questionnaire (Google Forms), as well as through a focus group discussion that took place at the end of the playtesting session. The questionnaire can be found in Annex 3 below.

Regarding the questionnaire evaluation survey, the findings overall reveal a very positive impact of the course to the participating students in terms of the knowledge, skills and attitudes developed.

In total, the students participating were 15-16 years old and male in their majority, while most of the participating students took part in more than 6 sessions within the course.

The gender distribution of participating students

The age distribution of participating students
In terms of evaluating the knowledge and skills developed within the course in relation to key learning objectives, the great majority of the participating students stated they have developed their cooperation skills and their creativity to a great extent, while they also learned a great deal about Location-Based Games and how to develop them. The participating students also stated they learned a lot about the rules of creating a game in physical space, LBG development platforms, building a simple game scenario, and the history of games in antiquity. Students also replied they learned a lot about identifying the core elements of an urban open space. Finally, their views were less positive about developing their imagination.

A very positive change in the students’ perceptions and attitudes was also recorded, regarding the role of green and blue infrastructure in promoting health and wellbeing among the citizens. This positive change in perceptions and attitudes is especially evident regarding the link between the urban green and blue infrastructure and physical exercise, as well as the importance of this infrastructure’s role in the everyday life of citizens. It is also important to note that the students reply they are now in a much better position to identify opportunities for physical exercise in an open space that they had never thought of before.
The students’ change in perceptions and attitudes towards the role of green and blue infrastructure in promoting the health and wellbeing of citizens

The change in the students’ perceptions and attitudes was also very positive regarding the role of mobile devices in relation to offering educational opportunities for all as well as the chance to develop a wider perception of the physical space. Finally, most students agree to a great extent that mobile devices can exercise imagination and creativity through developing Location-Based Games (LBGs). Moreover, students found the process of developing the LBG educational, pleasant and interesting.

Finally, when the students were asked what aspect of the course they would need more support with, in the framework of the course, they replied they needed more support mainly with building the game scenario and secondly with having more field trips on-site to work on details of the location aspect of the game.
The students’ change in perceptions and attitudes towards the role of mobile devices in relation to education

Students’ feedback on the process of developing the game
In the focus group the findings presented above were confirmed, however it offered an additional opportunity to the students, the teacher and the experts/facilitators to discuss regarding the students’ learning experience, positive aspects of the course as well as problems and obstacles for both the students and the teacher, and proposals for improvements to the course in the framework of implementation in secondary education.

The students’ learning experience was overall positive and they were really interested in the topic and the course activities, however students stated they wish they had more time to dedicate in working for the course activities. Unfortunately their school workload was heavy and some of them even found it hard to attend in some of the course sessions. This created additional stress to the management of the course and the work needed to complete the course activities. Moreover, although most course work took place during the scheduled sessions in the class or on the field trips, the students also needed to work from home especially during the activities of Stage 3 (building the game scenario and developing the game texts like information, instructions an dialogues) and Stage 4 (developing the game on the TaleBlazer platform).

The participating students stated they were looking forward to working on the PREHealth game project more in the next school year, adding more activities in the game and extending the game itinerary, and that they would think about new activities promoting health and fitness during the summer vacations, to contribute in the next school year.

Regarding the use of the TaleBlazer platform, students said that although in the beginning the User Interface of the TaleBlazer Editor seemed overwhelming with many options and settings, they soon
got comfortable in using it through working with it and testing the different platform features. After the end of the course the students said they would definitely use the TaleBlazer platform again to design a Location-Based Game, even if this was outside the school curriculum.

The students noted that although the game itinerary – part of the Athens Health and Fitness Itinerary designed in the framework of the PREHealth project by the project partners in Athens in cooperation with local project stakeholders – consisted of areas in the historical centre of Athens familiar to all participants, the course learning experience has changed the way they now view these open areas; they now see them as areas of great potential for multiple different uses promoting a healthier lifestyle for all citizens of Athens.

Finally, the students stressed that they wished there were more field trips in the course in order to identify and map the many different possibilities for physical exercise and other wellbeing activities they could integrate in the game, make the needed adjustments to the locations of the game activities in the platform and playtest the game on more occasions. On this issue, they added that Siftr was a very helpful tool for collecting information and media as geo-referred data they could revisit at any point during the game design.
Annex 1

Criteria for the design of the health and fitness itinerary (HFI):

- **Accessibility**: The itinerary route and stops should be accessible to the public and should have good connections with public transport (Metro stations, bus routes etc.)

- **Suitability**: The HFI should offer opportunities in order to promote health in the form of physical activities, active travel, active recreation and/or social interaction. The HFI should also be suitable for developing a Location Based Game and implementing the pilot phase/playtesting, by including a number of landmarks and areas of interest.

- **Central location**: In order to reach a wider audience, the itinerary should include attractive/central spaces that the residents and visitors of the area use already either for recreation (green and blue spaces) or their daily transport.

- **Connectivity**: The HFI should connect green and blue spaces with walking/cycling networks and other open spaces (e.g. archaeological sites, squares, historical sites)

- **Safety**: The HFI should include places where the users are safe from traffic and contradicting/incompatible uses.

- **Duration**: The HFI should be walkable within maximum 1 hour. However, it should offer a potential for extension in the future, to include connections with more open spaces in adjoining areas.

- **Flexibility**: The HFI should include spaces along the route and stops that can offer a variety of green and blue infrastructure and opportunities that can accommodate a wide range of users (i.e. the elderly, children, youth, active and less active users etc.).

- **Knowledge of special characteristics and users’ needs**: The HFI should include spaces the students are familiar with and use in their everyday activities, therefore assisting the design.
Annex 2

Worksheet for documenting original games and activities that promote physical exercise and wellbeing in the selected Health and Fitness Itinerary.

Design an original game

Name of your game

Inspiration
What game or sport did you “hack”?

Number of players or teams
How many players can play at a given time?

Space / Time
Where can it be played? Indoors or outdoors? On a green space or blue space? How long does it take to play?

Materials / equipment
What is needed in terms of equipment or materials to play the game?

Aim of the game
What does the player have to accomplish to win?

Rules
What is allowed to the player?
What is not allowed?
Annex 3
Evaluation questionnaire for Students (the questionnaire can either be filled in in paper form or easily be transferred into a Google Form to be filled in online).

1. Age..................

2. Gender  ☐ Male  ☐ Female

3. Which of the skills and knowledge below did you acquire through your participation in the course? Please tick ✓ as appropriate:

<table>
<thead>
<tr>
<th>Skills and knowledge</th>
<th>A great deal (5)</th>
<th>A lot (4)</th>
<th>To some extent (3)</th>
<th>A little (2)</th>
<th>Not at all (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I developed my cooperation skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I developed my imagination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I developed my creativity</td>
<td></td>
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</tr>
<tr>
<td>I learned about location based games and how to develop them</td>
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<td></td>
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</tr>
<tr>
<td>I learned about the rules of a game, and how to design and improve a game in physical space</td>
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</tr>
<tr>
<td>I learned about the online platforms for the development of Location-Based Games</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>I learned how to build a simple game scenario</td>
<td></td>
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</tbody>
</table>
I learned how to identify the structural elements of an open urban space

<table>
<thead>
<tr>
<th>Role of urban green and blue infrastructure</th>
<th>A great deal (5)</th>
<th>A lot (4)</th>
<th>To an extent (3)</th>
<th>A little (2)</th>
<th>Not at all (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The urban green and blue infrastructure promote health and offer opportunities for physical exercise even when they do not include designated sports facilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The urban green and blue infrastructure play an important role in the everyday life of citizens.</td>
<td></td>
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</tr>
<tr>
<td>My perception about the importance of urban green and blue infrastructure has changed after participating in this course.</td>
<td></td>
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<tr>
<td>I can now identify opportunities for physical exercise and wellbeing in an open urban space that I never thought of before.</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

4. How do you perceive now – after your participation in the course – the role of green and blue infrastructure in the city? Please tick ✓ as appropriate:
6. How do you perceive now – after your participation in the course – the use of mobile devices? Please tick ✓ as appropriate:

<table>
<thead>
<tr>
<th>The mobile devices – smartphones and tablets:</th>
<th>A great deal (5)</th>
<th>A lot (4)</th>
<th>To an extent (3)</th>
<th>A little (2)</th>
<th>Not at all (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can help develop a wider perception of physical space.</td>
<td></td>
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<tr>
<td>Offer educational opportunities for all.</td>
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<tr>
<td>Can exercise imagination and creativity through the process of developing educational games.</td>
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</tbody>
</table>

7. Did you find the process of the game development:

<table>
<thead>
<tr>
<th>Interesting</th>
<th>A great deal (5)</th>
<th>A lot (4)</th>
<th>To an extent (3)</th>
<th>A little (2)</th>
<th>Not at all (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Educational</td>
<td></td>
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</tbody>
</table>

8. What more would you like to have during the game development stage?

<p>| A | A lot | To an | A little | Not at all |
|---|-------|-------|---------|-----------|-----------|</p>
<table>
<thead>
<tr>
<th></th>
<th>great deal (5)</th>
<th>(4)</th>
<th>extent (3)</th>
<th>(2)</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More guidance for the scenario development part.</td>
<td></td>
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</tr>
<tr>
<td>More guidance for the game development application part.</td>
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<tr>
<td>More field trips.</td>
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</tr>
</tbody>
</table>

Other: Please give us your opinion!