



Intellectual Output 1

CTApp Game Concept

Erasmus+ Programme
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CTApp: Teaching Students Computational Thinking Through a Mobile Application

**Intellectual Output 1: State of the Art on Serious Gaming &
Computational Thinking**

Task A5: Development of a Game Concept



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I. Introduction

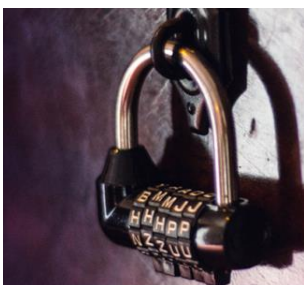
Designing a game’s concept is a crucial step in game development, and a task that can prove even more complex in the case of serious games. The game’s concept will affect its overall cohesion, the player’s goals, the storyline, levels of challenge for the player, success in entertaining, and more. In the case of serious games, something that must be taken into consideration when designing and developing the game concept is the learning aspect and purpose of the game. The key messages of the material have to be embedded in the game in as seamless a way as possible, not interrupting the player’s experience of the game, but still achieving the goal of transmitting the required knowledge, while maintaining an entertainment factor that keeps the player engaged.

Children’s psychological and cognitive development takes place to a large extent through play. When play is integrated into the educational process, the children’s freedom of expression and creativity must be combined with the application of rules and goals.

In this report, we look into the different concepts that were used in the development of the game concept for CTApp, and then introduce the CTApp game concept.

II. What are Escape Rooms?

Escape rooms first appeared in Japan in 2007 and have spread rapidly, mainly since 2012, to countries in Asia, Europe and the Americas. These are puzzle and adventure games, in which players are asked to work together and solve puzzles using items provided to them from the room they are in, in order to unlock the door and escape.



Escape rooms are a type of Escape games, which involve a team discovering clues and solving puzzles to move through a number of rooms, often in order to escape the site of the game, in a limited amount of time. Escape rooms require teamwork, communication, initiative, as well as critical thinking, attention to detail and rational thinking to apply a wide range of knowledge and effective methods under the pressure of time. Most escape rooms are purely recreational. However, escape rooms are becoming increasingly popular with vocational programs as a means of involving students in their learning environment and encouraging collaboration and the development of social skills.

Adapting the popular recreational activity of escape rooms for educational purposes is an innovative teaching method with the potential to enhance the learning experience. An escape training room is essentially no different from an entertainment room. The noticeable difference is that in an educational room the puzzles, hints, and solutions concern specific learning objectives. From an educational point of view, escape games are collaborative, focusing on student engagement and providing instant feedback, which makes them attractive for classroom learning activities.

In the past years, escape rooms have also moved to online or virtual spaces, becoming accessible to players from different locations and devices. They are used as bonding experiences for remote teams, or just a fun alternative for those who can’t make it to a physical escape room. Most online escape rooms can be explored both by a team or individually.



Escape Room games in Arabic cultures



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In Dubai the creator of Escape Quest says that interactive problem-solving games are currently competing with traditional entertainment in the UAE. Zoe Macy has opened three rooms for Escape Quest in Dubai and plans to open more across the GCC. It has spread in the Arab Gulf countries called escape rooms and is increasingly popular in the United Arab Emirates. Zoe Macy founded Escape Quest in Dubai and was one of the pioneers who introduced the concept of escape games to the UAE. Since its launch in September 2014, two rooms have opened in the Jumeirah Lakes Towers area, with an 80% peak visitor rate (“Escape from daily stresses in UAE-devised game”).

Escape Reality is an escape-room game concept based in Dubai. It launched its first centre on Sheikh Zayed Road, with the 22-year-old company director Bhakti Khubchandani announcing her plans to open more centres in more Gulf countries and globally, investing about \$18.25 million in the business. They have already opened centres in Glasgow, Scotland; Cardiff, Manchester, and Leeds UK, as well as Los Angeles and Chicago, “After Dubai, we are now looking at Abu Dhabi and are in talks with a company for a joint venture in Kuwait,” she told Arabian Business. (Deulgaonkar)

Using data from Google, Travel Advisor, and Yelp, have put together a ranking for the top 25 countries based on their top-ranking escape room business using a weighted average for these three sites. No Arab countries are listed in the top 25 countries with best escape rooms. (“Top 25 Countries with the Best Escape Rooms - March 2019 -”)

Arab countries where escape rooms are popular are UAE, Saudi Arabia, Egypt, Jordan.

Arabic has around 300 million native speakers and is the fifth most spoken language in the world. Arabic is not typically a translation for Escape room games because the market does not generate enough revenue (“uutiset: Escape Room - Der kranke Kollege - Arabic language version released”). But since this game is free to play anyway it would be very good to make it available to such a large group of people.

Searches for this information was predominantly done in Arabic.

Searching for 'digital escape rooms in Arabic' in Arabic harnessed about 381 000 results on Google search.

III. Benefits of Using Escape Rooms in Education

The following conclusions are drawn through research, based on the pre-existing literature^{1,2,3} to highlight the benefits of the use of escape rooms in education.

Initially, it turned out that, regardless of the teaching content and age, escape rooms in education were an auxiliary tool for understanding concepts difficult to understand in the traditional way, while encouraging users to show improved attitude, mood and activity. Through the educational escape rooms, the students developed communication and cooperation skills, as well as practiced problem solving strategies.

At the same time, with the use of this educational tool students are transformed from passive receivers into active participants in learning, as they are asked to explore data, accept challenges and solve problems.

In the context of education, the adoption of escape rooms as problem-solving games could provide a simulation of the world in which students practice and develop skills and perceptions.

¹ <https://pergamos.lib.uoa.gr/uoa/dl/frontend/file/lib/default/data/2896400/theFile>

² <https://ir.lib.uth.gr/xmlui/bitstream/handle/11615/43401/12059.pdf?sequence=1>

³ http://openresearch.ocadu.ca/id/eprint/3079/1/ShalabAlsham_Dana_2020_MDES_INCD_MRP.pdf



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According to the literature study, the majority of escape training rooms were based on Collaborative Learning Theory, Active Learning Theory, Game-Based Learning Theory, Problem Solving Learning and Collaborative Problem Solving:

Active Learning

Active learning techniques cultivate superior skills and show better learning outcomes compared to traditional teaching methods. Students have a deep understanding of new knowledge, cultivate skills, acquire a sense of responsibility as well as perseverance, in order to actively solve a problematic situation.

Game Based Learning

It focuses on the learning object and the mobilization of the students through a playful process, such as rewarding and ranking the students according to their learning performance. In addition, it has been argued that a play and problem-solving environment provides students with immediate learning outcomes within a pedagogical context. It has been shown that this kind of process facilitates the acquisition of motivation, skills and knowledge. This results in students getting involved and experimenting without being overwhelmed by the feeling of failure.

Collaborative learning

Collaborative learning as an educational methodology provides opportunities for students to develop communication and collaborative skills. A prerequisite for collaborative learning is the existence of communication, i.e. the development of dialogues for the exchange of messages and information between collaborators. In order to facilitate the communication without spatial and time restrictions during the cooperation of the trainees, various internet tools of modern and asynchronous communication can be used.

Learning through Problem Solving

Constructivism is a theory of learning that advocates that knowledge is constructed through the interpretation of the learner's experiences, which originate from the real world. At the same time, this learning theory focuses on knowledge building, critical thinking, and problem-solving strategy. A constructivist framework that successfully applies to the learning process is the Problem Solving Learning model.

IV. Benefits of digital mobile games

Mobile learning games are considered to encourage both cognitive and social-emotional learning in young people and adults. Most of the research that has been done on mobile games in education focuses on improving students' knowledge through the application of digital mobile games. In particular, several studies have shown that students understood and interpreted difficult concepts, terms and situations more easily. In addition, an increase in knowledge in the fields of Education was identified. In most of the research that has been done, the emphasis is on developing skills using the game. In particular, they stand out as promoting communication skills and the ability to collaborate between students. In addition, some research demonstrates the cultivation of problem-solving ability. Finally, in research based on Special Education, digital games have been shown to contribute to the development of cognitive skills, such as memory and observation. Most of the research also on the effect of portable digital game on the educational process presents positive attitudes of the participants, as it shows an increase in students' interest in the learning process and the teaching object, gaining a positive experience through the game and minimizing the



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feeling of failure. At the same time, the mobilization of the participants and the feeling of involvement in relation to the learning object is maximized.

V. The escape room concept in CTApp

The game will be set in a house, the CTApp house. The player will be thrown in the house environment as soon as the game starts, and the goal will be for them to solve quizzes related to Computational Thinking so as to move between the different rooms of the house. The game will end when the player has solved all the quizzes. They will then be able to exit, or escape the CTApp house.

The game process for the player will follow this sequence:

1. Enter the house.
2. Face the quizzes in the rooms house.
3. Solve a quizzes to proceed to the next room.
4. Go through all the house rooms and escape from the CTApp House