



A Dynamically Evolving Multicultural Escape Suitcase Travelling a Participatory Journey

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ABSTRACT

Escape rooms have gained popularity across the globe, be it for entertainment, team building, or learning purposes. Solving puzzles has intrigued humanity since ancient times and playing games together facilitated intercultural encounters, encouraging mutual learning. This situated action builds on the idea of a mobile escape room within a suitcase, which when traveling shares previous encounters and collects new puzzles, thereby ever evolving. A suitcase will arrive in Sibul, Malaysia, with augmented reality stickers that entail puzzles created in Namibia. Visitors need to solve the puzzles to open the suitcase, which contains treats from Namibia, as well as materials to create new puzzles. Visitors participate in creating their own cultural puzzles, upload them to the augmented reality application, and thereby contribute to a new multicultural escape suitcase. The puzzles can also be played back at home, and the suitcase will continue evolving as it travels.

CCS CONCEPTS

• **Human-centered computing** → **Participatory design**.

KEYWORDS

Escape Room, Puzzles, Multicultural, Game Design

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1 BACKGROUND

Playing games is a fundamental aspect of every culture, acting as more than just a source of entertainment. Play is an engaging activity that requires intellectual or physical engagement, with the aim of achieving a desired outcome [5]. It is believed that engaging in this activity can promote self-confidence, creativity, and fantasy, as well as improve quick learning, failure and risk management, communication abilities, and adaptability. Additionally, it can aid in the construction of reality during interactions with others or the environment [5]. It serves as a valuable means of learning about each other, creating connections, and promoting shared experiences. Games can be engaging, generate interest, attract new audiences, and provide cultural content that can create lasting experiences [5]. Games related to traditions and cultural practices offer players the opportunity to engage with and explore history and cultural heritage [5].

Escape rooms in particular are a prime example of this, as a live-action game, they offer a unique spatial experience where people can learn together by solving puzzles [10]. The concept of escape rooms originated in Japan in 2007 and has since gained global popularity. In 2019 there were 7,200 escape rooms in 1,445 cities across 105 countries [6], and current surveys estimate around 14,000 escape rooms worldwide. Several studies indicate that educational escape rooms promote 21st century skills, such as creativity, collaboration and communication, as well as providing high levels of enjoyment [9]. Incorporating extended reality technologies, such as augmented reality (AR) and virtual reality (VR), into escape rooms can provide an additional level of immersion [7, 8]. Having

co-designed our own escape room with children, we can confirm Manzano-León et al. [9]’s findings that children enjoy actively participating in crafting puzzles and challenges as much as playing the game itself; participating in the creation of escape rooms also contributes to the overall learning experience.

2 CO-CREATING A MIXED REALITY ESCAPE ROOM

Our escape room project, which commenced in 2019, was a collaborative effort with yearly cohorts of students from a public primary school in Windhoek, Namibia. The aim was to co-create an engaging and interactive mixed reality escape room with an emphasis on collaborative puzzle solving. At the beginning we immersed students in the world of puzzles and board games, followed by a character building quest, which later formed the foundation of the escape room narrative. During the global Covid-19 pandemic, using a distributed co-design approach, the students created the story plot [3]. Over the years, various prototypes were developed and tested, which included AR and VR applications [1]. In 2023, spanning three months, the project shifted its efforts to refining and expanding existing elements, in addition to incorporating sensors into the escape room [2]. The final mixed reality escape room features four stations that integrated VR, AR, and sensors, as well as a variety of engaging elements, such as riddles and stereograms. The narrative framing the escape room was the mission to save a yummy candyland that is being threatened by thieves.

The last cohort of student creators were invited to showcase the escape room at a local Tech Innovation Bazaar. In order to provide a demonstration, all four stations of the escape room were meticulously packed into a single suitcase. At the Tech Innovation Bazaar, participants of all ages took part in the escape room experience (see Figure 1). Inspired by this presentation, for which the escape room had to be transported to another location and fitted into a suitcase, the idea of developing a transportable escape room materialized. A new suitcase-enclosed escape room was developed, reusing student-created puzzles and AR.



Figure 1: Scanning AR triggers to open the suitcase

3 THE SUITCASE ESCAPE ROOM TRAVELS TO SIBU, MALAYSIA

3.1 Concept and Goal

Escape rooms and participatory design process pursue similar goals, whereby participants are encouraged to utilize and reflect on their own knowledge, as well as working in teams and engaging in creative problem solving.

The aim of the proposed situated action, is to create a multicultural evolving escape room suitcase that facilitates playful explorations of other cultures and a participatory approach to creating new puzzles. Each person playing can bring their own cultural practices and traditions to the existing suitcase escape room, which gradually leads to a colourful and diverse bouquet of puzzles and cultural knowledge. The project involves sharing own experiences, routines, and cultural practices, with the development of new puzzles. This will allow participants to expanding their knowledge on others’ cultural practices, and reflecting on one’s own. The conference participants, who are coming from all over the world, will develop and contribute their own ideas, thereby creating a versatile and diverse space for all to experience. Thus, the main focus is on promoting multicultural exchange and communication, while allowing for creativity and enjoyment in the exploration and participatory design process.

3.2 Set-Up and Activities

A locked suitcase containing sweets from Namibia will be placed at the conference’s exhibition space. The situated action will be facilitated by one of the authors. The theme of the escape room remains similar to the original, as it revolves around a ‘yummy world’ full of sweets; the suitcase will literally be filled with real sweets. Participants will begin by playing the suitcase escape room, which consists of solving three AR-based puzzles. Each puzzle has a single integer solution, and all three numbers must be entered in the correct order into the suitcase’s combination lock. The suitcase is equipped with a QR code and three stickers, following the practice of travellers who collect stickers of their travel destinations on their suitcase. The AR application can be downloaded onto mobile phones using the QR code. The stickers serve as AR triggers, providing puzzles with videos and 3D graphics. Upon deciphering the puzzles, the participants can open the suitcase and take out sweets.

Participants then start designing a similar puzzle, preferably based on own cultural practices and heritage. The instructions on how to add a new puzzle to the suitcase will be located in the suitcase. Providing participants with a table and chairs would be desirable. The participants begin by defining a theme for the new puzzle, and then devise puzzles using different mediums, such as photos, videos or handcrafted items. The solution to the puzzle must one of the original integers. In the suitcase there will be blank stickers, a box with crafting materials (e.g., pens, scissors), and a link to the AR application where triggers and new media can be uploaded. Additional puzzles and media developed on-site are integrated into the existing application (i.e., also updating the already downloaded application). Thus, over time more stickers will be placed on the suitcase, which are linked to an extensive cultural library with puzzles from all over the world.

3.3 The Initial Puzzles

As the the suitcase starts its journey in Namibia, the original three puzzles will share experiences and cultural practices from Namibia.

The first puzzle was co-designed by the last cohort of students working on the escape room [2]. It shares one of their favourite daily activities, namely dancing. For this puzzle they created a dance formation video, which provides a clue for the first number.

The second puzzle is drawn from a previously co-designed game with another cohort of school children in Namibia. The game was aimed at sharing cultural heritage objects and practices from the Ovahimba tribe with primary learners [11]. Various objects of cultural significance are used by the Ovahimba people, of which many of them do not reveal an obvious utility, such as the *Otjikosinga*. The peculiarity of the object's shape makes it perfect for guessing activities, which are common in escape rooms. Different suggestions for its purpose will be associated with the second number. Participants will need to scan a marker, which is a stylised vector image based on a drawing from one of the learners. As a hint, the players can view a video of daily activities by Ovahimba people, in which they use the *Otjikosinga* for its intended purpose.

The third puzzle will be about a traditional practice of the Juhoansi community in Donkerbos, with elements drawn from previously developed VR application [4]. The VR application draws upon a cultural experience that guides players through a Ju/'hoansi-San hunting story. The San are an indigenous group of hunter-gatherers, who have traditionally relied on hunting for survival in the desert. While this practice is now prohibited by law, it has been a crucial part of their culture for centuries. The VR application has documented this cultural practice, making it tangible for future generations. Drawing on scenes in the VR and from previously recorded videos and audios a puzzle will be designed engaging the audience in traditional practices of the San people from Namibia.

3.4 Technical Realisation

The AR application, developed using Unity, is intricately linked with a web-based Content Management System (CMS) utilizing Piranha CMS for dynamic content management. This system is distinguished by its real-time update capability, allowing users to modify tracked images, with the AR application promptly reflecting these changes through a headless API architecture. This innovative integration facilitates a seamless and interactive AR experience, dynamically bridging digital content with the physical world through user-driven customisation.

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