Room2Educ8: A Conceptual Framework for Designing Educational Escape Rooms

Panagiotis Fotaris[1] and Theodoros Mastoras[2]
[1]University of Brighton, Brighton, UK
[2]University of Macedonia, Thessaloniki, Greece
P.Fotaris@brighton.ac.uk
mastoras@uom.edu.gr

Abstract: Despite being a relatively new concept, escape rooms are used in academia as learning and collaborative tools. Research findings have established that educational escape rooms (EERs) can create immersion as they combine the strengths of storytelling and gameplay, therefore eliciting high motivation and engagement and so promoting successful learning. Yet evidence demonstrates that there is little consistency in the approaches adopted in this emerging field. A major obstacle faced by educators is the lack of practical design frameworks for EERs. To address this, we propose Room2Educ8, a user-centred conceptual framework based on Design Thinking principles to operationalise the development of EERs. This framework provides heuristics for empathising with learners, defining learning objectives and constraints, adding narrative, designing puzzles, briefing and debriefing participants, prototyping and playtesting, documenting the whole process, and evaluating the escape room experience. It delivers an easy-to-follow guideline that can be adopted and adapted in various learning contexts to create immersive learning experiences. Room2Educ8's prescribed nature makes it also approachable for commercial escape room designers who consider moving into Serious games territory. To validate the integrity and use of the proposed framework, 104 participants with no prior experience in EER design used Room2Educ8 from 2018 to 2022 to develop 26 EERs. Feedback was obtained through a combination of surveys and focus groups. The framework validation suggests that Room2Educ8 can be proposed as a valid tool for EER design. Participants found the framework very detailed, with clear and understandable steps that were easy to follow regardless of lack of prior experience in EER design. It can be used to develop a wide range of EER types covering different topics and allows designers to get a deeper understanding of the people they are designing for.

Keywords: educational escape room, design thinking, conceptual framework, game-based learning, gamification

1. Introduction

Following the shift from traditional didactic classroom models to the adoption of more learner-centred active learning approaches, escape rooms are gaining popularity as alternative learning and assessment environments designed to enhance students' learning and 21st century skills (Guckian et al, 2020). An educational escape room (EER) can be defined as an instructional method requiring learners to participate in collaborative playful activities explicitly designed for domain knowledge acquisition, skill development, or behavioural change so that they can accomplish a specific goal (e.g., escape from a physical or virtual room) by solving puzzles linked to unambiguous learning objectives in a limited amount of time (Fotaris & Mastoras, 2019). Various reviews indicate that, due to their playful nature which favours positive behaviour (Zhang et al., 2018), EERs can enhance learners' motivation, engagement, and time management, increase confidence in critical thinking and decision-making, improve knowledge acquisition and academic performance, and encourage social interaction (Veldkamp et al., 2020; Fotaris & Mastoras, 2019).

EERs frequently expose players to real-life scenarios with puzzles that fit into the story and involve interacting with many objects in realistic ways, thus bringing greater authenticity to the activity and making it more immersive (Guigon et al., 2018). Students can experience a situation in which they need to trust their own and their colleagues' competence, work together as a team, and handle both time constraints and the consequences of not working fast enough (Taraldsen et al., 2022). This approach aligns with both: a) the paradigm of narrative centred-learning environments (Rowe et al., 2011) which are defined as "a class of game-based learning environments that contextualise educational content and problem solving with interactive story scenarios"; b) the situated learning theory (Lave & Wenger, 1990), which states that situated or scenario-based learning should take place in the environment in which it would normally be applied. When used as a method of simulation-based education (SBE), escape rooms can be mapped effectively to Kolb's experiential learning cycle (Kolb, 1984), as it permits active experimentation in a safe environment, prior to undertaking concrete experiences "in the wild" (Poore et al., 2014). Debrief and reflection are essential to learning in Kolb's cycle, and the real value of the EER could be argued to be purely these elements, in common with other types of SBE (Guckian et al, 2020).

Researchers have begun to build upon the notion of teachers as designers of learning experiences for students. EERs have the potential to enable new forms of teaching, as evidenced by the rapid increase in publications related to use of escape room for educational purposes (Fotaris & Mastoras, 2019), but choices about the design of the EER room (e.g., group size, context, time, rules, etc.) can affect the learning experience (Taraldsen et al., 2022). As research in EERs is still in a preliminary phase, no unison framework about how to design them has been established yet. There is a need for frameworks, methodologies, or guidelines especially aimed at EERs that could help educators not only in creating these new learning environments (Taraldsen et al., 2022; Veldkamp et al., 2020; Guigon et al., 2018), but also in developing design dispositions that will help them adapt to the complexity of teaching in the 21st century. To address this issue, we propose Room2Educ8, a user-centred conceptual framework for EER design that can be adapted to any subject and escape room type. It is based on design thinking, a process that has been used as an instructional design method for the development of course content or teaching material, in curricular development, and as a teaching strategy to achieve subject-specific learning goals (Panke, 2019).

This article first provides an overview of the available frameworks for EER design, followed by a detailed description of Room2Educ8, so that each stage will be easy to understand and use. It then presents the method that was employed to validate the proposed framework's integrity and use. The article concludes by discussing Room2Educ8's use, study limitations, and plans for future work and evaluation.

2. Background

EscapED was the first theoretical framework to provide a methodology for creating EERs and interactive game solutions for learning and behaviour change within higher education settings (Clarke et al., 2017). It consists of six sequential steps (Participants, Objectives, Theme, Puzzles, Equipment, Evaluation), with each one of them being broken down into other areas for developers to consider. Although the escapED framework has informed the development of various EERs, either in its original form (Martina & Göksen, 2022; Löffler et al., 2021; Otemaier et al., 2020) or in a modified version (Snyder, 2018; Neumann et al., 2020), its quality and efficacy in terms of usability and usefulness has not been validated yet.

Another methodology about designing EERs is SEGAM (Guigon et al., 2018), which describes how to approach various aspects related to EERs such as constraints, pedagogy, parameterisation, tests, and background. It divides an EER into several levels, with each level representing a stage of the game and having at least one associated riddle that corresponds to one or more educational objectives (diagnostic, formative, summative or discovery of a notion).

Eukel & Morrell (2021) presented a cyclic design process to create, pilot, and evaluate EERs comprising 5 steps: Design, Pilot, Evaluate, Redesign, and Re-evaluate. While this approach offers some generic advice on EER development, it appears to be a simplified and iterative adaptation of the waterfall project management methodology. The provided information for each step lacks depth and there is no evaluation of the proposed method.

Nicholson and Cable (2021) proposed a framework that enables the setting of specific learning objectives and individual learning outcomes for students in an EER by mapping them against 7 dimensions (setting, social, story, skills, strategy, simulation, self) to build a cohesive interactive story that provides learning opportunities. Although the authors give instructions on building an EER using this framework, they do not provide information about the framework's own evaluation.

The COMET framework was developed as a step-by-step approach to designing EERs that would meet specific medical knowledge, skills, attitudes, and safety objectives while considering the unique dynamics of an interprofessional team (Dittman et al., 2022). It comprises 5 components (Context, Objectives, Materials, Execution, Team Dynamics) and was piloted in a workshop aimed at enabling small groups to collaboratively design an interprofessional escape room.

Despite their different approaches, the aforementioned frameworks share one thing in common: they rarely validate the quality and efficacy of the frameworks themselves in terms of usability and usefulness, opting instead to assess the impact on learning of a single prototype escape game that was developed using the

particular framework. Room2Educ8 addresses this issue, as it was validated by 104 participants who used it to develop 26 EERs on various subjects.

3. Room2Educ8 framework

Room2Educ8 aims to allow practitioners to develop their creative confidence, which is required for game-based learning to be fully realised, by engaging in hands-on projects that focus on building empathy, encouraging ideation, and fostering active problem-solving. Its process can be described as a cycle of (1) empathising and observing, (2) defining the problem, (3) contextualising, (4) designing, (5) briefing and (6) debriefing participants, (7) prototyping and playtesting, (8) documenting, and (9) evaluating (Fig. 1), with the designers also reflecting and devising throughout the cycle. These steps were influenced by a typical design thinking process of (1) empathising and observing, (2) defining the problem, (3) creating ideas, (4) prototyping, and (5) testing.

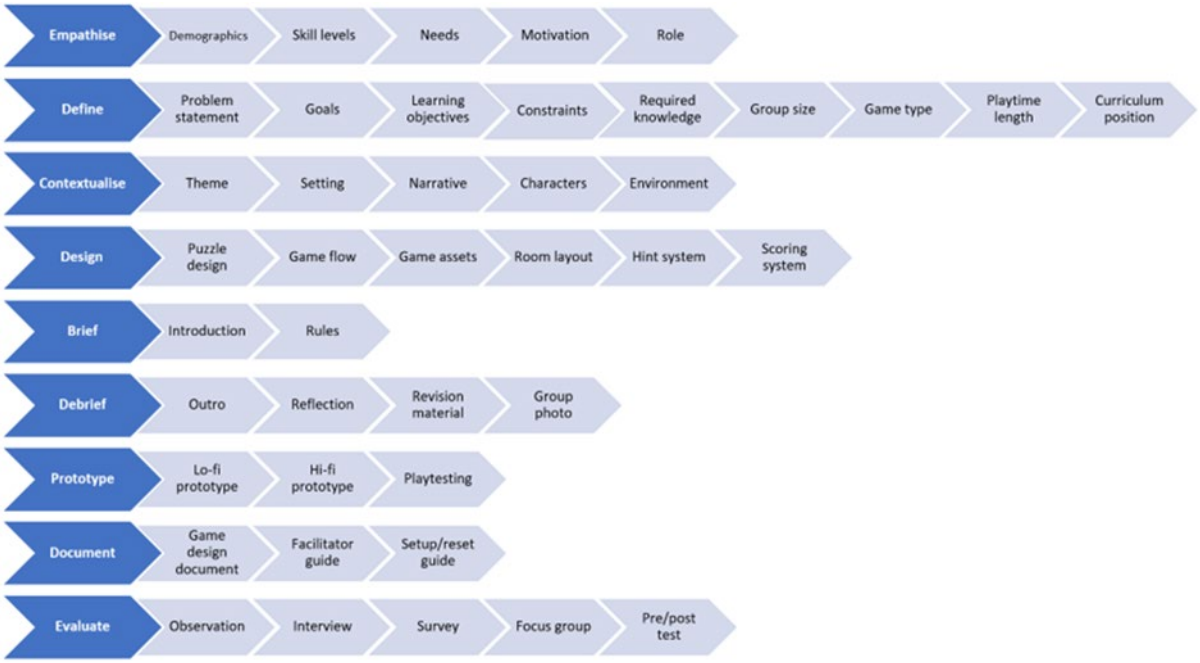

Figure 1: Room2Educ8 framework

3.1 Empathise

The first step of Room2Educ8 calls for EER designers to gain an understanding of both the people they are designing the EER for and the problem they are trying to solve. Techniques such as focus groups, interviews, observations, and surveys, as well as data from academic records can be utilised to collect information about learners' demographics, educational background and needs, attitude towards subject matter and playing for learning, player role (e.g., students as players / designers / observers), and skill level. The collected data can then be used to build learning personas, i.e., fictional characters who represent certain traits and qualities of the target audience for whom the learning experience is designed for (Quintana et al., 2017). These should be considered throughout the EER development as they can help designers to identify and understand the learning objectives, challenges and preferences of their learners.

3.2 Define

As is true when developing any curriculum, clear goals, learning objectives, and constraints are critical to ensuring that the content is delivered effectively (Davis et al., 2021). The second step of Room2Educ8 synthesises the findings from the "empathise" step to define constructs that should be closely considered when designing an EER such as: *problem statement; goals; learning objectives; constraints* (time, available space, scale, budget, curriculum, class-size, resources, language)*; required knowledge* (explicit, assumed, mix)*; group size; game type* (physical, digital, puzzle box, puzzle hunt, hybrid, serial game, escape room in a book/postcard/t-shirt)*; playtime length; game position within the curriculum*.

A specific problem can be defined by identifying the who's, what's, and why's that exist in the space around the issue, such as asking who is experiencing the problem, what the problem is, and why it matters. This should be

followed by setting up *SMART goals*. Answering questions like those in Table 1 should provide a sense of direction and motivation.

Table 1: Sample questions to define SMART goals

Goal type	Question
Specific	• What is the overall purpose of the EER? • What are the learning objectives this EER is going to support? • What type of EER will be developed? Is it going to be physical (permanent or pop-up), digital, hybrid, puzzle box, serial story, or escape room in a book/postcard/t-shirt? • If the EER is physical, where will it be located (e.g., classroom, lab, library, office, storage room etc.)? • What knowledge is required to succeed in the game? Is it explicit (students are given all of the relevant information needed within the game world), assumed (students are being tested or assessed on what they already know), retrievable (students use information retrieval skills to find what they need in the real world), or a mix? • How many participants will be in each group? • Where will the EER be positioned in the course curriculum (e.g., stand-alone activity, at the introduction of a course, during a course in addition to a lecture, as assessment, a serial story that will run periodically)? • Will you develop alone, or will you co-create with the target audience? • Will the story be stand-alone like a full movie or framed as an episode in a series with a continuous narrative arc)? • Will the EER be used as a formative or summative assessment tool?
Measurable	• How can you quantify or qualify that the learning objectives have been met? • How will the designer know when the game is successful?
Attainable	• Does the goal require the right amount of effort? • Is there sufficient budget to develop the EER? • Are the necessary resources available (e.g., space, props, equipment)? • Do learners have the necessary skills to play the game? • Are there any language barriers that may prevent participants from playing the game? • How many learning outcomes are sufficient without overloading participants?
Relevant	• Why is achieving this learning objective significant?
Time-focused	• What will be the duration of the game? • How much time will be available for self-reflection after the game? • How many sessions will be necessary to involve all participants? • What is the deadline or time restraint to develop the EER?

3.3 Contextualise

The third step of Room2Educ8 is to place the EER in a particular context that gives meaning to the activities the learners do, provides an authentic reason for escaping, and links the puzzles together in a cohesive storyline, so that participants can identify with the game experience and build personal motivations to complete the game (Clarke et al., 2017). Context includes *theme*, *setting*, *narrative* which contextualises knowledge and skills needed, *characters*, and *environment*.

It is critical to select the theme early in the design process, as it will dictate the rest of the decisions made about the game (e.g., setting, characters, tone of the puzzles). Themes such as mystery, sci-fi, horror, heist, historical, treasure hunt, and prison break are common within EER (Nicholson & Cable, 2020). The *time period* and *place* where the game will be set should be decided next, as this can determine what types of elements will be most appropriate to develop the puzzles from. A *story* should be created to provide a consistent, immersive narrative for the activity that will be introduced and discovered by the participants in bits and pieces. When crafting the story, EER designers should answer questions such as: Why are the players in the room? How did they get there? What do they need to do to escape or succeed? What is at stake if they do not escape? Why do they need to hurry? Why are there puzzles and clues in the room?

Another consideration is the *characters* that are part of the plot. In EERs, participants are expected to be an active part of the learning process, so they should be given the leading role (*protagonist*) in a story that they feel they are influencing, with an outcome they believe they can affect (Nicholson & Cable, 2020). Once this role has been decided, the other characters need to be fleshed out as well. Who are the *antagonists* responsible for the challenges and puzzles the participants must overcome? Is there an *ally* who can provide hints, tools, and instructions? The instructor usually acts as the ally to guide the learners towards success and ensure they have a positive learning experience. With compelling characters in place, the basic concept of the story can then be expanded into a storyline using the three-act structure (Skolnick, 2015).

Like the theme and narrative, the room's physical *environment* can affect the activities and overall learning outcomes. The game space becomes a memory palace whose contents must be deciphered as the participants try to reconstruct the plot (Jenkins, 2003). Choices about decoration, physical props, lighting, technology, and audio-visuals of game spaces have narratological consequences and must follow the room's theme to prevent cognitive dissonance (Nicholson, 2016). Providing on-theme costume accessories and inviting participants to dress up is also an opportunity to encourage immersivity (Lyman, 2021).

3.4 Design

The fourth step of Room2Educ8 involves designing the *puzzles* that participants must solve during the game experience, developing a *hint* and/or a *scoring system*, and defining *game rules*. Designers must determine which learning outcome each puzzle will support, understand what the participants know before they start the puzzle, and what they should know after completing it. Participants should solve every puzzle to complete the game and meet the learning objectives. Puzzles should be as self-guided as possible, make their goal easily understood, be clearly linked to clues, take less than 5 minutes to solve, and provide clear feedback when solutions are tested (Lyman, 2021). The first puzzle should be relatively easy to set the stage for success for participants, followed by diverse puzzles of increasing difficulty, which challenge participants in different ways as they progress in the game. This method can target a variety of learning approaches and is more likely to engage multiple team members, thus increasing the game's success rate.

When designing the *game flow* through which participants proceed during the game, a popular strategy is to follow a linear puzzle structure, i.e., present one puzzle at a time; solving it will then make the next puzzle available. Linear pathways are easier for participants to understand, the story flows better, and can be timed and paced, therefore less guidance is needed, and progression is easier to monitor (Guigon et al., 2018). Alternatively, in a non-linear game, multiple puzzles are available to participants all at once, and after all are solved, their outputs can be used to solve the final meta-puzzle. A flowchart showing how puzzles and clues are connected is an effective way to visualise puzzle structure.

EER designers should consider any physical and/or digital *assets* that will be manipulated to solve the puzzles or will be used as clues, e.g., the room itself as a space, containers, locks, envelopes, game tech, countdown timer to promote a sense of urgency, and narrative elements that embody the theme or setting. It is recommended to utilise assets that can be reused and/or are cheap to replace, as well as to produce refill packs with replacements for game elements in case they are misplaced or malfunction. The "one clue, one use" rule (i.e., each clue or prop is used only once to solve a puzzle and then is retired from the game) and the absence of red herrings can also improve the overall gaming experience (Lyman, 2021).

A *room layout* with clue placements and arrangements of the puzzles, as well as a flowchart mapping out how participants will navigate the room, can help manage and visualise the overall flow of the experience (Davis et al., 2021). Additionally, cards may be used to provide details of each individual puzzle and its location in the room, starting objects in each location, what prompts players to start each puzzle, and what clue/reward makes players go to the next puzzle. These techniques are useful for checking for consistency in the room design, sharing the design with others, and resetting the room.

To foster a positive learning experience, it is crucial to develop an incremental *hint system* that offers help to participants when they are stuck and fits the environment and narrative organically. Hints can be delivered to participants personally (e.g., via a TV screen, through the room's PA system, on written notes, via an app/website etc.) or by pre-set hints on apps/websites or on hint cards. Defining hint rules is recommended, especially for EERs with assessment goals (Veldkamp et al., 2020).

Finally, a *scoring system* can be used to tap into people's natural competitiveness and encourage them to do better. A final score can be awarded based on whether players were able to finish the game, the time it took them to do so, the number of hints or clues they used to solve the puzzles, or the number of puzzles they solved (Lyman, 2021). Designers should also consider whether there will be consequences to players for any errors they make, e.g., miscalculating a medical dose may result in a two-minute penalty (Davis et al., 2021). Scores leading to tangible rewards (e.g., sweets, stickers, marks, etc.) should be used cautiously, as there is the risk that players will focus on doing only what needs to be done instead of engaging fully with a puzzle, which can result in not achieving the learning outcome.

3.5 Brief

The fifth step of Room2Educ8 is for designers to consider how they are going to inform participants about the EER's backstory, objectives, and rules before the game begins. From a narrative perspective, this is Act 1 (exposition) of the three-act structure (Skolnick, 2015). A pre-game *briefing* can provide background information about the main characters (the "who"), the setting (the "where"), the time period (the "when"), and the inciting incident, as well as set up the dramatic question: what must the protagonists do to solve the problem they face? This prologue can be in the form of a pre-written script read by the EER facilitator or the players themselves. Alternatively, an introductory video can add significantly to the immersiveness of the experience, make players engage more naturally with the storyline, and heighten the sense of urgency for escaping from the room. A list of *rules* should also be provided, including information about the time limit for successful completion, forbidden items, hint and scoring system, handling props and furniture, what is – and what is not – part of the game, case sensitivity of text entry fields, consent forms, health and safety etc.

3.6 Debrief

The sixth step of Room2Educ8 is for designers to consider how they are going to make participants aware of the learning that occurred during gameplay. To provide clarity, resolution, and closure to the story, a *debriefing* session upon completion of the EER may begin with an *outro video* showing what happened at the very end of the story, what participants did in the game, why doing that was important, and how their actions improved the circumstances of the game's characters. Next, the facilitator should guide participants in reflecting on their performance, the game content, the puzzles, the skills needed to solve them, and their overall experience, and then use this discussion to clarify teaching points. As participants may desire feedback on observed team-based skills, open-ended questions can be used to prompt dialogue about leadership, delegation, effective communication, and task assistance (Zhang et al., 2018). The debriefing may be concluded by giving away *revision material* that summarises key learning outcomes the participants explored during the game, and by taking a *group photo* (or screenshot) of participants optimised for social media.

3.7 Prototype

The seventh step of Room2Educ8 is for designers to consider how they are going to *prototype* and *playtest* the EER. Once the design is finished, the next steps are to make a *lo-fi* testable prototype, have participants with similar skill sets to the intended learners playtest it, return to the design process to solve problems that came up during testing, and produce a refined prototype. This cycle may be repeated several times, so it is recommended to use few resources in creating the early prototypes, as they will most likely be changed after one play. Each playtest should address issues about realistic playtime, difficulty level, puzzle mechanics, relevance to learning objectives, quality of hints, and cohesive narrative. Testing individual puzzles, paper prototypes, the debriefing structure, and the full game at different stages will provide important feedback to improve the design and achieve game balance and playability (Davis et al., 2021).

3.8 Document

The eighth step of Room2Educ8 is for designers to consider how they are going to *document* the process of developing the EER. A highly descriptive *game design document* (GDD), created and edited throughout development, can act as a guiding light and help the design team to refine scope and production needs. General anatomy of a GDD includes a game overview with general information about the EER and its learning objectives, followed by sections that describe each part of the design (e.g., puzzles, narrative, assets, etc.) in progressively more detail. It is recommended to produce two additional documents: a) a *facilitator guide*, which should contain the learning objectives, briefing and debriefing instructions, game rules, room layout, a game walkthrough with clues and answers for each puzzle, rules and/or pre-set times for providing hints; b) a *set up/reset guide* with clear instructions about how to set up and reset the game for another play-through.

3.9 Evaluate

The ninth and final step of Room2Educ8 is for designers to consider how they are going to *evaluate* the EER experience and assess whether the EER met its goals and objectives, what aspects of the game contributed to or detracted from this, and how the learning experience could be improved. Instructor *observations*, review of video footage from game sessions, and learner feedback using post-activity *interviews*, *focus groups*, *surveys*, and the debriefing session are common methods to gather this information. When the EER is used as a tool to assess knowledge and/or soft skills, the achievements on the learning goals can be measured by means of a *pre-/post-/delayed post-knowledge test* (Veldkamp et al., 2020).

4. Room2Educ8 validation

Since the proposed framework is based on design thinking principles, it was embedded in a compulsory postgraduate module named "Design Thinking" for the MSc in User Experience Design course at the University of Brighton, where students had 13 weeks to collaboratively design, develop, facilitate, present, and document a one-hour EER experience using Room2Educ8 for their coursework (Fig. 2).

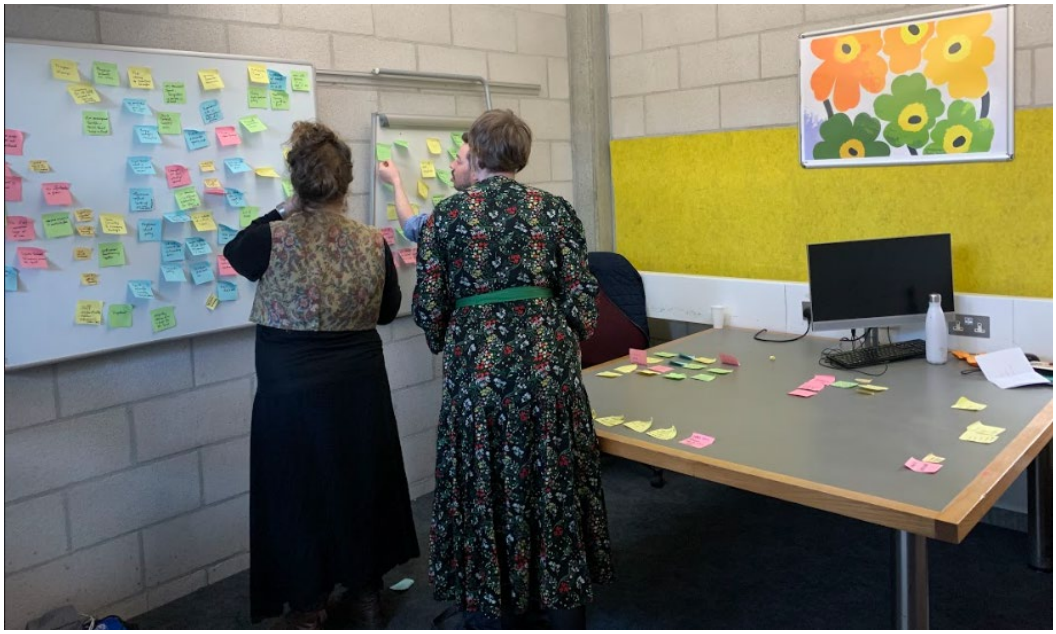

Figure 2: Study participants using Room2Educ8 to design an educational escape room's puzzle flow

To assess Room2Educ8's integrity and use, a mixed-methods internal validation study, which was based on Instructional Design model validation (Richey, 2005), ran for 4 academic years (2018-2022) with a different cohort of students every year. A total of 104 students (*N*=104, 48 males, 56 females) aged 21 to 32 with no prior experience with EER design worked in groups of 4 and created 26 EERs (14 digital, 8 physical, 4 hybrid). 16 EERs focused on cybersecurity awareness, 6 on Information and Communication Technologies, and 4 on information literacy. All students completed a survey of 10 statements measuring overall perceptions of Room2Educ8's clarity, usability, and usefulness (Table 2). The perception scale was a five-point Likert scale ranging from "1 – strongly disagree" to "5 – strongly agree". To support or refute the quantitative findings, qualitative data were collected through 26 focus groups (4 students per group) moderated by a lecturer and then analysed using content analysis.

Survey results in Table 2 indicate that the framework is very detailed, with clear and understandable steps (4.25) that are easy to follow regardless of lack of prior experience in EER design (3.89). It provides designers with a comprehensive view of EER design (4.41) and can be used to develop a wide range of EER types (4.02) covering a variety of topics (4.09). Using Room2Educ8 can increase confidence in EER design (4.44) and help to develop 21st century skills such as empathy (4.27) and teamwork (3.94). The focus groups also yielded similarly positive results, as is evident by the sample responses in Table 3. Although data collection was repeated 4 times in total with 4 different cohorts of students, this did not affect the study results which appeared very similar in every run.

Table 2: Survey results (N=104)

Survey statement	Mean	SD
I feel that each step in Room2Educ8 was easy to understand	4.25	0.83
I believe that all steps in Room2Educ8 are necessary	3.95	0.89
The use of Room2Educ8 helped me to get a comprehensive view of EER design	4.41	0.60
Room2Educ8 can be used to design a variety of EER types (e.g., physical, digital, hybrid)	4.02	0.74
Room2Educ8 can be used to design a variety of EER topics (e.g., medical, STEM, literature)	4.09	0.66
Room2Educ8 can be used to design EERs regardless of prior experience	3.89	0.96
The use of Room2Educ8 increased my confidence in designing EERs	4.44	0.63
I plan to reuse Room2Educ8 to design any future EER	4.04	0.99
Room2Educ8 has helped me to work effectively in groups	3.94	1.03
Room2Educ8 has helped me to get a deeper understanding of the people I am designing for	4.27	0.86

Table 3: Sample focus group responses

Topic	Response
Clarity	"At first, I was overwhelmed by the large number of Room2Educ8 steps, but the detailed instructions made them easy to follow."
Usability	"Although I had never heard of escape rooms before taking this class, Room2Educ8 made designing an EER pretty straightforward."
Usefulness	"I must admit that I was sceptical about this assignment at first, but by the end I could clearly see how Room2Educ8 can be an effective tool to learn and practise design thinking skills."
Communication	"Despite being rather shy and quiet as a person, designing an EER with Room2Educ8 increased my confidence and made it easier for me to express my ideas and communicate with my classmates."
Teamwork	"This was an excellent activity for team members to get to know each other. We gelled very well, and everybody contributed to the project."
Motivation	"That was by far the most fun I had in an assignment. I will definitely use Room2Educ8 to design my next EER, this time in VR."
Formality	"According to the framework, we had to connect every puzzle to a learning objective, and that required a lot of effort."

5. Conclusion and future work

The rationale for developing Room2Educ8 was to translate EER design into practical steps that educators and other interested parties with no prior experience with the escape room format can reasonably implement for their own teaching practice. Its prescribed nature makes it also approachable for experienced commercial escape room designers who consider moving into Serious games territory.

The framework enables the mapping of learning objectives against puzzles and narrative to build a cohesive interactive story that provides contextually immersive learning experiences. Educators and researchers can use Room2Educ8 with any core content subjects to develop EERs that reinforce or teach critical concepts using auditory, visual, and kinaesthetic modalities. Additionally, they can assess their students' soft skills by having them use Room2Educ8 to design EERs. As the framework's design thinking approach fosters many of the desirable traits identified as 21st century competencies (Voogt & Roblin, 2012), it enables its users to acquire knowledge, skills, and attributes needed for collaborative problem solving. Using Room2Educ8 may also contribute to the development of judgement, self-reflection, and practical wisdom, as it seeks to improve the learning experience in an inclusive way by incorporating the views and insights of the learners themselves. The human-centredness of such a framework can serve to nurture qualities necessary for social interaction and the cultivation of empathy.

A limitation of this study is that, although the expected target audience for Room2Educ8 is educators, it was used and validated by participants who lacked a background in Education studies. Therefore, future works will include similar trials with Education students, pre-service teachers, and professional practitioners already

working in the education sector in order to observe any similarities or differences towards already tracked reactions to the proposed framework. Another limitation is that Room2Educ8 was only validated internally, i.e., its validation focused upon the integrity of the framework and its use. To support the study findings, a follow-up external validation addressing the effects of using the framework – the developed EERs themselves, and their impact on learners – will be conducted in the future.

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