# *Let's Open the Locker of Creativity* - How the Traditional Educational Escape Room Changed into a Virtual Puzzle Game During the COVID-19 Pandemic

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**Abstract.** This research aimed to analyze the opinions of prospective early childhood and primary school teachers regarding implementing the educational escape room method in the teaching process in three forms: traditional 1:1, miniature version, and virtual. These three forms have been utilized in blended learning sessions since the onset of the Covid-19 pandemic, necessitating alternatives to physical, educational escape rooms. This qualitative study is based on the focus group interview method, conducted in 12 discussion focus groups. The participants consisted of 62 female final-year master's degree students who, over one semester, participated in an elective course designed to familiarize them with the educational escape room (EER) method.

The research findings indicate that most respondents perceive more advantages than disadvantages in the educational escape room method across all its forms. Students observe a positive impact on team building, collaboration, motivation, and satisfaction with task completion. Respondents suggest that puzzle-solving is an activity suitable for individuals of all ages, and they consider creating their own EER project as an effective method of working with youth and adults.

**Keywords:** Blended Learning · Educational Escape Room · Gamification

## 1 Introduction

In recent years, gamification has become an increasingly popular strategy for enhancing learning outcomes. Gamification involves using game design elements in non-game contexts to increase engagement, motivation, and learning outcomes [1]. One promising form of gamification is educational escape rooms, which involve the creation of a physical or virtual room from which participants must escape by solving a series of puzzles or challenges [2]. Educational escape rooms offer a unique approach to learning by creating immersive and interactive environments that encourage active learning and problem-solving skills. This article's objective entails examining opinions expressed within focus group discussions conducted among individuals undergoing teacher training regarding


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the efficacy of the escape room tool in fostering interpersonal connections, influencing the motivational process in learning, and assessing the merits and demerits associated with its implementation. Additionally, the article seeks to explore perceptions about the offline forms of escape rooms, namely the traditional 1:1 format, the miniature variant, and the online version.

The closure and restrictions associated with the epidemic threat during the Covid-19 pandemic have significantly impacted education [3]. Scientific research emphasizes that teachers, educators, students, and university lecturers face challenges in primary, secondary, and higher education [4]. Many negative aspects and specific positive changes have been discussed, particularly those related to developing and implementing new technologies in teaching. The educational escape room in the classroom typically took the form of a physical space - a room arrangement or a miniature version. Remote teaching has necessitated the search for new solutions.

## 2 Theoretical Framework

Educational escape rooms, often associated with gamification and the Game Based Learning (GBL) approach, have gained popularity in recent years, although the history and theory of incorporating games into education have a much longer tradition [5]. The use of escape rooms during educational activities and entertainment activities also finds its references in the theories of cooperative learning [6] and Flow Theory [7]. As discussed in the Discussion section, many teachers and researchers have recognized the use of educational escape rooms as a tool for improving learning outcomes and soft skills where students *"(…) enjoyed the activity and was highly engaged during the activity, more than in comparison to regular classes."*[8].

Educational escape rooms can be designed and implemented in various forms for educational purposes. The most common choice is to replicate the commercial entertainment vision of such places in a 1:1 scale classroom, transforming the space into a large-scale game. Another form is the miniature version, where the concept of an escape room is preserved but adapted to a "box" version within a limited space, not necessarily a box. Another form is the online game, which follows similar rules to a physical escape room. In many cases, this virtual form has replaced offline versions during the restrictions associated with the Covid-19 pandemic. Gamification was part of online teaching in many online classrooms where modern and creative teachers and educators were unafraid to cross boundaries. It was indicated that *"(…) it is possible to infer that gamification can be effectively combined with traditional teaching methods, such as online lectures, in order to enhance students' engagement and deliver curricula material that usually is taught through face-to-face education. Likely, technology-enhanced learning initiatives will become more prominent as the education landscape is reorganized following COVID-19, and gamification may therefore be considered as an option to augment traditional learning no longer deliverable at traditional face-to-face classes."*[9]. An online educational escape room can be considered an example of implementing gamification in e-learning.

The effectiveness of educational escape rooms, in general, can be attributed to their ability to create an immersive and interactive learning environment that encourages

active participation and problem-solving skills. Educational escape rooms promote critical thinking, problem-solving, and teamwork skills by providing participants with a series of puzzles or challenges to solve [10]. The engaging nature of the game also motivates participants to engage significantly with educational content, leading to increased retention of information, as well as empathy [11].

Furthermore, educational escape rooms can be designed to promote learning in specific subject areas. For example, an educational escape room designed for teaching computational thinking. It is found that: *"(…) educational potential of escape rooms in (…) science education as an engaging, problem-based environment for processing, rehearsing, and formative assessment in which thinking and teamwork skills are required, with the opportunity for teachers to scaffold learning processes without losing students' feeling of ownership, discovery and victory."* [12].

## 3 Method

In October 2022, 62 early childhood and preschool education students studying at the University of Silesia in Katowice, Poland, were invited to participate in an elective course titled *"Educational Escape Room"*. Throughout the semester and after completing the course, the students were invited to participate in focus group interviews conducted in 12 focus groups. Below are the results of the discourse analysis conducted during interviews, aimed at addressing the research problems derived from the research objectives, which were formulated as follows:

- What are the opinions of participants undergoing teacher training regarding the effectiveness of the escape room tool in fostering interpersonal bonds, influencing motivational processes in learning, and assessing the advantages and disadvantages associated with its implementation?
- How do respondents perceive different Escape Room (EER) forms, namely: the offline version in the traditional 1:1 format, the miniature variant, and the online version?

These research problems are related to three subtopics, which are detailed below. Additionally, the reflection in the Results section has been organized according to these subthemes.

The instructional activities were based on workshops during which the students tested, planned, designed, built, and implemented educational escape rooms. In the final phase, they solved puzzles in their peers' games. The participants could experience and try escape rooms in three forms: 1:1, miniature, and virtual.

All participants were divided into two instructional groups, Group A and Group B, for the research. Group A consisted of 26 women studying full-time, Monday through Friday, in their second year of master's studies. Group B, on the other hand, consisted of 36 women studying part-time, on weekends (Friday to Sunday), and also in their second year of master's studies. In Group A, the respondents were divided into five four-to-five-member focus groups; in Group B, they were divided into seven four-to-five-member focus groups. Each group went through three sessions of focus group interviews.

The research was conducted in 12 focus groups, following the respondent-moderator focus group model [13]. The researcher participated in both the instructional activities

phase and the interview phase. However, during the crucial phase, the researcher selected group leaders who moderated the discussions, allowing for more authentic responses. The entire instructional-research process lasted from October 2022 to February 2023.

The focus group interviews aimed to analyze future teachers' attitudes, experiences, and reflections regarding the effectiveness of the escape room method in education and relationship building, depending on the form: 1:1, miniature, or virtual.

The selection criteria for participating in the focus group interviews were as follows: 1) year of study – all students were in their final year of master's studies; 2) specialization/field of study – all students were studying early childhood and preschool education; 3) participation in classes at the university both before and during the COVID-19-related restrictions, experiencing remote education; 4) voluntary choice of elective classes and participation in the study – all students freely chose to participate in the escape room classes; 5) familiarity with all forms of escape rooms – all students had the opportunity to experience both offline and online forms during the semester-long instructional meetings.

After reviewing the relevant literature, the following subtopics were identified, around which the moderators formulated their questions:

- Educational escape room and relationship building within the group at each working stage with this method.
- Evaluation of different escape room forms and a comparison between offline and online forms in terms of selected educational aspects.
- Advantages and disadvantages of the educational escape room method concerning pedagogical work.

Each group consisted of four to five individuals, and the designated moderator was a student and a participant in the discussions. The membership in a specific focus group was identical to the membership in the project group in which students worked on their own 1:1, miniature, and virtual escape room projects throughout the semester. Therefore, participants could exchange their views during the semester-long project work, implementation, and puzzle-solving stages. The duration of each session was flexible for each group and was not time-limited. The researcher played a combined role of an interviewer who intervened and an observer.

The obtained data were qualitatively analyzed and coded according to categories corresponding to the subthemes. The method of focus groups, based on interviews and discussions, which is used interchangeably in this article, is a good choice when qualitatively exploring the participants' perspectives. The main reason for choosing this method was the nature of the topic focused on the five-month cycle of experiencing the pedagogical method of escape rooms by the respondents. The opinion of final-year students, most of whom (66.12% of the participants) are already working (part-time students) or cooperating (full-time students) in the profession, is critical at such an advanced stage.

## 4 Results

The focus discussions conducted by 62 respondents in 12 focus groups were filled with emotions and complemented the student's experience of various escape rooms, both offline and online. The conclusions drawn from the analyses and several examples of

students' statements are organized below according to subthemes. The names of the respondents have been anonymized.

### 4.1 Educational Escape Rooms (EER) and Team-Building at Every Stage of Using the Method

The conclusions drawn from 11 out of the 12 focus groups created regarding team-building during the escape room method were very similar. Students emphasized the significant role and potential of the puzzle room in fostering community and relationships within project teams. There were no significant differences between groups A and B. They noted that this method requires a high level of collaboration with others. Here are some statements supporting this thesis:

- Student X31: *"Without teamwork, no project could succeed."*
- Student X1: "*It is the perfect method for integrating and building deep relationships. We are faced with a task, an exciting challenge, and it brings us closer together."*
- Student X22: *"The most challenging part for me was the initial phase before we came up with the concept. Later, when we started creating stories, developing the plot, and constructing puzzles, I felt we were inspiring each other. I was so involved that time flew by quickly. I discovered abilities in my classmates that I had no idea about."*

Collaboration with others, and thus establishing and maintaining relationships, is important both in the planning and design stages and in the construction and implementation of the escape room. Respondents also emphasized the ability to negotiate, reach a consensus, and share a common vision regarding the escape room's storyline and content. It was mentioned that every puzzle provides an opportunity to seek common solutions.

- Student X44: "We spent the longest time working on the puzzles and the logical sequence of events. We needed to have a cohesive vision to achieve the outcome we did. It didn't work out at every moment, but ultimately, we succeeded, and I'm proud of what we created."

The importance of team cohesion was emphasized when time pressure increased as the deadline for the design phase approached. In 7 teams, it was strongly expressed that the experience of building an escape room had solid emotional potential. Students acknowledged that negative emotions, such as anger or frustration arising from conflicts, and positive emotions, such as joy and pride, emerged during the process. The sense of fulfillment and community was particularly strong when successfully implementing their own project.

- Student X6: *"We argued the most during two moments: the initial conceptual phase and building the specific physical space of the miniature escape room. It was a roller coaster of emotions."*
- Student X32: "*These were the best educational activities this semester. We laughed and argued together. Afterward, I felt a tremendous sense of satisfaction."*

One of the teams, which relied on a clear division of tasks during the creation of the escape rooms, noticed during the discussion that building relationships ultimately

depends on the individual personalities and characteristics of the team members, as their sense of community was not particularly highlighted. This team admitted they collaborated to complete the project but *"cooperated out of necessity without significant willingness."*

Significantly, during the discussions, all teams initially focused on emphasizing the importance of relationship building to a greater or lesser extent in constructing their own escape room, and only in the second instance did they consider this issue in the context of solving puzzles created by others.

Among the respondents, it was evident that more emotionally intense relationship building, filled with discussions and internal crises within the team, took place during the design of their own escape room.

- Student X58: *"Building the escape room was more challenging because I had never worked in this way before, but I also enjoyed it more than solving them. Especially in the virtual escape room, solving puzzles was not as exciting as creating."*
- Student X26: *"I thought we would not have enough time to come up with everything and prepare it ourselves, but we managed it with my classmates. When I saw how our converted room looked like a 1:1 escape room, even before other girls entered to take on the challenge, I knew we did a good job. I would gladly do it again."*

Regarding puzzle-solving, collaboration was also intense, but the sense of community manifested particularly after completing the task, often in the form of team satisfaction.

When constructing an escape room in the 1:1, miniature, and virtual formats, most respondents (9 groups) did not perceive a difference in relationship-building stimulation between these formats. However, they did notice a difference when solving puzzles in someone else's escape room and attempting to escape from a different escape room. In these cases, the sense of community, the potential for relationship stimulation, and collaboration were rated highest for the 1:1 and miniature versions while significantly lower for the virtual quest cage game in most focus groups.

### 4.2 Evaluation of Different Escape Room Forms and Comparison of Offline and Online Formats in the Context of Selected Educational Aspects

Evaluation of different escape room forms and comparison of offline and online formats in the context of selected educational aspects.

In the surveyed focus groups, participants were asked to compare the educational escape room as an offline method (in the 1:1 and miniature versions) with the online format to assess their sense of motivation. Most focus groups (10) rated their level of motivation for creating an offline and online puzzle room equally high. The participants emphasized similar stages of creation, such as the theme selection phase, story selection phase, logical story progression planning, construction of individual puzzles, and the building phase (in the case of offline options, manual preparation of space or interior arrangement, prop preparation; in the case of online options, platform selection, tool familiarization, creation of digital stages). However, when solving puzzles created by others, the motivation level was higher for the offline formats. The virtual

version engaged the students, but not to the same extent as the "box" or 1:1 room escape experiences.

- Student X19: *"I was most engaged in the 1:1 escape room - I do not know when time flew. I had so much fun. We had great teamwork with the girls, so we were strongly motivated at every stage of designing, decorating the room, etc., and worked towards our goal."*
- Student X1: *"If I had to choose the most boring stage, it would be difficult for me because I really liked it, but I got a little bored with the virtual one."*

Individual factors also influence motivation.

- Student X59: "I definitely think it is something 'new' and unconventional. I enjoy creating different stories - whether on paper or in life, as part of various activities, etc. So here I have another field to explore. However, I usually have a problem with working in groups (in general) because I often can't collaborate the way I want to - but that is more of a flaw related to the consequences of perfectionism and the desire to perfect everything to the last detail, but not at the expense of fairness (sometimes when I see someone slacking off, I lose motivation to work in a group). So, I definitely have to be careful about that. However, I am glad I can get to know and experience this method, which opens a gateway to my future school practice."

Considering that the respondents are future teachers of grades 1–3 in primary schools and preschool groups, they were asked about this perspective. The conclusion drawn from the analysis of statements and findings in the 12 focus groups is that the offline/physical form is definitely more beneficial for younger children. For older students and adults, the online form is equally good. There were no significant differences between groups A and B.

The students' opinions regarding the role of puzzle rooms in imparting knowledge were inconsistent. Respondents saw the possibility, but at the same time, there were strong voices suggesting that it was primarily just entertainment. Importantly, students rated the online platform game slightly higher as a tool, as it *"does not evoke as many emotions and excitement as physical escape rooms, allowing the student to focus on the content."*

### 4.3 Advantages and Disadvantages of the Educational Escape Room (EER) Method Concerning Pedagogical Work

Discussions in focus groups were intended to identify the advantages and disadvantages of the educational escape room method in the context of future (or current) professional work. The respondents unanimously expressed high satisfaction with the activities and recognized the immense potential of this creative method in terms of general educational work, knowledge acquisition, and educational goals. The statements made in the focus group interviews later confirmed the results of an anonymous evaluative survey conducted independently by the institution where the session occurred.

The respondents emphasized the educational advantages of escape rooms, both in the form of 1:1, miniature, and virtual formats, in terms of:

- Activating students during lessons or extracurricular activities and diversifying educational tools (emphasizing that it should be "one of the methods" rather than replacing other traditional methods).
- Developing soft skills and serving as a tool for knowledge transfer.
- Flexibility in crisis situations, such as a sudden transition to remote education.

The following statements serve as examples:

– Student x59: *"Working with this method is activating, so I think it would benefit everyone as a way to 'refresh' lessons. Sometimes it can be done individually, and sometimes in groups. Our perception is not yet accustomed to such things during classes, so I believe it is something stimulating and motivating in terms of intrinsic motivation. I think this method should be used to summarize specific subjects or within spelling lessons, which are usually just 'shrouded in boredom.' I also think that EER cannot replace normal lessons. It is rather an addition, something 'extra,' 'festive,' but also something that develops logical thinking or attention."*
– Student x60: *"Escape rooms can teach organization, planning, prediction - which are necessary later, for example, in programming - logical thinking, creativity, attention concentration, and sometimes even technical skills related to construction. It also depends on the type of escape room."*
– Student x7: "*As a future teacher, I believe this method helps conduct in-person and remote classes. The definite advantage is the attractive form of work, which can better motivate students."*
– Student x11: *"I see only the advantages of creating a virtual escape room in education, starting with the accessibility of the tool used. The tool is transparent and well-constructed, so participants enjoy solving tasks that could be discouraging if presented on paper as a quiz. Such an escape room is also a challenge for slightly older people - it does not provide everything on a silver platter; you often have to search for ways to progress to the next slide or ponder over task solutions. For the youngest, this form will also be exciting, especially considering the fact that we are a media society, and children have access to smartphones/tablets/computers from an early age. This educational path - involving a digital screen, the possibility of clicking on specific elements, and playing music during certain tasks - will only enhance knowledge absorption".*

Additionally, respondents identified advantages in increased motivation, digital skill development, creativity, imagination, critical thinking, and collaboration.

The most prominent conclusion regarding the disadvantages in the context of pedagogical work was the significant time investment required by educators or teachers in constructing escape rooms.

– Student x57: "The main disadvantage of creating a virtual version is the time-consuming nature of the work. If we want the escape room to be of the highest quality in content and editing, we must be prepared to spend several hours working with the tool. Traditional version drawbacks: the materials needed to create such an escape room can be costly; it involves working with physical objects."

Other drawbacks mentioned were:

- Material costs for the offline version,
- Lack of access to devices in the online version,
- Logistic difficulties in organizing traditional escape rooms within the school premises,
- Issues of technology overuse and media saturation in the online version, particularly concerning younger children and associated health problems.

The following statements confirm these considerations:

– Student x3: *"Such an experience in the classroom is undoubtedly more memorable. However, the drawback of a traditional escape room is that it involves a large group of children in one room, requiring careful logistical planning to ensure that all students are engaged and have the opportunity to participate."*
– Student x1: *"A disadvantage of using this method online could be eye strain from staring at a computer monitor."*

Students also emphasized that the method and topic should be adapted to the children's age and developmental level, rightly emphasizing that constructing an escape room is a task suited for older children and adolescents. In the case of younger children, it is the teacher's responsibility to ensure their focus on solving puzzles.

In conclusion, despite the various dimensions of the discussions in all focus groups, the students are aware of the drawbacks and weaknesses while emphasizing the numerous advantages they perceive.

## 5 Discussion

Numerous scientific studies and educational reports have indicated that in many countries, the Covid-19 pandemic, particularly in the years 2020-2021, was a time of significant challenges and changes [14]. The response to the threat was the transition of many schools, universities, and institutions to remote forms of education. However, many institutions sought to overcome these challenges by introducing innovative remote methods [15] and simulations and games [16]. The elective course "Educational Escape Room" existed prior to 2020, only in the form of direct offline contact. At that time, the game format was conducted as a 1:1 escape room, transforming the classroom into an escape room. The second form was the miniature version, symbolically called the educational escape room in a box, which meant limited space but not necessarily a box. In the winter semester of 2020/2021, searching for alternatives and options for similar games to quest cages on online platforms became necessary. One semester was conducted remotely, and after the success of this format, confirmed by evaluation surveys, the entire course remained in a blended learning format, utilizing three forms. Research comparing students' attitudes towards the online and offline versions of educational escape rooms, particularly in chemistry, indicated that both forms support motivation in the learning process [17]. The escape room method has proven adaptable in such crisis situations [18].

The Covid-19 pandemic significantly increased the popularity of online versions of escape rooms [19–21]. For example, during the academic year 2019/2020, the method and research were implemented at the University of Almeria as part of the course "Socio-educational Programs in Children, Youth, Adults, and Seniors" in the Social Education

degree. The results essentially confirmed what researchers had demonstrated at that university: virtual escape room games can awaken students' curiosity, participation, and motivation. Furthermore, the cooperative nature of this method was emphasized [22]. Increased team interaction, team-building, and a sense of community were also highlighted in studies conducted among dentistry students [23].

In our own research, future early childhood education teachers primarily appreciated the potential of using this tool as a challenge to solve for elementary school students, where the nature of the teaching content is integrated. At the same time, the respondents emphasized the method as an enriching element for subject lessons in older classes (through puzzle-solving or constructing their escape rooms). The universality of this method, both in its online and classic versions, is demonstrated by an experiment involving implementing an escape room in the STEM field. The research was conducted during two courses of experimental sciences and mathematics in the second year of the Primary Education degree at a Spanish university during the 2020/2021 academic year. The cognitive and affective domains were examined. Positive emotions, motivation, and reduced anxiety were observed. Researchers also noted the advantages in terms of knowledge transfer [24]. The method itself and its added value, such as community-building and teamwork, or, in the case of our research, the didactic component that aimed to familiarize students with the intricacies of the offline and online versions of the method, are just one aspect. The characteristic feature of all 1:1, miniature, and online escape rooms is that they have a narrative and relate to a specific range of knowledge. This range can be arbitrary, making the method universal. Other researchers' studies show that participating in this type of game increases knowledge in the specific subject area addressed by the escape room [25]. My experience implementing this method online during the pandemic allowed me to confirm this during media education classes, where students constructed virtual escape rooms on the Genial.ly platform, focusing on cybersecurity threats [26]. The research has also compared the level of acquired competencies and emotions among students in technical fields and future teachers. In both areas, no significant differences were observed. Positive emotions predominated, and competencies increased [27]. Such positive evaluations of the method and its reception can be attributed to the recipients being representatives of Generation Z, which seeks and expects innovation [28]. In this context, it is justified to implement the educational escape room method in both offline and online versions (not only in crises) in the training and curriculum of future teachers, not only in early childhood education but also in educator training for working with older youth.

In conclusion, numerous scientific studies and reports have highlighted the challenges and changes brought about by the Covid-19 pandemic in the education sector. The response to this situation was the widespread adoption of remote education, including the innovative use of educational escape rooms and online simulations. Research and experiences have shown the positive impact of escape rooms on motivation, knowledge acquisition, teamwork, and community-building. The adaptability of the escape room method in crises and its appeal to Generation Z makes it a valuable tool for both offline and online teaching environments. Future teachers can benefit from incorporating this method into their training and curriculum to enhance student engagement and learning outcomes.

## 6 Conclusion

In conclusion, it is worth emphasizing that after participating in a semester-long escape room course in three different forms, the surveyed students appreciated this form of educational work and evaluated it positively. They clearly distinguish be-tween their discussions on designing their escape room and solving puzzles created by others. They recognize the method's potential in their future professional work, mainly to diversify lessons, enhance student motivation, develop soft skills, and foster relationship-building within student groups. These advantages are evident both in the process of creating and solving puzzles. However, the participants acknowledge that, in the case of younger students, only the latter option is the appropriate solution. Among the disadvantages of creating an escape room, there is a significant role of the time-consuming and material burden on the educator who initiates such an activity. In the case of solving puzzles, sensory overload may be perceived by the respondents.

The students emphasized that if they had to choose only one form, it would undoubtedly be the offline version, namely the 1:1 or miniature format. However, they also expressed high satisfaction with the opportunity to experience all three forms, meaning engaging in blended learning. Therefore, escape rooms can be regarded as a method of cooperation and activation, which can utilize the three forms mentioned above, while the virtual version can be considered a crisis-oriented approach in remote education.

Nevertheless, it is essential to acknowledge the limitations of the present study. The research methodology was qualitative, relying on qualitative focus group interviews as the primary data collection method. While this approach offers a rich and nuanced understanding of the participants' opinions and reflections, it is constrained by the relatively small sample size.

Consequently, it would be beneficial to supplement these findings with experimental investigations that target the cognitive, emotional, and behavioral dimensions. Such a research design would contribute valuable insights and enhance the study's comprehensiveness. Further research is needed in the Polish educational context to examine the effectiveness of all three methods in primary and secondary school didactics.

It is also worth emphasizing the research and workshops' practical dimension. The Educational Escape Room (EER) module has been permanently integrated into the curriculum for students at the Faculty of Social Sciences, University of Silesia in Katowice, and the program has been expanded to include other groups, including international students from social sciences fields, participating in the Erasmus+ exchange program. This expansion was made possible due to the recognition of the course through the *T4EU Innovative Teaching Award 2022* competition. In the 2023/2024 academic year, as part of the master's seminar for early childhood and preschool education students, also a small-scale pedagogical experiment utilizing the EER method is planned among a group of younger elementary school students.

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