

Design, creation and execution of educational escape rooms

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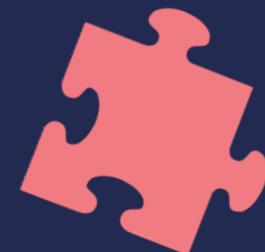
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Introduction



Escape rooms

“ Escape rooms are live-action team-based games where players discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to accomplish a specific goal (usually escaping from a room) in a limited amount of time ”

Nicholson, S. (2015).
Peeking behind the locked door: A survey of escape room facilities.



The “Black Widow” escape room at Escape Quest, Virginia.

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Wikimedia Commons.

Origin of escape rooms

- Although escape room-style video games had been developed earlier, it was not until 2007 that the first physical escape room, called 'Real Escape Game', was created in Japan.
- This event marked the beginning of escape rooms as a worldwide phenomenon, as they quickly spread to the rest of the world.
- Today, escape rooms are a very popular leisure activity, and there are thousands of facilities dedicated to them.
- The platform *World of Escapes* (<https://worldofescapes.es>) gathers information about escape rooms worldwide.

Origin of educational escape rooms

- At first, escape rooms were used exclusively for recreational purposes, but over time they also began to be used for **educational purposes**.
- Some teachers turned to recreational escape rooms to foster the development of soft skills such as teamwork or communication.
- At a certain point, teachers also began creating escape rooms specifically designed for learning, which are now known as **educational escape rooms**.

Educational escape rooms

“ Educational escape rooms are games designed with educational purposes in which the participants, usually organised in teams, must solve a series of puzzles within a specified time frame by discovering clues, accomplishing tasks, and applying field-specific knowledge and skills”



Gordillo, A., Santamaría, A., López-Pernas, S., Gutiérrez, S., Milošević, M., Čosić, M., Barra, E., & Elmoazen, R. (2025).
Best Practices for Creating and Conducting Educational Escape Rooms: A Comprehensive Guide for Teachers.
Universidad Politécnica de Madrid.

Educational escape rooms: Characteristics

Final goal



Limited time



Puzzles



Narrative



Hints, clues, and distractors



Teamwork



Educational purpose



Educational escape rooms: Formats

- Escape rooms can be classified into three types based on their **format**:
 - **Physical.**
Physical escape rooms are those that require participants to interact with physical elements and that lack virtual elements.
 - **Virtual.**
Virtual escape rooms are those in which all elements are virtual.
 - **Hybrid.**
Hybrid escape rooms are those that combine physical and virtual elements.

Educational escape rooms: Delivery modes

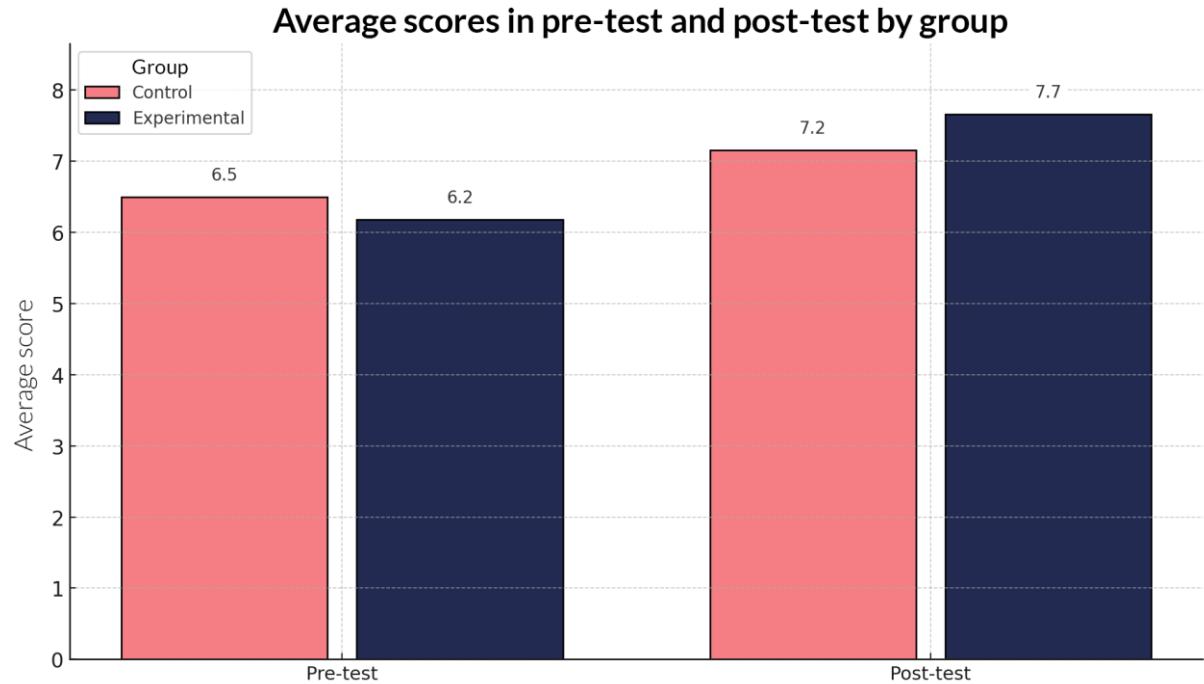
- Escape rooms can be delivered through two modes:
 - **Face-to-Face.**
An escape room is considered to be conducted face-to-face when all participants are physically present in the same location so that they can interact physically with each other.
 - **Remote.**
An escape room is considered to be conducted remotely when participants, instead of being physically present in the same location, play the game from different locations of their choice.

Benefits of educational escape rooms

- ✓ Increase in student motivation and engagement.
- ✓ Acquisition of knowledge and development of **hard skills** (e.g., technical skills such as web programming, applying descriptive statistics techniques, or interpreting clinical data).
- ✓ Development of **soft skills** such as problem-solving, time management, communication, teamwork, leadership, and conflict resolution.
- ✓ Promote active learning and real-world application of knowledge and skills.

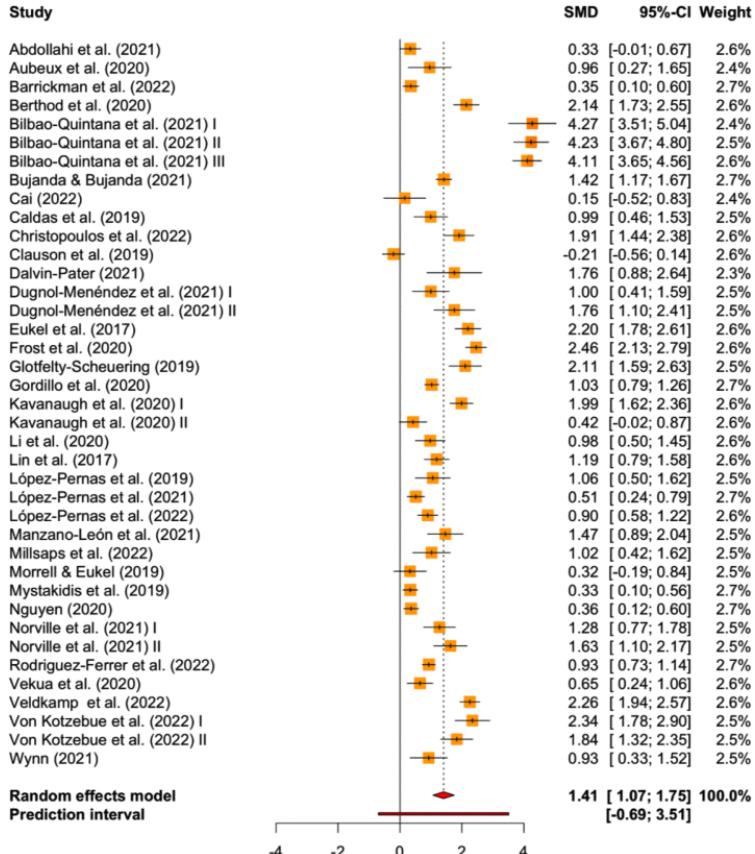
Benefits of educational escape rooms

	CONTROL GROUP (N = 162)	EXPERIMENTAL GROUP (N = 164)
p-value	< 0.001	< 0.001
Effect size	0.33	0.49



Gordillo, A., & López-Fernández, D. (2024). Are educational escape rooms more effective than traditional lectures for teaching software engineering? A randomized controlled trial. *IEEE Transactions on Education*, 67(5), 660–668. <https://doi.org/10.1109/TE.2024.3403913>

Benefits of educational escape rooms



López-Pernas, S. (2024).

Educational escape rooms are effective learning activities across educational levels and contexts: A meta-analysis.
IEEE Transactions on Learning Technologies, 17, 711–724.
<https://doi.org/10.1109/TLT.2023.3328913>

Game-based learning

- Educational escape rooms are a type of game and, therefore, their use falls within the scope of **game-based learning**.
- Game-based learning is an educational methodology that encompasses all forms of learning in which students acquire knowledge or develop skills through **games**.
- This methodology is based on the premise that games have a series of **characteristics**, including:
 - High capacity to provide **fun** and **entertainment**.
 - **Rules** that determine how to win and lose.
 - **Interactivity** (with other players or with the elements of the game).

Game-based learning ≠ Gamification

- ❖ Gamification is the use of game elements (e.g., points, leaderboards or badges) in non-recreational activities in order to boost motivation and achieve various improvements.
- ❖ In game-based learning, learners actually play a game, whereas in gamified activities, game elements are applied without necessarily playing one.
- ❖ Educational gamification aims to make an educational activity or task less boring by integrating game elements, while in game-based learning an enjoyable activity (a game) is used for educational purposes.

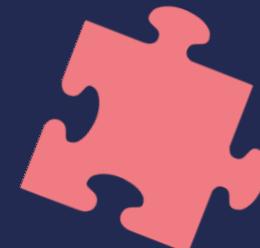
Examples of educational escape rooms

- The hoax factory.
- Baltic Sea.



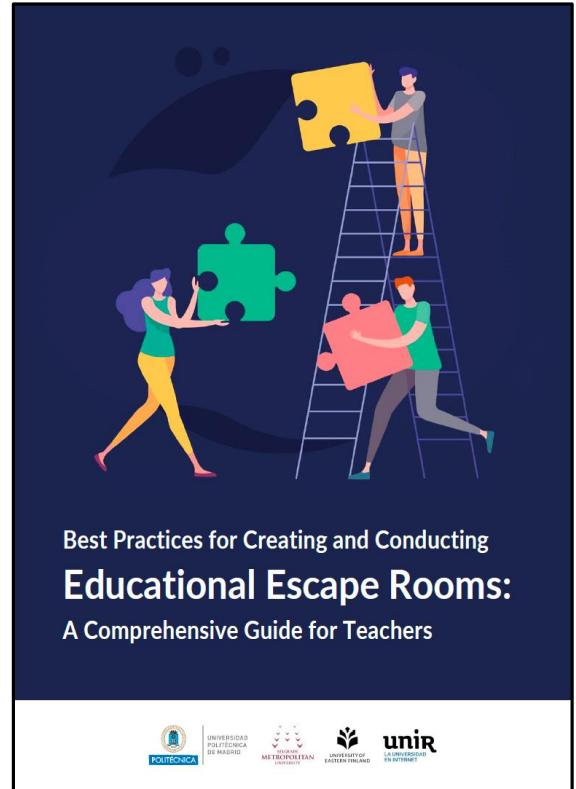


Design, creation
and execution
of educational
escape rooms



Best practices guide

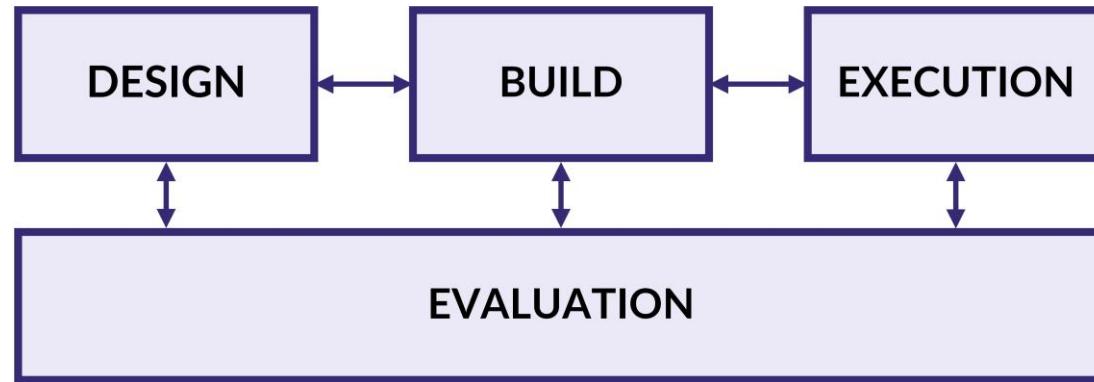
- There is a guide that includes **guidelines and recommendations** for helping teachers of any educational level and knowledge area to **design, build, execute, and evaluate** educational escape rooms considering different formats (physical, virtual, and hybrid) and delivery modes (face-to-face and remote).
- The guide is freely and openly available at <https://iglue.dit.upm.es>.



Gordillo, A., Santamaría, A., López-Pernas, S., Gutiérrez, S., Milošević, M., Čosić, M., Barra, E., & Elmoazen, R. (2025). *Best Practices for Creating and Conducting Educational Escape Rooms: A Comprehensive Guide for Teachers*. Universidad Politécnica de Madrid.

Workflow

- There are many different ways in which a teacher can design, create, and execute an educational escape room.



- In the following slides, a workflow appropriate for most situations is described.

Workflow

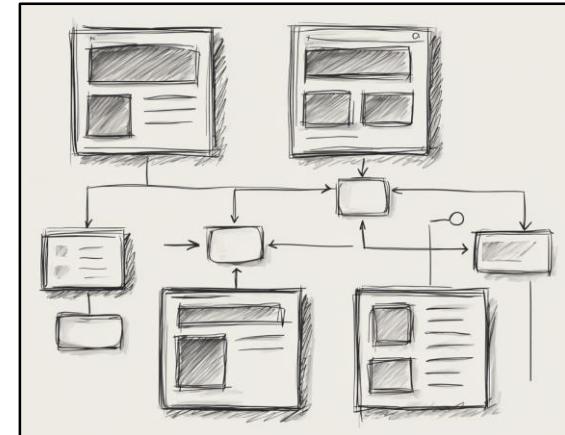
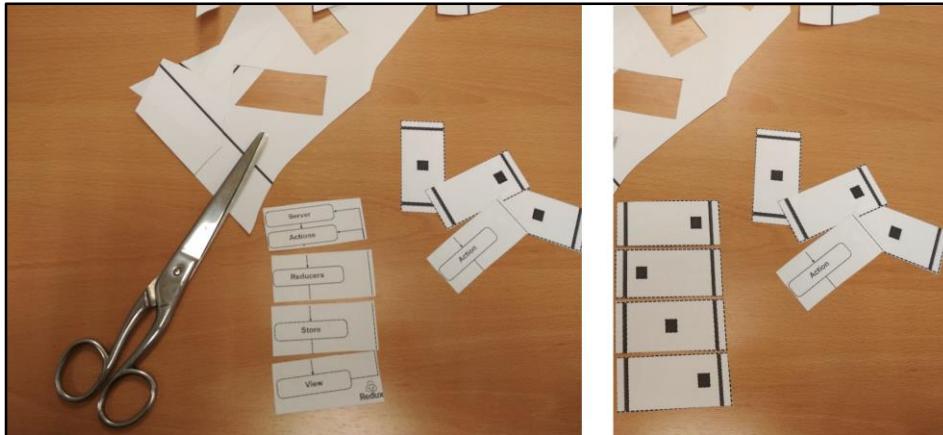
1. Identify the **target audience** and the **educational setting**.
2. Define the **learning objectives**.
3. Choose the **format** (physical, virtual or hybrid), **delivery mode** (face-to-face or remote), **participation mode** (individual or in teams), and **duration** of the escape room.
If team participation is allowed, also choose the **size of the teams**.
4. Define how **assistance** will be provided to the participants.
This step includes determining whether the escape room will be **supervised** and how the **hints**, if any, will be provided.

Workflow

5. Decide whether the educational escape room will be offered as a **graded activity** and, if so, how grades will be calculated, and how the activity will fit within the corresponding syllabus if it is offered as part of a course or study program.
6. Craft the **narrative**. This step includes defining the **storyline, setting, context** and **final mission**.
7. Choose how the **puzzles** of the escape room will be structured (linear or non-linear), determine the number of escape room puzzles, and design them one by one.

Workflow

8. Test each puzzle individually by using prototypes (e.g., paper resources or digital mockups).
9. Test the whole educational escape room by using prototypes and refine it based on the test result.



Workflow

10. Build the educational escape room according to its design.

This step includes crafting, printing, developing and/or acquiring all the resources necessary to conduct the escape room with its target audience, including **instructions, props, clues, puzzles and hints**.

11. Test and refine the educational escape room as follows:

- a) **Review the narrative** and check that every puzzle, task, clue and resource presented to the participants has a reason consistent with it to exist.
- b) **Test each puzzle individually** and refine the puzzles based on the test results.
- c) **Test the whole educational escape room** and refine it based on the test result.

Workflow

12. Prepare the execution of the educational escape room: organize the desired **shifts** and decide whether **asynchronous participation** will be allowed, provide participants with **initial instructions**, and set up the **location** and all **resources required** to execute the activity.
13. Execute the educational escape room with its target audience and evaluate its **impact** on participants' perceptions and learning.
14. Improve the educational escape room for future executions based on the collected data and the **lessons learned**.



Best practices for
designing, creating,
and executing
an educational
escape room



Defining appropriate learning objectives

- It is advisable to define the **learning objectives** of the escape room through **specific and measurable** statements that describe the **knowledge and skills (both hard and soft)** that participants are expected to acquire or improve through the game.
- When defining the learning objectives of an escape room, the following aspects should be taken into account:
 - The skills and knowledge level of the participants.
 - The context and the planned date of execution.
 - Whether the escape room will be used to teach **new concepts or skills**, or rather as an activity for **review or consolidation**.

Examples of learning objectives

-  Know the elements of the periodic table.
-  Operate with complex numbers.
-  Interpret electrocardiograms.
-  Understand, interpret, and create UML class diagrams.
-  Strengthen listening comprehension of informative and academic content in English.
-  Develop teamwork, communication, and leadership skills.

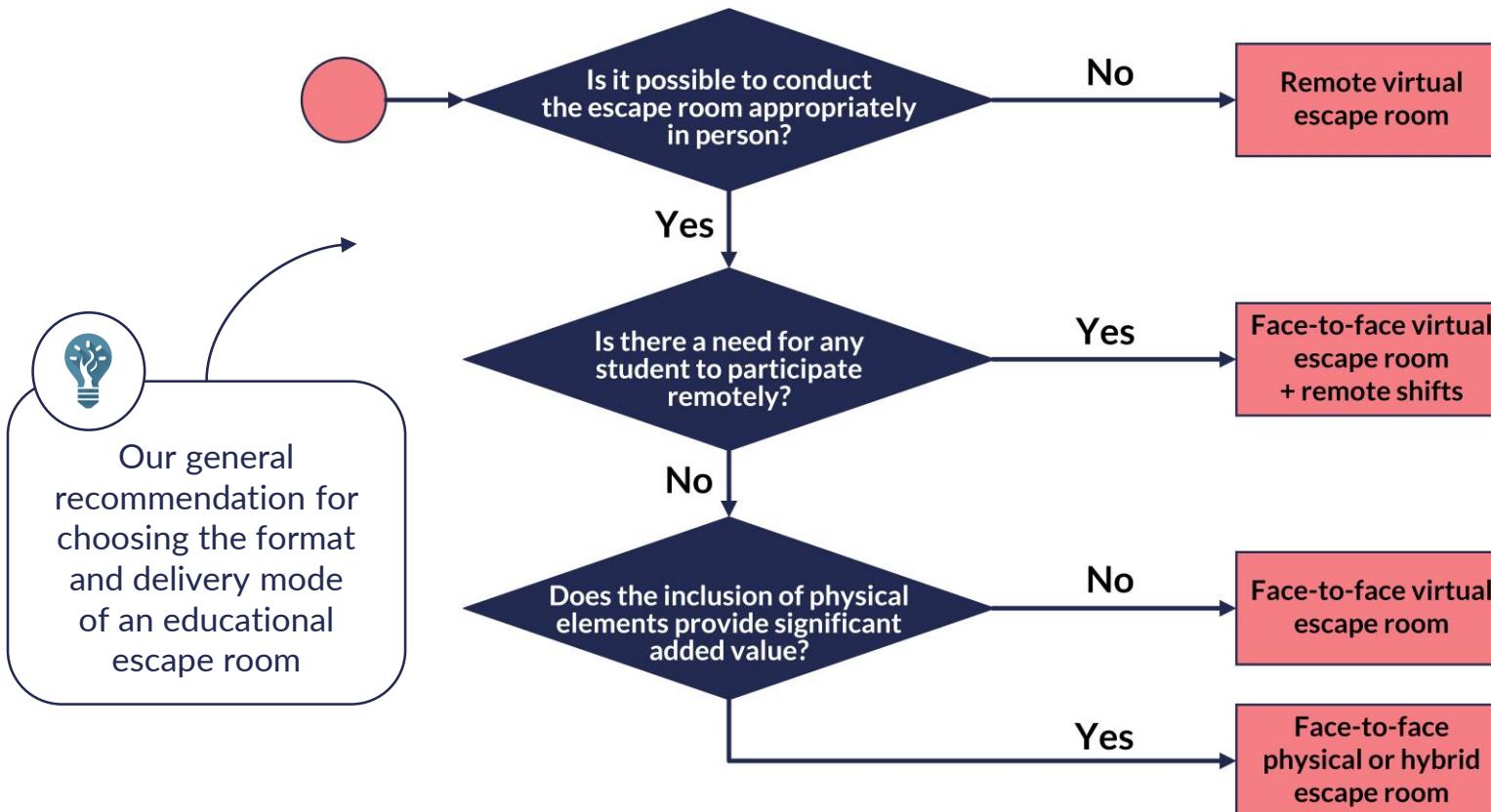
Choosing an appropriate format

Physical escape rooms	Virtual escape rooms	Hybrid escape rooms
<ul style="list-style-type: none">👍 Inclusion of physical elements that offer possibilities not present in virtual escape rooms.👎 Limitations due to the absence of virtual elements.👎 Lower reusability.👎 Greater environmental impact.👎 Difficult to conduct remotely.	<ul style="list-style-type: none">👍 Greater reusability.👍 Lower environmental impact.👍 Easy to conduct remotely.👎 Limitation of game mechanics and participant actions due to the lack of physical elements.	<ul style="list-style-type: none">👍 Offering more possibilities thanks to the inclusion and combination of physical and virtual elements.👎 Inconveniences similar to physical escape rooms in aspects such as reusability, environmental impact, and remote execution.👎 Potentially more difficult to supervise and monitor.

Choosing an appropriate delivery mode

Face-to-face	Remote
<ul style="list-style-type: none">➢ Allows participants to communicate and collaborate in person.➢ Facilitates control of the environment (lighting, sound, decoration, etc.).➢ Offers more possibilities for interaction with physical elements (e.g., laboratory equipment, virtual reality glasses).➢ Simplifies supervision, control, and monitoring of the escape room.➢ Requires an appropriate physical space and limiting capacity due to space constraints.	<ul style="list-style-type: none">➢ Eliminates the need for a physical space and allows hosting more participants without concerns about space limitations.➢ Greater accessibility: facilitates participation of students who face barriers to in-person attendance (e.g., due to physical disabilities, caregiving responsibilities, health issues, or geographical constraints).➢ May hinder communication and cooperation among participants.➢ May reduce the sense of immersion.

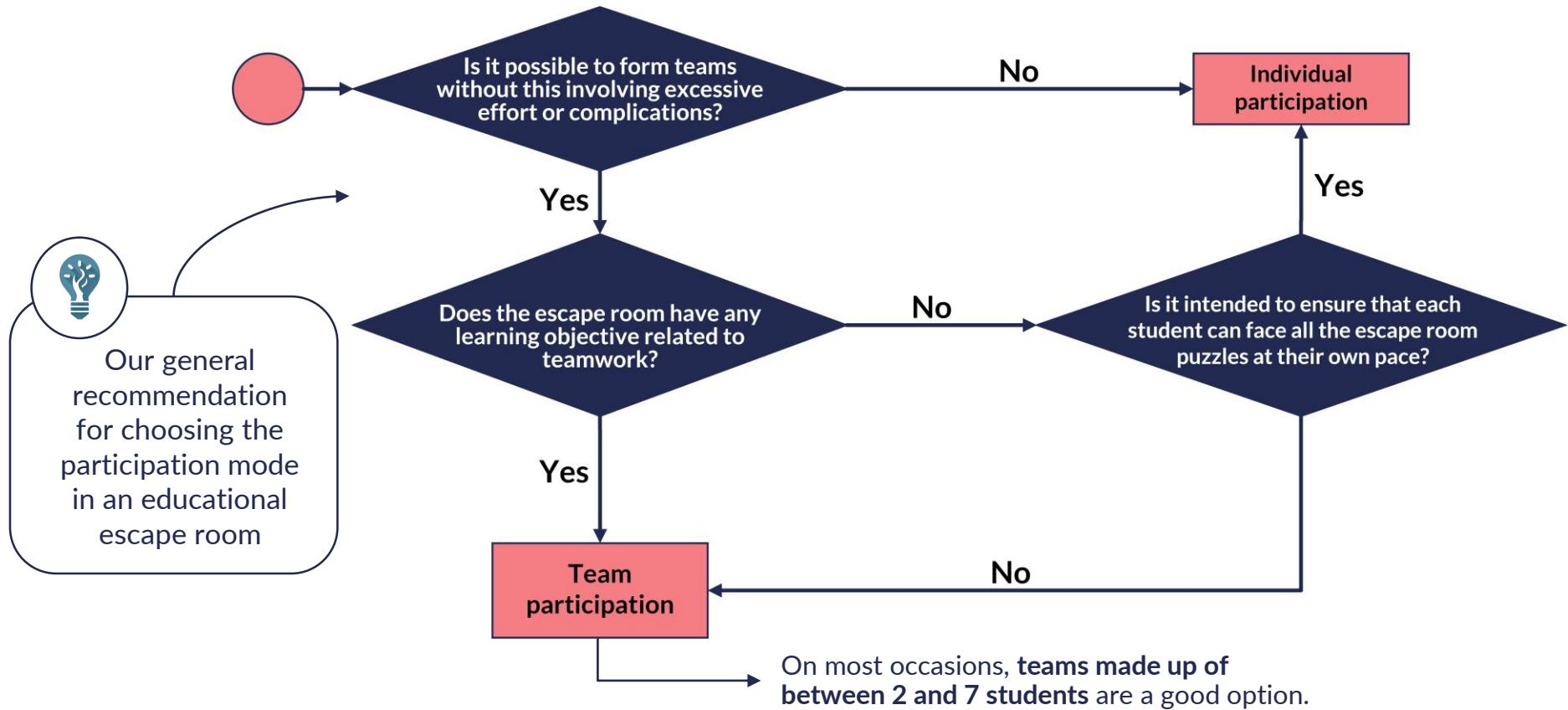
Choosing an appropriate format and delivery mode



Choosing an appropriate participation mode

Teams	Individual
<ul style="list-style-type: none">◀ Provides more opportunities to develop soft skills such as communication, teamwork, leadership, and conflict resolution.◀ Can be more motivating.◀ Reduces individual pressure.◀ Risk of unequal participation.◀ Difficulty in assessing individual performance.	<ul style="list-style-type: none">◀ Allows each student to face all the escape room puzzles at their own pace.◀ Fosters personal responsibility, self-management, and independent decision-making.◀ Enables a more accurate assessment of individual performance.◀ Significant limitation to soft skill development.

Choosing an appropriate participation mode



Establishing an appropriate duration

- The **duration** of an escape room should be long enough for students to achieve its **learning objectives**, but short enough to avoid a significant risk of them becoming **tired or losing interest**.
- A **duration of 1 to 2 hours** is usually appropriate for most educational escape rooms, as it allows for meaningful learning objectives to be addressed and resembles the typical duration of a class session.
- When defining the duration of an educational escape room, the planned **complementary activities** (e.g., introductory sessions, pre-tests, post-tests, and debriefing sessions) should also be taken into account.

Crafting a consistent and engaging narrative

- The **narrative** of an educational escape room refers to its specific **story**, including its **theme or setting**, the **role of the participants**, and the **final goal**.
- The narrative provides a **context** for the puzzles.
- If an educational escape room has a **coherent and engaging narrative**, it is more likely to **motivate participants** and produce positive impacts on their **learning**.
- A common practice is to include an **introductory video** that presents the narrative of the escape room and specifies the final goal and the time available to achieve it.

Crafting a consistent and engaging narrative

► Most important recommendations:

- Clearly define the story, the context, and the final goal.
- Give participants compelling reasons to accomplish the final goal, along with a clear justification of why it must be achieved before the allotted time expires.
- Connect all puzzles through the narrative.
- Ensure that every puzzle and resource presented to participants has a reason to exist that is **consistent with the narrative** and maintain coherence across all elements.
- Start the escape room with a strong hook to capture participants' attention from the very beginning.

Examples of final goals of escape rooms

Escape from
a place



Investigate
a crime



Defuse a
bomb



Solve a
mystery



Create
a cure



Find
a loot

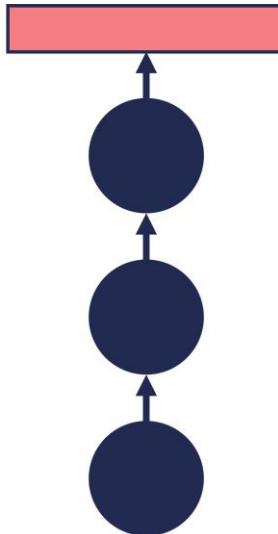


Locate a
missing person

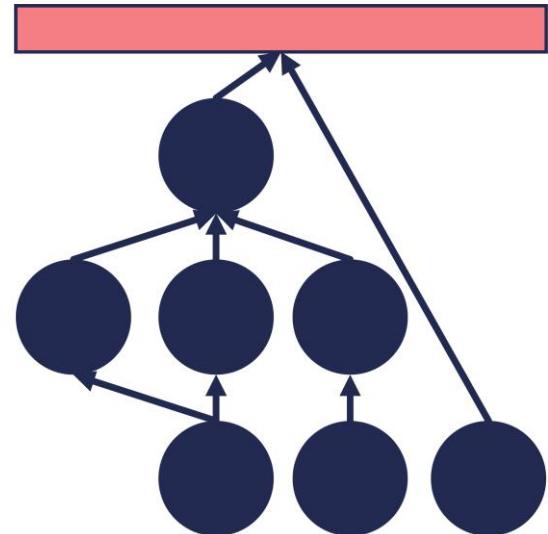


Designing the puzzles appropriately

- First of all, it is necessary to choose an appropriate way to structure the escape room puzzles.
- The **structure of puzzles** in an escape room can be mainly of two types: **linear** and **non-linear**.



Linear

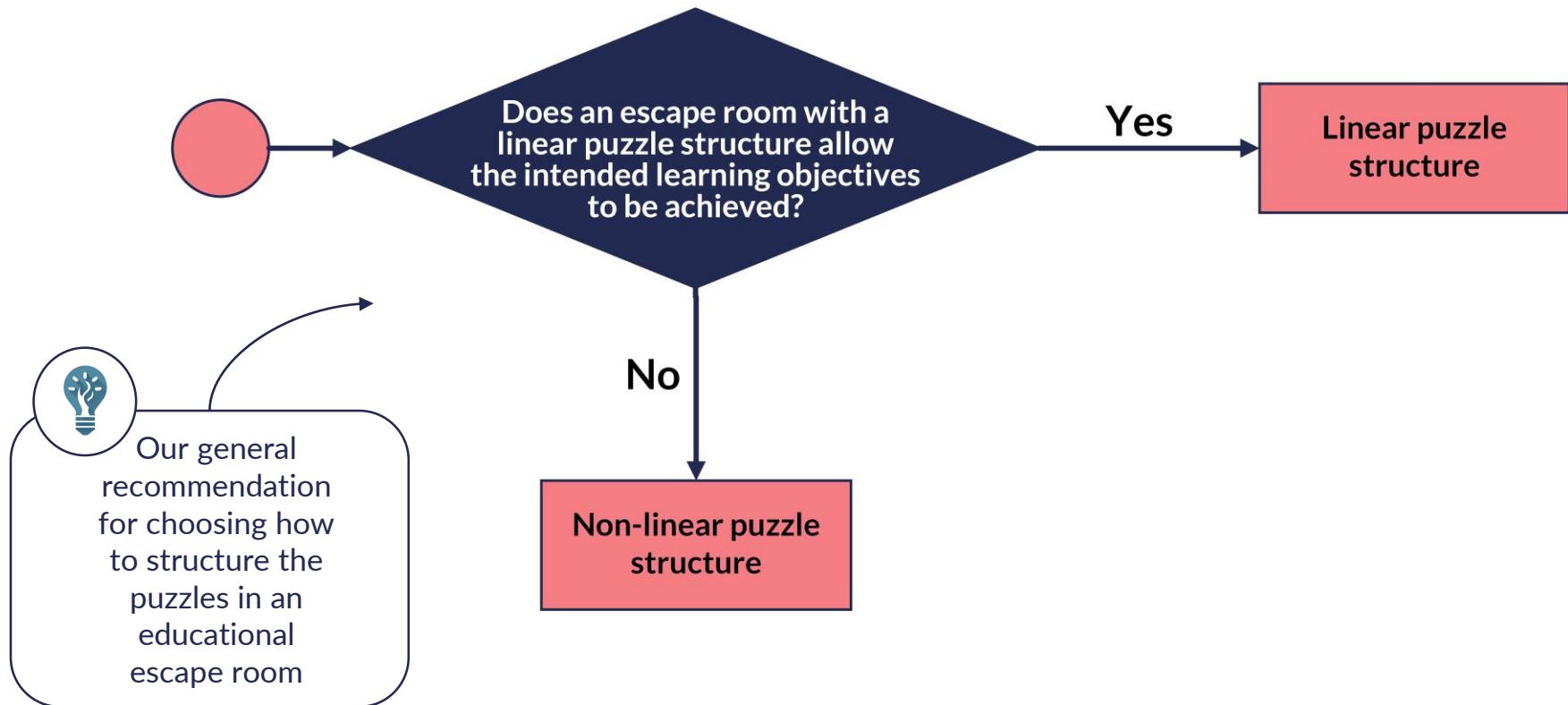


Non-linear

Designing the puzzles appropriately

Linear puzzle structure	Non-linear puzzle structure
<ul style="list-style-type: none">👉 Ensures that all team members face every puzzle, giving each participant the opportunity to achieve all learning objectives.👉 Simplifies the design and testing of the escape room.👉 Makes monitoring the escape room and assisting participants easier.👉 Does not allow the simulation of certain real-world situations.	<ul style="list-style-type: none">👉 Allows each participant to contribute to solving different puzzles according to their skills and knowledge.👉 Provides more opportunities to develop soft skills such as decision-making, strategic thinking, teamwork, leadership, and delegation.👉 Escape rooms with a non-linear puzzle structure are more difficult to design, test, and monitor.

Designing the puzzles appropriately



Designing the puzzles appropriately

- Every learning objective of the escape room should be addressed by at least one of its puzzles.
- Since they must cover specific learning objectives, puzzles in educational escape rooms are usually **highly subject-dependent** and therefore cannot be acquired but must be **designed and built from scratch**.

Designing the puzzles appropriately

- It is highly recommended that every puzzle in an educational escape room meets the following requirements:
 - The solution to the puzzle should be unique and easily verifiable in an objective way.
 - The participants must be able to find the solution to the puzzle within the allotted time using the available resources.
 - The probability that participants will solve the puzzle through trial and error should be very small.
 - The puzzle should not have irreversible states so that participants, regardless of their past actions, should always have the opportunity to solve it.

Designing the puzzles appropriately

- ❖ It is highly recommended that every puzzle in an educational escape room meets the following requirements:
 - Participants should be clear about when they have solved the puzzle. A good practice is for the puzzle to include visual or auditory feedback.
 - The puzzle should have a reason to exist consistent with the narrative.
 - The puzzle should be connected or related to other escape room puzzles.
 - The puzzle should be **tied to a learning objective** and **combine educational and playful elements**.

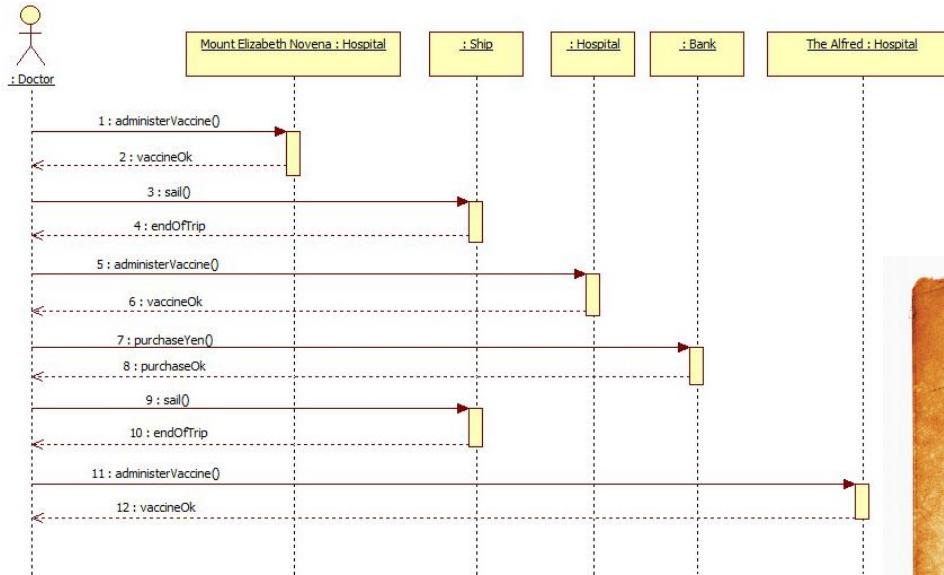
Designing the puzzles appropriately

- When combining educational and playful elements, achieving an appropriate balance between them is important.
- An approach that has proven useful for designing educational escape room puzzles is to intertwine educational content with game mechanics often employed in recreational escape rooms, in such a way that solving the puzzles requires participants to apply field-specific knowledge and skills, as well as to perform actions typically required to solve puzzles in recreational escape rooms.

Examples of actions required to solve puzzles in recreational escape rooms

- Finding objects, symbols, and messages.
- Deciphering codes.
- Assembling objects.
- Identifying patterns.
- Listening to sounds.
- Observing lights.
- Substituting symbols.
- Using objects in unusual ways.
- Interpreting images.
- Searching for information using different sources.
- Solving a riddle.
- Opening locked doors and boxes.

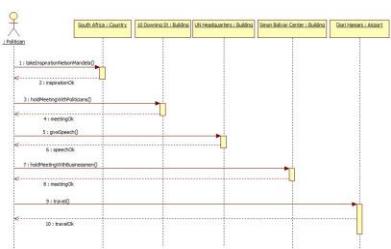
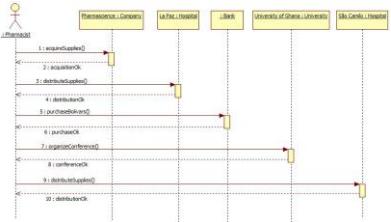
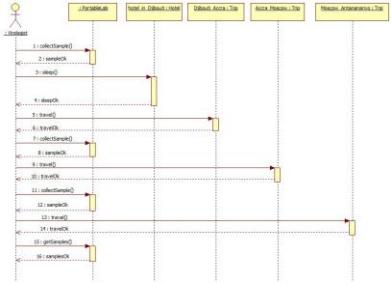
Puzzle example



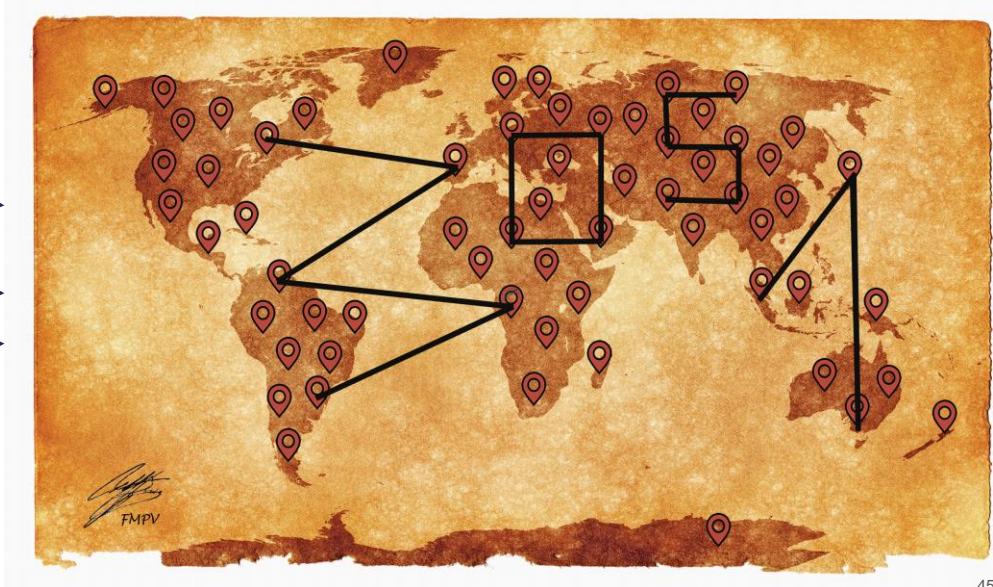
If the participants correctly interpret the diagram and draw the path it represents, a number will appear on the map.



Puzzle example

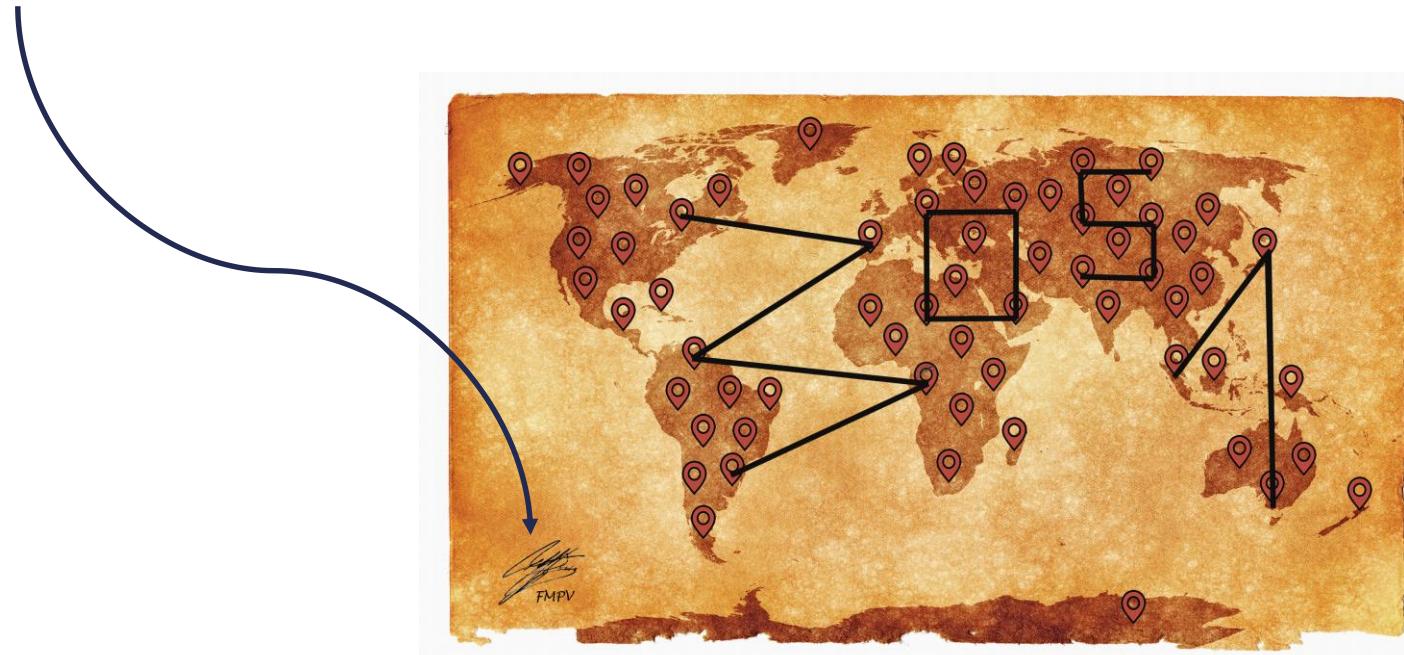


If they repeat the same process with three other diagrams, they will get four numbers on the map.



Puzzle example

Participants must realize that four letters appear in the map's signature and that each of them corresponds to the initial letter of an actor shown in the diagrams. If participants arrange the numbers according to these letters, they will obtain the solution to the puzzle: 5130.



Establishing an appropriate difficulty

- The **difficulty** of an educational escape room should be high enough to captivate participants but low enough to allow them to solve the puzzles and learn.
- Recommendations:
 - Consider both educational and playful elements when adjusting the difficulty of the puzzles.
 - Design the escape room puzzles with **increasing difficulty**, ensuring the first one is very easy.
 - When adjusting the difficulty of an escape room, consider the possibility of adding or altering **clues and distractors**, as well as changing the approach employed for delivering **hints** to participants.

Helping participants to solve the puzzles

- ❖ It is quite common for participants to get stuck while trying to solve an escape room puzzle.
- ❖ If participants remain stuck at one puzzle for too long, there is a risk of them getting bored, frustrated or even angry, and they may also fail to engage with all the puzzles.
- ❖ Therefore, it is crucial to provide participants with help for solving the puzzles.
- ❖ An excellent way to provide this help is by **delivering hints to participants using an appropriate strategy**.

Helping participants to solve the puzzles

► Recommendations for delivering hints:

- Use **pre-created hints** for all puzzles.
- Limit the **frequency or number** of hints.
- Require participants to pay some **cost** every time they request a hint (e.g., score reduction, drop in the leaderboard, or completing additional tasks such as answering a quiz).
- Create **multiple hints for each puzzle**, arrange them in sequence so that they are in **increasing order of usefulness**, and deliver hints in order.
- Organise the hints of multi-task puzzles into different **categories** and allow participants to choose the category from which they receive each hint.

Helping participants to solve the puzzles

Recommendations for delivering hints:

- Deliver free hints to **lagging participants** or suggest them to request hints.
- Use on-the-spot hints as a fallback in supervised escape rooms when no more pre-created hints are available.
- In unsupervised escape rooms, use automated hints and provide **final hints with the puzzle solution** in order to prevent participants from getting stuck indefinitely.

Supervising the escape room whenever feasible

- **Supervising** an educational escape room during its execution is always beneficial because it allows to:
 - Ensure that the rules are followed.
 - Monitor and control the activity in real-time.
 - Assist participants with any incidents or doubts.
 - Resolve conflicts.
 - Help participants solve the puzzles when necessary through hints delivered by supervisors.

Supervising the escape room whenever feasible

- In educational escape rooms conducted **face-to-face**, supervisors can be in the same location as participants and communicate with them in person.
- In educational escape rooms conducted **remotely**, a video conference room can be set up to supervise the activity.
- Educational escape rooms can also be conducted **without supervision**. However, we recommend limiting the use of unsupervised escape rooms to those cases where supervision is not possible or would require an unaffordable effort (e.g., escape rooms offered through MOOCs).

Defining the strategy of student grading

- 💡 It is important to decide whether an educational escape room will be offered as a **graded activity** and, if so, how the **grades will be calculated** and how the activity will fit within the corresponding syllabus if it is offered within a course or study program.
- 💡 We recommend offering educational escape rooms in one of the following two ways:
 - ✓ As **non-graded activities**.
 - ✓ As **formative assessment activities** in which the score obtained has **little influence** on the students' final grade.

Defining the strategy of student grading

- The following options can be considered for **calculating students' grades**:
 - ✓ Award students points just for participating in the educational escape room.
 - ✗ Award students a pass/fail grade depending on whether they successfully complete the educational escape room or not.
 - ✓ Score students proportionally to their percentage of completion of the educational escape room (e.g., based on the solved puzzles).
 - ✓ Score students based on their performance in the activity by considering multiple factors such as the puzzles solved, the time spent solving each puzzle, the weight of each puzzle, and the hints obtained.

Consider accessibility and inclusion

- When a teacher creates an educational escape room, they should do everything possible to make it **inclusive and accessible** for all students.
- Possible measures:
 - **Physical adaptations** (e.g., ensuring that the space is wide enough, using adjustable furniture, offering additional shifts that allow remote participation).
 - **Sensory adaptations** (e.g., captions, providing adequate lighting).
 - **Cognitive adaptations** (e.g., giving simple and clear instructions, extra time or closer monitoring for students with cognitive disabilities).
 - Allow the use of **assistive technology** and ensure that virtual resources are compatible with assistive devices such as adapted keyboards and special mice, as well as with screen reading software.

Building the escape room with reusability in mind

► Recommendations:

- Use virtual resources whenever possible, as long as they do not pose any significant limitations.
- In the case of using physical resources:
 - Use printable resources that can be easily reproduced for future use.
 - Use materials that can withstand repeated use.
- Build the educational escape room and all its puzzles in such a way that they are easy to reset.
- Store all digital files in a trusted digital repository and make backup copies.
- Create instructions that contain all the information necessary for a teacher to properly execute the educational escape room.

Using resources with low environmental impact

- 💡 Escape room creators should, to the extent possible, **use resources with a low environmental impact**, that is, resources that minimise harm to the environment during their extraction, production, use and disposal.
- 💡 A very effective and recommendable way to reduce the environmental impact of an educational escape room is to use **virtual resources** instead of physical ones.
- 💡 In the case of using physical resources to build an educational escape room, we recommend the use of **sustainable and recyclable materials** whenever possible.

Testing the escape room thoroughly

- It is essential to thoroughly test an educational escape room before participants play it, since the presence of an error can have very negative consequences:
 - It can prevent or hinder participants from progressing and, consequently, **prevent or hinder them from achieving the learning objectives.**
 - It can lead to significant **confusion**, as participants may be unsure whether the error is unintentional and needs to be fixed or if it has been deliberately included as part of the game and thus the escape room is functioning as intended.
 - It can **break the sense of immersion and excitement.**

Testing the escape room thoroughly

- ❖ It is highly advisable to test an educational escape room not only **after it has been built** but also **during its design**.
- ❖ During the design phase, tests can be carried out using **simple prototypes** made from paper or by employing digital mockups.
- ❖ It is advisable to **test each puzzle individually** before testing the whole escape room.
- ❖ It is also advisable to review the **narrative** and check that all the resources presented to the participants are consistent with it.
- ❖ An interesting option is to conduct a **trial run** of the educational escape room with users who have not been involved in its creation (e.g., volunteer students or teachers unrelated to the activity).

Other recommendations

- Consider the possibility of changing the design of the escape room to simplify its construction.
- Consider the possibility of **scheduling shifts** and allowing **asynchronous participation**.
- Provide participants with **initial instructions**.
- Motivate participants while playing the escape room.
- Conduct a **debriefing session**.
- Evaluate the impact of the escape room on participants' perceptions and learning (e.g., using questionnaires, pre-tests, and post-tests).

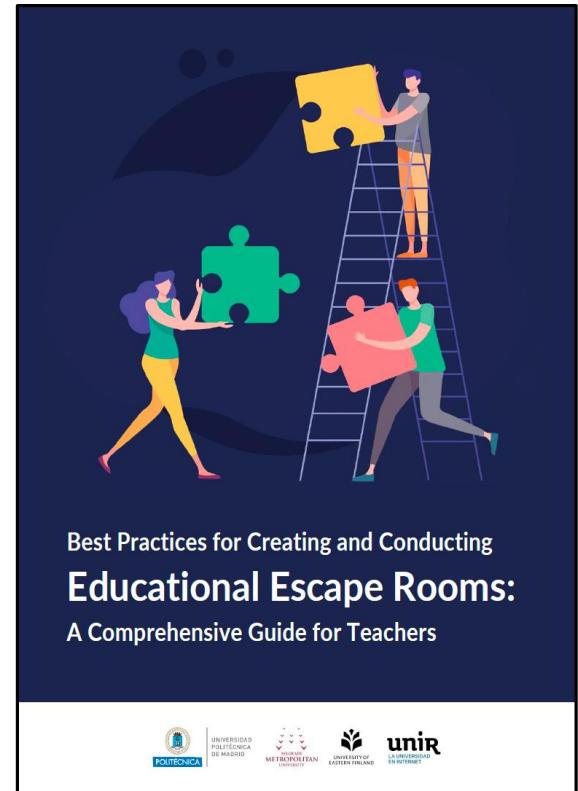


Resources for creating educational escape rooms



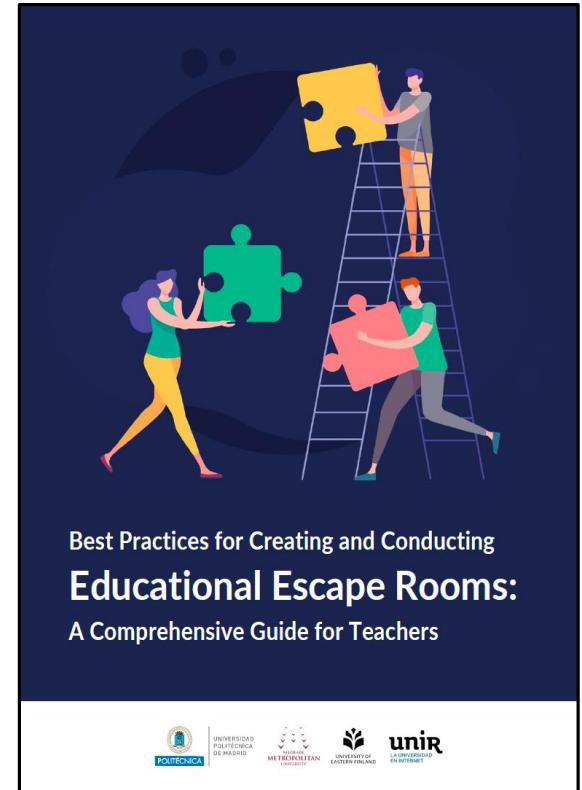
Resources for creating educational escape rooms

- Annex 1 of the best practices guide includes a list with a wide variety of resources that may be useful for teachers when creating an educational escape room.
- The resources are organized into categories based on their format and purpose.
- The guide is freely and openly available at <https://iglue.dit.upm.es>.



Use of generative artificial intelligence

- Annex 2 of the best practices guide includes recommendations on how to use generative artificial intelligence tools to create content for educational escape rooms.
- The guide is freely and openly available at <https://iglue.dit.upm.es>.



Best Practices for Creating and Conducting
Educational Escape Rooms:
A Comprehensive Guide for Teachers



Use of image generation tools based on artificial intelligence

- There are some measures that may be helpful when creating images for an escape room using image generation tools based on artificial intelligence (e.g., Midjourney or DALL·E):
 - Adopt a common style.
 - Use images as inputs.
 - Reference characters.
 - Edit regions.

Adopt a common style

User prompt

picnic, leftovers, blue table cloth, pixar style --ar 16:9

Output generated by Midjourney

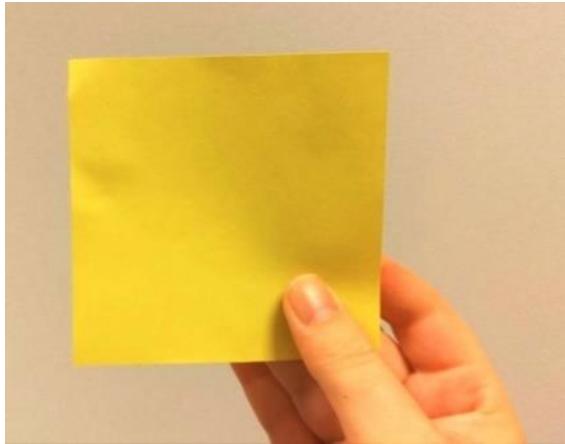


Use images as inputs

User prompt

holding post-it, up close, blurred background, pixar style --ar 16:9

Image



Output generated by Midjourney



Use images as inputs

User prompt

boy in hospital bed, happy, feeling well already, healed, balloons, family standing by his side, pixar style --ar 16:9

Image



Output generated by Midjourney



Reference characters

User prompt

illustration of a man sitting in a cafe --ar 4:3

Character reference



Output generated by Midjourney

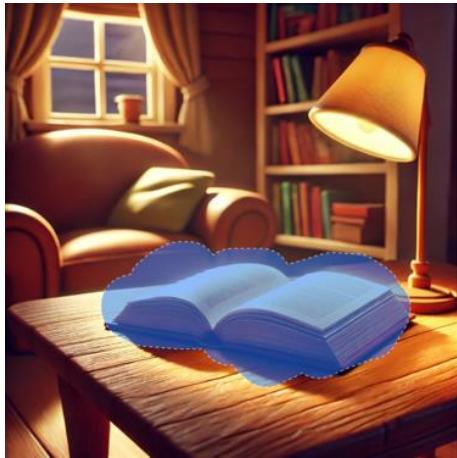


Edit regions

User prompt

No book or anything

Image + selection of the area to edit



Output generated by DALL·E 2



Example of an educational escape room based on a scene generated with MidJourney



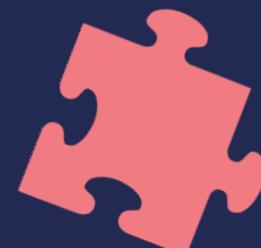
Educational escape room “Baltic Sea”.
<https://escapp.es/escapeRooms/91/join>



¡Thank you!

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