

ESCAPE ROOM

CREATION GUIDE



Are you a **teacher or trainer** interested in using the **Escape Room model** in teaching? This guide is what you were looking for!

INTRODUCTION

This guide has been designed to allow the reader to understand **all the steps** that make up the process of designing an **educational escape room from scratch**.

It aims to provide very practical support to all teachers who do not wish to use prepackaged educational escape rooms.

In addition to retracing the design process that must be the basis of the work, the guide will provide **tools and advice** to make your Escape Room an **experience** that has the right characteristics to be used for educational purposes.

The guide will allow you to deepen some very important aspects from the point of view of the design of an educational escape room:

1. **Narration** - the beating heart of the story that gives life to the Escape Room. Provides a comprehensive theme that can support the consistency of the experience and promote immersion e involvement.

2. The expected **Learning Process** - the reason behind creating an educational escape room.
3. The **Game Flow** - describes the structure and phases of the gaming experience for the participants.
4. **Design of Puzzles** - can be of many different types and involve both cognitive and physical skills.
5. **Advice for inclusion** and management of needs related to **Learning Disorders**.
6. The **Debriefing** - is one of the most important phases that follows the game (but often is overlooked), in which players are made aware of the learning that is taking place verified during the game.

By following the practical advice of the guide, it will be clear how to create an Escape Room that can be:

- **engaging**, thanks to an in-depth study of storytelling techniques and useful tips for good storytelling;
- suitable for teaching **STEAM content**;
- **inclusive**, thanks to content specifically designed to ensure positive use by students with disabilities and learning disabilities;
- **interactive**, thanks to the advice on useful tools available online;
- **positive for girls' enhancement**, thanks to the useful suggestions that transmit positive models for girls, stimulating their interest in STEAM subjects.



SUMMARY



01
STORYTELLING
IN ESCAPE
ROOMS FOR AN
EFFECTIVE
PEDAGOGY

Page 4

What are the elements we should think about to generate an effective and captivating playful learning experience?



02
HOW TO
CREATE AN
ESCAPE ROOM
FOR STEAM
EDUCATION

Page 17

How can we design an educational escape room for STEAM? How to connect the ER experience with STEAM programmes and with other matters too?



03
RESOURCES
TO FIND
CONTENT

Page 26

Which elements are to be used? And where is it possible to find content to use and draw inspiration from?



04
PRACTICAL
ADVICE

Page 37

How can we manage the difficulty and support the players during the experience? How to manage an effective debriefing?



05
DISORDER
OR
DISABILITIES

Page 45

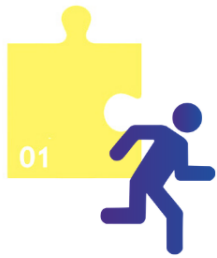
Which methods and approaches should be used to involve pupils with SDA difficulties?



06
POSITIVE
ROLE
MODELS FOR
GIRLS

Page 58

Which methods and approaches should be used to deal with this aim? And to implement the ideas proposed through an educational Escape Room? We will discover seven inspirational stories about the women in STEAM!



STORYTELLING IN ESCAPE ROOM FOR AN EFFECTIVE PEDAGOGY

- I. **Why is learning to tell a story important?**

- II. **Storytelling for an effective teaching**
 1. Storytelling: definition and functions
 2. Storytelling and STEAM
 3. Some inspiration for STEAM Escape Rooms

- III. **What are the keys to good storytelling?**
 1. A possible strategy
 2. Empathy: how to create it

I. **Why is learning to tell a story important?**

If you learn how to tell a story with the right attitude, it can really help you on several occasions! This is not an exaggerated statement!

I was 29 and looking for a new job. I had just finished a job interview at a major marketing company, but my shyness played a bad joke on me once again: I was convinced that no one would call me back.

I had just begun the descent in the elevator to the ground floor when it unexpectedly stopped. I looked for reassurance at my "travel companion", whom I had barely noticed until then. He was a man in his forties, very elegantly dressed, tanned, and perfectly shaved. But the thing that struck me most about him was his terrified look. I didn't have time to open my mouth when he said to me in a faint voice:

"I suffer from claustrophobia."

"Don't fret, somebody will let us out soon ..." I sounded the alarm and after a while, a soothing voice informed us that the technicians had already been informed and asked us to stay calm.

"With the traffic at this time, they will take at least half an hour to arrive!"

"Don't worry. There is no danger ... "

"Easy to say, you don't know what I'm going through. I feel suffocated... ". He kept his eyes closed and was growing pale. His forehead was sweaty, and he was starting to breathe heavily.

"You are right, tell me if I can do something to help you"

"Tell me a story"

"A story?!"

"I have to get out of here, at least with my mind"

"Ok ... er ... let's see ... once upon a time ..."

"No no no... Do I look like a child to you? Try to be credible, please! "

I had grasped the concept, but it was not at all clear how to do it ... I didn't know anything about him ... how could I invent a story on the spot that intrigued him? I observed him, looking for inspiration: he had red hair (which reminded me of a classmate I had a crush on) and weird sideburns (like an actor I had seen at the cinema whose name I didn't remember at all); in his hand he held a magazine entitled "The Molossers: special French Bulldog"; he seemed to frequent the gym assiduously, judging by his broad shoulders... I realized I was searching in the dark. Trying to keep calm, I took a deep breath and noticed his scent: it was very aromatic, it reminded me of the smell of coffee. This last detail reminded me of a piece of news I had read that morning while eating breakfast.

"Forgive me, I just have my head somewhere else ... my employer urgently summoned me: a demanding client wants a proposal for his next advertising

campaign. I only have half an hour to find a slogan for your coffee ... I'm sorry, I'm just digressing ... "

"I don't understand marketing ... but I'm a good coffee consumer ..."

"In less than a month it will be International Coffee Day and we need an idea to submit to our client ... I studied all night, but I don't know where to start, I don't drink coffee anymore..."

"You don't know what you're missing ... but why?"

Nothing was true (except International Coffee Day, like I read in the newspaper!), but maybe I was on the right path ...

"It's a long story ... Three years ago, the boy I was in love with told me: "I have to talk to you, let's meet in two hours and have a coffee". I thought I was dreaming!

I was so excited that I set out for the appointment well in advance. A sudden storm forced me to take refuge in front of the entrance to a cinema along the road..."

My fantasy had taken over. But now he had his eyes open and was looking at me with a hint of curiosity. He listened in silence. This seemed to be a good sign ...

"I was anxiously waiting for it to rain, I was without an umbrella and I never wanted to go to the appointment completely drenched! Just then, he came out of the cinema... along with my best friend! "

"And what did you do?"

"I went to the appointment and drank that coffee with him ... Obviously, I was prepared, and I knew how to react as if that news didn't surprise me at all. To console me, I went to the kennel and adopted a dog ... Spartacus! He's a mongrel but he's a beautiful cross with a French Bulldog. It is really adorable! That was my last coffee. The very thought of it disgusts me and I just don't know how to convince others otherwise. "

"Well, it's understandable... But this shouldn't compromise our work! Let's not waste any more time, don't you just have half an hour left? "

Searching for the right slogan, we started an interesting discussion, we talked about bistros, aromatic awakenings, pleasant breaks with friends, but above all... French Bulldogs! He has three of them and confessed that Spartacus's adoption was the part of the story that had struck him the most! Indeed, shortly before the arrival of help, he developed the winning slogan in his opinion: "Behind every brilliant idea, there is always a good coffee!"

II. **Storytelling for an effective teaching**

Even if you probably won't be locked up like the storyteller, it may also be useful for you as an educator to discover how stories can help you establish a constructive approach in particular moments of teaching. The storytelling technique, especially, can help you to start a learning experience that requires motivation and involvement, such as Escape room.

1. **Storytelling: definition and functions**

Let's start by providing a definition: "Storytelling" is a communicative method that uses stories to convey a message. The goal is to attract the attention of the listener/reader, generating in him/her the desire to follow the story to find out "how it ends". The main goal is the involvement: a user involved in a story will inevitably end up paying the utmost attention, taking up the story's message.

This discipline is widely studied and used in various fields (business, didactics, advertising, etc.), as it can be extremely effective. It responds to multiple needs, including:

- sharing experiences,
- conveying emotions,
- establishing social and religious values,
- providing entertainment,
- directing towards a choice
- explaining natural and historical phenomena and events,

- creating relationships,
- educating and transmitting knowledge.

Actually, storytelling was considered a privileged form of communication from ancient times, not only for the transmission of tradition and cultural identity of a population, for the construction and sharing of a system of values, symbols and ideas, but also for educational and training purposes. Homer and Aesop, in ancient Greece, the Epics of Gilgamesh, in the Mesopotamian civilizations, Hesiod and the Old Testament, among the Jewish people are just a few examples that demonstrate how in ancient times education was based on narration.

2. Storytelling, teaching and STEAM

Indeed, storytelling represents a formidable element for the learning purposes, as it stimulates interest, curiosity, engagement and memory development (Conle C., 2003).

It is undeniable that some topics and matters lend themselves better than others to transposition into a narrative approach. Although it can be more immediate to apply storytelling to the humanities sector (for example, to explain feudal society through a story), when it comes to STEAM, some difficulties might be faced. However, these difficulties do not lie so much in the arguments or opportunities, but rather in the greater creative effort that must be used to find the right approach! For example, physicist Richard Feynman was able to explain energy conservation with a fairy tale (Feynman, R. P., 2000).

Actually, some elements determine the success of storytelling in STEAM teaching.

- First of all, the use of narration in some phases of the didactic activity can prove to be functional as it allows for the creation of an alternative communication channel (Norris et al., 2005). Through storytelling, we can leverage the sphere of imagination, fantasy and feelings. This positively influences the reaction to the didactic proposal, generating positive expectations. Organizing a lesson starting with "*Now I'll tell you a story*" ensures that students perceive the beginning of a parenthesis that is

accessible to all, as if it was an invitation to get comfortable and listen, to let their imagination work.

- The facts and actions told in a narrative seem more concrete and understandable. This approach makes everything more familiar and allows students to be involved through the recognition in the story of known elements, which evokes memories;
- A narrative approach involves telling something new and unexpected, insinuating a doubt, or even adopting an unusual point of view. This creates curiosity and keeps the attention alive, placing scientific and non-scientific language on the same level (Avraamidou, L. et al., 2009). Technical rigor and narrative approach are therefore conciliated through creativity.
- Storytelling allows to organize thought and content within a logical path that involves multiple channels of communication, from visual to auditory, thus stimulating cognitive, linguistic, and mnemonic skills at the same time. Moreover, today we can easily produce not only words and images, but also videos, graphics, diagrams, maps, animations, etc. We speak of "digital storytelling" meaning the organization of such, contained within a transmedia narrative structure created thanks to digital tools and technologies.

How to concretely apply storytelling to STEAM teaching? Let's see some possible approaches:

a) Search for a new point of view on a problem and/or theme.

It is common to start from current events or contemporary history to introduce new topics or ask questions. This makes it possible to create a link between the learning experience and life experience, through the transmission of skills according to a cause-effect logic.

For example, we could tackle the theme of calculating speed, distance and time in physics starting from the competitions in which the refugee team that for the first

time participated in the Olympics in 2016, not competing for any nation, but under the aegis of the Olympic flag.

Or tell about the living legend Felix Baumgartner, an Austrian skydiver, and his leap from the Stratosphere which marked an era to introduce an earth science lesson.

Or even take a leap in 1714, when a prize entitled "Longitude Act" was established which guaranteed 20,000 pounds (comparable to about 8 million euros) to anyone who solved the calculation of longitude to prevent the perpetration of a series of catastrophic shipwrecks.

b) Proposer de nouvelles interprétations

It is possible to tell the life of scientists to make students appreciate that what they study is the result of the work of "everyday people". In this way, they can discover the more "humane" aspect of famous people (for example that Albert Einstein had difficulties in school or that Isaac Newton had an unfortunate childhood).

a) Use gamification

This approach is one that leaves more space for creativity. Through a story, our goal can be to open a scenario to simulate the most varied situations. This can allow us to bring listeners into a mission, imagine a prestigious competition, simulate a scenario in which characters with different roles have to propose different solutions to a problem, create teams that have to collaborate, and so on. Scientific theory becomes the set of rules of our game, which can be provided in equally imaginative and possibly contextualized ways with respect to the story.

In this case, the narrative triggers a call to action, as in the case of a scenario that precedes the experience of an Escape Room, involving students to approach a topic as an integral part of the story.

The Escape Room experience can be contextualized in this last point, but the creation of stories and scenarios can also draw inspiration from what we have said in the previous points.

3. Some inspiration for STEAM Escape Rooms

Let's try to suggest some examples of plots:

- a) It is a great day for **Felix Baumgartner**, the Austrian skydiver: all the televisions in the world are connected to watch his new launch from the Stratosphere, which will go down in history as a new record! But an envious rival put him to sleep and locked him in a secret cell (or maybe in the spacecraft that is orbiting the stratosphere!). His salvation is in your hands!

- b) We are in what used to be **Einstein's house** and we have to find out where a very precious letter from him is hidden (which he may have kept using a system of clues based on his studies!). We do not know what the letter contains, but it could be unpublished research that could surprise the whole world!

- c) In 1719 **John Harrison**, the son of a carpenter, who is just twenty years old, builds a series of particularly frictionless wooden clocks. Being aware of his skill, he decides to focus on the Longitude Act award. He went to London to present his idea to the commission composed of prominent astronomers and watchmakers but discovered that the latter had never met due to a lack of valid projects to examine. John then decides to present his project by knocking on the house of George Graham, a member of the commission. What the books do not tell (or rather, the conflict of our story) is that he was received by a strange butler who locked him in an underground cell, wanting to take over his studies. Only with your help can this be prevented!

- d) To test the effectiveness of his/her work, **the publisher of the biology textbook** used in the classroom has developed an innovative test. The publishing house has just informed that the class has been selected for this test, informing that an interesting reward will be made awarded to the children for this inconvenience. It will be necessary to exit the locked

classroom and the puzzles to find it are inspired by one or more chapters of the book! It will be good, as promised, to guarantee a reward, but a simple day without homework or questions could be very welcome!

III. What are the keys to good storytelling?

What can help you to realize good storytelling? Joe Lambert, founder of the Center for Digital Storytelling in California, identifies some useful elements:

- personal point of view,
- structure of the narrative that raises questions and provides non-trivial answers,
- use of emotional and engaging content,
- economy of the narrative (you can say a lot with little),
- pace appropriate to the narrative modalities.

The stories don't necessarily have a happy ending, but rather, an important element that increases the user's attention is the perception of authenticity (Fontana A., 2009). Even if we are telling of an alien abduction, we can be credible and convey authenticity if we are convinced of the purpose of our story!

1. A possible strategy

Starting from the elements identified by Lambert, let's try to understand what your strategy should be:

a) Building trust in the narrator: Our feelings towards a narrator influence our reaction to his/her story.

The feelings towards a storyteller influence the reaction towards the story. You can use elements that serve to strengthen the story and, above all, try to enhance your point of view. One method is to fill the story with some information or observation that can make it clear that you are not telling something that does not concern you, but that in some way you have also been involved. This helps to build credibility and trust (in the opening story of

the guide, for example, the girl adds more credibility to the story **by telling an episode that - apparently - she experienced first-hand**).

- b) Conveying familiarity:** The more familiar a story seems, the more powerful it is. The public needs to recognize familiar elements in the story, which evoke memories, familiar faces, and already lived experiences. To do this, it is possible to compare the characters in the story to familiar people, linking the problem with something that our audience already knows (in the story the girl observes the man and creates a scenario and characters from some familiar elements).
- c) Leaving space for imagination:** stories are more persuasive when readers work their meaning out on their own. Effective storytelling is one that evokes a message, leaving the interlocutor the space to create an image in which he can recognize himself.
- d) Working on emotions:** Stories require dramatic development and emotional dynamics. The storyteller must engage the audience. When he/she tells a story, he/she should feel part of it. It is not enough to tell the facts as if our interlocutors were passive listeners: our goal is to make the public experience emotions and sensations to remember (fear, curiosity, serenity, fun, etc.), always stimulating their imagination.
- e) Using simplicity:** Simple stories are strong stories. It can be useful to eliminate everything that is not necessary for the narration: for example, cutting events, joining two minor characters, or minimizing mentions to other places. Concrete examples can be effective, and even the usage of common words.
- f) Encouraging immersion:** The more readers are involved in the story, the more likely it is to produce an effect, that the call to action is effective. It may be helpful to include questions. This serves to create direct contact between the

interlocutor and the listener, and facilitates the creation of a solid bond within the story.

g) Identifying "allies" in the story: it is easier to keep the attention and curiosity high if we use elements that can revive them at the right times (not too often but not too rarely). Twists, false leads, unexpected events ensure that the public does not lose the curiosity to know what is about to happen, how the story will evolve. Especially speaking of preparatory stories for an E.R. experience, objects can be valid allies they can in fact create surprise, suspense or curiosity ... For example: what is a gift package doing in a crime room? They are important if we manage to animate them almost like characters if they contain particular meanings. Let us not forget to correctly introduce those that represent something important for the story, which can be linked to the conflict and the solution. A few details, well examined, may be enough to have the strength to remain etched in the minds of the listeners.

2. Empathy: how to create it

The strategy described above pursues a very specific objective: **to create empathy**. Without empathy, it is impossible to make the audience feel like an integral part of a story and the interlocutor will remain a simple passive spectator. Hence, the story will hardly be effective. The narrator can't permit it, especially if he/she is creating a call to action to kick off an Escape Room's experience.

To create empathy, it is necessary to build a conflict that pivots the whole story. It is the main element that the storyteller can use to be able to enter the mind of his/her interlocutors. Conflict can take the form of a trial, an unpleasant event, or as an antagonist. It is an apparently insurmountable obstacle that separates the protagonist from his goal. It is in the face of a conflict that the listener / reader finds the motivation to contribute to the protagonist's cause. Empathy makes the reader feel the desire to support the protagonist in finding a solution and overcoming the problem (**Call-To-Action**). Motivation, will, and determination therefore play a very important role.

How is it possible to create empathy? There is no difficult or fast rule, but some tips may be useful:

a) Starting idea

- Theme: focus on the target. By knowing the audience, the narrator can identify what generates interest, curiosity, and attention in it;
- Characters: we imagine characters that are able to captivate our audience and create a vision in the mind of our interlocutor;
- Setting: we choose non-trivial scenarios that we can contextualize correctly, even if with a few elements, so as to be credible and to enhance the story.

Let's imagine all this before we start writing, and in as much detail as possible. This will facilitate the writing process.

b) An effective and exciting introduction

The introduction allows us to quickly gain (but also to lose just as quickly) the interest of our audience. It is precisely the moment in which an empathic bond is established with the public. Try to make sure that the introduction to our story is intriguing and exciting. Its function is to present the protagonist, the context in which he/she finds himself/herself, his/her strengths and weaknesses, but there is no need to be didactic! Indeed, we can find the most captivating thing in the story and try to start from there.

c) Rhythm

In order not to bore our audience, let's use a fast pace and don't get lost in digressions. Eliminate what is not strictly necessary.

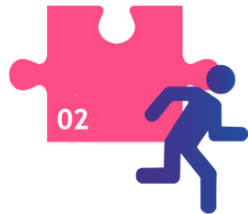
d) Call to action and solution

The positive resolution of the conflict must require the participation of our audience, who must feel indispensable to help the protagonist overcome it. We act in this way on motivation, which also can be solicited by revealing the benefits of becoming allies of the protagonist. We make sense of the whole story, leading anyone who is reading to be convinced that helping the protagonist represents an opportunity that can bring concrete benefits for ourselves or for others.

e) Tone of voice

This is not a small detail: our voice must be confident and convincing. We transmit strength and conviction by expressing ourselves with our story.

Once the work of creating and defining the story is completed, the next step will be to look for the resources that will help us to make our work as concrete as possible, based on the final output we want to realize. The next chapter will provide a useful overview of the resources available on the web.



HOW TO CREATE AN ESCAPE ROOM FOR STEAM EDUCATION

- I. **Educational objectives**
- II. **Background topic**
- III. **Scenario**
- IV. **Puzzles**
 1. Puzzles' features and components
 2. Puzzles' forms
 3. Puzzles' sequences
 4. Tips for good puzzles
 5. Adaptations for SLDs

For starters, it is essential to highlight that educational escape rooms will neither look nor be constructed in the same way as commercial ones. Their goal differs, *ergo* the design process differs as well. There are two major – and noticeable – differences. When created to be used in an educational context, the room will have to have an educational objective – or several. Professional escape room designers do not prioritize on skills' improvement or knowledge acquisition. Secondly, the teacher must know the target group, whereas the designer will be the one to design puzzle sequences without any prior knowledge of the background of his future clients.

In this second chapter, we will go over the necessary knowledge and guidelines for starting the creation process. In the next pages, we will discuss the educational objectives, the background topic, the scenario and the puzzles. This guide also aims

to be inclusive for learners with SLDs and to present ways to empower girls. Ideas for adaptations on both topics will be presented in this chapter.

I. Educational objectives

The first step in the educational escape room's design process is to clearly define the demographics of the future players. Teachers should consider: the age group and their educational needs, the difficulty of the game, its scale (how many students will have to play at the same time?) and its length (Clarke and *al.*, 2017). Groups of 10 tend to play differently than groups of 4 in professional facilities, which usually limit the number of players to 7 (Nicholson, 2015).

The second step is formulating the learning objectives. It is important to do so at the beginning of the process, in order to create meaningful, purposeful, interwoven puzzles, rather than trying to integrate objectives into ready-made puzzles.

Conceivable learning objectives include: deepening the knowledge on one or several parts of the curriculum; developing soft skills such as collaboration, time management, as well as problem-solving skills; becoming passionate and involving as many participants as possible; and finally, testing the knowledge and the understanding of the knowledge previously acquired by the students informally.

Below are two examples of educational objectives for STEAM education. We will detail the scenarios linked to these objectives at a later stage. Both follow the 2019 French curriculum for students in the 1st grade (16-17 years old) of general education.

Educational objectives of scenario A:

- Physics, *Theme 4 – 'Waves and signals – 'Mechanical waves'.* (Ministère de l'Éducation nationale, 2019b): Students will work on the different types of mechanical waves, the notions of frequency and wavelengths. Having a good comprehension of these notions constitutes the first educational objective of this scenario.

- Biology, *Theme 1 – ‘The Earth, Life and organisation of living things’ – ‘Genetic information, its transmission, its expression, its variation’* (Ministère de l'Éducation nationale, 2019c): Students will work on DNA structure and sequences, which constitutes the second educational objective.
- Additionally, this scenario could include notions from music education, mathematics, technology
- Communication, active listening, digital skills

Educational objectives of scenario B:

This scenario has been created with the aspiration to empower girls to pursue a career in STEAM, by presenting them with role models of famous women scientists.

- Mathematics, *Theme 1 - Algebra and Theme 5 - Algorithmic and programming.* (Ministère de l'Éducation nationale, 2019a): Students will work on sequences and series and cultivate their knowledge on programming.
- Additionally, this scenario could include notions from engineering, fine arts, history
- Collaboration, reasoning skills

II. Background topic

The background topic of the Escape Room provides context and validity to the scenario and puzzles. It will help make the game more appealing to the players, hence, engaging. Generally, it will make the story more powerful by using the storytelling skills highlighted in Chapter 1.

Even if we highly recommend it, having a background topic is not mandatory for the Escape Room to function. Nicholson's study (2015) shows that commercial Escape Rooms do not always have a background topic (or *theme*, as he calls it). The most basic ones contain only a collection of puzzles, sequenced in a specific order. Others have a theme, without an overarching story. The Room is therefore set up in a

specific environment, with adapted props and decor. The players are free to create and imagine the story themselves (Nicholson, 2015). The third possibility is having a scenario without a theme. Players are assigned responsibilities and given context regarding their role in the game, but the story could be set up in a different environment, without affecting the playability of the room. Finally, the Room can have both a topic and a scenario, as well as interwoven puzzles. In this case, the puzzle sequence makes sense only in the context of the specific Room.

The topic of the Escape Room could be virtually anything, whether real or fictional, the only limit being the designer's imagination. According to Nicholson (2015), the main topics in professional facilities are: the modern era, a specific date between 1900 and 2000, horror, fantasy and laboratory, among others. Below are two topics adapted for STEAM education, following the learning objectives highlighted above.

Topic of scenario A: Nowadays, in a conservatory. Students are working on their recitals, rehearsing their next performances or relaxing in the hall. Different kinds of music, coming from different instruments, are heard echoing in the building.

Topic of scenario B: Nowadays, in a science museum. The museum's next exhibition – on women scientists – is almost ready to open. It displays many paintings, tools and devices which have belonged to the aforementioned scientists. (Fenaert, 2020)

III. Scenario

Once the topic of the Escape Room has been determined, it is time to create a scenario. Once again, the only limit is the designer's imagination. Nicholson (2015) points out the most recurring storylines of the 175 surveyed facilities: escape from an unpleasant place; investigate a crime; defuse an exploding device; gather intelligence or espionage; carry out a heist, etc.

However, the designer will have to make sure not to overcomplicate the story, in order to avoid disorientation, especially regarding SLDs students. We will come back on the adaptations for SLDs in the fourth part of this chapter.

Following the topics described above, here are examples of possible scenarios.

Scenario A: A valuable instrument has been stolen. Police officers – played by the students – enter the school. The culprit is still inside the building. The chief inspector decides to lock the building for an hour, with everybody inside, giving the officers time to identify the missing instrument and identify the thief. After tracing the instrument, the police officers will conduct a DNA analysis on clues found on it, so as to identify and arrest the culprit before s/he succeeds to escape

Scenario B: Two hours before the inauguration of a museum exhibition, the director realizes that one of the objects loaned by a private collector has not been showcased. There is no explanation about it, and nobody in the museum seems to know its utility. A group of friends, IT specialists and historians – the students –, who travelled to the museum especially for the opening of the exhibition, offer their help and knowledge to find the missing information regarding the artefact. They have an hour ahead of them before the crowd starts entering the museum. For the purpose of this scenario, the mysterious object will be Ada Lovelace's '*Diagram for the Computation by the Engine of the numbers of Bernouilli*', published in *Sketch of The Analytical Engine Invented by Charles Babbage* by Luigi Menabrea (Ada Lovelace, 2020). This diagram is perceived to be the first computer program. (Gregersen, n.d.)

IV. Puzzles

Escape Rooms revolve around puzzles. They constitute the heart of the game, which cannot be carried out without them. Indeed, puzzles are described by Pinard (2018) as the backbone of the narrative. They can take various forms and styles, which are up to the designer's creativity.

1. Puzzles' features and components

According to Wiemker and *a/.* (2015), Escape Rooms' puzzles in their simplest form are made of three components: a **challenge, a solution and a reward**, giving either a clue which unlocks the next puzzle or the next puzzle itself.

Clare (2015) gives out more features:

- A puzzle must be **static**, up until the participants engage with it.
- It should create **surprise**, either by integrating an element unlikely to happen or unexpected. Alternatively, a surprise could be caused by an element that will make sense at a later stage.
- It should be **logical and clear**. Participants should be able to understand the output of the puzzle.
- It should be **challenging**, without being too complicated, so that participants can remain in Csikszentmihalyi's (1996) state of "flow". It is described as the ideal state of mind for players: a moment where the mind is set only on the goal and fully immersed in the story.
- To deal efficiently with difficulties that players could encounter, it is essential to set up **clues**, which constitute – again, according to Clare (2016) – the final component of a puzzle. Clues can take virtually any form: a drawing, a sound, a piece of furniture, etc.

2. Puzzles' forms

Puzzles can either be physical or mental. Physical puzzles require the manipulation of real items. They can be mazes, locks, tangrams or brain-teasers such as Rubik's Cube, etc. On the other hand, mental puzzles require the use of deduction and the correlation of clues to find the solution. They can be codes, riddles, correlation of clues, etc. They tend to be immaterial.

5. Adaptations for SLDs

When all the boxes above are ticked, one question remains: are the puzzles adapted for people with Specific Learning Disorders (SLDs)? If you wonder what SLDs are, please refer to part 5 of our pedagogical guide (available on our website).

Below is a list of guidelines to follow, so as to adapt to the game (Escape Rooms on social entrepreneurship, 2020):

- Use an adapted font (Arial, Century Gothic, OpenDys), in sizes 12 to 14, with a 1.5 line spacing.
- Reduce the number of tasks that require writing and diversify the types of puzzles.
- Give explicit guidelines and break instructions in several simple sentences.
- Avoid red-herrings and give clues one puzzle at a time. For example, avoid giving a clue for the last puzzle as a reward for the first one. If you wish to do so, creating a colour code to link puzzles with clues could be a solution.
- Focus on logic rather than memory
- Make great use of visual elements
- Choose puzzle types that foster collaboration in order to get players to help each other.
- Avoid difficult physical manipulations/use of fine motor skills
- Provide support when tasks require space management skills

6. Examples of puzzles for STEAM and role models for girls

Drawing from our scenarios, here are some puzzles ideas for each of them:

Puzzle idea 1 for scenario A: The push of a button triggers a succession of notes. Successfully repeating the notes' sequence on a keyboard (either a virtual or a real one), releases a key. (ex: given by the game master)

- Remember to stop any other sound in the room while the sequence is playing to avoid distractions.

Puzzle idea 2 for Scenario A: Write down a DNA sequence. Leave some of the nucleotides blank. The nucleotides to be found will create a code.

- Remember to write with big, clear letters. If you are printing it, use the fonts given above. You could also use Legos instead of paper. Associate one Lego colour to a nucleotide and build a sequence with it.

Puzzle idea for scenario B: Print pictures/paintings of several famous women scientists and inventors. Write a short description of their work aside. Stick everything on the wall to create an exhibition. Place a crossword in a safe, locked with an ABC multilock (for more information regarding the different types of locks, please refer to Grain 13, IO3). Link the riddles to the scientists' descriptions. Colour several boxes on the crossword grid. Completing the crossword will reveal the code, indicated by the coloured squares. (Fenaert, 2020)

- Make sure that descriptions are written in black, OpenDys or Arial, size 12, with a 1.5 spacing. Align left. Use white paper.

More examples of this can be found in Chapter 6, which considers ways of making STEAM escape rooms inclusive and educative regarding gender equality.



RESOURCES TO FIND CONTENT

- I. **Resources for creating content**
 1. Scenario
 2. Teaser
 3. Puzzles
 4. Final objective

- II. **Collaborative creation: involving students**

The Escape Room game can be used as a methodology for learning. To do this, the designer has to imagine a Room that will be used in an educational context, with one or more pedagogical objectives. He also needs to know his target group in order to design suitable puzzle sequences. The pupils will have to act cooperatively to solve the puzzles and achieve the final objective. Even if it is an educational room, the pupils participate in an immersive game. They are immersed in a universe. The ER is a puzzle game that requires associating, combining, decoding and manipulating clues to solve puzzles. The objectives within may be disciplinary, providing ways for the application of a given concept, or transversal, through the implementation of basic computer skills. Whatever the learning objective of the escape game may be, and all the more so in its creation, it becomes possible to bring together a group of pupils, to determine roles with the aim of a greater project, or even to assemble groups into project teaching.

I. Resources for creating content

In this third chapter, we will share several tools to accompany the creation process. These tools are related to several components of the room: the scenario, the teaser, the puzzles and the final objective.

1. Scenario

A scenario is the outline of the plot of the game. It sets the framework for the participants' involvement: or in this case, the pupils. In fact, the scenario must be motivating and intriguing enough in order to immerse them in the story. The participants should not put together the entire scenario from only the beginning, for it will become clearer once the various puzzles get solved. Needless to say, the narrative of the script is essential. Once the game is over, the players may not necessarily recall all of the puzzles, but the story should remain clear. The scenario thus consists of three elements: the story that is told, the journey through the game, and the final reward that concludes the game.

You must determine the beginning and end of the scenario, it will make it easier to construct the rest, i.e., the personality traits of the characters, the atmosphere, and other details of the story. The starting point of the scenario is composed of the context, the types of characters that are included in the game, the triggers of the situation. For what reason(s) are the participants stuck with a time limit? Imagination can provide new possibilities for acting out the game, such as making use of the limits of the area where the game takes place, or even prompting notions that you would like your pupils to revise, drawing inspiration from an existing fact or using a randomly chosen image or word to encourage curiosity. The end point of the whole scenario should answer the following questions: what is the objective of the players and what would happen if they fail?

To facilitate the creation of a scenario, you can make a visual representation of it in the form of a flow chart. Solutions have been put online to automate and customize the creation of an interactive scenario. Here are some examples:

[Celestory](#) is a tool for the online creation of playful learning and training applications. According to Pierre Lacombe, co-creator of Celestory, “the user, whether creative, trainer, teacher or HRD, fills in a tree structure according to logical links. Once the interactive scenario has been personalized, the choice of format is given: chatbot, video, formal game, or with voice assistants.” The principle is simple, bubbles are connected to other bubbles with logical connectors. Various paths are created, which will lead to different sections of the story. It is also possible to create variables that integrate affinities between characters, or to place video and illustrations throughout the story. There is a free formula for personal use, limited to a single project, exported with a watermark.

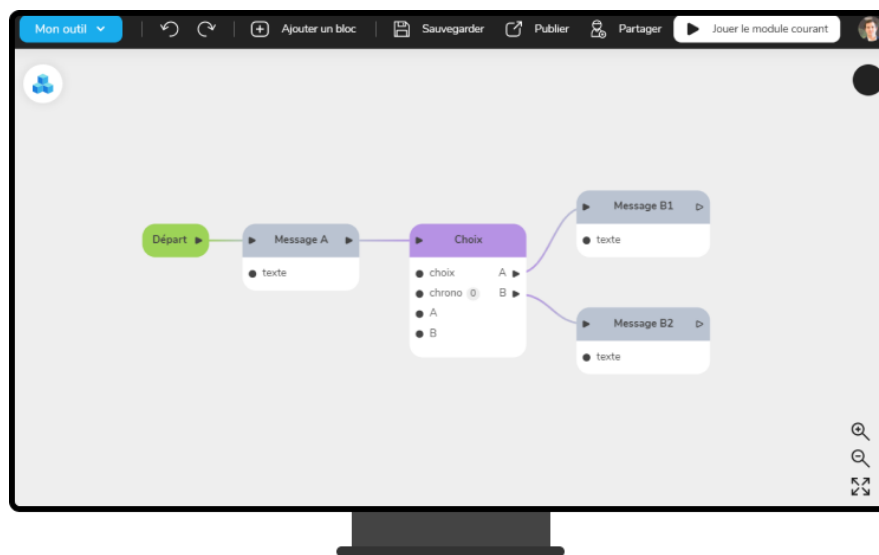


Figure 1 — © Celestory's platform

As they present it on their website, [MindMeister](#) is “an online mind mapping tool that allows you to capture, develop and share ideas visually”. Maps are graphical representations of information that translate the relationship between concepts and ideas. MindMeister allows your imagination to run free by combining video designs, images, external links and PDFs to bring these ideas together in a central workspace. The free (Basic) version of MindMeister includes up to three mind maps, real-time collaboration with full email support.

[StoryboardThat](#) is an online service that makes it easy to create storyboards, or in this case, stories in the form of images. To do this, you can choose from a number of

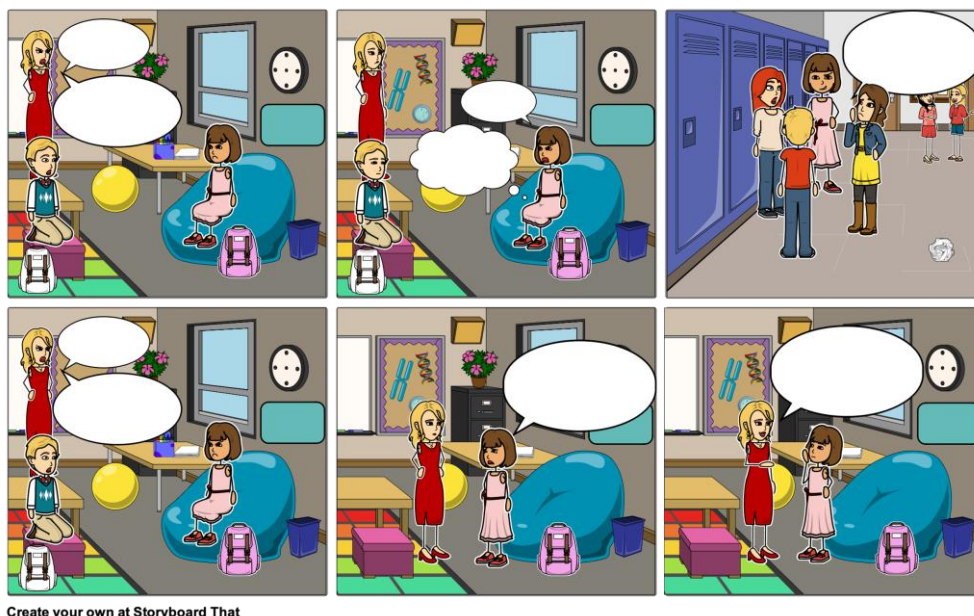
thumbnail board templates: it's up to you to script and tell your story! You can also add bubbles and write dialogues.



Figure 2 — © MindMeister's platform

Once your creation is complete, you can export it in many formats (PDF, GIF, PowerPoint). You can try and use this service free of charge for a fortnight.

Afterwards, the number of storyboards created, as well as the templates and options offered will be limited.



Create your own at Storyboard That

Figure 3 — © StoryboardThat's example

2. Teaser

The teaser is the first encounter within the Escape Room game, it appears at the beginning of the game in order to present the scenario. Its forms are varying and include: animation, avatar, oral presentation of the game master, or video. The teaser must clearly present the situation in which the players find themselves and the problem they have to solve, raising a feeling of envy in them. Be careful, the catchphrase must be sufficiently explicit! Otherwise, the participants will not understand the story completely.

To introduce your Escape Room game, you can make a short video with an editing software. Video editing consists of selecting recorded images or videos and putting them together in a coherent or artistic way.



Figure 4 — © L. Guimard—[Teaser Escape Game \(6e\) "Trouver la clé"](#)

Solutions have been put online to create simple and powerful editing. [Shotcut](#) is a free software available for Windows, MacOS and Linux. This free software allows you to import media (videos, sounds, images), increase or reduce their duration, mute the sound of a video (useful when you want to synchronize another sound to your video), add filters (colour balance, contrast, fade, calibration) and export. [Windows Movie Maker](#) and [Adobe Spark](#) are also easy to use.

An animated video can introduce your immersive experience. Animated presentations can provide captivating stories and context for the viewer. The idea here is to use the slide as a means of grouping and organizing text and objects. [Powtoon](#) is an online service that you can use to create your mission teasers. After registering on the platform, you can create different types of *powtoons* from a blank template or customize them according to your content and needs. As with most presentation softwares, the platform uses the drag and drop feature: slides and elements can be moved with the mouse. An editing bar will allow you to assign advanced functions to the elements, such as the order in which certain elements appear and disappear, for example. Once finished, you can upload your presentation video to your computer or directly to YouTube or Vimeo.



Figure 5 — © A. Payet—[Escape Game FLE](#)

You can also imagine creating a short video with an avatar that will present the mission. This could be a character from your plot or a character that represents you. [Voki](#) is a free website that allows you to create an animated avatar and make it talk. You can choose in which language your avatar will speak. Once it is created, it is possible to send it by email or to post it on a website.



Figure 6 — © B. Truchetet—[video DGSE—Escape Game mathématique pédagogique](#)

3. Puzzles

Once the scenario and the trailer have been created, you have to design the riddles that make up the game and that will mobilize the methods and knowledge to properly achieve the educational objective. The puzzles must be designed with the audience in mind, with a clear objective set, and all within a given time frame. You can imagine different puzzles through coding, manipulation, observation and logic games. An Escape Room game is made up of several puzzles that can be more or less linked together.

To create a puzzle, you need three elements: a material (such as a safe to open, for example), a skill (calculation, word manipulation), and a means (a key, a code).

The [Mécanicartes](#) present the different possibilities of these three elements. Their main aim is to enable you to learn how to break down any board game in order to understand how it works and then to reconstruct it by adding new rules. In fact, the Mécanicartes will allow you to create your own game. By associating a card from each category, you will be able to define a large number of combinations and therefore types of puzzles. Mécanicartes are Creative Commons creations. You can use the materials for free as long as it is for educational purposes.

The [Lockee](#) online application allows you to create virtual locks that allow access to content. These locks can be digital, directional, schematic, passwords, etc. and unlock access to text, image, sound, external video, or to a link. To create your account, you only need a valid email address, and once activated, you will be able to create up to thirty locks. After the lock has been created, you can download it as a link, QR-Code or in XLM format to save or share. It is also possible to integrate it into a Genially or a classic web page.

The S'CAPE site offers you a large number of resources for making escape games. [The "Bric à brac" section](#) includes many online tools to create your educational puzzles.

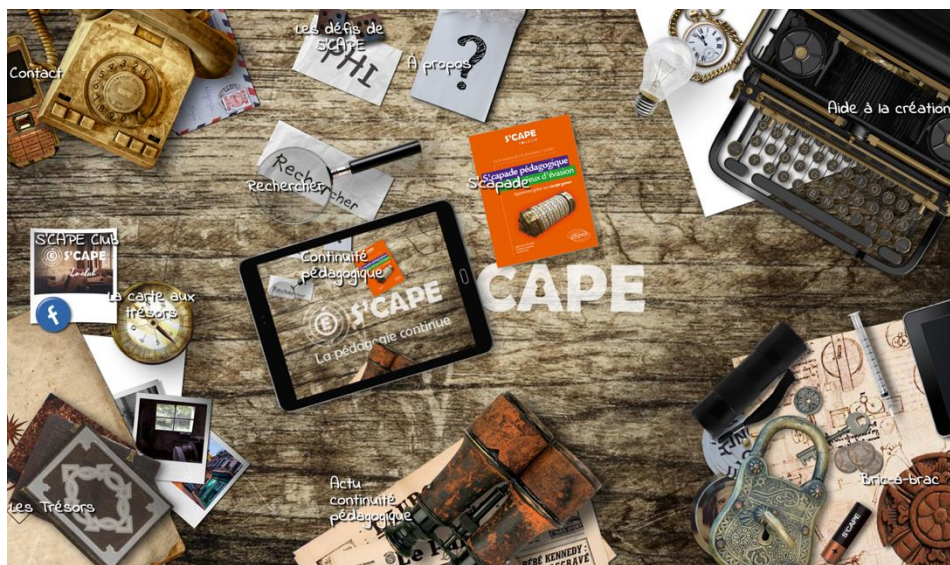


Figure 7 — © Scape—[Home page of the website](#)

4. Final objective

The final objective is the goal to be reached to finish the game. This final puzzle can only be solved with the answers to the previous puzzles. If the goal is to find an object, it can be placed in a closed chest with a combination lock. If the goal is to get out of the room, a key can be hidden. If the goal is to open a secure file, a password must be found. If the aim is to get something from a character, the coded sentence to be pronounced must be found. Whatever the final objective to be achieved, to

succeed, you must combine the solutions to the riddles encountered throughout the adventure. In fact, if a puzzle has not been solved, the participants cannot reach the final objective.

Augmented reality (or AR) can be used for the final puzzle. This technology works through a terminal that uses the real world and inserts live virtual objects, animations, text, data, and/or sounds that the user views from the screen. By using augmented reality as part of the development of an ER, you can make any image “digitizable” and thus associate an action with it and make it richer information-wise.

[Blippar](#) generates Blipps, i.e. the association between a trigger (which belongs to the real world) and a virtual overlay. By creating a Blipp, you determine which element of the real world (image or object) will trigger the appearance of a virtual element (an image, video or 3D model, for example). The Blippar online platform allows you to create Blipps, while the Blippar application allows you to read them by scanning. You will need to enter a code (one at a time) to see the augmented reality.

The final puzzle can also be a QR code to be coloured in. The QR Code shown is incomplete: the central part is not coloured, but squared with numbers in each box. The results of the previous puzzles give the references of the boxes to be coloured. When the QR code is reconstructed, it must be scanned to access the final objective. [Mal-den-code](#) is an online tool to complete the creation of QR codes.

In another example, each puzzle can result in a musical note. At the end of the game, you can use the *Lockee* site (presented in the *Puzzles* section) which offers a virtual keyboard. If the notes are played in the order of the lock, it will be unlocked.

The possibilities to reach the final objective of a mission are infinite, just let your creativity flow!

II. Collaborative creation: involving students

The Escape Room game is played as a team, allowing you to compare opinions, exchange and debate on the methodology to be adapted in the face of a puzzle, seeing that the objective is common.

According to Karin Lundren-Cayrol, “the collaborative approach combines two approaches: that of the learner and that of the group [...]. In the collaborative approach, the learners collaborate with the group’s learning and, in return, the group collaborates with the learners’ learning. Two learners who make different mistakes in the same situation can thus, by confronting their points of view, converge towards the right answer” (2001). This collective intelligence is, in fact, dependent on the involvement of each individual and on the activities proposed. Puzzle constructions are of real interest because they evoke groups to ask questions, show initiative and express innovative ideas.

The design of an Escape Room game by the pupils makes it possible to mobilize digital skills, and, most notably, to interpret the notions learned in class in different areas: information searches, document design, use of digital tools to create puzzles (such as QR codes, virtual locks, etc.) all while demonstrating the means of collaboration.



PRACTICAL ADVICE

- I. Managing difficulty**
 1. Decision on the type of escape room
- II. Supporting the players**
- III. Managing the time limit**
- IV. Fulfilment of learning objectives and debriefing**

In this chapter, we will explain how to manage difficulty when creating an educational Escape Room. First, we will explain the challenges to educational escape rooms that come from the formal educational system, the attitudes of teachers, students, and educational authorities. Then we will continue with making decisions on the type, the preparation and subsequent teacher meetings involved in the creation and implementation of, as well the design of the Escape Room. We will also focus on some practical considerations when testing the game. Following suit, we will talk about supporting the players and the group dynamics. Then, we will discuss how to manage time limits and give some advice on how to verify the fulfilment of learning objectives and the acquisition of knowledge. Finally, we will explain the importance of debriefing.

I. **Managing difficulty**

There are some main challenges to educational Escape Rooms.

Formal educational system

Continuous changes in the national curricula, priorities related to teaching and learning process methodologies, changes in the strategies of educational institutions are objective obstacles to the actual implementation of educational escape rooms in school.

- **Attitudes**

Traditional attitudes about teaching (According to Richards (2008), methodologies are explained as forms of learning that were very much seen as being under the teacher's control. In this regard, the traditional classrooms are seen as ceremonial places where students sat in rows like spectators, while the teacher sat in front of them, as a mayor or a priest would (Crawford et al., 2005). Unlike traditional methodologies, the modern teaching methodologies are much more student-centered. Scrivener (2005) explains that in modern methodologies, the main role of the teacher is to help students in the process of learning by encouraging, involving and helping them to try things out and to explore) and some teachers' resistance to innovative elements in pedagogical practice and classroom experimentation would be a challenge to the implementation of an Escape Room.

Students' attitudes are a very important factor for the realization of innovations. The internal resistance (explicit or implicit) of the participants in the educational process - principals, teachers and students- is a very serious challenge to overcome.

- **Timing**

Each new endeavour, each new idea and methodological development is associated with investing a lot of personal time and effort for the development of the idea, planning activities and implementation of the idea. Legal restrictions related to the coverage of the curriculum in class and the acquisition of certain knowledge, skills

and competencies, which require strict adherence to certain pedagogical methods and limited time for different disciplines can also be a challenge to integrating the Escape Room into the real learning process.

- **Support from other teachers**

In some cases, the development and implementation of an Escape Room involves the participation of a team of teachers. They should have the same attitudes towards teaching methods. The support of all participating teachers is an important factor for practical implementation.

1. Decision on the type of escape room

According to the preliminary analysis and the challenges, the team of teachers before developing the scenario must decide on **how to implement the activities** and **the number of participants needed** to solve each task - small groups of students (up to 10), whole class (divided in groups of 4-5 students), single participants.

- **Preparatory meeting of the teachers involved in the creation and implementation of the Escape Room**

It is really easy to create an exciting and fun Escape Room that involves finding clues and solving puzzles pertaining to content, but it is a different thing entirely to use solid instructional strategies that match the activity to clear learning outcomes. While the game should be fun, the puzzles, clues, and game strategy should be based on sound pedagogical approaches such as recall of prior knowledge, evaluating information, making connections, etc.

The team must decide on the **main idea** and **topic** for the educational task. All tasks and activities must be **in accordance with the curriculum** of the included subjects. Tasks can **be diagnostic** in nature for students' knowledge **before learning a new topic** or area of study. Some of the activities can present new information, new scientific concepts or new ideas to students. Other activities may focus on **self-**

directed learning or require the **use of already acquired knowledge and skills from previous lessons**. The team should also consider **ways to assess students' progress** and develop criteria for assessing that progress. Appropriate tests should also be developed to assess objectively students' educational progress. The expected results must be clearly and concretely defined so that the students achieve the goals set by the activities in the game.

- **Next teacher meetings**

At subsequent meetings, the team must identify and coordinate the **educational content** and **determine the topics** to be included. Teachers strive to select **challenging** and **interesting tasks**.

The teachers **establish the difficulty of the tasks** taking into account the **levels of their students**. That happens after they have analyzed the students' needs and their learning styles. Teachers set **tasks of varying difficulty**, considering the age group and the individual abilities of students as well as the requirements of the curriculum. The selected tasks and activities should be fully consistent with the curriculum.

- **Design the Escape Room**

The team must **decide on the duration** of the game, the **number of participating groups**, and the **number of participants in each group**. The distribution by groups can be done **after studying the needs of the participants**.

Teachers prepare **scenarios** as well as the **relevant parts** of the game. **All parts** of the game **must be consistent and synchronized** and **have** a complete finish and **ultimate goal**.

The team **designs the physical space** and prepares scenes for the various activities. The team decides **how to achieve game balance** - a range of different types of puzzles; a range of different difficulties of puzzles; lots of different things for people to do; a variety of different types of locks. Students may inadvertently destroy a visual, a riddle or a clue. The team should **make spares** in case a replacement is necessary, or if the game should be run for multiple classes at the same time.

- **Practical considerations when testing the game**

Once the team has planned the game and prepared the puzzles that form the game, they have to bring them all together. After all the work the teachers put into creating the game, they really do not want the clues not to work, or for something not to add

up in the game. They should re-read their explanation of the game and check all riddles and hints to ensure that the game is ready to go!

The team should test the game with multiple audiences before deploying it for students. Some puzzles may take longer than the team expected, others shorter, and still others are unsolvable as written--a multi-level playtest strategy, with revisions between each new audience, is key to success.

- **Playtesting**

At this stage, it will enable the teachers to discover whether they have the **right balance of playability and learning**. The game should be also tested for **accessibility to a wide range of people** - people with disabilities, allergies, or phobias. The **safety of the game** for all participants is also very important and it should be considered during the testing.

II. **Supporting the players**

To support participants, teachers **develop Escape Room rules** and present them in the form of general rules before the start of the game. They can present them orally, digitally, or put them on the wall of the room as a poster. The teachers **introduce the format** of the Escape Room and **orient the students to the narrative/scenario** briefly. Get acquainted with the rules of conduct, **difficulties in unlocking or unusual locks**.

Everyone should be acquainted with the rules for maintaining **health and safety issues**, which includes **acceptable behaviour in the room** and what to do in **emergency cases**.

You never know how people are going to react and perform in this type of learning environment the first time. Group dysfunction is a real thing! What do you do if the game is more difficult than you expected and learners fail to complete on time?

You should develop **a system to control what is happening during the game**.

To communicate with the players, the teacher can be **present in the room** at the time of the game (straightforward communication) or be **watching from a hidden place** outside using a telephone, walkie-talkie, or texting via a tablet or smartphone. Teachers **give hints and clues** when necessary to **reduce the difficulty** – they decide on how to give the hints (on request or when they think they are needed); the number of clues; straightforward or cryptic clues.

During the game, the teacher is not instructing and therefore is free to observe student learning without embarrassment. The teacher can identify which students are participating, which students are getting stuck **on which task, and can provide more guidance to those that need** it. The teacher should be watching, interacting, and taking notes on student learning and accomplishment during the game.

It is extremely important to find **a balance between the teacher guidance and the participants' feeling of autonomy** during the Escape Room gameplay.

Teachers must **ensure the active participation of all participants**. When the whole class divided into groups of 4-5 students **plays the game in the same room at the same time, confined** learning spaces within the larger room should be created.

The **use of different digital devices** is recommended in order to **foster teamwork and collaborative learning**.

III. Managing the time limit

The distribution of playing time is of great importance for the practicality of its use. If the game itself is 60 minutes, then 15 minutes should be provided for being acquainted with the rules and the scenario before it starts, 10 minutes for discussion after the end and time for cleaning and tidying up the space. All of these needs need to be considered carefully for the game to be implemented effectively in the classroom.

IV. Achievement of learning and debriefing objectives

The expected LEARNING process, which is the purpose of an educational Escape Room. This determines the importance of:

- Testing the playability of the game
- Considering the degree to which the game is achieving its intended learning outcomes
- Thinking of an approach for self-assessment with respect to learning outcomes
- Self-checking the Escape Room before testing.

The game should be tested to see if it is appropriate and reproducible and if it meets the set goals and expected results. The self-assessment of the participants for the achieved educational goals is also a good tool for assessing the game. A self-check can be done before testing.

The power of the Escape Room experience often lies in the **debrief**. Debriefing as a **reflection on learning**. This is one of the most important aspects. Students can become so immersed in breaking out, that they may not always grasp everything they should have learned. Throughout the students' participation in the Escape Room, the debriefing stage is their only opportunity for reflection; without reflection, experience cannot lead to long-term learning. Always include some type of post-activity review and/or assessment to ensure that the main learning points were recognized and understood. In groups, students will have to assess two aspects - the value of the Escape Room itself, which will be useful for identifying any problems in the ER and fixing them, and they will have to evaluate themselves as a group. Students must be aware that what one person in a group does might affect the rest of partners.

The teachers can design de-briefing points beforehand or within the game itself by letting students identify review points, as well as having them present questions or reflections as the final task for escape.

The teachers should set aside at least 10-15 minutes to allow students to talk about the experience. It is recommended having students explain each of the puzzles, and after discussing what teachers observed. It is important to point times when teachers saw communication really fall apart, or when they thought students were on the same page. This is a great way to have students understand where their strengths and gaps lie.



DISORDER OR DISABILITIES

- I. **Introduction: which students are we talking about?**
- II. **Definition of potential challenges**
 1. Identification of ER points to adapt
 2. Adaptation of those challenges
- III. **Game-master support**
- IV. **Debriefing process**
- V. **Improvement of the creation of an inclusive Escape Room**

In this chapter, we will see how to create an Escape Room that is inclusive and adaptable to all kinds of pupils. The pupils most likely to encounter peculiar challenges due to their special needs are those with Specific Learning Disorders. First, we will make a small recap on what Specific Learning Disorders are and the challenges they might pose to students in mainstream education. Then, we will identify potential weak points in an Escape Room and the adaptations available to make them more inclusive. Following, we will talk about the role of the Game Master and the importance of debriefing, post-Escape Room, as well as the ensuing improvement process at the end of the ER creation.

I. Introduction: which students are we talking about?

Escape Rooms are good for all pupils in terms of pedagogical potential and engagement, but they might pose specific challenges for certain students. In this chapter, we will cover the case of students with Specific Learning Disorders, but all adaptations will benefit any pupil.

There are different kinds of SLDs, or “Dys”, that can bring about additional challenges to pupils during the Escape Room. Some simple adaptations can be implemented in order to avoid the majority of those additional challenges, and to allow for an inclusive and engaging learning experience for all.

- **SLD**

First, let us make a small recap of the different SLDs and their accompanying potential challenges. These include Dyslexia, Dysgraphia, Dyscalculia, Dysphasia and Dyspraxia. All of them are considered as cognitive disorders, meaning they influence the way the brain processes information.

Dyslexia is the most common Specific Learning Disorder. It translates into difficulties in reading and language-based processing skills. The brain takes longer than usual to identify and connect letters and words with other kinds of knowledge.

Dysgraphia usually affects a person’s handwriting ability and fine motor skills.

Dyscalculia translates into difficulties to understand numbers and learn math facts.

Dysphasia affects a person’s ability to speak and understand spoken words.

Dyspraxia is characterized by difficulties with fine motor skill such as hand-eye coordination for reading from one line to another or for writing for example.

However, this last disorder is generally classified as a Developmental Coordination Disorder and not as a Specific Learning Disorder. However, we will address it nevertheless, as it impacts the learning process and education as well.

- **Other difficulties**

An added difficulty can come in the form of co-occurrence of several disorders at the same time. According to the 2014 publication of the French National Institute of Health and Medical Research (Inserm), 40% of the children with one “Dys”, a Specific Learning Disorder, also have at least an additional accompanying Dys. ADHD is also one of the additional challenges that can co-occur with SLD and should be addressed as much as possible.

II. Definition of potential challenges

We will now talk about identifying specifically the areas of the ER where the pupil may face some challenges due to their SLD, or other difficulties.

Potential challenges will depend on the potential SLD that the pupils in your ER group have. If you are aware of a pupil having a SLD, it is good to orient your adaptations towards the specific challenges that this pupil has, and to ask them for feedback after the ER to see if they've encountered any difficulties. But if you are unaware of the potential pupils with SLD in your classroom, the easiest way to proceed is to make all reasonable design choices possible in order to minimize SLD-related challenges during your ER.

47

1. Identification of ER points to adapt

- **Overview of the Escape Room, which points to tackle?**

Going over your ER project, what are the areas where potential challenges for SLD can occur?

Main potential challenges of each SLD are:

Dyslexia can affect reading fluency, decoding, reading comprehension, memorization, writing, spelling, and sometimes speech.

Dysgraphia can come in the form of difficulties with: spelling, spatial planning on paper, sequencing the sentences into words, composing writing, thinking and writing

at the same time, and can also show in overlapping letters or words and inconsistent spacing when writing as well.

Dyscalculia can translate into difficulties memorizing and organizing numbers, calculus, or abstract mathematical operations, telling and estimating time.

Dysphasia can translate into a difficulty to sequence sentences into words. When heard, speech can sometimes sound as a foreign language in which they are unable to tell when one word ends and the next begins.

Dyspraxia translates into difficulties with fine motor skills, movement, and coordination, and consequently with language and speech.

SPECIFIC LEARNING DISORDERS CHALLENGES

DYSLEXIA

Challenges with reading fluency, decoding, reading comprehension, memorization, writing, spelling, and sometimes speech.

DYSGRAPHIA

Difficulties with: spelling, spatial planning on paper, sequencing the sentences into words, composing writing, thinking and writing at the same time, and can also show in overlapping letters or words and inconsistent spacing when writing as well.

DYSCALCULIA

Challenges with memorizing and organizing numbers, calculus or abstract mathematical operations, telling and estimating time.

DYSPHASIA

Difficulties to sequence sentences into words. When heard speech can sometimes sound as a foreign language in which they are unable to tell when one word ends and the next begins.

DYSPRAXIA

Difficulties with fine motor skills, movement and coordination, and consequently with language and speech.



STEAMER



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In order to see if your escape room can cause any of the previous challenges, it is always good to go over a checklist to see if you haven't overlooked anything.

- **Series of checklist questions:**

- Are all your reading materials readable and adapted?
- Are your locks solvable with minimal fine motor skills?
- Is your environment free of unnecessary distractions?
- Are your ER paths clear and logical?
- Are the structure and rules of the escape room clear from the beginning of the ER?
- Is the space allocated to the ER accessible to all pupils?
- Is the way you are going to organise the ER in the classroom going to be efficient and practical?
- Is the time constraint clear to the players?
- Have you tested your ER already?

- **Rating the challenges**

On a scale of difficulty of 1 to 10 for example, how to classify the potential difficulty of certain tasks and what to look out for?

Depending on the level of the pupils that are going to solve the Escape Room, it may be useful to give a specific rate of difficulty of all challenges. This will allow for a later comparison with how difficult the pupils perceived the challenges, and if the difficulty was well-estimated by the teacher beforehand. If a big discrepancy appeared between both numbers for one particular challenge, the perhaps its design will need some adjustments.

Additionally, a structure map of all the clues, the enigmas and the ER solving paths is useful to have for the teacher in order to know where they are in the escape room, how much time they took to solve each step, and to mark off any hurdles that a team could encounter.

2. Adaptation of those challenges

Once the potential challenges have been identified, what are the possible adaptations/alternatives that can be put into place?

- **Challenges with reading clues or enigmas if written in improper fonts or in overlapping text/words.**

Solution: For all written texts, you may follow the pedagogical guide's chapter on inclusion advice about written texts.

As a reminder: Choose an inclusive font (OpenDys, Arial, ...) in a size between 12 to 14, with a spacing of 1.5, and aligned to the left (not justified). Also, avoid using italics or underlined text. Be careful of the contrast of the text to be sufficient. A way to check if the contrast is enough can be on the following link [Coolors Contrast Checker](#).

- **Challenges with distinguishing sounds when using spoken language.**

Solution: Multiplying the mediums of communication. Do not give all clues through a phone for example, but also have small papers to write the clues down. Or, if you do use vocal records, make sure the pronunciation and sound quality is on top.

- **Challenges with solving locks due to too many fine motor skills needed**

Solution: using bigger locks, or locks that don't require fine motor skills to open. Simple key locks are okay for example.

- **Challenges with concentrating and moving around the ER due to overload of sensory information or unsuitable room set up:** cluttered space, confusing space allocations, etc.

Solution: Prepare a plan of your ER set up beforehand and test it with friends. Take note of any practical problems and of the space needed depending on the number of pupils participating.

- **Challenges in solving riddles due to confusing lettering or numbers ensembles.**

Solution: rely on logical puzzles and simple yet subtle riddles. If complicated letterings and numbers are required, try to present them in a manner that is as airy and structured as possible.

- **Challenges in estimating time**

Solution: Reminder of the importance to handle the time management during the Escape Room needs to be made before the Escape Room. A person responsible for the timer can also be named before-hand. Visual reminders of the time remaining (with color-codes for urgency for example) can be used for more efficiency.

- **Poor communication**

Solution: Reminder of the importance to communicate well with the team before the beginning of the Escape Room. A pupil can be designated as responsible to check that everyone is communicating well during the Escape Room before-hand as well.

Also, additional clues and game master help need to be given in a clear manner as well.

- **Shutdown due to overstimulation**

Solution: As with the rest of the Escape Room, a test first is a good way of noticing if a background noise for example is setting the ambiance as intended or if it is too distracting. As with any things, while multisensory clues are a good thing, too many sensations will defeat the purpose. The idea is to

vary the clues' sources and mediums, not to give everything at once and to overload the pupils' senses.

Additional tip: Teamwork is a key component of an Escape Room. It is a very good thing to foster collaboration and to make balanced teams. This way, if one pupil has a weak point, it can be compensated by someone else. Asking the teams to communicate all clues out loud is a good way to help with reading challenges as well for example. Teams need to be diversified and with pupils that complete each other's set of skills.

- **Possible general practical adaptations:**

- **Locks**

Use minimal fine motor skills to solve locks. This doesn't mean that easier locks should be found, but that the mechanism used to open them should not require fine motor skills. Making the lock bigger is a way to minimize that for example.

- **Clues**

Using the prescribed written materials advice to write the clues is one way to ensure that everyone is able to decipher it properly. This doesn't mean, again, that the clue should be easier, just legible.

- **Puzzles**

Again, avoiding the need for fine motor skills by making the puzzle pieces bigger or legible (if it's a cipher puzzle for example) are the most important aspects.

- **Riddles**

As specified above, written materials inclusion advice should be followed, but another way to circumvent the problem could be to multiply the ways in which riddles or clues are given: oral riddles, images instead of words, etc.

- **Atmosphere**

The atmosphere is also key, but as in any good game, it should not be overpowering. There is nothing more frustrating inside a video game for example, than to have repetitive music or sounds that are way too loud throughout the whole game. Atmospheric elements are there to add to the experience, not overpower it. Sensory overload is also something that should be avoided. Discrete ambient music or sounds can be a nice addition, but should stay something that is pleasant.

- **Props**

As with the atmosphere, the props can add some immersive aspects to the ER but it is important not to overload the ER with useless props. Props will allow you to create the atmosphere, but also to hide the clues more efficiently in the

ER. However, your ER should not resemble a cluttered second-hand store either. Again, the overflow of information is never good and could even lead, in the case of props at least, to injuries.

- **Possible technological adaptations/aids**

- **Reading device**

Another way to circumvent the challenges of the written materials is to equip pupils with marked reading-related learning disorders with a reading device, for example. Perhaps even to remind the whole team that reading clues aloud is also a good way to advance the Escape Room and to allow all team members to participate as well. Communication is after all, key in the solving of ER.

- **Auditory help**

Another form of help that could come in handy for some pupils is an audio help. That is to say, a device that would read the instructions aloud when given a specific QR code, in the manner of audio guides in museums.

- **Visual aids**

In the case of specific writing in special fonts that are not dys-friendly (for example, a handwritten letter with Edwardian script), it could be interesting to make a QR code available to a pupil that has a reading disorder, so that they could scan it to access a digital dys-friendly version on their phone.

- **Apps**

Some apps will allow dys pupils to decipher written texts more easily if necessary, for example. Some apps can download texts and adapt them to a pre-set format that is chosen as ideal by the pupil.

III. Game-master support

- **In-game support and guidance**

During the ER, it is possible that a pupil encounters a challenge that was either unexpected, or whose difficulty was underestimated during the design of the ER. The role of the Game-master is to subtly support the players in the ER in order to stir them out of their dead-end, without taking from the gaming experience. This part will be about achieving this result. The Game master needs to be unobtrusive to the ER experience but is essential to the good unfolding of the Escape Room.

- **In-game observations**

The game-masters are also able to observe and identify possible previously undetected weak points or challenges in the ER. It is important to take note of those for further improvement of the ER.

IV. Debriefing process

The importance of debriefing to improve your ER afterwards is even more essential in the case of SLD. Here there will be steps to take to collect feedback on the efficiency of the Escape Room and how your potential adaptations impacted the game play.

- **Identification of unexpected challenges**

After the ER, were there any unexpected challenges for the pupils, especially the pupils with SLD? If yes, what were those challenges and how did they pose a problem?

The idea here is to identify if the additional challenges were due to something related to their Learning Disorders, or if it was related to the design of the ER itself. Designing the difficulty and the different paths to solving the room may prove very tricky. The ER needs to be challenging enough to create interest and gratification

when they finally solve it: not too challenging that they get stuck and frustrated, and not too easy that they get bored. This balance is quite difficult to attain and may necessitate several ER versions and trials to get it just right.

- **Positive feedback on adaptations**

Other important questions to answer post-ER are:

- Did the pupils (especially with SLD) notice any adaptations and how would they rate their usefulness?
- How did the activities go for the whole group?
- How did the adaptations impact the overall gameplay?

Indeed, adaptations may have been noticed by the pupils they were meant for and they may have found them useful. It is not only the challenges and points for improvement that are important to identify, but also the elements of adaptations that were worked, and were positive for the group. To do that, post ER surveys may help in providing feedback to identify points of improvement or difficulties.

V. **Improvement of the creation of an inclusive Escape Room**

- **Post ER surveys**

How to design a small post-ER survey to continuously improve the process? The different ways to go about it.

A post-ER survey to give to the pupils who experienced the Escape Room is an interesting step to include into your ER-making journey. It will help you identify weak points in your narrative or in your design.

- Did the path(s) designed to solve the ER work?
- Were the different clues leading to the right answers without problems?
- What were the most difficult moments of the ER?
- Were there enigmas or riddles that were too easy?
- Was the challenge motivating/enough/too much?

- Did they find the final answer? If not, why?
- Do they have comments on how to improve the ER?
- What elements did they prefer?
- Was the experience fun?

- **The adaptive diary**

The adaptive diary is a document to fill in progressively and to keep by the teacher or educator creating the ER. Keeping track of the evolution of the design of the escape room, especially in terms of inclusion, can help other people in the future to design their own ER.

Holding up a diary with all the adaptations, for which pupils, or group of pupils, the general feedback received, etc. basically a diary of what works and what doesn't is very useful for other educators, teachers, etc. who want to make inclusive pedagogical ER.

In this diary, you can also include the feedback from the pupils, both with and without Dys, and take note of their observations and experience with the ER.



POSITIVE ROLE MODELS FOR GIRLS

- I. **The possible ways to deal with the problems, and how to implement the ideas proposed through an educational Escape Room.**
- II. **Seven inspirational stories about the women in STEM**

In this chapter we will consider how to make a STEAM escape room not only educative and inclusive but balanced regarding gender equality. Despite the recent improvements in society and STEM in terms of gender equality, something is just not working well in the classroom. The many reasons, why these gender gaps are left open, start to appear or become apparent at earlier stages of school, which should be a signal to educators to consider the issue of gender gap in curriculum more closely when creating an educational tool or method.

We will discuss the possible ways to deal with the problems and how to implement the ideas proposed through educational Escape Rooms. In a more practical part of the chapter, we will introduce seven inspirational stories about the women in STEM who influenced the world and whose stories might inspire a creation of an inclusive and gender-balanced learning tool for a better and more effective education.

I. **The possible ways to deal with the problems, and how to implement the ideas proposed through an educational Escape Room**

1. Here we will start with an idea that might appear strange and least expected, especially in the modern educational field. However, this idea was born while observing a STEM Escape Room in a small town in Latvia not long before the creation of this guide.

An interdisciplinary Escape Room was built to teach and test students' knowledge about water, water characteristics and water pollution. All the students were excited and loved the experience. While monitoring a group of students consisting of only girls, the teacher was surprised at how fast and how effectively the group worked, which was not the case in their classroom. Not only the girls were more collaborative and communicative in doing the STEM tasks, but they were also enthusiastic, creative, and proved to be able to perform outstanding problem-solving skills. Repeating the experiment with other girl-only groups and after discussing and investigating the experiment, the group of teachers concluded that girls feel more confident with STEM subjects while being separated from boys.

A study in the UK by Effective Pedagogies for Girls Learning (2018) also emphasized the idea of same-sex classes. While unpopular and frequently considered old-school, this approach may actually make a significant impact on how well girls perform in STEM. Built by Me (2019)

2. Being exposed to positive women role models in STEM on a regular basis can influence girls' attitude towards science positively/favourably. We will consider and elaborate on this approach further by citing inspirational stories about famous women in STEM which can be used in STEAM Escape Rooms. Here, we would like to stress that we should expose girls to the positive examples of women in science more often. The role models should not be high-flyers in STEM, they can be next-door neighbours, friends or even teachers; real people and real things are still the

best examples and role models. Therefore, our inspirational stories are for you to use.

3. Allow girls to lead in STEM tasks. Very often teachers assign roles in group work, so why not to use this opportunity in designating leading parts to girls? Let them feel more responsible for the team, the scientific performance, and at the same time to get used to these roles. This will also help girls increase their competitiveness and proactivity in the task.

Furthermore, by giving positive feedback on the outcome, teachers might push girls to feel valued and more successful in STEM subjects. Moreover, this approach can boost girls' self-confidence in science, which is often considered a barrier to STEM careers. This may apply to a STEM Escape Room, where there is a possibility to assign a leader for a group of students, though it may greatly depend on the design of the Escape Room.

4. The following way to increase girls' interest in STEM we what we called, **How It Is Made**. The internet is extremely rich in this field and will offer you myriads of ideas, videos, books, etc. This approach discovers how **STEM is being applied in real life**. The opportunity to recognize STEM subjects in everyday objects may better connect learning to real life problems and solutions, which makes learning more meaningful and thus, motivating. Findings revealed that girls who believe that **experience** and **learning** expanded **intelligence** were more likely to do better on math tests. They also expressed more interest in pursuing science subjects in the future. The opposite belief achieved the opposite effect. PISA (2014)

5. Experimental games narrate girls' interest in STEM. Minecraft lessons in Citadaskola in Liepaja, Latvia proved that girls, when given the opportunity, without any hesitation take up the roles of engineers, constructors, architects when playing. Legos seem to also have boosted their STEM skills and thus, confidence in the STEM curriculum. A hammer, scotch tape, a piece of wood and paper, plus the element of creativity help girls build towers as tall as the ones built by boys. Let them build and

experiment. Being an experimental game itself, a STEM Escape Room fits this approach best.

6. Collaboration and cooperation are highly valued and well performed by girls by their nature. Escape Rooms are a cooperative and teambuilding activity in which girls are voluntarily involved in a more proactive way. STEM and STEAM Escape Rooms are a very successful finding in a contemporary and demanding classroom, fitting and benefitting both genders in a relevant way for each.

Collaboration with parents in a STEM Escape Room is an idea brought by the already mentioned rural school in Latvia. This kind of collaboration brought girls confidence, leadership, STEM inspiration and desire for more science. The collaboration of educators with parents beyond school, collaboration with colleagues, and collaboration with the community in narrowing the gender gap in science will definitely lead towards dropping gender stereotypes.

Parents' and teachers' support of and interest in their students, and school policies and practices, can help shape students' perceptions of their own strengths. Closing gender gaps in the labour market requires that all parents, educators and employers become more aware of their own assumptions and conscious or unconscious biases. By doing so, they will be able to provide girls and boys with the appropriate support, and ensure that success at school and beyond is gender blind. (Boston, J., & Cimpian, A. 2018)

7. Making STEM classrooms more interactive and modern has always been a key to successful teaching and motivation, especially for girls. An Educational Escape Room is a very interactive tool if not the most interactive one. Bringing an Escape Room to a STEM classroom is possible. Bringing a STEM classroom to a STEM Escape Room is possible too. Including positive role models for girls in an Escape Room is doable as well. Therefore, it means that bringing more positive role models for the girls in the STEM classrooms through STEM Escape Rooms will be a beneficial multitude.

Additionally, integrating inspiring films, books, TED Talks about women in STEM within the narrative of the Escape Room will help bring more positive role models for girls in the STEM classes.

II. Seven inspirational stories about the women in STEM

Here we will present more practical suggestions on using role models in STEM for girls. Sharing the extraordinary stories worth being used for fiction literature and films, (and some have been used already!), the stories we have been fascinated by ourselves, and the stories, which contain not only outstanding achievements in STEM but mystery, enigmas and even detective investigations. The main characters of all these stories are women who influenced the world of STEM in different ways. We will share the stories in a riddle way-giving the key words to guess the character, and then providing readers with a short introduction and some useful websites allowing readers to conduct a deeper research. Moreover, all these stories can be used for creating STEM and STEAM Escape Rooms using these stories either as scenarios, narratives, or separate puzzles, etc. but one idea will be provided as an example.

1. Key words: **an actress, Marine Navy, Bluetooth, WiFi, beauty icon, secure radio communication, munition, torpedo.** Although these words seem to present a riddle themselves, they depict the lifelong enigmas that is **Hedy Lamarr**. Said to be one of the most beautiful women and actresses, Hedy Lamarr was an inventor by nature, inspired and obsessed to contribute to the sooner end of WW2. She was passionate about inventing and patiently waited for the world to recognize her innovations. "Improving things comes naturally to me." Hedy Lamarr. Hedy Lamarr helped invent WiFi and secret radio communication. However, her Patent on technology was confiscated.

IN-DEPTH ADVICE

<https://www.hedylamarr.com/>

<https://www.womenshistory.org/education->

<resources/biographies/hedy-lamarr>

<https://www.youtube.com/watch?v=0TqBoua3Rng>

Our suggestion for an Escape Room idea would be a STEM Escape Suitcase brought to the classroom, once owned by Hady Lamarr, full of secrets and secret ciphers, and containing ... a beauty kit.

2. Key words: **primatology, ethnology, anthropology, chimpanzees, East Africa, UN Messenger of Peace, low-top canvas sneakers, barefoot, zoologist, genetic kinship, 60-year immersion, chimps mother, mentor.** This laboratory definitely has different sounds, which became an integral part of **Jane Goodall's** life. Equipped with little more than a notebook, binoculars, and her fascination for wildlife, Jane Goodall braved a realm of unknowns to give the world a remarkable window into humankind's closest living relatives. Through nearly 60 years of ground-breaking work, Dr Jane Goodall has not only shown us the urgent need to protect chimpanzees from extinction; she has also redefined species conservation to include the needs of local people and the environment. Today she travels the world, speaking about the threats facing chimpanzees and environmental crises, urging each of us to take action on behalf of all living things and the planet we share. (The Jane Goodall Institute)

Escape Room suggestion: Newspaper article title: A Young Woman, 26, Disappears for 60 years in African Forest. Investigation should be updated, volunteers wanted!

TO GO FURTHER

<https://www.janegoodall.org/our-story/about-jane/>

<https://www.youtube.com/watch?v=-kq7vMrc9DU>

<https://www.youtube.com/watch?v=k5Q6-hh49mU>

as well as numerous books, and the documentary film *Jane*.

3. Key words: **Nobel prize unearned, stolen Photograph 51, the Dark Lady of DNA, double helix, crystallography, X-Ray laboratory, robot to Mars, the double helix.** A sad, yet full of glorious scientific discoveries, story about the unsung mother of the double helix, **Rosalind Franklin** has been attracting people's attention for decades now. The Dark Lady of DNA spent most of her short life in dark labs, surrounded by men who did not accept her as a scientist, but instead used her scientific research for their own work, making their way to the Nobel Prize. In May 1952, Franklin took a picture that would become famous – Photograph 51 – capturing the X-ray diffraction pattern of DNA. This image, along with other data from Franklin's research, made their way to Watson and Crick, who were also studying DNA at the same time. This data gave them the insight they needed to determine the true double helix structure of DNA. Rosalind Franklin was fully devoted to science, working not only with DNA, but also studying viruses, as a result of which, she brought valuable "lasting benefits to mankind".

TO GO FURTHER

<https://www.youtube.com/watch?v=jiME-W58KpU>

[https://www.newscientist.com/people/rosalind-](https://www.newscientist.com/people/rosalind-franklin/#ixzz6d9c4TKuH)

[franklin/#ixzz6d9c4TKuH](https://www.newscientist.com/people/rosalind-franklin/#ixzz6d9c4TKuH)

https://www.youtube.com/watch?v=1vm3od_UmFg

Our idea to honour Rosalind Franklin through an Escape Room is to create an abandoned house and a dark secret room of the female scientist, where the famous photograph's frame is on the wall. The photograph is hidden in a safe. There are a lot of papers containing studies on DNA, formulas, pictures and descriptions all in a jumble, which once put back in order will provide a code...

4. Key words: **theorem, worthy a Nobel Prize, Physics, Mathematics, symmetry, conservation, supersymmetry, Albert Einstein.** Creative Mathematics Genius, as she is often addressed now, **Emmy Noether** is one of the most inspirational female role models in the history of science. The

Noether's Theorem, also labelled as the most beautiful idea in physics – is symmetries applied to conservation laws, or a relationship between symmetries in physics and conservation principles. Although it sounds too complicated for a non-mathematician and/or a non-physicist, Noether's Theorem is explicable and understandable enough for school students

TO GO FURTHER

<https://www.nature.com/articles/d41586-018-06658-w>

<https://www.youtube.com/watch?v=MxmDphojQUU>

<https://www.sdsc.edu/Science/Women/noether.html>

who study physics. This basic result in the theory of relativity was praised by Einstein in a letter to Hilbert when he referred to Noether's penetrating mathematical thinking. But it is not only for the theorem that Emmy Noether is famous. She constantly struggled her entire life for a place in Mathematics, where there was hardly any space for a woman at that time.

Some biographies inaccurately portray Noether as a somewhat helpless genius at the mercy of men's charitable actions. In reality, she had an assertive personality, and was eventually recognized as a leader, and as the first female plenary speaker at the renowned International Congress of Mathematicians (Celebrate the mathematics of Emmy Noether)

The Escape Room idea to honour Emmy Noether: to create a STEAM Escape Room including elements of symmetry, Illusion, mirrors, and/or flipped things around an upside-down room.

5. Key words: **computer, programmer, network, engineer, security, Ethernet, wireless network bridges, the mother of Internet, scientist.**

American computer programmer and network engineer, mostly known for her work in network security, **Radia Perlman** is often referred to as the Mother of the Internet. Both her parents were engineers who worked for the US government. Her father worked on radars, and her mother was a mathematician and computer programmer. Perlman was an outstanding student in school and was keenly interested in science and mathematics.

Radia was raised in a progressive household, which helped her develop a moral and social conscience. She once said “The kind of diversity that I think really matters isn’t skin shade and body shape, but different ways of thinking.” Radia Perlman invented wireless network bridges, which transformed ethernet from a limited single-unit technology into a robust multi-unit one, which is currently used by the majority of internet service

providers and making today’s Internet possible. Her work in network security was pioneering for her time. She is the author of a textbook on networking and network security, and holds more than 100 issued patents. A wildly creative thinker, Radia Perlman even developed a child-friendly programming language used by children as young as 3. Though she grew up in a family that was involved in science and technology, Perlman also developed a keen interest in literature and music. She wrote poetry and enjoyed playing the piano.

TO GO FURTHER
<https://www.internationalwomensday.com/Activity/7213/13-Women-in-STEM-Who-Changed-the-World>
<https://xconomy.com/national/2019/07/08/future-of-the-internet-what-scares-networking-pioneer-radia-perlman/>

Escape Room idea: Lost Wi-Fi. One of the puzzles in any STEM Escape Room could be to fix the Internet connection without WIFI with the instructions given as a hint and the hint can be given by...Radia Perlman!

6. Key words: **analytics, metaphysics, calculation, mathematics, calculating machine, noble, commuter programmer.** Enchantress of Numbers, **Ada Lovelace** was a very intelligent and well-educated lady from high society. Being a daughter of the famous poet Lord Byron, whom she never knew, and having been raised by a very progressive mother for those times, Ada for her short yet bright life was regrettably weak in health but made outstanding progress in science, mathematics in particular. This was a brave act for a

beautiful, yet fragile young girl. Even after a marriage and birth of three children she continued her investment into mathematics. Her lifelong friend and the so-called father of the computer, Babbage, was her mentor and scientific project manager in modern interpretation. They co-wrote the creation of an analytical machine that, when given programmes, could do anything from calculating to composing music, which sounds like creating a modern computer.

TO GO FURTHER

<https://www.youtube.com/watch?v=IZptxisyVqQ>

<https://www.sdsc.edu/ScienceWomen/lovelace.html>

<https://www.youtube.com/watch?v=uBbVbqRvqTM>

Escape Room ideas to memorize Ada Lovelace could also be an Escape Suitcase of a lady with some ... coding puzzles. Or, it can be a digital Escape Room on programming and coding, full of secrets of the beautiful young woman.

7. Key words: **engineering, princess, dolls, pink aisle, an engineering toy for girls, entrepreneur, construction toys, spatial skills.** This STEM girl is definitely a role model for many girls and parents of girls. As a child, **Debbie Sterling** dreamt about princess dresses, as a lot of little girls do. She was smart and good at mathematics, but eventually lost interest in STEM as she never knew one woman in STEM around her. However, her high school teacher advised her to take up engineering, which surprised her but somehow set the idea in her mind. So, she followed the advice. Debbie Sterling is the Founder and CEO of GoldieBlox, the award-winning children's multimedia company disrupting the pink aisle in toy stores globally and challenging gender stereotypes with the world's first girl engineer character. Debbie is an engineer, entrepreneur, and one of the leaders in the movement towards empowering girls to build their confidence, dreams and ultimately, their futures. She was named TIME's "Person of the Moment," (2015) honoured by the National Retail Foundation as one of 25 "People Shaping Retail's Future," and was recently added to Fortune Magazine's prestigious "40 Under 40" list.

In 2015, Debbie was inducted as a Presidential Ambassador for Global Entrepreneurship and honoured by the National Women’s History Museum with a “Living Legacy” Award for her work to empower girls around the world.

Debbie received her degree in Engineering at Stanford University in

To GO FURTHER

<https://medium.com/@makaylamlatkins/debbie-sterling-an-engineer-that-inspires-me-c7a426a0bbb1>

https://www.youtube.com/watch?reload=9&v=FEeTLopLkEo&ab_channel=TEDxTalks

https://www.youtube.com/watch?v=JAA92pFmhak&ab_channel=StanfordeCorner

2005. (<https://www.engineergirl.org/13512/Debbie-Sterling>)

Escape Room ideas inspired by Debbie Sterling: GoldieBlox, Debbie’s prototype toy can be a ...game master; a fairy tale made from construction toys with puzzles to solve.

To conclude we would like to quote the L’Oréal-UNESCO For Women in Science statement that “ One day, we will live in a world where girls are encouraged to study science, where women have adequate support to balance the responsibilities of research and motherhood, and where scientists are judged purely on the merit of their discoveries and the potential of their work to change the world” and we proudly feel that the European project STEAMER is a small but mighty contribution to the changes that needed so much in the world and education.



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