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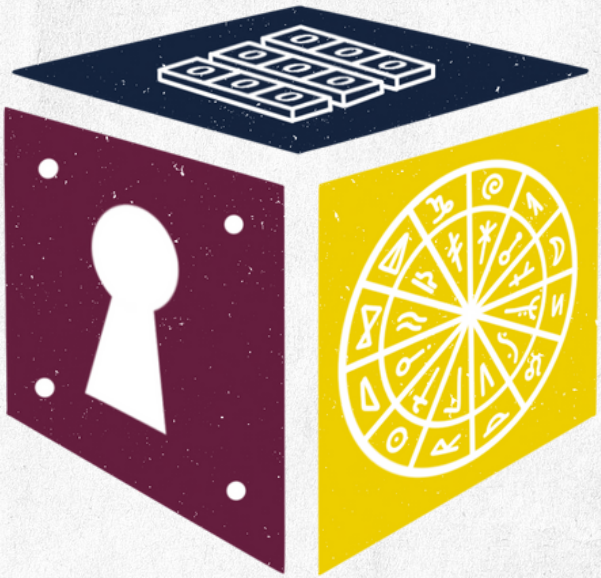

Breakout BOX

The Manual

Be International
Za hranice vzdělávání

SHOKKIN!

ticket2europe

2022

This manual was created as an Intellectual Output (IO1) of the Strategic Partnership project “Breakout Box”. The project was implemented by Shokkin Group (Estonia) in collaboration with Be International (Czech Republic) and Ticket2Europe (Spain), with the support of the Estonian National Agency.

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PLAYVERSITY

Playversity is an online hub for educational games and playful educators. We strive to change the way learning is perceived by spreading the use of quality game-based learning solutions in the youth work and education fields.

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Foreword

> ***When we look at the real-life emotions created with just a small amount of elements, and when we look at the passion playing a role, unravelling a story, testing the boundaries, we can feel the power of games.***

Play and games give us a unique opportunity to travel in time, space, even into new worlds without laws of gravity, providing new meanings to ordinary objects and potential for amazing discoveries. Whenever you see adults playing like children and children playing like adults, you understand that games have the power to make a change within us.

Why not make the most out of games for the good?
Let's use the power of games to question how society works and whether we are doing our best. Let's use the power of games to empower and engage learners in taking action in their local communities, in their own lives.

Let's make a change, one game at a time.

Table of contents

Introduction

About the project

"Breakout Box" is a Strategic Partnership project for Innovation in the youth field funded by the Erasmus+ programme of the European Commission and implemented by Shokkin Group (Estonia) in collaboration with Be International (Czech Republic) and Ticket2Europe (Spain), with the support of the Estonian National Agency.

> **The project aims to explore the use of educational escape boxes in youth work and design innovative educational methods that develop competencies of young people connected to socially relevant topics.**

The project consisted of three **Transnational Partner Meetings,** a **Training Course** held in the Czech Republic in order to train youth workers and educators on how to use the innovative methods and escape games in their field of work and a **Multiplier Event** held in Estonia as an interactive event providing space for discovery and exchange of good practices in the field.

Additionally, the project produced two **Intellectual Outputs:** this **"Breakout Box Manual" (IO1)** with theoretical and practical information for educators, youth workers who would like to use educational escape games in their work, and six educational **"Breakout Boxes" (IO2)** that will address socially relevant topics for young people to develop their competencies.

Breakout
BOX

Timeline of activities

Kickoff meeting
June 2021
(Estonia)

Research and exploration phase

Publication of IO1: Breakout Box Manual
January 2022

Game development and prototype phase

Mid-term meeting
March 2022
(Czech Republic)

Publication of IO2: Breakout Boxes
June 2022

Training activity
July 2022
(Czech Republic)

Evaluation meeting
September 2022
(Spain)

Multiplier event
October 2022
(Estonia)

Funding bodies

Erasmus+ is the EU's programme to support education, training, youth and sport in Europe. With a budget of €26.2 billion for the period 2021-2027, the programme places a strong focus on social inclusion, the green and digital transitions, and promoting young people's participation in democratic life.

Erasmus+ has opportunities for people of all ages, helping them develop and share knowledge and experience at institutions and organisations in different countries. The programme also offers opportunities for a wide range of organisations, including universities, education and training providers, think-tanks, research organisations, and private businesses.

Detailed information on these opportunities, including eligibility criteria, is available in the Erasmus+ Programme Guide.

More information: **ec.europa.eu/programmes/erasmus-plus/about_en**

To bring Erasmus+ as close as possible to the participants and make sure it works well across different countries, the EU works with National Agencies to manage the programme.

The National Agencies are based in Programme Countries and their role involves providing information on Erasmus+, selecting projects to be funded, monitoring and evaluating Erasmus+, supporting applicants and participants, working with other National Agencies and the EU, promoting Erasmus+ and sharing success stories and best practices.

About the manual

"Breakout Box: The Manual" is one of the main intellectual outputs developed during the long-term project of the same name as an educational escape game development resource. It holds theoretical and practical information for educators, youth workers, youth organizations and other stakeholders of the education and youth work fields who would like to develop educational escape games in their work.

Inside this manual you will:

- **Discover** the concept of educational escape games and its applicability to the education and youth work fields;
- **Understand** the development logic of escape game taking as a base existing examples developed by youth workers from across Europe;
- **Explore** game design methods, tools and frameworks that you can use to develop your own educational escape games on different topics;
- **Evaluate and assess** your results with templates and assessment exercises to carry out with your target groups;
- **Get inspired** with follow-up resources and good reads on the field.

How to use it?

The manual is divided into seven chapters gradually unfolding the topic of educational escape rooms, from a general introduction of game-based learning and typology of educational games to a step-by-step development guide with downloadable design resources:

"To say that nothing is true is to realize that the foundations of society are fragile and that we must be the shepherds of our own civilization."

— Ezio, Assassin's Creed: Revelations

1 Educational Games

1.1 What Are We Talking About? A Short Introduction Into the World of Educational Games

One could say that no matter what a game is like or about, it has the potential to teach players something new. Simply throwing a ball from a student on one side of the room to the other can easily teach how to measure the strength of the throw, how to aim better, how to maintain contact with a playing partner or how to focus and stay alert when waiting for the ball to be thrown at you.

Games engage us in and provide space for social interactions, letting us learn not only about our own strengths and weaknesses, but about other players' as well. Even though throwing a ball from one person to another does not qualify as a game (rather as a *play*), it can also be used for learning. **Playing is one of the most natural ways to learn, with many sides to it.**

We can play with space, objects, with one another, or even mix all these elements and play with all of them at once. But, if something such as *a play* (once defined as "aimless expenditure of exuberant energy") can teach us about ourselves and the world around us, imagine what a game as a more complex and intended system can do.

In their book "The Study of Games", Elliot Avedon and Brian Sutton-Smith define a game as "an **exercise of voluntary control systems**, in which there is a **contest between powers**, **confined by rules** in order to **produce a disequilibrial outcome**".

There are so many definitions of games, types of games, and technical forms out there that it is hard to wrap your mind around what is and what is *not* a game. But as soon as you strip away the genre differences and the technological complexities, all games—no matter if played online, in a classroom, by yourself, or in a group—share **four defining traits** as described in the book "Reality Is Broken" by Jane McGonigal: **goal, rules, feedback system, and voluntary participation.**

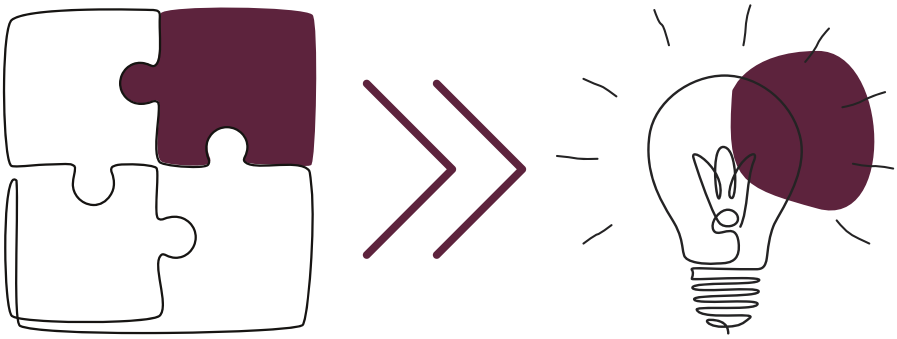
The **goal** is the specific outcome that players will try to achieve.
It makes them more focused, attentive and keeps them oriented throughout their participation in the game. The goal provides players with a sense of purpose.

The **rules** place limitations on how players can achieve the goal.
By removing or limiting the obvious ways of achieving the goal, rules push players to explore previously uncharted possibilities. They unleash creativity and foster strategic thinking skills.

The **feedback system** tells players how close they are to achieving the goal. It can come in form of points, levels, scores, progress bars, or, in its most basic form, it can be as simple as the players' knowledge of an objective outcome: "The game is over when..." Real-time feedback serves as a promise to the players that the goal is definitely achievable, providing motivation to keep playing.

At last, **voluntary participation** requires that everyone playing the game accepts the goal, the rules, and the feedback knowingly and willingly. By doing so, common ground for multiple people to play together can be established; the freedom to enter or leave a game at will ensures intentionally stressful and challenging work is experienced as a safe and pleasurable activity.

Games model real-world systems that can help make learning concepts more relatable. To make a game educational, you can add a fifth defining trait: the desired **learning outcome**, the essential reason for creating the game. When designing an educational game, you look into the target group and the topic to identify relevant learning needs that will guide the game design process.



1.2 Game-Based Learning

You can often encounter scepticism towards games. Some say "games" and "plays" are the opposite of "learning" and "seriousness". Today, many adults associate games with modern-day shooters from the first-person perspective. However, extensive research argues that play is integral to a child's development. It is a natural way to explore our environment, social constructs and the world around us. Vygotsky wrote: "Games are the natural form of work in children, a form of activity which is inherent to a child, as preparation for life in the future."

Game-based learning (GBL) can be defined simply as "learning through games".
For us, GBL is an approach to learning design. The educator consciously incorporates games in the curricula of their creation and intends to engage students in the learning process, spark curiosity, start a group discussion, revise content in a more interactive format, or provide an embodied experience that prolongs the learning effect. In short, GBL is the "intentional use of games and game elements in the educational process". We can appropriate and use games that have not been created for specific learning purposes or incorporate games designed with relevant learning outcomes in mind.

As mentioned in *Gamify Your Classroom*, matching game mechanics with learning objectives, mixing in books and teacher-led reflection, is a key to effective GBL. Ultimately, we would like to create meaningful experiences for learners to live through, leaving a long-lasting mark in their perception of any subject, topic or case.

1.2.1 Why to Use Game-Based Learning?

Humankind has been using games and stories to teach for thousands of years. And using games in the learning process seems like a very logical thing to do.

In "Gamify Your Classroom", Matthew Farber argues that games provide both a social construct and structure to give meaning to activities. He mentions developmental psychologist Jean Piaget who based his learn-by-doing theories on observations of children playing the game of marbles.

Several other educational theorists observed different forms of play and engagement with games and detected their effects on the learning and development of players. To play games, we voluntarily take up a challenge to learn and understand the rules first—and, often, it is as complex as understanding a new mathematical concept. But once we know the game, we willingly suffer to get better at it.

When we speak about GBL, it is not just about getting games to schools—it is about integrating a type of learning and teaching a game can bring. Games enhance problem-solving skills and motivate us to stay persistent, try again and get better each time. Games raise our acceptance of failure and mistakes, helping us see them as essential steps on the way to learning and development. One can find many reasons to use GBL in the educational field:

- To reshape academic content into an appealing form;
- To enhance critical and strategic thinking;
- To engage students not otherwise engaged with the topic;
- To support both struggling and talented students, allowing space for exchange.

The main reason for exploring GBL as an educator is to create an environment that fosters real intrinsic motivation in learners, allowing them to discover, experiment and develop.

1.2.2 Example of Game-Based Learning

To make things a bit less abstract and theoretical, we would like to give you a real example of GBL with a short analysis: **Five Tricks.**

Spoiler Alert:

Five Tricks is a great game to use with groups of learners, but if you would like to play this game as a player, then you might consider skipping to the next chapter, since we will reveal and analyze the game's logic.

"Five Tricks" is a card game played with traditional playing cards. In the version we use at our training, groups of four players are seated at several tables in a tournament-style setting. There is the lowest table and the highest table. By playing several rounds of a card game, a winner and a loser are decided at each table. The winner moves one table up, the loser one table down, and the process repeats several times (usually until the timer runs out or a certain amount of exchanges between tables have occurred). So far, it seems like a regular game, right?

The game has a **goal**: to be sitting at the highest table by the time the game is over. It has **rules**: the card game itself has rules and the players are allowed to switch tables only when they win or lose. It contains a **feedback system**: the players are aware of the time remaining. In the card game, the players also track how many hands they won, whether they are better than others and have higher chances of moving upward. By keeping a track of how many times they switched tables, they can figure out how good they are compared to everyone else. And, naturally, the players accept these rules, goals and **choose to participate.**

The game could be aimed at training your skill of choosing the right cards, anticipating how your opponents will play and strategise. What happens, however, if we add a few more elements to the game? In Five Tricks, players are not allowed to use any verbal communication, and, most importantly, **every table plays by different rules.** The fundamental rules of the card game are the same, but each table has a slight adaptation of them: at table 1, the ace is the lowest card, the game is played clockwise, and spades are trumps, meaning any spade beats a high card. At table 2, the ace is also the lowest card, but the game is played counterclockwise, there are no trumps, and the highest card always wins. At table 3, the ace is the highest card, diamonds are trumps, played clockwise, and so on....

Each table plays by different rules, which would not seem like a problem until the first players change their tables. Without any prior knowledge, they are thrown into a completely different world—the inability to communicate verbally often causes frustration and questions start to pop up in the players' minds: "Did others not understand the rules? Are they stupid? Am I stupid? Should I teach them how to play it? How do I do this without speaking? What is going on?"

At this point we are moving a bit more towards structured and planned GBL. The game is still a game. It still has the goal, rules, feedback system, voluntary participation—without accepting the game, even though it might be getting very frustrating, the spell could easily be broken. So, what does all this mean? How is this educational? How does it promote learning?

Five Tricks was designed to open up the topic of **intercultural communication**, and it is safe to say that it simulates many of its aspects very well. The game sparks interest, most often through the curiosity of what is happening, or frustration, which many players experience. But that is not enough for a real learning experience. When the game is over, we let the curiosity and the frustration flow and ask the players: *"How do you feel now? What do you think happened?"*. We move on towards extracting the wisdom: *"What strategies did you choose? What did you think about the others when you switched tables? How can you relate this to real-life situations?"*

By sparking interest through a game, we can explore specific topics afterwards and dig deeper. We can gather the wisdom from specific players' experiences of moving to different places (or even switching workplaces, for that matter), rules that were new for them in real life, and perhaps move on towards an input about how culture works; how norms, identities or values are constructed. **This is when the learning is truly happening and this is what GBL looks like.**

However, it is not the only example of GBL: studying a language with *Duolingo*, a heavily gamified tool for language learning, definitely comes under GBL. Using a *Kahoot* quiz during a lesson to revise previously acquired knowledge can be considered GBL. Playing *This War of Mine*, a video game in which players take care of a group of civilians surviving in a war-torn city and then continue exploring topics that might be associated with the game, is also GBL. We explore the many shapes and forms GBL can take below.

If you would like to facilitate the game, check out the following instructional video

1.3 Typology of Educational Games

As mentioned in *Game On (2018)*, a manual on educational board games, there is no formal satisfactory classification of games or educational games, or we have never encountered one. With so many possible forms and combinations, it is incredibly difficult to create a comprehensive, yet not overwhelming taxonomy of games. Thus, we have divided games by looking at their most common type and technical execution. We looked at which types of games are often transformed into educational games and came up with the following matrix:

Most common game execution:

- **Tabletop games:** games usually played on a table or any other flat surface: board games, card games, dice games.
- **Large-scale games:** games normally played with a group of people, involves physical movement, discovery, interaction with one another, possibly in various spaces.
- **Video games:** games played by electronically manipulating images produced by a computer program on a display.
- **Conversation games:** games that normally do not require movement and are based on verbal interaction among players in one room.
- **Escape games:** games involving a group of players cooperating in discovering clues, solving puzzles and accomplishing tasks to progress and accomplish a specific goal.

Most common game types:

- **Simulation:** games that normally simulate a real event or a realistic situation where players act as themselves, interacting with other players, non-player characters or the game world.

- **Roleplay:** games that normally create a story where players are required to take up a new identity and interact with each other or the game world.

- **Puzzle:** games that normally challenge players to gain specific information, to find out the right answer or a working strategy to a specific task.

- **Adventure:** games that normally use the game world for exploration and interaction. Such games often include missions, rewards and possible plot twists with no direct win or lose situation.

In escape games, we can also identify a few subcategories:

- **Escape rooms**: a room full of puzzles and a mission to complete.

- **Escape boxes**: a closed box that progressively unfolds like a matryoshka, with a specific mission to complete.

- **Envelope-based puzzle games**: a story-driven game that unravels step-by-step through a series of envelopes given by hand.

- **Puzzle hunts**: a game outside or in various spaces that utilises different puzzle stations or orienteering.

- **Virtual escape games**: an escape game set in virtual reality by using a specific app or social media platforms.

You can try an experimental online escape quest created by a group of young people in the following link: **et.shokkin.org/online-escape-quest-where-is-he**

2 Escape Games

2.1 History of Escape Games

While humankind seemed to enjoy puzzles, mazes and riddles for centuries, the origin of escape games should be studied from the broader perspective of quests, treasure hunts, adventure challenges or video games. Most sources claim escape rooms as we know them can be traced to 2004, when Toshimitsu Takagi developed a simple online point-and-click game named *Crimson Room*.

In *Crimson Room* you must navigate in room-like environments, zooming in and out on different parts of the room and interacting with items and elements found. The game is simple: you wake up in a crimson-coloured room, suffering from retrograde amnesia. You don't know where you are or how you got there. All you know is you need to escape this mysterious red room by finding the key to the door. You can play the game here: **www.crazygames.com/game/crimson-room**

According to multiple sources, the first modern escape-room event was created by the publishing company SCRAP in Kyoto in July 2007. Takao Kato, the creator, aimed at creating a fully immersive game in which players had to solve a series of puzzles and riddles to escape from a locked room. The game was showcased and played in a single room at first, but with time, SCRAP has become known for its real escape game event hosting thousands of players in a shared space.

In 2011, the first escape room closest to modern ones opened in Budapest in "Parapark", created by Attila Gyurkovics. Ever since then, the trend of escape games has exploded and many rooms and specialised companies have started popping up all around the world. UK-based company Aim Escape claims there were over 50,000 escape rooms opened worldwide in November 2019.

With the COVID-19 pandemic, many escape room companies went back to the online format, while many others are taking their games outdoors... Experiments with this form of entertainment are far from being finished.

2.2 What Are Escape Rooms?

Escape rooms can be characterised as a team activity in which a group of players is **locked in one or several rooms** with and where they have to work together to find clues, solve puzzles and, as a result, escape the room. The game usually lasts for 60 minutes and can be played by a group of two to six people. Most of the time there is a game master who briefs the team and explains the rules and story, monitors the game process, provides extra hints when requested, and stops the game when the time runs out.

All escape games have a **theme** reflected in the game story, a specific **role** players play, the **physical setting** of the game, thematic **puzzles** and the ultimate **mission** for players to fulfill. Common themes and missions are escaping a serial killer, unravelling a murder, diffusing a bomb, preventing a global catastrophe, or running away from a haunted hotel. There are also escape games set in the worlds of popular films or television series, such as Game of Thrones, Harry Potter, Nightmare on Elm Street, Mission Impossible and many others.

Most escape games are a type of entertainment provided by commercial escape game companies. However, puzzle-based games are also being set up in libraries or museums more often, attracting more attention and interest from the wider public, and in this manual we would like to experiment with their educational potential in the youth work and education-related fields.

2.2.1 The Difference Between Educational and Commercial Escape Rooms

There are many ways to distinguish an educational escape room from a commercial one. A few key differences can be that every educational game is designed with learning outcomes in mind from the very beginning of the process. The nature of the story may not be to escape, but to understand and solve a problem, unravel a story, or help a character. Puzzles and challenges can rely on prior knowledge in an educational escape game. Educational games are made to be more flexible, creating space for maneuvers when it comes to game duration or team size. **You don't necessarily want the players to finish the game quickly, but instead to go through the story thoroughly.**

The game is over with a **debriefing** or a reflection process guided by an educator. An educational escape game can have alternative endings based on the decisions made by players. Lower budget, higher mobility and importance of the role of the story are often the key characteristics of educational escape rooms.

Topic	Conventional Escape Rooms	Educational Escape Rooms
Audience	Broad	Specific target group with well-defined learning goals
Success Rate	Variable	High
Puzzles	No need to align with the curriculum	Align with the curriculum
Puzzles Outcomes	Variable	Numerical or alphabetical codes
Spaces	Usually one or several connected rooms	Usually more limited (classroom)
Time to set up and clear away	Freer	Limited (academic timetable)
Number of users	Usually one team (3-7, average)	A whole class or course (groups of 20-100)

Table 1. *Differences between Escape Rooms and Edu-Escape Rooms. Retrieved from Grande-de-Prado, M.; García-Martín, S.; Baelo, R.; Abella-García, V. "Edu-Escape Rooms" Encyclopedia 1, no. 1: 12-19.*

2.2.2 Example of an Educational Escape Room

An example of an educational escape room we would like to share with you is the game ***Secrets & Lies of Class 8A***, originally developed in 2018 by an international group of youth workers and youth leaders at the training course *Escape Radicalization*. The game was designed to address the topic of bullying in a classroom of students aged 14+ and it has been modified several times to make it shorter and enhance some content aspects.

The premise of the game is that a teacher reaches out to the local student council for help. The teacher suspects something is going on in the classroom but is unable to unravel the whole situation and is concerned there is very little time left before something serious happens. The teacher asks the youth council representatives to study the situation, discover what is happening in the class and find an answer to who is the one bullying others. The council has only 45 minutes, by that time the class will be back from another meeting in the other wing of the school.

Players then proceed to work their way from the teacher's desk through other areas of the classroom, unravelling the story of relationships being built and destroyed in this class.

By the end of the game, the student council builds a clear but complicated picture of relationships that they report back to the teacher and provide information on what can happen in the near future and what are the reasons leading to a toxic atmosphere in class.

After the game is over, the game master leads a debriefing regarding why and how bullying occurs, followed by a discussion of whether players encountered similar situations in their group and how such atmosphere influences every member of the group. At the end of the game session, the educator introduces various roles in the bullying process and provides tips on how to react in similar situations.

Executing this game with young people gives us an opportunity to discuss bullying from an observer's perspective and talk about "Class 8A" while gradually moving to an open discussion of how they feel in their own class and what they wish would be different. After such sessions in small groups, teachers can follow up with discussions, invite professionals in bullying, or lead common team-building activities. The story of Class 8A is able to address bullying in a classroom using a safe means.

The game was created and adjusted to suit any typical classroom involving only one-room space. It was adjusted to fit the 45-minutes limit and created as a linear game in which participants are asked to figure out puzzles in one area before they can move on to another.

You can find this game's outline and materials at playversity.co




2.2.3 Why to Use Educational Escape Games

The concept of escape game fits the idea of a memorable and exciting experience very well. Escape games include social interaction, a story, provide mystery, sense of achievement and require you to put knowledge and skills to practice. All these elements give us a hard-fun experience where players are required to put real effort into the game. Escape games can be time and location bound, which allows us to have a real experience with a logical beginning and end. They can be built around any topic, suit any subject and can be themed so as to appeal to a specific group of players.

According to a systematic review on escape games in education, the reasons teachers chose to use this method in education were:
1) exploring an active learning environment;
2) increasing students' motivation or engagement;
3) improving learning;
4) practising or developing teamwork and communication skills.

One of the studies says reported experiences with escape games for educational purposes are generally positive. The reasons for this are manifold but concentrate mainly on outcomes. Only one article reported a slight decline in students' results after using an escape game (Clauson et al., 2019). A few others report a little effect on students' results but point to increased motivation and enjoyment as a positive outcome (e.g. Duncan, 2020; Huang et al., 2020). Researchers have reported on the opportunities to apply curriculum content, create practical situations closely related to the profession, and emphasise and enhance the development and applications of skills relevant to the 21st century, such as creativity, critical thinking, problem-solving, and cooperation.

Escape games provide an immersive and emotional experience that will stay written in players' memories for a long time. Groups of players live through a truly embodied process of being active physically, mentally and socially, making escape games a great opportunity to be used for educational purposes.

Educational escape games can be used to introduce new material, revise a topic, assess knowledge, evaluate soft skills, challenge views and create motivation to dive deeper into the topic of the game. Setting a portable room in a tent in a park, creating one in the corner of a youth centre space or a classroom allows us to bring fun and engagement in learning which many youth workers and educators desire.

2.3 What Are Escape Boxes?

Alongside escape rooms, a new, more portable version of escape games has been evolving: an escape game that fits in a box or a suitcase and can be used for both entertainment and educational purposes. Several board game companies created escape boxes of different sizes that use cleverly made ciphers, card sequences, narratives and time-limited challenges to create a self-paced game for people to enjoy. Only the content plays in some games, while in others, the box itself has riddles or tools to help solve puzzles. This ultra-portable version of an escape game has opened brand new directions for educators to explore.

2.3.1 Why to Use Escape Boxes?

The fact that traditional escape games and even portable educational ones have a series of setbacks pushed us to experiment with different concepts. A classic escape game requires a dedicated room or even several rooms, a game can be played by a small group of players, but there are a lot of resources going into creating an escape game of such format.

Even though an educational escape game works very well in an open youth centre environment or as a travelling game, it's not ideal for a large classroom, youth exchange group or youth camp environment. However, puzzle-based escape boxes can help avoid the shortcomings of an escape room and bring the fun of getting a live escape game experience into a larger group and a more restrained environment. Here are some strengths and weaknesses of escape boxes mentioned by Scott Nicholson and Liz Cable:

Advantages	Disadvantages
Can be used with small groups or adapted for a classroom with multiple copies or stations	May require many copies of the same material for a large group
Low requirements for an environment mean it is less expensive than a whole room	Physical immersion and emotional engagement are less likely to occur
Portable and can work well in a classroom environment	Helping many groups at the same time can be overwhelming for a single facilitator
Can be run completely on its own without a facilitator	Role-playing challenges are difficult to implement with a large number of groups

Considering these advantages and disadvantages, escape boxes or breakout boxes provide an engaging format to a classroom and have all the potential to create a memorable experience for students.

2.3.2 Examples of Escape Boxes

Escape box is a new concept that has not yet been very popularised. Some commercial escape room companies have created interactive boxes that can be used for corporate events and involve an intricate box with mechanisms for interaction and secret compartments. A few relevant examples of escape boxes in education to share with you are BreakoutEDU and Fakescape:

BreakoutEDU is a US-based initiative that has developed a kit involving a set of boxes, locks and materials used in a typical escape game. Now, the company provides opportunities to subscribe for game scenarios, design courses and instructions that use the physical kit and a platform for educators to share their games and concepts using the kit and the idea of escape games.

Fakescape is a university student-led initiative from the Czech Republic, running media-literacy and fake-news escape-game-inspired activities in schools around the country. The game revolves around a presidential election in a fictional country, in which the players represent journalists in need of understanding which candidate is the most honest one and who truly intends to change the country for the better. Through a set of puzzles, delivered by a facilitator, participants race to be the first ones to deliver relevant information on presidential candidates to the public.

These examples show two approaches to escape game-inspired adaptations for the classroom. In the first one, there is a kit, a mystery in the box that needs to be solved, while the other one has a level-based approach, providing puzzles one after another. In the first case, there is potential for more decision-making and collaboration among students. The second case concentrates more on the game's content, focusing on learning points behind each puzzle. In both cases, it is evident the level of interaction, curiosity, challenge and will to engage in the game is high, making escape boxes a great alternative to quizzes or plain group tasks.

Solving an escape box turns high emotions in learners. At this level, the educator has the ability not only to discuss the topic and specific learning content covered in the game, but also provide support to groups, helping them reflect on their behaviour, contribution, strategy to cooperate, make decisions and communicate effectively with other group members.

3 Educational Perspective

We classify educational games as those developed or adapted to serve a **specific learning outcome relevant to the target group**. When learning goals are aligned with game goals and mechanics, it allows players to make meaningful actions and choices.

That is where game design and educational design worlds merge. The alignment of learning goals or outcomes, game goals, pedagogy and game mechanics in the design of educational escape rooms are crucial.

When choosing pedagogical approaches in support of the learning goals, alignment with game aspects, such as puzzle paths, type of puzzles and team size are very important to achieve educational goals. When choosing approaches such as team-based or collaborative learning, aligned puzzle structure can be path-based or hybrid, creating interdependence between the players.

The following model illustrates the interdependence of the elements in educational game design:

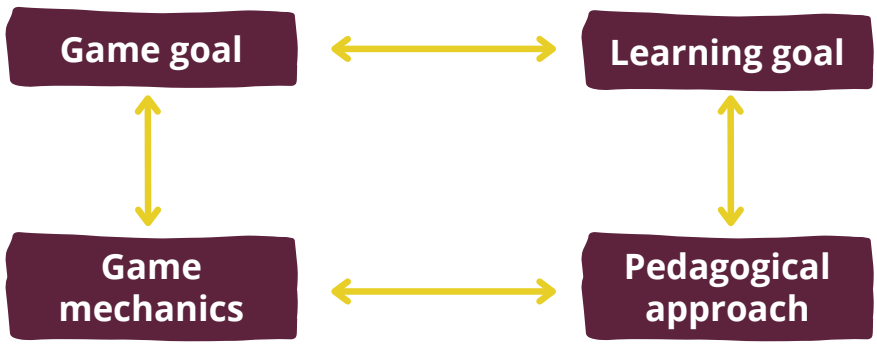


Figure 1. *The design framework on alignment between the game goal, learning goal, pedagogical approach and game mechanics (Van der Linden, van Joolingen, & Meulenbroeks, 2019)*

Selecting the learning outcomes is at the beginning of this pathway. First, it is important to choose a **specific topic** for the escape room that will be close to the designer's area of expertise and will allow creating more detailed and in-depth scenarios that could be full of metaphors and enhancing factors. The topic can be anything relevant for the educator, such as geography, history, mental health, gender-based violence, or environmental awareness.

Once a topic is chosen, the designer can take a critical look at what the **target group** already knows about it; what kind of opinions or prejudices they might have; what is the target group's desire to learn; what is relevant and needed for them to learn or what their level of knowledge or skills should be according to the learning goals of the curriculum/program/campaign. When educators go through these questions, they can find learning gaps or the most relevant points that can work as the basis for designing the activity.

Learning outcomes are statements that describe the knowledge or skills learners should acquire by the end of a particular assignment, class, course, or program, and help them understand why that particular knowledge and those skills will be useful to them. They focus on the context and potential applications of knowledge and skills, it helps learners connect learning in various contexts and help guide assessment and evaluation.

Good learning outcomes emphasise the application and integration of knowledge. Instead of focusing on coverage of material, learning outcomes articulate how learners will be able to employ the material in the class and beyond. Learning outcomes should focus on what the target group should know and realistically can do by the end of an assignment, activity, class, or course.

The process of developing learning outcomes itself offers an opportunity for reflection on the content of the activity in the broad context of its potential applications. Developing learning outcomes means the context of the learning will always be emphasised, and activities focus on the knowledge and skills that will be most valuable to the learner now and in the future.

Following the process suggested in the *Trans-Disciplinary Methodology* by Arnab & Clarke, developing the objectives for the game experience early in the design process will ensure the experience is designed with a purpose in mind, and the game theme and puzzles can be developed to polish the objectives rather than try to embed new objectives into an already designed game. This step is broken down into four areas for developers to consider:

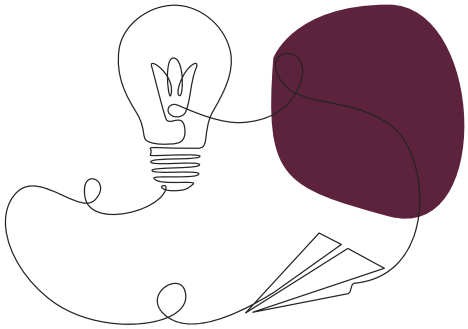
Learning Objectives/Behavioural Change Objectives
These objectives are required in order to create a meaningful educational game. They can be integrated into the theme, puzzles and chosen mode to help structure the learning plan or outcomes.

Solo/Multi-Disciplinary
One or multiple disciplines represented within the game experience.

Soft Skills
Interactive live-action games can aid the development of soft skills such as communication and leadership.

Problem Solving
You can include problem-solving challenges to make the game experience intriguing to players. A range of challenges will appeal to different types of learners.

Following these steps should provide a foundation in which it is clear what the objectives the game is trying to achieve. It will also provide a basis for developing the evaluation strategy later in the design process. It is suggested that one educational escape room experience sets up **three learning outcomes** that tackle the game itself as well as the pre-game or follow-up learning activities.



3.1 Planting Learning in Escape Games

It is a bit easier to create an engaging and meaningful experience in educational escape rooms, since there is already a solid frame of commercial escape rooms that work well. Escape rooms provide immersion, drive engagement, provide instant feedback and are intuitive when it comes to ease of understanding what to do. Thus, we just need to choose where to inject educational elements into the playing experience and how to extract their results afterwards. When creating an educational escape room, the designer can use the following elements:

- **Game scenario**

The scenario has the potential to include knowledge elements, but most importantly, a story that is relatable, striking, and close to the heart will provide a richer experience and have the potential to change players' attitudes or behaviours.

When creating a scenario, one should decide who the players are in the story, who the main character is, what happens in the story both before the game and afterwards, what kind of events occur during the game, and what kind of plot twists might take place.

- **Pre-story**

Introducing the game context, setting the mood, providing introductory details and information can all be done in the pre-story. Here, participants can have the time to analyse some data, memorise key information or create their information database before entering the game. Participants are excited to join the game, so it is hard to keep them engaged with lots of information being thrown at them. Using more engaging media such as video, audio message, posters, diary, or a character monologue, and making the pre-story meaningful for the whole plot and giving players a clear reason to study, read or listen to something can work more than well.

- **Environmental storytelling**

Physical objects such as clothes, posters, and symbols can enhance the scenario and thus enrich the playing experience, immersing the players into the game world, providing stronger emotions and long-lasting effects.

- **In-game storytelling**

Maybe we have a victim's diary from the beginning, or we find recorded messages from a friend along the way. All of this is a chance to get deeper into the context, acquire more information, introduce concepts and make us apply learnt concepts in practice. In-game storytelling is what you want to include in any edu-escape room.

- **In-game actor**

If you want to provide space for in-game discussion, repeat important information or create a dialogue with players, this can be done with an in-game actor playing a specific role throughout the scenario. In this way, you can control the pace of the progress, increase story immersion and have the flexibility and the ability to point out important details or data without disturbing the game experience.

- **Puzzles**

The main aspect of educational escape rooms. They have to be dynamic, intriguing, increasing in difficulty, but need to remain possible to solve in a short time. To enhance the learning, you can have thematic puzzles, answers corresponding to specific data or even puzzles based on concepts, facts and knowledge sources spread around the room. Carefully choosing the puzzles will provide a better learning experience and be topic appropriate.

- **After-story**

Once the game is over and the timer stops, you can hold space to explain game metaphors, unravel the story or even introduce a plot twist. All this creates a richer experience for players that allows them to retain what they learned for longer.

- **After-game activity**

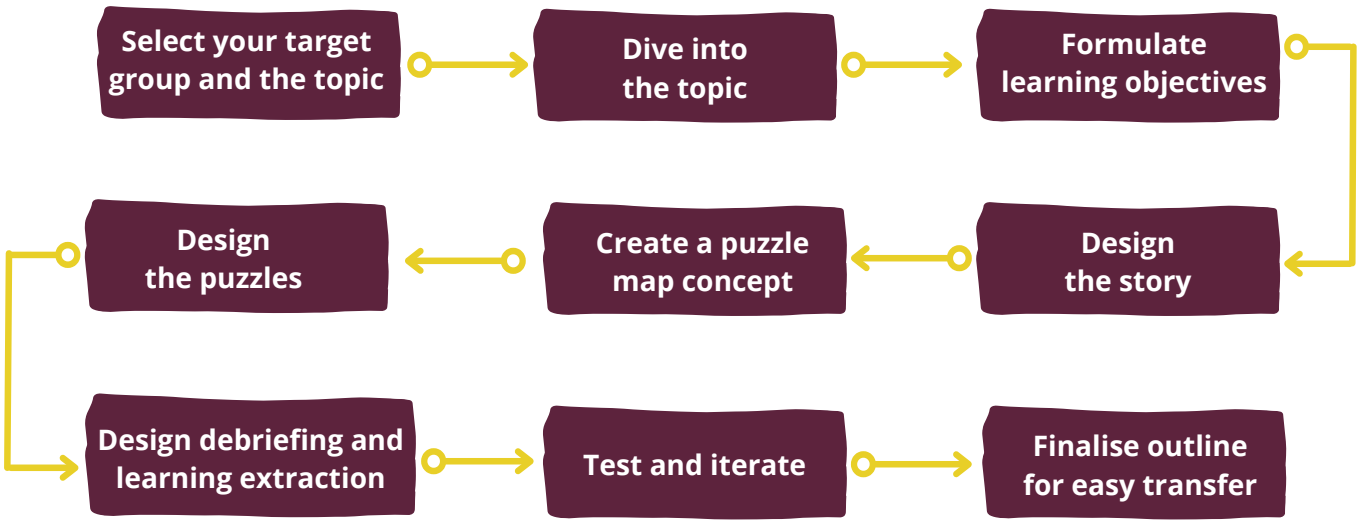
After the game ends, giving players space for personal or group reflection, guided debriefing, and theoretical input can help provide an excellent opportunity for knowledge transfer. Debrief practices help decontextualise the game experience for further use in real-life situations.

- **Follow-up activity**

Recommending a book, article, documentary, providing a flyer, or invitation to an event of a similar topic can be a great way to use the escape game as a platform for increasing curiosity and involving the players in further activities on that topic.

4 Escape Room Development

This chapter is dedicated to a step-by-step approach to designing an educational escape room. At first it might seem like a rather difficult task. However, we offer a systematic approach that allows the developer to take logical steps from thinking about the learners who will participate in playing to planning how to extract concrete learning, iterate based on tests and make the escape room ready to be transferred into different contexts. In the following chapters, we will explain all the steps mentioned in the diagram in greater detail.



4.1 Pre-Work

Once an educator decides to create an escape game, they start a journey that might seem a lot more difficult at the beginning. However, escape games provide us with a certain framework and logic of stories and puzzles, so pretty much anyone can create an escape game on a topic they are passionate about. The difficulty lies in making a good escape game that is relevant to the target group.

As a basis of any educational design process, we seek inspiration in **design thinking approaches**. It allows us to work with an identified problem and stay realistic with what is achievable with the resources at hand.

Logical steps to be taken at this stage are following:

- **Define and review the target audience:** Look at the target audience first. For whom are you making this game, is there a specific age, geographical location, do members share any particular interests, can you use a theme that will appeal to them more? What are they keen on doing, and what might not work with this group?

- **List possible game topics:** Finding a relevant game topic can be easier if you are working within a specific field or training on specific topics. It might be a bit harder if you work with many different topics. Finding design opportunities often comes from noticing needs and problems. An experienced design thinker maintains a mindset which instinctively reframes problems into opportunities. Make a list of all the problems, topics, learning gaps you've noticed: some of them may be the basis for an escape game.

- **Keep it simple:** Describe your challenge simply and optimistically. Make it broad enough to allow you to discover areas of unexpected value, and narrow enough to make the topic manageable.

- **Sketch out end goals/learning outcomes:** Define your goals for undertaking this challenge. Be honest when determining a realistic scope of the impact you think this activity should have on the learners as well as regarding time and resources available to produce the output. What will you work to produce? Where do you expect to get at the end of this process? If you are creating a solution for your classroom, it may be something that will be easy for you to try and implement. But sometimes, you are creating something beyond your direct skills, or something that involves many other people. Before you dig into the specifics of your challenge, consider what might be a feasible "deliverable".

- **Establish constraints:** It is crucial to define constraints and get specific on the problem or question you try to address. Does it need to fit into a particular timeframe? Can it be integrated with an existing structure or initiative? Make a list of the constraints you need to manage.

- **Do further research and look for inspiration:** Look into recent articles, books, documentaries on your topic of choice. Try to find some cases or news stories. Look how this can fit with a fictional world (e.g. a TV-series universe). These sources can inspire you to write the story, prepare a physical environment, develop characters, or sketch a plot twist.

And now, once all this pre-work is finished, you are ready to build a great educational escape room starting with a good story.

4.2 Story Design

Julia Morris gives a great reason on how the story sets an escape room apart from any other class activity. In her book *Escape Rooms in Education: A Practical Guide*, she writes:

> *What sounds more appealing: 'We have to finish these five tasks by the end of the lesson to get through the chapter before the exam!' or 'We need to find five clues to uncover who murdered Sir John. We only have 60 minutes before the carriage arrives to take away the dinner guests!'?*

Stories provide immersion and drive engagement. They can increase the levels of oxytocin (*the "love" or "happiness" hormone*) and have physiological and psychological impacts on the listeners while making the experience even richer as if we are part of the story. In low-budget educational escape rooms, stories are a great choice to make up for budget limitations while still driving immersion.

Every part of the escape room should be connected to the story: atmosphere built with sounds, objects, decorations, the layout of puzzles, the content of puzzles, character names, roles of players, escape room name, the ultimate mission for the players, etc. Thus, diving into story design goes before moving into puzzles.

4.2.1 Choosing the Theme and Settings

Story design starts with a choice of **theme**. It might be dictated by the game topic chosen before or the subject you are teaching. For example, if you teach a history class, the theme could be set in a specific period, e.g. an ancient Greek library or a medieval prison. If it's an escape room about gender-based violence, it can be set in a room of a teenager, a DV shelter or a psychologist's cabinet.

When thinking about a theme and possible setting, keep your options open at the beginning and always come back to the learning objective and topic and question how the theme is connected to it. Try to choose two to four options that might seem the most logical. The right one will pop up in the following steps.

Let's go with the gender-based violence example and pretend we are preparing an escape room to support learning about different types of violence—physical, emotional, sexual, as well as about possible reasons behind it. Room, DV shelter, psychologist cabinet, police station could be our options. We will choose the right one later.

4.2.2 Choosing the Problem and the Characters

Once we have our theme and possible settings figured out, we can move forward. We would recommend taking a deeper look at the problem from which the plot hook will stem. At this point, we recommend doing some more research about the chosen topic. It will help you come up with solutions for the problem and plot the characters are struggling with.

We can choose several problems for our gender-based violence example, since it happens on both individual and structural levels and is often present in families, schools, companies and institutions. To reflect on it and support processes of teaching and learning such a complex topic, we can try to start from a personal level and then possibly build up the connection towards the structural part of the issue. Therefore, here is our problem:

> *A person is experiencing gender-based violence from another person. The person experiencing the violence asks for help, but there is not enough action taken from the institutions. Something should be done about it.*

This simple problem can serve as a base to build upon, create characters and develop the story. We can proceed with the character creation, which will guide us towards fleshing out the conflict, resolution and also decide on the final setting. We recommend having at least three characters in mind:

- **The protagonist:** main character whose story the players will be exploring;
- **The antagonist:** the one who causes, contributes to or escalates the problem;
- **The guide:** the one who approaches the players with a call to action to take part in resolving the problem.

For our protagonist, we choose a girl who has been experiencing harassment at school, perhaps from her classmates. Let's call her *Mariella*. We also create *Arthur*, a classmate who harasses *Mariella*. We can come to the guides later, but we know it is somebody who knows *Mariella* and has their suspicions something is off.

From here, we grab post-its or a big piece of paper, get creative, brainstorm who the characters are in more detail, add some minor ones, connect them to our settings and once in a while look back at the research we did on the topic. After five cups of coffee and one tiny breakdown, we have the skeleton of the story:

Mariella is a regular girl at her high school. She lives with her mother, a single parent. They share an okay relationship, but Mariella does not feel close to her mother.

Arthur, on the other hand, comes from a well-respected family. His father has a lot of connections, but is abusive towards Arthur's mother. Through this, Arthur started to normalise gender-based violence within himself and eventually picked Mariella as one of the victims. He has never hit her, but often had sexist remarks, tried to touch her without consent and perhaps took an inappropriate picture of her that he then shared among his friends, who were cheering for all of his actions.

Mariella tried to notify the school, but the only thing she's got was the assurance that all is good and "boys will be boys". She had no idea how to talk about this to her mother since they never discussed such things prior to this incident. She befriended a social worker who supported her, but otherwise could not do much. She decided to report Arthur's behaviour to the police.

Eventually, seeing that nothing changes—also because Arthur's father knows one of the police officers and manages to halt the investigation—she runs away to join a workshop on how to combat gender-based violence in a different city without telling anyone.

Mariella's mother goes to the police and reports her daughter missing. The secretary puts her report in the system and notices that Mariella made a report a few weeks ago. It seems like there is no progress on the investigation, and the police officer hasn't mentioned anything about it to Mariella's mother. The secretary becomes suspicious of foul play and calls a group of investigators from a different governmental body to figure out what is going on while the officers are getting lunch.

4.2.3 Making It Work

Our story might not be a Hollywood blockbuster script, sure. But will it be sufficient to create an engaging learning experience if approached correctly? Also sure! We only need to figure out some last details. It becomes clear that our setting will be a police station. Our guide is the secretary who introduces the players to the story, and the players will be in the role of investigators who need to figure out what happened to Mariella.

Most importantly, it is time to take a closer look at the intended topics we have set for the story. We cover gender-based violence that is happening on a personal level —mostly between Mariella and Arthur, but also in the case of Arthur's parents.

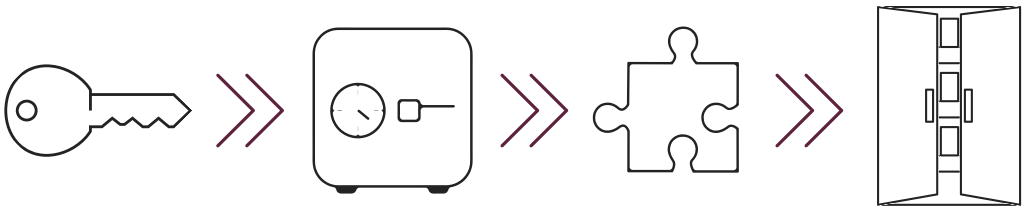
On the example of Arthur's parents, we can show the generational perspective and acquired behaviours when it comes to gender-based violence. The approach of the school and the police demonstrate normalisation of such attitudes and can shed light on gender-based violence seen as a structural issue.

By letting the players discover that Mariella took action at the end and joined a workshop to learn how to tackle the issues she has been experiencing, we show an example of behaviour leading to participation, to initiate a change. Now it is up to us which parts of the story we let the players unravel and how this information will be incorporated into puzzles.

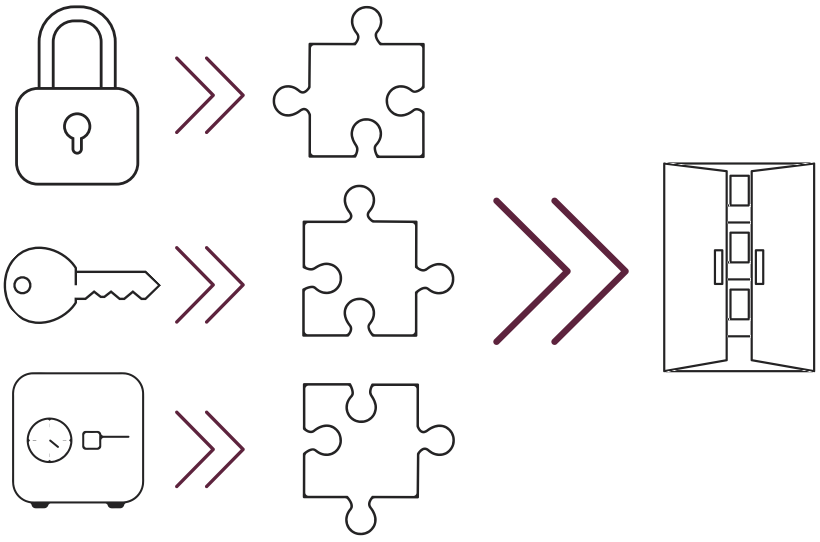
Inspiration for the theme and story can be found at lockpaperscissors.co

4.3 Puzzle Paths

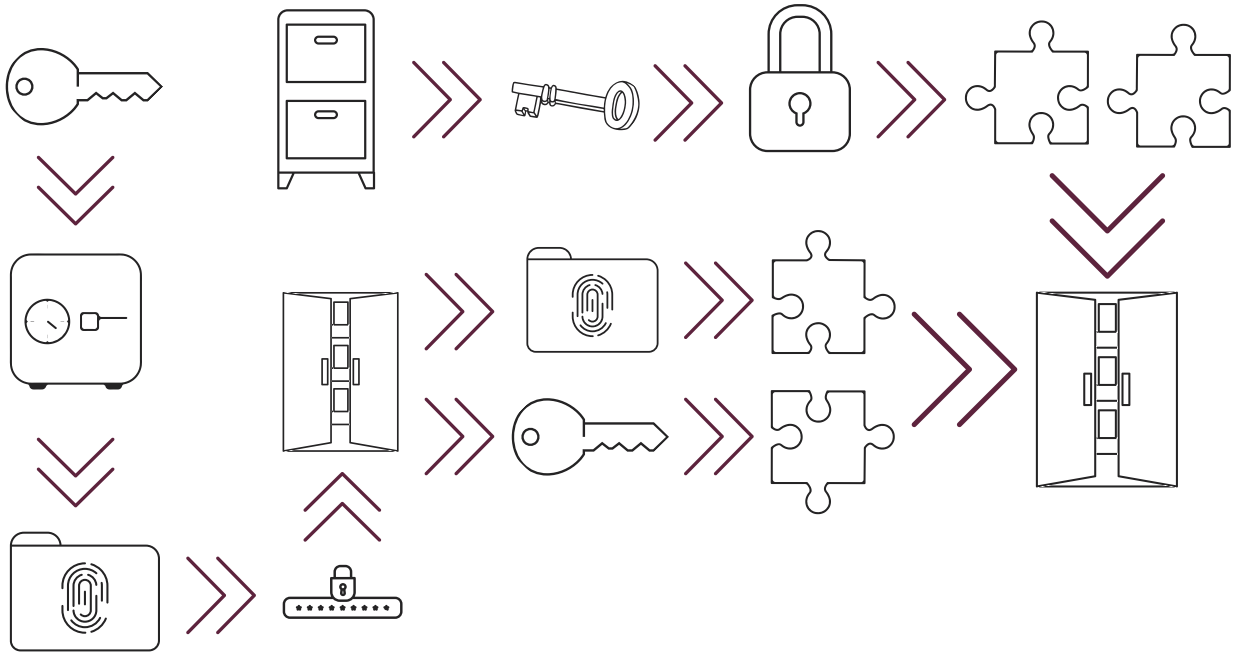
When creating an escape game, a designer can choose to concentrate on one of three most commonly used game structures: **linear, non-linear or multi-linear.**



Linear escape rooms are also known as sequential games with a puzzle sequence at the core of their design. In every box, you find another task or an essential tool to complete another step. In this structure, there is a logical sequence of steps and usually participants are physically constrained to move to another side of the room. It is the best game type for less experienced players, and if a designer wants to have an unravelling story with every player loop.



Non-linear or open escape games have tasks or puzzles that provide players with a piece of the key or final information needed to complete the game. In this structure, players are free to work on more than one puzzle at a time. This game structure is great if the main reason for the game is to practice team collaboration and communication as it provides an opportunity for team multi-tasking. This, however, makes it more difficult to follow a whole story and needs extra effort to keep the focus on the story and topic in place.



Multi-linear game structures create opportunities to take different paths that can lead to the finale of the game. In this structure, based on the narrative or based on the intro, players can make decisions about which path to take and discover. But players can also unknowingly follow a specific path based on their previous decision, which will result in a big surprise at the end of the game when the story finale might be influenced by the path they have taken.

This structure is the most complicated one for the designer to create, as it requires developing multiple paths, story endings and possible plot twists. However, it can also provide stronger emotions when players realize that there was perhaps a better way to solve the game if they would have paid more attention.

When creating an escape room, it is a good idea to decide on the game structure early on. It can help give you order to the number of puzzles, any relevant story plots or practical decisions that could be later dictated by the game's structure.

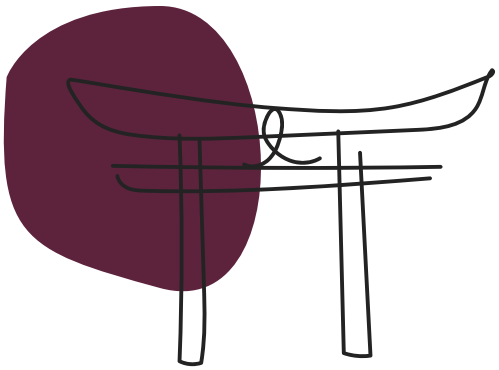
4.3.1 Creating Content Gates

When designing an educational game, we want the players to experience something. We create a sequence of actions that the players take in order to progress from one part of the game to another. The ability to create gates is crucial for an escape room designer and even more so for an educational game designer.

You do not want players to feel overwhelmed with 10 puzzles that can be solved at the same time or for players to skip story parts and therefore miss out on the whole idea of the game. **You want the experience to feel organic and the story to flow from one puzzle to the next.**

Before designing the puzzles, look at the story and break it down into pieces that should be communicated to the players one at a time. From there, you can distribute these pieces throughout the game. Some information goes into the pre-story, some pieces can be part of the game environment, while others are accessible only after opening a certain box or passing a stage. The plot twist or outcome of the main event can become available after the final puzzle or right at the end of the game once everything has been decrypted.

One thing to consider when designing an educational escape game is to start with a linear sequence at first or provide a clear starting puzzle to be solved. This way, you engage the players in the story and trigger collaborative work from the very beginning.



4.4 Player Loops

In escape room design, we understand the whole timeline of players identifying, solving and completing a puzzle as a **"player loop".** A typical player loop consists of six main steps.

The first step is **identifying possible gates**. Find things that might be a puzzle or used in the games. We might find similar patterns in different parts of the room, or a locked box that needs a physical key. All these can be possible gates for a puzzle.

Once some gates are identified, players should start **collecting clues**. We might find more patterns of specific objects next or we might find a lock with the same patterns like the ones on the wall.

When many clues are collected, we can **select a gate** we would like to concentrate on and start interacting with it. Most clues are collected at the start of the game and if you have many objects that do not make sense, it can be frustrating. So having an intuitive correlation between clues and gates is really important.

After selecting one gate, players proceed to **solve the puzzle** using the clues they have collected. Sometimes coming back to look for a few more clues might be necessary. It should be the most challenging part of the player's loop. It is where players put their cognitive and social skills together to build on ideas of one another and find the correct path.

Once the puzzle is solved and we understand the logic, we can proceed to **completing the puzzle**, for example, by calculating the number of relevant patterns on each wall separately. Completing a puzzle can take a few minutes but should not be tedious.

Once the puzzle is completed, we have the answer and we proceed to **input the answer**. It should be clear and easy. It is extremely annoying when you start trying to solve a puzzle again just because the game objects were not aligned enough and gave us an ambiguous answer or misled us into looking at it from the wrong angle.

After a player loop is completed, the team moves on to identify more gates, or select a gate from previously identified ones or look for more clues. In a linear game, you want the following loop to be more challenging than the previous one. Sticking to five-six player loops will be enough to keep a game played within a 45-minutes limit.

4.5 Puzzle Design

As mentioned previously, you should aim to create five to six good player loops for an escape room that would take around 45 minutes to complete. There are a few things to keep in mind when designing puzzles for escape rooms.

Firstly, you want to have **correlations between the story and puzzles** that make sense. If the narrative is around the topic of fake news, you might want to have puzzles connected to newspaper articles or tweets, to incorporate a puzzle where participants need to look for details, or a puzzle involving videos from around the world. If you are looking to contact a teenager, you might want to have puzzles connected to video games or youth culture, you can have puzzles connected to school subjects or sports the character enjoys. Enhancing stories through puzzles allows the teams to stay immersed in the game.

All **puzzles should be carefully crafted** before using them. Make sure that the puzzle has only one correct solution and there is no possibility for ambiguous answers. Check for spelling or grammar mistakes that can end up being misleading. Avoid any spelling mistakes in answer inputs.

Puzzles should be ordered in **increasing difficulty** with the first loop being the easier one to get players into the joy of the game and then you can increase the level of challenge by sneaking in an occasional easier loop to keep the sense of achievement high. Spend more time on designing the final player loop and its main puzzle to reach as high a finish as you would like to have.

When creating your initial puzzle idea board, make sure to have **puzzle variety**. You do not want only text-heavy puzzles or puzzles connected to spotting information or symbols. You want to have a game that will involve different senses, and perhaps a puzzle that can be based on a video, another on decoding a written message, another one connected to images that are on the wall, and another one based on the use of some gadgets that are discovered. It will ensure a more joyful experience for the players.

4.5.1 Good Puzzle Checklist

When creating puzzles, we suggest keeping several things in mind to ensure the puzzle will be engaging and integrated well into the player loop:

☐ **Is the puzzle integrated into the storyline?**
Firstly, try to integrate the puzzle into the storyline. Perhaps the character is using some kind of medication and a specific number of pills or side effects can provide a clue. Or there might be a laptop or phone that must be unlocked by gathering clues related to hobbies, interests or birthdays of important characters.

☐ **Are the clues to the puzzle logical?**
Ensure that the clues make sense for the player and are clear. A little bit of wondering which clue belongs to which puzzle is beneficial. However, after a few minutes of trying different combinations, it should become clear that a certain clue is connected to a certain puzzle. One of the possibilities is also to provide specific hints: e.g. in the form of colour coding, so the players know which clues and puzzles correlate with each other. Indicate whether each object or clue is used only once during the game or some of them can be used multiple times (we suggest using each object only once to avoid confusion). Avoid "red herrings": materials that can strongly imply they are connected to a puzzle but, in the end, lead the players into a blind alley.

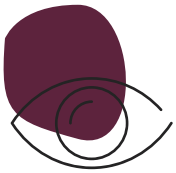
☐ **Can the puzzle be solved using only information contained within the room?**
Make sure the players have everything they need to solve all the puzzles. If specific knowledge is required for the game, emphasise it and provide it before the game starts in verbal or written form.

☐ **Is there only one answer to this puzzle?**
Ideally, each puzzle should have only one correct answer. Especially when working with mathematical clues where the players need to add, subtract, multiply or divide, make sure they enter the data in the correct order. Respectively, the players might randomly find the correct answer by wrongly solving clues connected to a completely different puzzle. Ensure no other puzzle, when solved incorrectly, can provide a solution to a different loop.

☐ **Does the puzzle add atmosphere to the room?**
This applies mostly to the visual part of the game setting. If the game takes place in ancient Greece, you can integrate elements of respective architecture. If your setting is a police station or a home of conspiracy theorists, you might perhaps think of creating a cork board with pictures and news articles and connecting them with lines of red thread.

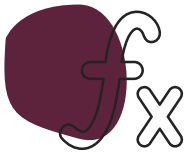
4.5.2 Puzzle Types

When designing puzzles, you might have plenty of ideas, and you can find many more online. Here is a simple categorisation for puzzle types in escape rooms that have been used more often in DIY games:



Observation, patterns and hidden objects: puzzles connected to observing regularities or irregularities in the game space. It might be a book that stands out, a specific row of chairs of the same colour or a hidden key under the only green table in the room. These puzzles require participants to thoroughly examine the space and find entry points for player loops.

Hearing: songs, narrated texts, Morse codes, repeated phrases, encrypted messages, sounds of musical instruments all can be the basis of a good puzzle.



Riddles, ciphers and math problems: all of them are great things to consider when creating a text-based puzzle. The only thing to be aware of is that the level of complexity should correspond to the target group. If you incorporate these into games, you might want to provide support materials, especially when it comes to mathematical problems. (And be always ready to provide some thematic hints!).

Touch and teamwork: Puzzles that involve physical touch can be connected to black boxes where participants can feel different materials or need to figure out the number or letter by its shape. It can be secret compartments or unscrewed chair seats that contain something inside. You can have puzzles requiring several players to collaborate in order to reach a certain goal.

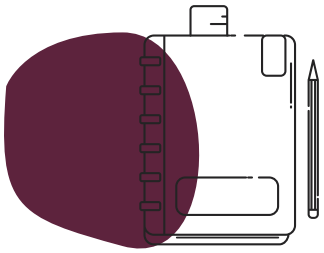
Mazes and mirrors: It is quite common to find a maze which, in order to pass, requires you to put a word together, find the correct code or have a key. You can use a mirror to read text backwards or point lasers to several mirrors that will point to the right number, letter or word. Mazes and mirrors provide physical fun and are enjoyable for teams.

Want to create digital locks? en.lockee.fr is a great place to start.

To create a game that can be finished in 45 minutes, you should combine **6 to 8 puzzles into 5 to 6 loops.** When you have a ready-made puzzle, test it on someone to see the reaction and see whether anything about it seems tedious.

78% Searching for physical objects hidden in the room	**37%** Riddles	**13%** Agility (laser maze)
58% Team Communication	**35%** Ciphers without key	**12%** Touch
54% Light (e.g. blacklight)	**26%** Hearing	**11%** Trivia (outside knowledge)
53% Counting	**26%** Mirrors	**11%** Shape manipulation
49% Observation (obvious)	**22%** Abstract logic (e.g. sudoku)	**9%** Liquids
47% Cipher with key	**20%** Research within room	**7%** Actors (social engagement)
47% Aha! Use of object	**20%** Strategic thinking (e.g. chess)	**4%** Actors (physical engagement)
43% Searching in images	**17%** Hand-eye coordination	**3%** Smell
40% Object assembly (jigsaw)	**16%** Untangling ropes/chains	**1%** Taste
39% Algebra and other math	**14%** Traditional word puzzles	***Out of 175 Escape Facilities Surveyed**
38% Pattern and tracing	**14%** Mazes	

Table 2. Types of Puzzles in escape rooms. *Retrieved from Nicholson, Scott. (2016). The State of Escape: Escape Room Design and Facilities. Paper presented at Meaningful Play 2016. Lansing, Michigan.*



If you want to find suggestions for escape room puzzles, you can explore the resource *101 best escape room puzzle ideas (nowescape.com)*.

4.5.3 Building Engaging Puzzles

You don't want a puzzle to be overly complicated or too easy. The sweet spot of a challenging puzzle cannot be reached on the first try. You might need to find a balance between a few of the following aspects:

- **Directions**
  Adding some hints or directions would be helpful in order to solve the puzzle while losing some obvious wording or symbolism will make it slightly more challenging. Some components or additional information might be placed in the game environment (written somewhere or to be found during previous steps) but should not be given together with the puzzle. Directions might also be incomplete to point the thinking in the right direction.

- **Layering**
  If the puzzle seems too easy or that is what you observed through testing, an additional layer to the puzzle will increase its complexity. The new layer can add a need for communicating, teamwork or paying extra attention to the surroundings. It will enrich the experience and increase the complexity of the puzzle.

- **Distractors**
  Small elements making the game more complex might be additional thematic distractors (not dead-end puzzles)—such as additional papers, extra lines of text, more numbers that are needed or different fonts. All of it will make it much harder to spot the most important information for solving the puzzle.

  Too many elements will make it tedious or impossible to solve, and very few distractors will make it easy from point A to point B. Think of each puzzle as a maze that would be nothing but a simple and direct path if there would be no similar paths all around.

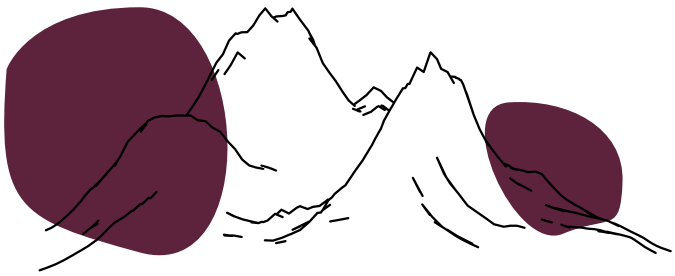
4.5.4 Puzzles to Avoid

- **Excessive amounts of outside knowledge**
  We cannot rely on players knowing a specific piece of information, so unless it is a way to test knowledge, avoid out-of-the-room answers or puzzles relying heavily on information that cannot be found in the game environment. As a Plan B, you can integrate a hint or have a message ready that can be transmitted to the players by the non-player character if the facilitator observes a lack of out-of-the-game knowledge in the teams.

- **Avoid adding too long puzzles**
  Even if a challenging puzzle can be very satisfying to solve, it gets very boring when you need to perform the same multi-step sequence over and over to decode a long sentence or even a whole paragraph.

- "**Overkilling" with layers**
  Deciphering information into a set of numbers, then changing it into letters only to later transform it into shapes is too many layers to one puzzle. Imagine if there has been a minor mistake in the first deciphering process and we need to go through it all again—quite frustrating. It's better to create an additional puzzle instead.

- **Time-wasters or "red herrings"**
  Puzzles designed to waste players' time are not a good idea. It opens another door for possible frustration and players feeling cheated. Unless there is a specific attention-based reason to use dead-end puzzles, they should be avoided.



4.6 Support Materials

Although the game seems to be ready once the room is designed, you should write down the **rules** and anything else intended for the players to know. For example, you can create additional support measures such as **do-not-touch stickers** and similar.

Design the clues or hints and think how you will communicate with players during the game without breaking the story. One option is using **walkie-talkies**, but it might not always be available in a DIY environment. A good practice is assigning a **facilitator** who assumes a role within the story (concerned parent, school council member, investigator...) and is always present, observing, and if asked, provides a clue that does not break the immersion.

It is also the right time to look at the best ways to **restart** your room. Practise it a few times and make back-ups. Having a written restart list with a simple diagram of the room including the codes, clues and player loops is strongly recommended.

4.7 Debriefing and Learning Extraction Design

Your room is ready. At this point, you can critically look back and see what needs to be adjusted to fit the learning outcomes. You can design the debriefing (after-game discussion) or any other learning-extraction method (after-game movie, self-reflection exercise, fact sheet, etc.) that makes a logical conclusion to the game.

The post-game stage is the key place where a debriefing or reflection can occur. As a learning theorist John Dewey said: “We don’t learn from experience. We learn from reflecting on experience”. Each escape game is an experience a team of players lived through, and we can benefit from it.

As mentioned in the book *Unlocking Puzzle-Based Learning*, the overarching goal of debriefing is to help the players consider their experiences and connect those experiences to things they already have known. By doing this, the learning outcomes become part of their knowledge about the world.

Here, it is necessary to discuss the game process and emotions first, afterwards moving to the game topic and the story, linking this experience and the story to real-life situations, actions and cases. At this stage, the educator has a very impactful role and has the possibility to enrich the experience by raising important points and introducing participants to frameworks and recommendations for their future.

A suggested structure for a debriefing can be as follows:

- *How do you feel after the game? How did you feel during the game?*
- *What happened during the game? What was the story about? What is the result?*
- *What did you discover throughout the game? What conclusion can be drawn from it?*
- *How does the experience relate to the real world? Have you ever observed a similar situation in the real world?*
- *How will you act in a similar situation? What can you do with this knowledge? What can you do differently in the future?*

Here, an educator can state what they noticed as well and follow up on answers of the players or bring entirely new points of view. A well-planned debriefing helps to reach the learning outcomes even if not all actions in the game went as planned. Thus, we recommend having a structure for a debriefing with specific questions and pre-planned timing for each section of the debriefing cycle. Of course, flexibility is allowed and encouraged, but without a planned structure, the risk of staying at the emotional game level and not moving to the application of learning stage is higher.

We also recommend providing materials for further exploration. A few examples are a simple handout that helps revise the gained competencies or instigate future action or a link to a video or a documentary that explores the topic further.

4.8 Iteration and Finalisation

Once the game is ready, test it yourselves first. By stepping into the shoes of future players, you can spot many shortcomings. Later, invite some dependable testers and observe their play (but don't interrupt unless you see a big mistake in the game), writing down anything that might need to be changed, enhanced or cut out. Iteration (*"the process of doing something again and again, usually to improve it"*) will help you balance out the game for various player profiles.

It is also quite common practice to cut some parts of the game after the first few tests, only to realise later that these elements have been there for a good reason and bring them back again, with slight changes perhaps. That's the process of iteration in a nutshell.

Keep in mind each group plays and thinks differently. It is not necessary—and, most probably, also not possible—to adjust the room to fit each and every way of thinking and play. However, documenting and awareness of the moments some players might struggle with helps provide a smooth and enjoyable experience.

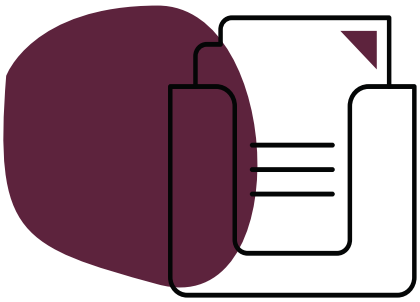
4.9 Room Evaluation

Once the game is finalised and has been tested by you and your colleagues or partners, it is good to continue gathering more feedback from game masters and players, to have an ongoing evaluation of the room's impact. You can have a simple feedback form for educators and players, and, when sharing the game with them, ask them to fill it out.

You would like to hear **thoughts on both the practical aspect of the game** (as in how easy it was to prepare materials, set up the room and reset it) **and the content aspect** (how was it to lead a debriefing, how does the educator measure the impact of the activity and how they would assess teams' motivation to learn more about the topic or change attitudes and behaviours) from other educators.

You can always ask for suggestions on improvements from your colleague. As an educational game designer, you should receive ongoing feedback on whether players find the story relatable in their context, their first thoughts on the topic, what their conclusions after the game sessions are, but—also very important—you might want to get tips on something they found annoying or hard to believe in the game.

Every time a game is facilitated, there will be things to improve in order to make it a better experience in the future. We once visited an escape room in Barcelona which kept us constantly struggling but never frustrated. Once the game was over, we learnt from the game master that the game had been in constant evaluation and iteration process for the last four years. After that fact, it made total sense that the game reached such a high level in keeping it satisfyingly challenging, placing a team in the state of flow for most of the game.



5 Facilitation of Escape Games

In an escape game, the role of facilitators is to introduce players to the game, monitor the game process, ensure the safety of players, facilitate the debriefing of the game and restart the game for the next group. In some cases, the facilitator can also play a role inside the game story, providing participants with extra information or supporting their progress.

Due to technical and content tasks, it is a great idea to run educational escape rooms in pairs. One role can be more technical (rule-briefing, monitoring, restarting), while the other can be more content related (game story, in-story participation, debriefing).

5.1 Pre-Game Stage

A typical escape game session would start with a group of players arriving at the place as a team and being introduced to the game rules first. Here, we suggest including a brief explanation of what an escape room is, what the most general rules to playing an escape room are, and basically anything specific that can be said about this particular game (is it linear? can players use outside technology? what is the game area? are objects used more than once during the game?).

Once the technical and rule briefing is done, you should introduce the game story. At this point, it is important to mention what happened in the story prior to the escape room experience, introduce the roles of the players, provide them with any necessary equipment (a diary, a phone, a tablet), and, if relevant, give them the time to study any specific information or media (website, newspaper article, video or audio file).

When the pre-task is over, the game master can let the players start the game and start the timer. It is always a good idea to let participants know about ways to ask for support whenever in need.

5.1.1 Trigger Warnings and Working With Trauma

When working with educational games on social topics, it is good to be aware of any possible previous experiences that might influence your players. If the game is based on the topic of domestic violence or suicide, you could get a player moving towards a panic zone.

One of the ways to avoid this in the design process is to remember your target group and point out possible risks. Create a story, scenarios or atmosphere appropriate enough and with respect to both the target group and the topic. Play-testing, asking for critical feedback, consulting with professionals and organisations in the design stage will help you avoid bad experiences.

The second way is to always provide a **trigger warning**. Let the players know what the game is about and what kinds of topics are on the table. Let them know whenever they get uncomfortable during the game, they can choose not to play, let the game master know at any point, and stop playing.

If a player struggles during the game and wishes to end it, it is required for the game master to pay attention to the player, talk to them and make sure whether they feel good, are alright observing the game, would like to wait in the pre-game room, or have a chat with some other game master. Although it is unlikely to trigger a player to this extent if the game has been crafted carefully, it is crucial to be ready to support participants in any situation.

5.2 Game Stage

During the game stage, the game master should remain in the background as much as possible observing the team progress, noting any important decisions and group dynamics. The game master should provide hints or support only if players ask or if the educator notices that players are stuck on one task a lot longer than envisioned during the design stage.

When a game is tested several times, you will have a good idea of each player loop's length and the most critical points in the game. Thus, the more the game is played, the less technical intervention will be required from the side of the game master. The game is over either when the team reaches a conclusion or time runs out.

In educational escape games, you can often find the facilitator to be like a game master in a **role-playing game**. They are not part of the game, but more like an invisible "guiding hand". They may present the opening as a narrator and monitor the progress. The facilitator can also take up the **role of a remote ally**, physically not present in the game space but remotely communicating with the players. Here, communication can be done over walkie-talkies, chat, text or calls. Also, the facilitator can take the role of an **in-person ally** being in the same game space as the players and taking an active role in helping players or providing feedback on their performance. In this case, it should make sense inside of the story as well as explain why this character cannot or is not willing to do the work for the players.

No matter the style of the role, it is important for the facilitator to ensure the teams are moving forwards and enjoying the experience even if the puzzles are demanding. If the players get stuck on a challenge for a long time, it is better to assist them to move forward so that the whole story can still be unravelled in due time and the learning objectives fulfilled.

5.2.1 Hinting

For many educators, it is the first instinct to provide a correct answer to a struggling student. But in escape game design, we wish to create a struggling environment. In any game, a winning strategy and a correct answer should not come too easy and evident. It is hard but vitally important for the educator to wait until the players request a hint, help, or to be sure the team reached a dead end and it would be beneficial to guide the group. But even when learners struggle or reach a dead end, the hint should not be a plain correct answer. Thus, **a hint system needs to be carefully crafted alongside the game and adjusted through play-testing.**

One way of creating a hint system is having two hints per puzzle. One vague hint may get the group on the right track, other hints can be more evident in case the previous did not help, and, only if any of the hints do not seem to work and the players keep making the same mistake, the game master can provide the correct answer.

Another way of creating a hint system is having the hint system available online and players can choose to use the hints whenever they feel like it. Constant iteration will allow you to polish each puzzle and reach a state when teams spend enough time on each puzzle and manage to be in the flow throughout the whole game.

5.3 Post-Game Stage

At this stage, the game master steps back into the process by leading the debriefing, providing a follow-up activity and, if time allows, the players can have a picture taken in the game area and have a talk about any puzzles or design decisions that can take place. Before closing the game session, it is a good idea to leave players with a possible follow-up activity. This can be a link to an article, documentary, you can provide a flyer or invitation to an event of a similar topic.

5.3.1 Game Re-Set

Most likely, you will have to run several games in a row and it is important to have a game that is possible to restart in less than seven minutes. When re-setting the game, you want to go from end to start putting objects back into correct boxes, locking them with correct locks, randomizing lock combinations and placing objects in their spots.

During the whole process, look out for any objects left by the previous team and check that the game elements are not damaged or scribbled on. Just in case, always keep a few extra copies of any printed material which could be potentially altered by previous players.

The easier it is to reset the game, the fewer mistakes will occur when a game is facilitated many times in a row.

6 Do's and Dont's When Designing and Running Educational Escape Rooms

After supporting many groups in creating educational escape rooms, we have identified some common challenges. To help you avoid them, here are a few suggestions:

- **Invest more time into the story.** It is extremely important to have a story that players can relate to, a story that makes sense even without an escape room. Think thoroughly about the characters and events, build the game world and it will be much easier to create meaningful puzzles as well.

- **Think of a "ta-da!" moment at the end of the game.** A strong finishing puzzle, a plot twist, a difficult decision will bring emotions sky-high and create memorable moments. The more escape games you play, the more you forget puzzles, but an unexpected or emotional high stays in the memory for a long time.

- **Avoid wasting time with senseless puzzles in any escape game.** They can cause frustration in the group, and if the group fails, it will be quite a bitter loss. When designing an escape room, remember to stay on the player's side. You want the game to be challenging but not frustrating, and you want teams to win.

- **Don't make tedious puzzles.** You want a puzzle to be solved in less than five minutes or you will end up finding many players to be frustrated and bored rather than excited to continue.

- **Always have back-up materials.** Some extra print-outs and any vital components of the game should be backed up. You will be surprised how often players forget to return an object, scribble on pieces not meant to be scribbled on or break fragile objects. Back-ups and duct tape should always be at hand.

- **Use out-of-game stickers when you come to set-up a game in a new environment**. Make sure to check with the owner of the classroom what can or cannot be moved, what should not be touched and prepare the space accordingly.

7 Design Resources

In this chapter of the manual, you will find a collection of templates we use when creating educational escape rooms. Feel free to download them and use them when creating a room for your group.

7.1 Game Design Blueprint

A simplified document in which you can include the most important information about the game. It serves as a cheat sheet to the game master and enables new facilitators to easily understand the concept of the room.

7.2 Storyboard

The storyboard helps you with the logical structure of events, as well as character building, including their motivations, backgrounds and descriptions. For more details story-building, see chapter 4.2 - Story design.

7.3 Game Map

The game map is a visualisation of the logical steps which the players need to take in order to solve the room.You place puzzles throughout the game from the entry point to the exit point and add action descriptions that are needed to be done by the players to move from one loop to another.

7.4 List of Materials and Correct Lock Combinations

To secure smooth setup, packing and replayability, all materials needed should be listed here, including those which are not directly connected to the puzzles, but contribute to the atmosphere of the game. In case the listed material is a lock or other object connected to puzzle solving, include the code in the designated column.

7.5 Reset List

The reset list makes it easy to prepare the game for the next team of players in a structure manner minimizing the risk of mistakes. The Action field should contain detailed instructions, e.g. where to place specific objects, boxes, pieces of puzzle.

7.6 Test Feedback

Testing is a crucial part in game development. Whenever you run a test, you can provide this document to your testers in order to receive feedback. Having written feedback gives you the opportunity to come back to it later, compare results of different game iterations and draw conclusions.

7.1 Game Design Blueprint

Escape Room name:

Escape Room authors:

Contact person (name, email):

Game Topic:

Learning Outcomes (2-3):

-
-
-

Group Size:

Age:

Play time:

Game Rules:

Intro Story:

Ultimate mission:

Developed by:
Pavel Vassiljev

Gameplay (what is the step-by-step of this room):

Starting point:

Puzzle #1

Puzzle #

Puzzle #

Puzzle #

Puzzle #

Puzzle #

Ending point

Closing/Debriefing/Analysis:

Follow-up activity:

Erasmus+ erasmus+ and european solidarity corps agency SIKOKSIN! Be International Za hranice vzdělávání ticket2europe

Developed by:
Pavel Vassiljev

7.2 Escape Room Storyboard

MAIN CHARACTER

Name, surname	*Age, sex/gender, nationality, education, vocabulary*
Hobbies, clothes, physical attributes	*Likes, dislikes, values, relationships, struggles*

ENVIRONMENT DESCRIPTION

Era, year, country, town	*Space*

Erasmus+ erasmus+ and european solidarity corps agency SIMOKRATI Be International Za hranice vzdělávání ticket2europe

Developed by:
Pavel Vassiljev

EVENTS/ACTIONS (BEFORE THE ROOM)

ACTIONS/REVELATIONS (DURING THE ROOM)

Developed by:
Pavel Vassiljev

RESULTS/CONSEQUENCES (AFTER THE ROOM)

PLAYER'S ROLE

Who are the players in this story?

INTRO TRAILER

What is the story told to the players?

ULTIMATE MISSION

What is the main task given to the players?

Is this story believable?

Is the mission appealing to the target group?

Is it intriguing enough?

Erasmus+ erasmus+ and european solidarity corps agency SMOKSIGNAL Be International Za hranice vzdělávání ticket2europe

Developed by:
Pavel Vassiljev

7.3 Game Map

ENTRY POINT *How do players enter the game?*

ACTION
(Movement)

PLAYER LOOP 1 *Puzzle description*

ACTION
(Movement)

PLAYER LOOP 2 *Puzzle description*

EXIT POINT
Grand finale.
How does the game finish?

Developed by:
Pavel Vassiljev

7.4 List of Materials and Correct Lock Combinations

Quantity	Unit	Material state (torn, broken, written on, etc)	Code/Answer

Erasmus+ erasmus+ and european solidarity corps agency SIMOKSIN Be International Za hranice vzdělávání ticket2europe

Developed by:
Pavel Vassiljev

7.5 Reset List

Step #	Action	Lock/Puzzle Type	Code/Answer
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			

Erasmus+ erasmus+ and european solidarity corps agency SIKOKSIN! Be International Za hranice vzdělávání ticket2europe

Developed by:
Pavel Vassiljev

7.6 Test Feedback

Name of the game tested:

Rate the game overall	*Bad*	*1*	*2*	*3*	*4*	*5*	*Great*
Rate the game's fun factors	*Bad*	*1*	*2*	*3*	*4*	*5*	*Great*
Rate the game's learning factor	*Bad*	*1*	*2*	*3*	*4*	*5*	*Great*
The story of the game was believable	*Disagree*	*1*	*2*	*3*	*4*	*5*	*Agree*
The puzzles connect to the story well	*Disagree*	*1*	*2*	*3*	*4*	*5*	*Agree*
How likely you would recommend this game to be played?	*Not likely*	*1*	*2*	*3*	*4*	*5*	*Very likely*
The game rules were:	*Confusing*	*1*	*2*	*3*	*4*	*5*	*Clear*
The game duration was:	*Too short*	*1*	*2*	*3*	*4*	*5*	*Too long*
The game difficulty was:	*Too easy*	*1*	*2*	*3*	*4*	*5*	*Too difficult*

How long did it take you to play the game?

What elements you enjoyed the most?

What elements you enjoyed the least?

What (if anything) was confusing at the beginning, during the game or after?

Was there anything you wanted to do that the game wouldn't let you do?

Any puzzles or story parts didn't make sense to you?

Did you win or lose?

Developed by:
Pavel Vassiljev

8 Partner Organisations

et.shokkin.org @shokkinest

Shokkin Group (Estonia) is a youth organization composed of young people aged 15-30, youth workers, educators and youth work trainers. The organization was founded in 2011 with the main aim of empowering young people of Estonia to live a pro-active lifestyle by providing them with opportunities to develop competencies for personal, professional and social growth. Shokkin Group specializes in game-based learning and creative solutions for the youth work and education fields.

Be International
Za hranice vzdělávání

beinternational.cz @beinternationalngo

Be International is a youth organisation based in Brno, Czechia. We believe in a world where young people enjoy their learning, are engaged in public affairs and develop themselves through non-formal education. Our journey towards a better world leads through synergy of local activities, international youth mobilities and volunteering.

ticket2europe

ticket2europe.eu @Ticket2Europe

Ticket2Europe is an organization founded in 2016 in Pontevedra with the mission is to open up new paths and development possibilities for young people, specially those in NEET situation or who come from regions with geographical obstacles. Our activities and projects are focused on areas related to European values and topics such as human rights, social inclusion, peace building, social minorities, youth employability and entrepreneurship.

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Breakout BOX

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