Digital escape room in collaborative learning

Popular recreational games, escape rooms, can be adapted and used in the educational context. This interesting, engaging, and collaborative activity can be used to introduce the new content, as an activity for reflection on the previously received input, or the assessment of knowledge or skills. The intention of the activity is to increase motivation, improve learning and develop collaboration (Veldkamp et al., 2020). The literature has described escape room settings in various fields, for instance, medicine, chemistry, mathematics, history, English, physics (Veldkamp et al., 2020). The game consists of a challenging story, formulated as a mission that students need to achieve in a short time. During the mission, they solve various clues and puzzles that lead them to the final clue which is the exit of the game.

The digital escape room can be performed synchronously and asynchronously (Neumann et al., 2020). Playing the escape room synchronously the educator introduces the game at the beginning of the meeting and divides the students into breakout rooms. In the asynchronous approach, the educator can introduce the game with a brief video and explain the mission and process. In both approaches is important to offer support, monitor the development of the game, to react and answer the challenges that may occur.

Planning steps

👫 Participants	
Target group	When planning this activity, take into account your participants, their prior knowledge, skills and experience. If possible, take into consideration the affinities and align them when writing the background story.
	Consider the time, difficulty, mode, and scale (Clarke et al., 2017). Which setting aligns the best the profile of your students?
	• How long will the play last? The activity can last from 15 minutes to several hours but to several days.
	• The level of difficulty depends on the goals you want to achieve but, on the level of knowledge or skills of participants, as well.
	• The mode defines the way the participant play; is the game cooperative, collaborative or competitive?
	• With scale, you define the number of participants that will play the game.
🖋 Content design	
Learning goals	Define the learning goals of the game. What will students achieve with this game? What content knowledge or skills do you refer with this game? Do students *demonstrate* the knowledge, or do you

	want to *introduce* or *extend* the content, or you want to *assess* the student knowledge in a summative way (Veldkamp et al., 2020)?
Position of the game	The position of the game is connected to the goals you want to achieve. When happens the game? Is the game a stand-alone activity or you want to place the activity at the introduction of the course? The position of the game can be also during the course and as assessment at the end of the course (Veldkamp et al., 2020).
Take-aways	Considering the learning goals, define the take-aways (Neumann et al., 2020), content- and goals-based elements that the students will be able to take away after this game. The number of take-aways depends on the structure and position of the game.
Structure	The structure of the game can be simple and open but also complex, depending on the position of the game and your goals. The structure defines how are the puzzles and clues linked to each other and how they influence the meta-puzzle (the puzzle that opens the gate and finishes the game). Fig. 1. *Puzzle structures in escape rooms: a) basic structures: open, sequential and path-based; b) a complex, hybrid structure, such as a pyramid. Squares are puzzles and rectangles are meta-puzzles (adapted from Nicholson, 2015).* Source of the image: Escape education: A systematic review on escape rooms in education - ScienceDirect Veldkamp, A., van de Grint, L., Knippels, M. C. P., & van Joolingen, W. R. (2020). Escape education: A systematic review on escape rooms in education. Educational Research Review, 31, 100364.
Think puzzles	Based on the take-aways defined previously, you need to think about the puzzles and clues that will be implemented in the game. At this level, think about the possible tool, e.g., what is the form of the puzzle? The puzzles can be multiple-choice questions, crosswords, drag and drop, and many more. Consider that the answers students give will be short or based on clicks. After solving the puzzle, as a result, the students receive a code. Think about what kind of a code you could implement in each puzzle. The codes are based on short sequence of numbers and/or letters. The codes students get from solved puzzles will either be the trigger for the next puzzle in a complex structure (if you have a predefined sequence in escaping the room) or will be an element to fill in the meta-puzzle, in an open structure. Write down the questions for the puzzles, answer options for the multiple choice or crosswords that you will implement in a digital environment in the content development stage.

Background story	The scape room needs an exciting background story. The story has to immerse players into the role of a detective or a rescuer that takes them through the whole mission during the game. There are some typical stories such as: detective story, mafia boss, invasion of aliens, natural catastrophe, apocalypse, ... The stories can be based on a movie or a book as well. The story with an exciting mission can be adapted to the content you are teaching. For instance, you can involve a chemist, a teacher, a mathematician doing some kind of experiment, research, or they get threatened form mafia, or they have one hour to safe the world.	

Content development

Game environment	Create an environment where the game will take place. The game itself has to be shareable and therefore think about which tool are you going to use. It can be a website, or you can use an app that enables the integration of a background image and to embed puzzles for the game. It is also interesting to embed the countdown time. There are a lot of videos on YouTube with 20, 30, 50 minutes or other countdown time, or there are apps with countdown timers that can be adapted and embedded to the game. Screenshot YouTube, video by The Skeptical Educator: Google Slides Bitmoji Escape Room Tutorial - YouTube	• Weebly, Wix or any other website tool • Google sites, google slides or MS Office pages, website • Apps such as: ThingLink, Miro, ... Online-Timer	Countdown	WebUhr.de
Images	• For the game development, you will need one **background image**. On this image will happen the whole game. You can create your own image, take a photo (of your university, for instance) or find one on the internet considering the creative commons licences. • You will also need **images for the puzzles**. Those images or icons will hide the links to the puzzles. The students will click on the puzzle image to the puzzle will pop up or open in a new window. • Find an **image for the escape – the meta-puzzle**. It can be an image of a key or a door lock key code, where you hide the meta-puzzle. After completing the meta puzzle is the game over.	• Google images / search filter / usage rights • Free Creative Commons Zero Images (pexels.com) • Creative Common Pictures	Download Free Images on Unsplash • Flickr: Creative Commons • Free Vectors, Stock Photos & PSD Downloads	Freepik

Create puzzles	The puzzles are the small tasks that students have to solve correctly in order to be able to advance in the game and to escape (finish) the game. Take the puzzles formulated in the previous stage and transfer them to digital activities. There are a lot of possibilities. Think about the tools and apps that are available to you. Create the activities and save the links.	• H5P, • Google forms. • MS Forms, • ClassTools Crossword Generator, • Home - Socrative, • Learning tools, flashcards, and textbook solutions | Quizlet Find more puzzle development tools –in Neumann et al., 2020 - Appendix B, p.424 [2]
Create meta puzzle	The meta-puzzle is the final puzzle that need to be solved to escape the room. You can create the meta-puzzle as a form that students will fill in with the codes that they received by solving the puzzles during the game. The meta-puzzle can be hidden behind the door lock image. After solving the game, escaping the room – entering all codes of the game – the students can receive a short message that they have just saved the world, deactivated the ticking bomb or anything that you have written in the background story – what the mission of the escape room is.	• Google Forms • MS Forms
Compile all elements	At this level you compile all game elements together. Open the game environment page, prepare all images and links of the puzzles. Add images on the background image of the game. Those images represent puzzle, hide links to the puzzles behind the images and add the image and link to the meta-puzzle as well.	
Test	Test the game. If possible, ask your colleagues to test the game with you.	
▶ **Implement**		
Go live	Play the game with your students. The students are divided into breakout rooms.	
✓ **Evaluate**		
Evaluate	Evaluate the game. Have you reached the goals defined at the beginning? What went well – what do you need to improve? Have the students participated as you planned? Has everything technically gone well?	

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Get feedback	Create a feedback form and ask students about their experience with the digital escape room.
Improve	Improve the game settings for the next play.

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