An investigation into the mechanics and affordances of digital escape rooms

Rachelle Rawlinson, Northumbria University

Abstract

Escape rooms are an increasingly popular way to offer an engaging education activity in the classroom. Digital escape rooms take aspects of physical escape rooms and apply them to digital environments using technological affordances and technically-mediated devices such as computers, mobile devices and VR headsets. This work-in-progress paper investigates game mechanics and the affordances of digital escape rooms to understand how players are engaged in play in digital escape rooms. This has been explored through a small-scale qualitative study of eight educators with experience of escape room play. Semi-structured interviews were used to identify examples of mechanics used to engage players in digital escape rooms and their associated affordances. Through thematic analysis several game mechanics and their affordances were identified. Participants demonstrated particular interest in spatial mechanics which is explored in this paper. The findings indicate that digital tools offer opportunities to increase access, flexibility, and create mixed reality experiences for players. Manipulating digital spatial boundaries enhances player immersion and interaction with digital tools, creating opportunities for discovery, teamworking and adventure. These findings offer insights into design implications for digital escape rooms for use in education.

Key words: affordances, digital escape rooms, education, escape rooms, game mechanics

Introduction

Escape rooms offer an educational model to incorporate active pedagogies into the classroom (Rawlinson & Whitton, 2024) enabling learners to playfully take a central role in their learning process, to actively construct their understanding while engaging in creative playful problem-solving pursuits (O'Brien, 2021; Manojlovic, 2022). This work-in-progress paper explores digital escape rooms to understand how mechanics and their affordances are used to engage players, with a focus on spatial mechanics, and offers insights into digital escape room design for education.

Background

Escape rooms are immersive, themed, live action games in which teams of players work to uncover clues and solve puzzles with the goal to 'escape' in a specified timeframe (Nicholson, 2015). Escape rooms/games have grown in popularity as a leisure activity and educational opportunity (Rawlinson and Whitton, 2024). The traditional 'escape room' is an in-person activity involving people physically coming together in a space. 'Digital escape rooms' refer to their digital counterparts and involve

people playing at a distance, mediated by an interface such as a computer, VR headset or mobile device. Digital escape rooms offer action-oriented, flexible and accessible gameplay experiences (Makri, Vlachopoulos & Martina, 2021). Different models of escape room include hybrid (in-person and digital converging), mobile (including apps) and digitally facilitated (players direct characters digitally).

In this paper I use Norman's (2013) definition of 'affordance' that describes the relationship between a user and object and the capabilities of the user to determine the objects use, e.g. a key and a keyhole, which is contextually relevant to both in-person and digital escape rooms but enacted differently.

Digital escape rooms take aspects of physical escape rooms and apply them to digital environments using technological affordances, such as screen real estate to direct players around digital spaces and providing real-time feedback in dynamic environments which offer players a role in their play. Digital escape rooms are hosted using a vast range of technologies ranging from web-accessible note taking (OneNote) or form creation (Google Forms) tools allowing password protection and linear sequencing of information, to more specialist design tools including augmented/virtual reality, video games and apps that operate online or offline and offer functionality such as conditional logic and visual novel creation.

Mechanics are key underpinning elements of game design, along with story, technology and aesthetics (Schell, 2004). Multiple definitions of mechanics exist but for simplicity, this paper assumes game mechanics to be rules that determine how a game works (Sylvester, 2013). Game mechanics relate to the way a player plays a game and how the game responds. Table 1 below outlines some key mechanics from escape rooms and describes how they are used.

Mechanic	How they are used in escape rooms
Puzzle-solving	Interlinked puzzles and challenges require players to solve them through clue-finding, critical thinking, creativity and problem-solving.
Discovery	Actively seeking information, uncovering clues, or items needed to progress whilst working to deduce how, when and why to use it.
Teamwork	Collaborative working and communicating to effectively co-ordinate effort, division of resources/tasks or working together (e.g. pressing buttons simultaneously).

Narrative	Provides context and purpose to the room/puzzles through storyline, role-play, thematic puzzles/clues and environmental storytelling. Narrative is key for immersion, collaboration and motivation of players.
Immersion	Relatable scenarios draw players into the game-world and gives purpose. Achieved through environmental storytelling and narrative, feedback, game-hosts and contextually understandable interactive elements e.g. role-play.

Table 1: Mechanics and how they are used in escape rooms

Game designers design systems of mechanics that generate 'events' created by interactions between the player and game and governed by rules which happen during play (Sylvester, 2013). This means for every group game-play looks different, as the interaction is ultimately controlled by players, who have a stake in controlling how the game unfolds.

Methodology

I designed a small-scale qualitative study to explore participants' experiences with escape rooms both as players and educators. To do this, I carried out eight semi-structured interviews with educators until I reached data saturation. During interviews, participants identified examples of mechanics used to engage players in escape rooms, and their affordances.

Participant selection

Participants were selected through uncontrolled quota sampling (Simkus, 2023) where participants self-selected based key characteristics: experience of playing escape rooms (including digital), current Higher Education teaching experience, and recent student experience on a postgraduate education degree.

This study aims to understand how game mechanics and their affordances are used to engage players, to offer insight into digital escape room design for education. To achieve this I recruited participants who had experience as both an educator and a student. This dual understanding allowed reflection on both the education system as learners (being engaged *as* a student), while incorporating professional expertise (designing engaging learning *for* students), therefore offering a multi-faceted perspective.

The diverse sample included 2 men and 6 women aged 30-44, representing various professional and academic backgrounds and diverse ethnic and disability statuses.

To maintain participant anonymity and confidentiality, Disney character names were used as pseudonyms. For neutrality I opted for lesser-known characters, which may still seem familiar (see Table 2).

Participant	**Role**
Rex	Staff facing – enhancing teaching practices
Remy	Student facing – teaching focussed educator
Asha	Staff facing – enhancing teaching practices
Rey	Student facing – teaching focussed educator
Safi	Staff facing – enhancing teaching practices
Stella	Student facing – widening participation
Wanda	Student facing – teaching focussed educator
Agatha	Student facing – teaching focussed educator

Table 2: Research participants

Data collection methods

During the semi-structured interviews, participants shared experiences and perspectives on escape rooms through the lens of player engagement, considering their role as both a player and educator. Questions were asked in three sections.

Firstly, focussing on **escape room formats**, reflecting on how different mechanics (e.g. time constraints, puzzle design, teamwork) influenced motivation and immersion during play. Participants drew on memorable experiences to explore aspects that were more, or less enjoyable (e.g. narrative coherence helps to build immersion and interactive design is memorable because it can be surprising).

The second part focussed on **personal play experiences**. Here participants discussed decision making: what to play, how to play and who to play with. They discussed their personal process of playing, including approaches to problem-solving, information discovery and engagement with game mechanics (e.g. narrative flow, immersion and discovery). Players reflected on mechanics they felt were most engaging, noting aspects that hinder engagement e.g. poorly designed puzzles and complex narrative.

Finally, participants drew **parallels between escape room mechanics and learning strategies**, such as active learning. This included sharing personal learning experiences and how these had been informed both positively and negatively by games and reflecting on current positioning in relation to game and how this supports or detracts from fostering engagement in learning environments. In this section participants drew parallels between escape room mechanics and constructivist learning principles including problem-solving, collaboration and experiential learning.

Data analysis

I undertook thematic analysis following Braun and Clarke's (2019) six-phase framework to analyse the data. This involved data familiarisation, coding, initial theme generation, theme development and refining themes. For this work in progress I focus on one emergent theme – mechanics and affordances, exploring implications for digital escape room design.

All decisions were guided by BERA ethical guidelines (2018) and Northumbria Universities ethical guidance and ethical approval received (project 5957 submission reference OBrien2024-5957-5694).

Findings and discussion

The data provided a wealth of information about participants' experiences of mechanics in escape rooms. This was categorised into five themes. This work in progress paper focuses on one emergent theme – mechanics and affordances. Table 3 below outlines mechanics participants discussed from their experiences of escape room play, and aligns it with affordances for digital escape room design. These affordances shape how players interact with the game and contribute to the overall play experience.

Mechanic	Participant quote	Affordance
Adventure	"…you become very invested in the characters, start to relate to them and put yourself in their scenario so you can work as if you are them" – Rex	Questing, character or role development (immersion), progressing through the story, solving puzzles and finding clues (discovery) supports immersion and engagement with the game.
Failure	"…sometimes I give up on something when I hit a frustration level, I walk away. But intrigue brings me back to it in an escape room and once the frustration has died down I try again." – Remy	Productive failure enables players to learn from mistakes and refine strategies.
Immersion	"sometimes I get so caught up in the game world I forget what I was meant to be doing or what I'm supposed to do next." – Safi	Enhancing players' sense of being 'in the game world' and motivates players to complete the activity.

Lateral thinking	"…I really like like Taskmaster type puzzles where it doesn't make sense and you have to figure out how to do it" – Asha "If it doesn't tell me the internet is banned, Google is a valid resource." – Remy	Creative and unconventional solution finding by considering different perspectives and using divergent methods to find solutions e.g. googling, offering opportunities for surprising discoveries.
Pattern recognition	"Sometimes our thing of like this is a mystery. There's some contradiction, or there's some tension. So it's like it. It seems like something that I need to pick apart" – Rey	Ability to perceive potential outcomes based on reading the environment. Reading the pattern means you can figure out what might come next. Scaffolding to support players linking information.
Problem-solving	"a game is often a similar way of creating problems you need to solve and pushing you in the right direction and that's beneficial for me. – Stella	Digital environments offer clues that indicate possible solutions to overcome challenges e.g. leaving an item in plain view that offers a solution to a problem, like a missing puzzle piece.
Strategy	"If working in a team like, almost divide and conquer is being like very clear what everyone's task is going to be" – Asha	Planning approaches before carrying them out, thinking ahead and being mindful of where you are now. These might shift depending on time dependency e.g. as time is running out strategy may be less of a consideration.
Space	"Sometimes the puzzles just making you feel more, in a sense, multi-dimensional like you know your importance in the space" – Rey	Screen real estate, environmental interaction (discovery), awareness of your own role and strategic positioning in relation to what's around you.
Surprise	"there was a laser puzzle where you had to line things up and when you did it hit a mirror and bounced in the other room. That was so surprising, but also kind of obvious, but so exciting and I couldn't help but laugh" – Wanda	Unexpected elements to keep the game exciting. Deducing correct information, knowing there will be unpredictability and deception.

Teamworking	"playing with the right team is so important. I've played with people who just take over everything but the right team you can learn from. You can suddenly be like how did you do that? And share solutions" – Agatha	Collaborative and cooperative mechanics push players forward as they work together to achieve common goals.

Table 3: Mechanics and affordances

Spatial mechanics

Participants expressed engagement with and interest in multiple mechanics. Space or spatial mechanics were of particular interest among participants which was evident across multiple interviews. During data analysis, I noted that participants referenced how spatial mechanics linked into structure and design of escape rooms as well as influencing play experience and engagement. The decision to foreground and explore spatial mechanics in this paper reflects this shared experience and the prominence of this theme in my data.

The concept of 'space' and how this is planned and used in escape room design was understood and reflected on differently by participants. There was synergy in perspectives that escape rooms exist as a spatial structure (Nitsche, 2008), and that escape room design is intended to support and encourage play experience players navigate through narrative based sequences. Five participants concluded that considering spatial affordances can encourage exploration beyond the boundaries of an escape room.

> …when I've played Minecraft escape rooms they lead you through rooms with the story. You complete one bit then move on to the next bit and the story unfolds are you move through the different rooms - Agatha

Manipulating spatial boundaries in physical escape rooms might involve exploring concealed rooms or passages, redefined layouts or revealed compartments which aligns with Nicholson's (2015, 2016) observation that spatial transformation is a core mechanic in immersive game design.

> …the surprise of a concealed room is hard to describe. It just makes you feel so excited and all of a sudden the space is even bigger – Wanda

These shifts not only surprise players but force them to reorient their understanding of the environment they are in, encouraging adaptive problem-solving and spatial reasoning.

In digital escape rooms, spatial boundaries are constructed through the interface itself. This means that spatial manipulation shifts from physical space to screen space, referred to as screen real estate. This might include approaches such as concealing clickable areas, layering interactions, scroll-based discovery, zoom and pan mechanics to name a few. In designing this way, players' spatial experiences are redefined.

Although digital manipulation may mirror physical concealment, operating through interaction design can create a different engagement experience for players.

> …surprising when you work in the digital environment… we were doing this one [digital] and one of the clues, give you co-ordinates, linked to a URL. That broke out of the game entirely and led you to Google Maps… like zooming in and out using all the screen real estate. I gasped I was so shocked – Rex

Manipulating spatial boundaries digitally (like screen real estate) can enhance player immersion and interaction, affording greater opportunity for discovery, teamworking and adventure. As players interact within space and with the space itself, connections to their own [spatial] positionality can become more defined.

> …I become really aware of where I am in an escape room, like physically, and what I'm doing and how I move in the space even when I'm online - Safi

The interplay between physical and digital environments as discussed by Asha highlights O'Keefe et al.'s (2024) 'blended spaces framework' which blends spatial design to create mixed reality spaces constructed of commmonalities between digital and physical spaces, incorporating the interplay of things, relationships and people to create novel experiences.

> …surprising how well escape rooms utilise the space. Like [in-person] how many puzzles you can fit like into one room that's not much bigger than a cupboard and [online] how you move around and there are no limitations but there are still boundaries - Asha

Participants highlighted preferences for digital escape rooms citing low-cost and controllable pace as positives difficult to emulate in-person (Makri, Vlachopoulos and Martina, 2021).

> Yeah, because, firstly, it [digital escape rooms] involves no cost, and certainly you can solve it at your own time. And you don't need to get people to come together physically – Rey

Additionally, using digital technologies in physical escape rooms can offer affordances in relation to access, inclusivity and flexibility in spaces.

> It's the case that a lot of escape rooms use spaces to create immersion by asking you to crawl, or go up and down staircases, so you'll then put in barriers in the space. So I think making sure that they are designed with as few barriers as possible and technology can support that as well as making games more inclusive. Think about it, you can make a space bigger with technology – Wanda

As well as providing opportunities for collaborating in spaces.

> I don't always think that working collaboratively is an easy thing. It can introduce a lot of challenges, but something like an escape room. I think it's really helpful to work collaboratively in that. It may be kind of little sort of ad hoc affiliations that you make with another person and often it's mediated by the space like sharing information and clues – Rex

These findings demonstrate that flexibility in design, technology integration and removing barriers in-game can support access and engagement. Reduced barriers offer opportunities for player collaboration and access that transcend physical spaces, creating more inclusive and engaging play experiences that expand the play space beyond the physical boundary. Navigating players (scaffolding) play experience with mixed reality integrations offers new opportunities for lateral thinking, problem-solving and surprises. For example, integrating technologies such as NFC (Near Field Communication) or RFID (Radio-Frequency Identification) into physical environments to blur the lines of boundaries, making small spaces feel expansive.

Educational contexts can be informed by learnings from digital escape rooms. For example by adopting technology into gameplay or educational spaces. By leveraging the affordances of digital, or computer-mediated interaction, including spatial mechanics into the classroom, we can offer opportunities for immersive and engaging learning experiences for students. The employment of such game mechanics in digital contexts aligns with playful learning practices and signature pedagogies (Nørgård, Toft-Nielsen & Whitton, 2017). Some examples of how this has been employed in education include supporting problem-solving simulation learning in medical education (Guckian, Eveson & May, 2020), or using tools such as 360-degree video and VR for immersive teaching and learning in drama (Brown, Childs & Youdale, 2024), as well as to support STEM subjects such as

molecular biology (Alonso & Schrroeder, 2020) and engineering (Magreñán, Jiménez, Orcos & Roca, 2023).

Conclusion and recommendations for practice

This work in progress paper considers how game mechanics and their affordances are used to engage players in digital escape rooms, taking a specific focus on spatial mechanics to explore its role in influencing gameplay and engaging players. Participants highlighted the impact of spatial manipulation in both a physical and digital environment on their sense of immersion, problem-solving strategies and collaboration. In educational contexts, these findings suggest opportunities for using such mechanics to shape engagement and learning in the classroom, especially in relation to experiential and authentic learning, particularly when designed with intentional spatial complexity.

Recommendations for practice:

- **Integrate spatial mechanics into curriculum design** – design learning spaces (both physically and digitally) with flexibility in mind. Learning opportunities can be designed to encourage students to creatively explore the boundaries of spaces to encourage discovery and curiosity, encouraging students to explore further.

- **Blend the physical and digital** – blending physical and digital spatial strategies, educators can create immersive learning experiences that extend beyond traditional classroom boundaries and that use affordances offered by technology to enhance education.

- **Align game mechanics with learning outcomes** – design tasks that mirror desired learning outcomes, encouraging students to think critically, creatively and problem-solve. For example, incorporating subject specific simulation, scenario-based work or opportunities for students to take on roles.

- **Design for immersion and collaboration** – create learning opportunities that allow for team working. For example narrative can provide context and purpose, and puzzles or problem-scenarios can set up situations where information is shared and explored in groups.

- **Balance challenge and inclusivity** – scaffolding learning experiences by keeping in mind how students use the space and the information they need to proceed. Keep practicalities in mind and consider what you may be able to supplement with additional explanations, or alternative engagement opportunities.

- **Debrief** – Following any activity provide opportunities to reflect on the experience. This will check students have understood links to learning and provides opportunities for highlighting key takeaways.

This work has provided insights into how design choices in escape rooms can inform educational design. Next steps and future research will involve further exploration into game mechanics to inform the design of digital escape rooms and consider their use in educational contexts.

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