There's no escape: Using Escape Room game design principles to engage library users

Introduction

Capturing the imagination of students and engaging them in library services and programs is important for university libraries at the start of each new academic year, particularly during orientation week. The challenge for library staff is working out how to renew orientation activities so that they stay fresh and relevant to new students, yet manageable within competing operational demands. In 2016, the La Trobe University Library piloted an engaging and interactive new orientation activity to help students to get to know the library. Our new approach brings together the digital and physical environments by capitalising on the internationally popular game, Escape Rooms. This paper presents a case study of the process used by La Trobe University Library to develop and implement this approach and the outcomes of the first implementation.

Escape rooms are a live puzzle game where players are locked in a room, need to find clues and solve puzzles to 'escape the room'. Escape rooms' popularity around the world is reflected in their consistent #1 ranking in the TripAdvisor 'Fun Activities' category. This game concept started in Japan in 2007, then gained popularity through Asia and spread to the U.S in 2012 (French, 2015). The rapid growth and extreme popularity of escape rooms has been examined in detail by Wiemker (2015) who stated that 'Escape Rooms are experiential at their core…. They require a diverse set of skills and knowledge to play and are therefore appealing as corporate exercises for team building.'

La Trobe University Library took the escape room concept and transformed it into a blended online and physical orientation game for teams of students to learn about key library services. **Escape Room at the Library** is an example of the potential of game design for increasing student engagement with the library in online (Walsh, 2014) and physical spaces (Angell & Boss, 2016). To get started students form a team of at least two and then access the **Escape Room at the Library** app via their mobile phone. The mobile app is used to access the hints and clues that are needed to solve puzzles scattered around the library. Through the game students explore the physical library space and become aware of key services and facilities. The game can be played at any time during library opening hours. Adopting this concept for library orientation utilises the principles of gamification and problem-based learning to enhance student engagement by tapping into intrinsic motivations.

Gamification

Gamification is an effective method to create more engaging orientation or induction programs in libraries. It is defined as "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012, p. 46). Gamification can also be described as "using game elements in non-game contexts as a means to engage and motivate users" (Fitz-Walter et al, 2012, p. 138-141).

Gamification works by tapping into human intrinsic as well as extrinsic motivations (Barrows, 1996) Examples of these motivations include people's normal desire for socializing, learning and achievement. Domínguez (2013), concluded that implementing game mechanics is not a small task and requires skilled crafting and a large amount of effort for it to achieve maximum effect and truly

improve engagement and motivation. Kapp (2012) lists the following elements as essential to game mechanics:

- Goals
- Rules
- Conflict, competition, or cooperation
- Time
- Reward structures
- Feedback
- Levels
- Storytelling
- Curve of interest
- Replay or do over

Puzzles are the underlying component of escape rooms. Each puzzle uses a game loop which is described by Wiemker (2015) as:

- A Challenge e.g. To open a combination lock of a box
- A Solution (to be found) e.g. Clues or puzzles to open the combination lock
- A Reward for solving the challenge e.g. The contents of the box when opened

Puzzles can be categorised into two types: physical and mental (Wiemker, 2014)

- A physical puzzle involves a task where real world items are manipulated to finish a challenge. An example of this is moving through a maze.
- A mental puzzle requires thinking and logic skills. The player must use logic such as deduction and correlation to solve the puzzle.

When we adapted the escape room concept to a student learning environment, we made use of both the elements essential to game mechanics and physical and mental puzzles in order to maximise engagement and learning effectiveness.

Escape Room at the Library and problem based learning

Problem based learning has been used successfully by many academic libraries around the world to increase the level of interaction in library learning activities (Angell & Boss, 2016). Barrows (1996) identifies six characteristics of problem based learning. Four of these characteristics are applicable to **Escape Room at the Library**, including: student-centred learning, creation of small groups, teacher as facilitator (in the case of **Escape Room at the Library**, the mobile platform acted as the facilitator), and learning stimulus organised around a problem.

The puzzles integrated into **Escape Room at the Library** are problem-based activities intended to enhance knowledge retention through a 'challenge, solution, reward' game loop (Wiemker, 2015). The combination of actively solving puzzles and physically experiencing the library has the potential to be a more memorable learning activity for students. In developing the 'cone of learning' model, Dale found that after two weeks, people retained only 10% of what they read, 20% of what they heard but recalled 90% of what they did. Dale (n.d) emphasises that 'experiential learning' involves all the senses. The more senses used in interacting with a scenario, the better the chance of retaining what has been learnt (French, 2015). The Escape Room at the Library game also uses tactile elements to involve as many senses as possible.

Development of Escape Room at the Library

To develop **Escape Room at the Library**, the Library team went through the following five stage process:

1. Development of the game design brief
2. Ideation
3. Technical development
4. Puzzle development
5. Testing

1. Development of the game design brief

An environmental scan of physical Escape Rooms in Melbourne was conducted by the Project Coordinator to analyse the structure and components of an Escape Room experience was the first step in the development of the game design brief. The scan also involved research into online 'escape games'. A concept brief was then created to identify the following areas of game development, including:

- Objectives
- Challenges
- Risks
- Measuring success
- Ways to capture data

Objectives

The objectives of the game project were:

- Playable at any time during opening hours.
- Facilitate many players at any one time.
- Zero staff facilitation, the game needed to be self-directed.
- Game needed to be accessible on the go

Challenges

In thinking through the game design, a number of challenges needed to be addressed, including how to:

- adapt the escape room game concept to the whole of the library building.
- make the game scalable to facilitate many teams at any one time.
- minimise disruption to non-game users of the library.
- minimise risk of injury to players and other library users.
- incorporate key messages/learning provided via the existing library orientation tour.

Risks

We identified the risks associated with live action game play and addressed them through the following methods:

- **Running** – Added a message in the 'how to play' section as well as the registration page.
- **Injury** – Ensured Library/University insurance covered the event. The university legal department created the game terms and conditions that included a clause for indemnity.

- **Congestion** – Designed the game as a blended online and physical game. The mobile app rotated each team through 3 different starting points in the library. When working out the placement of puzzles in the library, we avoided high traffic areas such as the help desk zone.
- **Maintenance** – In normal Escape Rooms, staff are required to re-set the game pieces for each team. This is time consuming and would not work when there are many teams playing at any point in time. We only designed puzzles that didn't involve resetting.
- **Damage control** – There was the potential for physical puzzle pieces to be damaged or go missing. When each puzzle was manufactured, we created two of each item. We also assigned a staff member to check if any puzzles needed replacing each morning during the game period. It took 15 minutes. There was only one occasion when we had to readjust the pieces. As part of the introductory message to set the scene or story of the game, it was heavily emphasised to the players that they did not need to move, lift or dismantle anything.
- **Cheating** – There was the potential for teams to cheat and we had to design a game with elements that would reduce this possibility. We decided that each team would be assigned a unique password that needed decoding using a cypher key in order to complete the game and obtain instant prizes at the end. We also used two cypher keys and alternated these keys for each team. Teams playing at the same time could not ask one another how to decode the password.

Measuring success

Managing stakeholder expectations can be difficult, how each individual assesses the success of a project can vary from person to person. We agreed to a common set of four quantifiable measures. The game would be considered successful if the post-game survey indicated that over 80% of respondents had fun, learnt something and would recommend the game to a friend. The last key measure was a participation rate above or equal to library orientation tour participation.

Ways to capture data

In order to measure the success of the game, we designed the ending of the game to lead students to a door where they were able to complete a post-game survey. We increased participation and incentivised completing the game and survey by providing prizes once players reached the door. The survey was designed to be completed in 3 minutes and tested whether students remembered the learning outcomes.

In addition to the post-game survey, we developed a back-end administration section as part of the mobile platform. This back-end section gave staff real-time information about:

- length of time taken for each puzzle,
- which storylines and passwords were assigned,
- start times and completion times,
- and which pages and hints were clicked on.

2. Ideation

The ideation process involved looking at the existing library tour script to identify information that could be used in the new game. We used 20% of the content from the library tour script. To decide which content was most important, we prioritised content based on 'what students would need to know now and what they can find out later as a result of knowing something now', for example:

- location of library facilities
- services offered by Ask La Trobe Staff

- where to find resources
- library notices and La Trobe Email account
- using the Dewey number system to find a book and book returns

Once we identified the learning content, we brainstormed a range of puzzles and storylines, for example:

- The crazy librarian
- Ghost
- Uncovered artefacts
- First university librarian's will
- Secret society
- Beings from another dimension

We also brainstormed puzzle ideas that could be used with storylines, for example:

- Entry in a fictitious book
- Diorama with alphabet and a book with information or story that will help to decrypt the scene in the diorama
- Cypher
- Maths or clue to move pieces
- Connect the right dots to form correct code
- Touch two things to connect and initiate clue (light/sound/pointers, unlock something)
- Refracted light
- Crossword and filter or set of clues that spell out something.
- Spot the difference
- Move objects with magnets
- Align objects in a particular direction to form a word
- Visual overlay – putting one item over another
- Colour code and notes or sounds
- Smell puzzle (put the right smell in order to get a code)
- Call someone (get a voice message with a clue)
- Photos with clues in it to lead the player somewhere
- Odd one out
- Mirror images to form a word or clue
- Words scattered on wall with a secondary eye piece. When player looks through eye piece from the right angle, it lines up the points to form a word or combination which is then used to give the next clue or open the combination lock.
- Painting on wall has details in it or secret message.
- Abacus type activity where units need to be moved to form something.
- Chest with boxes to pull in/out – one box has something that will lead them to…
- Flip blocks in a 3x3 square like naughts and crosses.
- Redirecting a light sources and/or using sensors

We worked with a Melbourne escape room company called Rush Escape Games to help turn our ideas into a workable game framework. The collaboration resulted in the development of four mini puzzles that would provide the clues for one main puzzle. On solving the main puzzle, players would

find the secret location and decode the password to claim their prizes. Puzzle designs for our final set of four mini puzzles included:

- 'Where's Wally' type puzzle
- Treasure hunt
- Spot the difference
- Visual overlay
- Image with secret details or message

Figure 1 - Students working on Puzzle 1

Figure 2 - Students working on Puzzle 4

3. Technical development

The following were the technical design considerations that helped achieve good game play:

- The mobile game platform used JQuery mobile and html5 web languages which meant that the game was accessible by all smart phones, tablets, laptops and desktops. The technology allowed the game to be phone and device agnostic.
- The game was hosted on a university web apache server and used a MySQL database to store data.
- A small file size (9 mb), enabled quick access to the game with no wait time. The game only needed to load once when first accessing the game (it was optimized for instant game play – there was no continual lag time due to page loading issues).

- There was a back end administration section for data gathering and analysis
- The technical design reduced congestion through the library space by randomizing starting points for each team.
- The technical design minimised cheating through randomised puzzle clues, using four different storylines, and having unique passwords to decode at the end of the game.
- Players could leave and resume the game at any time.
- Game information was saved to the browser cache for three hours. This timeframe enabled players to resume within three hours without needing to log back into the game.
- The system can be used for future orientation periods and subsequent set up of all game components would take less than 2 hours.
- The online system and game pieces can be replicated, customised and used at other institutions or other campuses.
- Hints were provided and a 'phone a friend' option was available. We noticed that no-one used the 'phone a friend' option.

In addition to the technical considerations, the aesthetics of the game was addressed by employing a graphic designer to design the mobile game interface (See Appendix 1).

4. Puzzle development

Rush Escape Games also created and manufactured the physical puzzles pieces. The Library team provided the following guidelines for designing the puzzles and game pieces:

- Puzzles should not require lifting, dismantling or moving.
- Incorporate as many tactile elements as possible.
- Each puzzle needed to be different (i.e. not use the same strategies to solve each puzzle)
- Game pieces should not require resetting.
- The level of difficulty for a puzzle was graded according to how long a puzzle would take to solve. Each puzzle had to be solved in 1 to 3 minutes.

5. Testing

Testing of the game prototype was extremely valuable. It allowed us to:

- test for game comprehension and puzzle solvability,
- discover any mobile rendering issues,
- confirm game time,
- and observe player behaviour.

Part of the testing process involved putting up paper prototypes of the puzzle pieces and releasing a workable beta version of the mobile game platform. Based on observed behaviour during the testing phase the number of players per team was changed to only two registered players. Due to the small screen size of a mobile phone, the screen could only be effectively shared two people. Therefore, more than two players per team was not ideal for engaging with the game. There were some students who chose to make a team of more than two even though the registration process only allowed for two players.

Results

The popularity of **Escape Room at the Library** completely exceeded the Library's expectations. The game continued after O-week and ran for a total of six weeks with 714 registered participants. The popularity of this orientation activity was an unintentional by-product of making learning fun and

interactive. The success of **Escape Room at the Library** was also demonstrated in the post-game survey:

- 96% of respondents stated they learnt a lot or learnt something
- 99% of respondents stated they found the game enjoyable or very enjoyable
- 99% of respondents stated they would recommend the game to a friend

In addition, over 80% of respondents remembered 16 out of the 20 learning points (see Fig 3).

Learning outcome	Learning points	Incorrect	Correct	Partial
Knowing the location of library facilities	Book return chutes	13%	*87%*	
	Reserve hold shelf	17%	*83%*	
	Laptop charging lockers	17%	*83%*	
	Tech Zone	20%	*80%*	
	Help phones	10%	*90%*	
	Self checkout machine	21%	*79%*	
Understanding the services offered by each Ask La Trobe Staff	Student Service Staff	14%	*86%*	
	Peer Learning Advisors	13%	*87%*	
	Library Advisors	10%	*90%*	
	IT Staff	3%	*97%*	
Knowing where to find resources	Book a library Workshop	23%	*70%*	*7%*
	Book a group study room	13%	*87%*	
	Stay up-to-date with important information	4%	*28%*	*68%*
Knowing that all library notices, including overdue and reminder notices are sent by email ONLY to your La Trobe Email account		24%	*76%*	
Knowing what is needed in order to perform tasks in the library	Borrow books	5%	*95%*	
	Pay for photocopying	22%	*78%*	
	Access rooms and building	10%	*90%*	
	Access the Library after 10pm	20%	*80%*	
	Access campus computers	10%	*90%*	
Confident about using the Dewey number system to find a book		11%	*89%*	
Knowing where to always put books after you have finished using them in the Library		10%	*90%*	

Figure 3 – Survey results

Some students had trouble remembering where to find resources to stay up-to-date with important information. This may be because this particular point was communicated via a written message as part of a clue rather than embedded into the game as a puzzle. This reinforces the idea that retention happens more readily when embedded into a problem based learning framework. In the case of **Escape Room at the Library**, the learning occurred when students were solving a puzzle. The online clue was a passive way to communicate a message and players were more focused on the parts of the clue that helped them locate the puzzle in the library.

Figure 4 - Students working on Puzzle 3

In the early stages of game development, we identified four key success measures. The results of each success measure are explained in Figure 5.

Key Performance Indicator	Result	KPI Met?
Participation rate above or equal to library orientation tour participation.	Between the period 8 Feb to 19 Mar 2016, a total of 357 teams of two or more people registered to play the game which is at least **714 participants.**	SUCCESS The number of players were higher than the number of library tour attendees for 2016. The number of students who attended the tours in 2016 dropped by approx. 50%. The game achieved close to the participation rate of 2015 tour attendance (1052) and had participation rates exceeding tour numbers from 2014 and prior.
80% of respondents noted that they learnt something.	96% of respondents stated they learnt a lot or learnt something.	SUCCESS
80% of respondents noted that they had fun.	99% of respondents stated they found the game enjoyable or very enjoyable.	SUCCESS
80% of respondents noted that they would recommend the game to a friend.	99% of respondents stated they would recommend the game to a friend.	SUCCESS

Figure 5 - Results of the game set against four key success measures.

Qualitative results

The post-game survey indicated students loved the concept of playing a game and learning at the same time, in particular, the problem solving element was highly regarded.

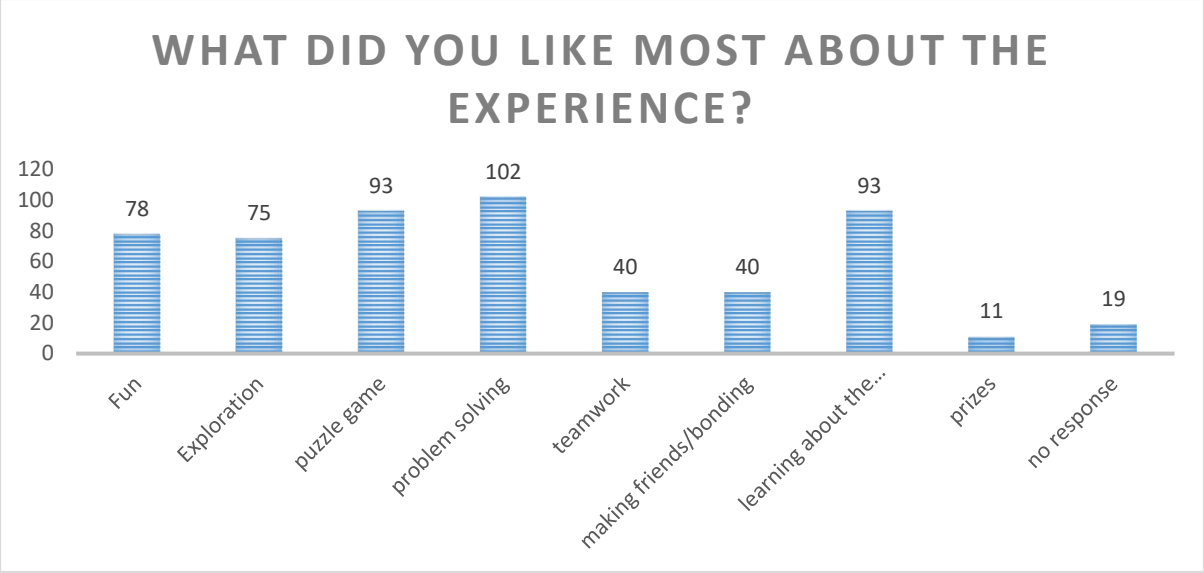

Figure 6 - Game experience

In **Escape Room at the Library**, students need to work together in a fun and relaxed way, and this was often a catalyst for students to develop friendships. Student comments in the post-game survey reflected the value of the game as an activity that helps students connect with and meet other students.

> "It was a good bonding experience with my friend"
>
> "I like meeting new people and knowing where things are"
>
> "I like exploring the library, and making friends"
>
> "I like the challenge plus meeting people"
>
> "Love puzzles, great game, really entertaining"
>
> "Fun introduction to the library, great idea"
>
> "Keeps you guessing, very complicated clues and requires team work"

The overwhelming positive response by students (and some staff) who played the game suggests that games like **Escape Room at the Library** can help students learn about the library in a creative way that is appreciated by students.

> "I like the puzzles, riddles, being able to solve and work through problems as a team"
>
> "The satisfaction of solving each step. The app was a great addition"
>
> "It was an enjoyable (and refreshing) way to get to know different parts of the library"
>
> "It was spread out so you could explore areas you wouldn't necessarily go to by yourself"
>
> "It forced you to explore different parts of the library and has made me feel more comfortable navigating the library"
>
> "I like the rush of adrenaline and having to think outside the box"

"I like the creativity and adventure"

Figure 7 - Students working on Puzzle 2

Future development

The game can be easily adapted for use at other campuses of the University. In developing the game for future use, the ending of the game would need to wrap up online as opposed to the current ending, where players reach a secret location. The current ending of the game was designed to capture qualitative and quantitative data to evaluate aspects of the game which included ease of use, technical issues, and capturing pain points. Now that we have been able to perform a thorough evaluation, there is no longer a requirement to heavily monitor the game in this way. In the future the ending could conclude with a player filling in an online form or simple survey to go into a draw to win prizes. The game format could also potentially be used to facilitate a wide range of induction programmes for other cohorts of students and new staff however, return on investment would need to be assessed before proceeding with the idea.

Conclusion

Escape Room at the Library was designed to complement library tours and offer an alternative to students who would prefer a more active and self-directed form of discovering the library. Our goal was to design an intrinsically-motivated activity similar to a library tour, that required minimal staff facilitation, that immersed students in the digital and physical worlds, that could be done at any time and which would maximise student engagement. It was devised to support students to discover and become aware of key library services and facilities, and to subsequently remember this information when needed.

The analysis of student feedback and general observations of students playing the game gave us good insight into the overall benefits of gamification in an educational setting. We noticed that students were able to make friends and form bonds while learning about the library in a fun and relaxed environment.

This case study demonstrates how the principles of game and puzzle design can be used to enhance discovery of library services and programs in a blended environment. It is an approach that could be applied to a range of library settings.

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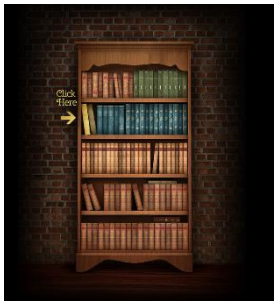
Appendix 1. Escape Room at the Library game

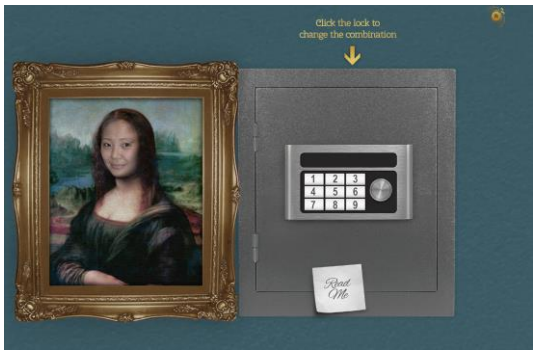


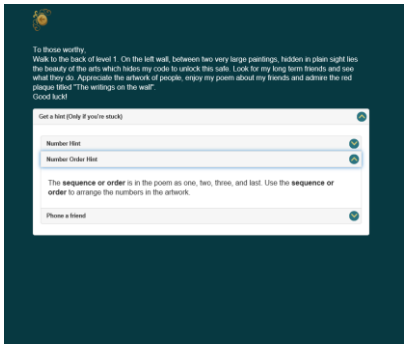
- After registering, players are presented with an image of a bookshelf.
- When the player clicks on the bookshelf, the bookshelf slides to the left revealing a secret room.
- The dot in the middle is used as a way to demonstrate how to navigate the game.

- In the secret room, they are presented with five items.
- Each item in this secret room is a starting point for a puzzle.
  Dots on the items are lit up in yellow when as the game progresses. This helps the player understand which puzzle to do first and so on.
- The boxes at the bottom is a progress bar to let players know where they are up to and how many more puzzles they need to unlock.
- There are a total of four mini puzzles.
- The camcorder is viewed first before starting any puzzle. It sets the storyline of the game.
- The puzzle sequence/order is randomised for each team to reduce congestion in the physical space.

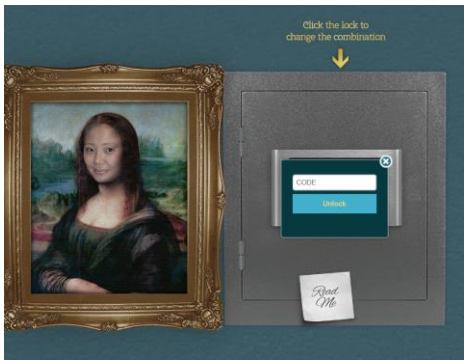
PUZZLE Example – Puzzle #1.

Puzzle #1 requires the player to read the note (which is a clue to the location of puzzle 1 in the physical library)

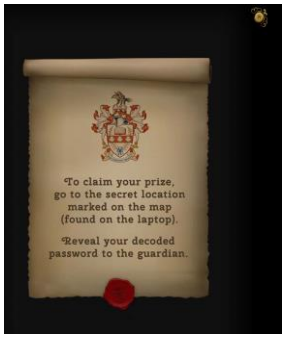




- The puzzle clue ('read me' note) also has a 'get a hint' option if the player is stuck on puzzle 1.
- Players find puzzle 1 in the physical library and attempt to solve it.
- Puzzle 1 is based on 'Where's Wally'.
- Once players solve puzzle 1, they enter the code (solution) into the safe.



- If successful, a 'well done' message appears and they are taken to the content of the wall safe.
- Inside the wall safe is a cypher key that they need to use at the very end of the game to claim their prize.
- In order to avoid cheating, we provided two types of cypher keys which alternated every time a new team registered.



•On completing Puzzle #1, studnets advance to puzzles 2-4. Once players solve all four puzzles, they have all the clues necessary to claim their prize.
•The last box in the progress bar, 'claim your prize', when clicked on, shows a paper scroll with instructions about how to claim their prize.