Deeper Learning
Puzzle Bus
education escape room toolkit
An escape room... what’s that?

An escape room is a room or series of rooms which participants are “locked inside.” In order to escape, participants must collaboratively solve a series of interesting puzzles.

Puzzle rooms are a fairly new concept, but have sprouted up all over in the past few years. You might be surprised to find them in your own neighborhood!
Sounds cool...but how is it educational?

Puzzle rooms require many of the deeper learning skills we are trying to support our students in developing! In order to solve puzzles and escape the room, a team must use effective communication, collaboration, critical thinking, creativity, and a growth mindset! We feel like puzzle rooms are a great way to teach these skills in an engaging way.

We’ve seen teachers build their own escape rooms in creative ways back at their own schools! Here’s an example of a teacher at an international school helping her students review for a test: https://citizen-c.me/literary-life/breakout

**Purposes**
- Communication
- Collaboration
- Perseverance (it’s okay to fail)
- Preview and review material
- Student engagement
- Learning about your own and other people’s strengths
- Creativity--involving the student in the creation creates big opportunities for this
- Entrepreneurial--students could actually build a business around this
Intrapersonal Skills

- Perseverance--it’s okay to fail
- Creativity--especially when students are solving AND designing puzzles

Interpersonal skills

- Communication
- Collaboration
- Community Building--learning about your own and other people’s strengths

Academic skills

- Local history and current events
- Entrepreneurship--students could actually build a business around this
- Preview and review material

Purposes

Besides being fun, puzzle rooms can support...
FAQ

How can I make an escape room?
Although some escape rooms have high production quality, others leverage creativity and ingenuity to “hack” the escape room activities. Escape rooms can be created with a zero-to-low budget, and be built out easily in a classroom. You don’t need many funds nor space to make this experience a reality!

How long will this take?
There is a lot of flexibility in terms of time. Although some educators have built escape rooms over the course of a semester, it is possible to create an escape room experience in less than a week (especially if you have students help!)

How can I use this in my classroom?
Escape rooms can be used to build up and measure deeper learning competencies. They can also be used as a project launch, community building challenge, learning activity, study tool, or even as a replacement for a test!
In this toolkit we will lead you through each section or major component of an escape room. We’ll use the **Deeper Learning Puzzle Bus** as a model example for each section. If you’ve been through the bus, this will look familiar!

The Deeper Learning Puzzle Bus is a mobile educational escape room designed by the d.school K12lab as an experimental alternative to assessment. We featured the bus at SXSWedu and many other conferences in 2018-19.
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Escape Room Components

- Puzzles
- Narrative
- Structure
- Materials
Breakdown of Escape Room Components

**Puzzles** are the main component of escape rooms. Series of connected puzzles make up an escape room. The more clever and interesting the puzzles, the more engaging the experience! Good puzzles engage different types of thinking and require multiple people to engage. Puzzles can focus on a subject area (math, history, etc) or based on a required skill (collaboration, communication). There are an infinite amount of different puzzles you can make for escape rooms.

A **narrative** is what ties the puzzles in an escape room together thematically, and creates the objective for the experience. Narratives set the tone and atmosphere for an escape room, and create a precedent for solving puzzles. Rich narratives can help participants be more energetic and imaginative.

The **structure** of an escape room dictates the flow of the experience. Structure links the puzzles together sequentially so that participants can ultimately win the game, or “escape”. There are different approaches to structures that help enable participants to stay engaged, and ensure that there is enough things to do inside for each individual.

Every escape rooms needs props, locks, and decorations to work effectively. Many of these **materials** can be repurposed from a classroom. Other essential materials such as combination locks and lockboxes can be purchased or even created with cheap materials such as cardboard.
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**Types of puzzles**

- **Code/logic based puzzles (critical thinking, academic knowledge)**
  - Chronology
  - Math equations
  - Ordering
  - Code/language deciphering

- **Experimentation/tool-based/cause and effect (creativity, perseverance)**
  - Mazes
  - Hidden clues
  - Secret passages
  - Specialized tools

- **Physics & engineering puzzles (critical thinking, content knowledge)**
  - Light
  - Magnets
  - Mirrors
  - Rube Goldberg type of contraption
  - Construction
What makes a good puzzle?

Sensory puzzles
   Puzzles that engaged multiple senses can be very interesting. Could you make a puzzle based on musical notes? What about smell? Even logic puzzles can incorporate other senses!

Requiring multiple minds/bodies
   Puzzles that require multiple people to take part are often the most memorable. Puzzles that can be solved with one person leave little space for interaction-- and are often boring.

Content specific
   Puzzles that require specific content are unique, and great opportunities to test knowledge. Wrapping in academic content into puzzles makes the content, and the puzzle more exciting.
The **Rebels Throughout History** puzzle was designed on the puzzle bus as a way to tie in content while requiring good communication. It were was designed to be easily recreated in a classroom.

In this puzzle, students must find photos of historical figures around the room and put them in chronological order. Once they get this order right, they must decode the puzzle to find a code to unlock a word combination lock.
Rebels Throughout History

**Puzzle Type:** Code/logic

**Skills required:** Critical thinking, mastery of content, experimentation, problem solving

**Content:** Good for all subject matter (images can be of anything requiring ordering)

**Difficulty to create:** Easy--can be done in less than 15 minutes
Materials Needed

Whiteboard markers

Five letter combination lock

Standard printer
Step 1
Draw 5 squares that are roughly the size of an 8.5X11” piece of paper. This is where students will put up the pictures.

Step 2
Use a cup to draw circles under each of the squares.
Step 3

Under each of the circles, write the following numbers. This will be the code that students need to figure out once they put up the pictures.

Step 4

Don’t forget to name your puzzle! This will also help identify what puzzles students need to work on.
Step 5

Print out five pictures of historical figures. The figures (or rebels) we chose were Moses, Antigone, Gandhi, Rosa Parks, and Ruth Ginsburg. Label the images with the figures’ respective names. These pictures should be hidden in the escape room.

Step 6

Leave tape or magnets for students to place historical figures on the board. They will need to put them in chronological order to complete the code.
Step 7

The number below the circles correspond to the correct letter in the figure’s name. The 5th word of Moses is S, the third letter of Antigone is T, and so on. The code spells out a 5 letter word which is the code for the lock!

Step 8

Program your combination lock to STARS, and use it to lock a box, or tool. When students get the code, they will be granted access to the next puzzle.
Switch it up!

Although the subject matter of this particular example is history (requiring knowledge of the historic figures) you can easily wrap in your own content. For example, maybe you are a science teacher giving a lesson on ocean life. Print out pictures of animal life that live in various depts of the ocean.
The **X Marks the Spot** puzzle requires collaboration, and participation from multiple group members. It can be scaled to require anywhere from 3-6 people, and is the most popular of our puzzles.

To solve this puzzle, students must find colored yarn that correspond with matching colored dots hidden around board with different numbers or words. They must connect the dots with the yarn and see where the strings intersect.
X Marks the Spot

**Puzzle Type:** Tool-based

**Skills required:**
Collaboration, experimentation, problem solving

**Content:** Good for all subject matter, can put up vocab words, mathematical equations, etc.

**Difficulty to create:** Easy--can be done in less than 15 minutes
Materials Needed

- Whiteboard marker
- Any type of combination lock
- Colored yarn (red and blue)
- Sticker dots

Puzzle Example
Rebels Throughout History
Step 1
Write down words or numbers across a whiteboard or chalkboard.

Step 2
Place colored voting dots in each corner of the board. Try not to place them directly in the corners, they should be slightly offset. Each color should have a corresponding color on the opposite corner.
**Step 3**

String will be used to connect the dots. This is why the placement of the dots shouldn’t be too obvious.

**Step 4**

Place colored string nearby, or hide it as a hidden clue.
Step 5

The string should intersect on one of your numbers or words. This will be the correct word! Multiple students will have to work together to hold the strings in the correct places. Try to spread out the dots as far as possible.

Step 6

To move the intersection of string, you can either move the voting dots, or just write in the correct code where they do intersect.
Switch it up!

This puzzle can be expanded on in many different ways. You can add more strings to have more intersection of lines which could produce multiple clues. In the example here, we added two more strings so there were 5 intersections which marked a word. These words were used for a madlib puzzle which would ultimately give a final clue to a word combination lock. You can find the madlib at https://bit.ly/2YTREw8
The **Worldly Traveler** is a great puzzle to tie critical thinking and geography together. It is very easy to remix, and the extremely simple to create.

Students will find scattered pieces of a letter which outlines a journey across the globe. They will have to find the locations on the map to determine which direction the traveler went. These directions correspond to a directional combination lock.
Worldly Traveler

Puzzle Type: Code/logic

Skills required: Critical thinking, mastery of content

Content: Can be used with any content related to geography

Difficulty to create: Very easy-- can be done in less than 10 minutes
Materials Needed

- Whiteboard marker
- Directional Lock
- Laminated World map
- A printer
- Worldly Traveler
- Puzzle Example
Step 1

Write a letter from one student to another detailing her recent trip around the world. Instead of using named locations, use regional specific areas such as Amazon Rain Forest or the Nile river.

Step 2

Use a laminated world map and tape it up to a wall.
Step 3
Students will need to track the journey with a whiteboard marker.

Step 4
The completed journey will give students a set of directions which can be imputed into a directional lock.
Step 5

Students use the directions in the directional lock in order to get to the next area or find a clue for another puzzle.
Narratives

The narrative provides an opportunity to engage the participants. A narrative can link the puzzles together in a cohesive story line and provide an authentic reason for escape. Where am I? Who am I? Why am I here? How do I get out? The narrative can be drawn from content or constructed from your imagination! Some examples include:

Themes

- Present
  - Social issues
  - News events
  - Where’s Waldo: find your missing school mascot or class pet
- Literary (books and movies)
  - Juliet saves Romeo
  - Phantom Tollbooth
- Science
  - Surviving in different biomes/ecosystems (rainforest, ocean)
  - Breaking out of a mad scientist’s lab
  - Moon landing or astronaut challenge
- Historical
  - Inside a historical figure’s home, office, or lab (ie. Albert Einstein, MLK, Marie Curie, JFK)
  - Events leading up to a major historical event
- Dystopian/Fantastical
  - Zombie apocalypse
  - Haunted school
- Mystery
  - Solving a cold case
  - Crime scene investigation
Narrative Example

(this is what we used for the puzzle bus)

You are a first year teacher. The semester just started and you are excited (albeit nervous) to get into the classroom. You had an amazing teacher prep program where you learned innovative practices to personalize and deepen student learning.

Unfortunately, you have now found yourself inside a traditional public school who does not value deeper learning at all, instead opting for drill and kill practices, and an over emphasis on irrelevant standardized tests.

On your first week, you were assigned as detention monitor by your school leader. A group of students were placed there because they were protesting that what they were learning was not relevant or meaningful to their lives and experiences. When you enter the detention room, you realized that there were no students! They had fled! Luckily they left a breadcrumb trail for any educator that is clever enough to solve their deeper learning puzzles.

Your school leader will arrive in 10 minutes to check on you! You better get out before you get get trouble. Find where the students went in order to gain their support and overthrow this broken education system!
The structure of an escape room dictates the flow of the experience. Structure links the puzzles together sequentially so that participants can ultimately win the game, or “escape”. There are different approaches to structures that help enable participants to stay engaged, and ensure that there are enough things to do inside for each individual.
Structure tools

The following pages are some resources that will help you map out your escape room. Some rooms may be linear, while others may be more open. You will have to decide what works best given your context and intention. It can be best to work backwards, considering the end result will always be to “escape.” You must also consider the amount of time you have, and how many puzzles you want in your escape room.
DESIGN YOUR OWN PUZZLE ROOM!

Step 1: What's your team's theme? (e.g., could be silly like “zombies seek to destroy the Earth by ruining the education system by implementing shallow learning,” or more authentic like “new law will endanger Western waterways”)

Step 2: Brainstorm, what sorts of items might be in that world? (e.g., textbooks, chalkboard, hall pass, apple for the teacher, etc.)

Step 3: What is the basic storyline? (e.g., to determine which education system was created by the zombies, you need to test the (a) various sets of curricular materials, (b) lessons plans, and (c) student work to determine which demonstrate deeper learning, and which were created by the zombies and only result in shallow learning). Explain who the players are, where they are, what they need to do, and why they only have seven minutes to do this.

Step 4: What does completion look like? Sometimes the solution “makes sense” the moment you step into the room: big locked pirate’s chest needs to be unlocked to get the treasure, giant red door needs to be opened, caged mythical bird needs to be set free. Sometimes the solution needs to be discovered.
Step 5 (OPTION A): Plan your puzzles. To get more players involved at once, you can have multiple puzzles lead to partial solutions, which all need to be combined to solve the last big puzzle.
Step 5 (OPTION B): Plan your puzzles. Puzzles can be sequential, where each puzzle provides a clue or piece to complete the next puzzle.

Puzzle A
Leads to clue for Puzzle B

Puzzle B
Leads to clue for Puzzle C

Puzzle C
Leads to completion of room!
Measuring Deeper Learning

The Deeper Learning competencies are a set of important skills that include mastery of academic content, critical thinking, collaboration, communication, perseverance and learning-to-lean mindset. Building these skills will help prepare students as lifelong learners beyond k12 education. Escape rooms are great opportunities to both build, and test the deeper learning competencies.
We designed several tools to help you measure student collaboration and communication while they go through the escape room. We co-designed these tools with researchers, and educators, and tested them on our puzzle bus, and in the classroom.
This matrix is a tool that can help you measure collaboration and communication as your students go through the escape room experience. This tool is intended to help record how effectively your students work together, and allows you to look at individual skills and needs.

You can make observations for the entire group, or split your class in two and half observing and half running through the escape room.
Here’s how it works
To establish what key skills will be measured on, you can the collaboration exercise with your students on the following page.
We found that collaboration looks different in different contexts. What looks good collaboration for some groups, may not work for others. This is dependent on school and home culture, age, and personalities of individual students. There is no gold star standard for good collaboration, so will have to work with students to identify what works best for them.

This tool will help you fill in the the key skills and observed behaviors on the Collaboration Training matrix. It takes less than 20 minutes total to run.
Using it to observe

To use the matrix, print out multiple copies or laminate one if possible that way you can reuse it--this works with any collaborative exercise, not just escape rooms.

Simply mark the appropriate spaces with a tally to indicate the behavior was observed. You can also make notes in the margins if something interesting happened that fit outside the expected behaviors.

<table>
<thead>
<tr>
<th>Collaboration Training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>KEY SKILLS</strong></td>
</tr>
<tr>
<td>Listening</td>
</tr>
<tr>
<td>Speaking</td>
</tr>
<tr>
<td>Group contribution</td>
</tr>
<tr>
<td>Ask questions</td>
</tr>
<tr>
<td>Cohesion</td>
</tr>
<tr>
<td><strong>EXPECTED BEHAVIOR</strong></td>
</tr>
<tr>
<td>Speak to peer</td>
</tr>
<tr>
<td>Listen</td>
</tr>
<tr>
<td>Offer help</td>
</tr>
<tr>
<td>Cheer/congratulate</td>
</tr>
<tr>
<td><strong>NUMBER OF TIMES OBSERVED</strong></td>
</tr>
<tr>
<td>III</td>
</tr>
<tr>
<td>III</td>
</tr>
<tr>
<td>III</td>
</tr>
<tr>
<td>III</td>
</tr>
</tbody>
</table>

| **OBSERVATIONS**      |
| Listen                |
| Ignore/interrupt      |
| Offer help            |
| Isolate self          |
| Cheer/congratulate    |
| Include someone/show support |
| Grief or insult      |
Debrief

The power of the escape room experience often lies in the debrief. Make sure you set aside at least 10-15 minutes to allow students to talk about the experience. You can use the collaboration training matrix to help guide your conversation. We recommend having students explain each of the puzzles, and after discussing what you observed. Detailing times when you saw communication really fall apart, or when you thought students were on the same page is a great way of having students understand where their strengths and gaps lie.
Reflection

You can also have students use this reflection tool to help them identify how they thought they did during the experience, and how this is the similar or different from what was observed.
Implementation

Now that we’ve gone over the basics of how to make an escape room and how you can use it, we need to discuss some ideas for how you can implement it in your classroom or school.

Based on your context, how you choose to implement an escape room will look very different. Below are examples educators who have prototyped escape rooms have shared with us.

**Spaces**
- Classroom
  - Either use your whole room or just a corner
- Advisory period
- Gymnasium
- Library
  - Libraries are great for larger escape rooms that you want to keep up for longer

**Roles for students**
- Students as participants
- Students as co-designers of escape room
- Students observe other students going through escape room

**Purpose**
- Use as a test or quiz
  - Can be effective for both the design and the experience as a participant
- School Fundraiser
  - Great way to bring community members in
- School competition
- Team building
- Students design for teachers
Now you are ready to make your own escape room! There are several ways to go about it. You might consider designing it for your students by yourself, or even having a colleague or two join in. You might even consider your students helping with the design and build for other students.

Every escape room needs a puzzle master. The puzzle master helps maintain the flow of the experience. They keep time, and provide clues when participants are stuck. Being a good puzzle master is about assessing what participants need in any given moment, and providing clues that will help push their thinking without giving the answer. In most cases, you will be in the room with your students. When you notice students are stuck, sometimes a clue as simple as asking “What do you think those numbers on the wall mean?” will be sufficient to help put students on the right track.

You must also keep track of clues that were already used, and reset the puzzles (especially if you aren’t having multiple students go through in quick succession).
The most expensive materials are typically locks, and lock boxes. Other materials can be substituted for low cost alternatives or even made out of cardboard. Second-hand stores like Goodwill and Savers are great places to acquire interested objects that can be manipulated to create puzzles. Old board games and decks of cards are invaluable for code puzzles. An old cookie jar might be a fun prop to hide a clue in.
Keep on Puzzlin’

Let us know where your escape room designing adventures take you!

Email louie@dschool.stanford.edu
Learn more at k12lab.org/puzzles