Mystery Room:

Engaging Marginalized Youth Through an Immersive Experience

Supplemental Materials

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Sponsor:
Banksia Gardens Community Services

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Edgar Caballero   edgar.c@banksiagardens.org.au; 03 9309 8531

FOCUS GROUP CONSENT FORM

Hello,

We are a team of students from Worcester Polytechnic Institute working with Banksia Gardens Community Services to develop a game and puzzle room, and the end of our project will result in a written report and a presentation. We would like to ask your child questions on how to improve the room.

This is an "informed consent form" describing the procedures and confidentiality agreement of our focus group (this copy is for you to keep).

This focus group will last between 10-20 minutes after taking part in the game and puzzle room. We will ask questions that ask what your child thought of the room—the strengths, the weaknesses, improvements, and ideas for future rooms. We will take written notes and voice recordings of the students. They will be stored in a secure location that only the research team, professors, and Banksia staff can access.

All participation is voluntary; your child only has to answer questions he/she wants to answer and can stop participating at any time. Anyone in the room will know that your child is present

and participating, but your child's identity will be kept confidential in all writing, assessment, and communication about our project.

This study has been approved by the Worcester Polytechnic Institute Institutional Review Board (IRB). Please feel free to ask any questions related to the study to either Professor Katherine Foo or Professor Lorraine Higgins (contact info for both listed above). You may also contact the chair of the WPI Institutional Review Board (Prof. Kent Rissmiller, Tel. +001 508-831-5019, Email: kjr@wpi.edu) or WPI's University Compliance Officer (Jon Bartelson, Tel. +001 508-831-5725, Email: jonb@wpi.edu).

Thanks again for your involvement!

You must be a parent or legal guardian to consent to allow your child to participate in this activity. If you consent your child's participation in this activity and to the terms above, please sign your name and indicate the date below. You will be given a copy of this consent form to keep for your records.

_____   _____

Participant Parent/Guardian Signature(s)   *Date*

The informed consent procedure has been followed.

_____   _____

Investigator Signature(s)   *Date*

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Edgar Caballero	edgar.c@banksiagardens.org.au; 03 9309 8531

Photo Release Form for Minors (if under 18)

We are a team of students from Worcester Polytechnic Institute working with Banksia Gardens Community Services to develop a game and puzzle room, and the end of our project will result in a written report and a presentation. The team would like to photograph the participants to present their interactions with the room. This form is voluntary, and should you decide to not sign it, your child can still participate in the game and puzzle room.

The Worcester Polytechnic Institute Research Team has my permission to use my child's photograph in research publications that are publicly accessible through the university. I understand that the images may be used in print publications, online publications, presentations, and websites.

Parent/Guardian's signature: _____ Date: _____

Parent/Guardian's Name: _____

Child's Name: _____

Phone Number: _____

Worcester Polytechnic Institute IRB# 1
HHS IRB # 00007374

2 April 2018
WPI IRB File: 18-0265

Re: IRB Expedited Review Approval: File 18-0265 "Mystery Room:
    Engaging Marginalized Youth Through STEM Education"
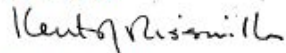
Dear Prof. Foo,

The WPI Institutional Review Committee (IRB) approves the above-referenced research activity, having conducted an expedited review according to the Code of Federal Regulations 45 (CFR46).

Consistent with 45 CFR 46.116 regarding the general requirements for informed consent, we remind you to only use the **attached stamped approved consent form** and to give a copy of the signed consent form to your subjects. You are also required to store the signed consent forms in a secure location and retain them for a period of at least three years following the conclusion of your study. You may also convert the completed consent forms into electronic documents (.pdf format) and forward them to the IRB Secretary for electronic storage.

The period covered by this approval is 2 April 2018 until 1 April 2019 unless terminated sooner (in writing) by yourself or the WPI IRB. Amendments or changes to the research that might alter this specific approval must be submitted to the WPI IRB for review and may require a full IRB application in order for the research to continue.

Please contact the undersigned if you have any questions about the terms of this approval.

Sincerely,

Kent Rissmiller
WPI IRB Chair

Supplemental Materials C - Additional References

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Supplemental Materials D - Sponsor Description

The Banksia Gardens Community Services center is a neighborhood house in the Broadmeadows suburb of Melbourne, Australia. This center aims to better the lives of its surrounding community through its commitment to community development and action research principles. Its mission is "Transforming Lives, Strengthening Communities, Reducing Disadvantage", and it aims to be a leader in education, training, and community engagement by providing opportunities to the disadvantaged. Banksia's ambition is to help people reach more education and employment opportunities that will enhance their lives. Additionally, it hopes to give a voice to those within the community facing injustice.

Banksia Gardens is a quasi-public organization which is funded through donations and government contributions. They currently have a budget of 1.2 million dollars which provides 5.7 million dollars worth of provided services per year. They are managed by a board of governance. Banksia has around forty employees, but often works with volunteers and other organizations in order to best provide helpful tutoring and learning experiences. The Banksia Gardens Community Services Center consists of one main building which houses a childcare center, several classrooms for study groups and courses, an IT room, a large hall, and a courtyard. Within the Banksia Gardens Community Services Center are a number of programs, both for adolescents and adults; these programs focus on job-training, socialization, computer programming, homework help, and basic life skills. Through these types of programs, Banksia Gardens Community Services is able to help around 80,000 people each year. An example of a typical program which Banksia offers is its computer club. This club gives youth access to computers, and provides opportunities to develop tech skills through beginner and advanced programming lessons.

There are many other organizations in the area that work on the issues of low graduation rates, limited access to technology, and low employment rates. These organizations include CSIRO, which carries out research to further the interests of science in the Australian community, and the Brotherhood of St. Laurence, which works to try to inform the government about poverty and ongoing problems so that it can be stopped. Other organizations are working to help better the impoverished communities like the Outer Urban Projects, which works to give a voice to underrepresented artists in impoverished communities, Dianella Health, which provides health services to impoverished communities, and Berry Street Childhood Institute, which helps provide children living in troubled areas with a good childhood by helping them become better speakers, leaders, and learners. The Department of Education and Training is another organization that is working to provide better education by helping people access and afford childhood education.

Supplemental Materials E - More Information About the Banksia Programs

Banksia Gardens has numerous programs catering to the surrounding community. Two of its most successful programs are ones which aim to aid the youth coming through the center by offering direction interactions and hands-on experiences; these programs are Banksia's homework club and computer club.

The homework club is a volunteer-run program that focuses on children with a need for academic support, while simultaneously providing access to growth through active social, emotional, and recreational activities. This happens through homework help, such as aid with reading, math tutoring, and support while creating science projects. The homework club is open to any primary or secondary student on Tuesdays, Wednesdays, and Fridays starting at 3:45 pm and ending at 5:30 pm.

Banksia's computer club provides interactive opportunities to use computers and learn programming skills through coding games and tutoring help; this club is based in Banksia's computer room. The computer room has three walls of computers with free access to all. These computers provide opportunities for internet access, practice with various technologies, access to games, and access to a number of coding games. These opportunities help youth gain access to these types of technologies, and even help teach important life skills that they otherwise might not learn.

Supplemental Materials F - Australian Curriculum

In order to utilize interactive, game-based learning methods to their full potential, it is imperative to understand and build upon the curriculum which students are expected to learn. The Australian National Science Curriculum aims to provide a solid foundation of knowledge and values which students can expand upon as they progress through school and beyond by organizing education programs around the three interrelated strands of science understanding, science inquiry skills, and science as a human endeavor (National Curriculum Board, 2009). Science understanding is the ability pull upon and apply appropriate scientific knowledge, such as pre-established concepts, laws and principles, when explaining or predicting scientific phenomena. Science inquiry skills involve recognizing which questions can be evaluated scientifically and setting up and carrying out investigations that lead to valid conclusions. Science as a human endeavor is concerned with the influence of science on social and ethical issues, and the influence of societal challenges on science research (National Curriculum Board, 2009). Together, these three content strands intend to foster students' interest in and appreciation for science.

The science curriculum is further broken down by principles of learning by grade grouping. Figures 1, 2, and 3 provided throughout the section below map out the expectation of learning and ability pertaining to each of the three strands for Years K-2, Year 3-6, and Years 7-10, respectively.

Science understanding	• comparing, sorting and classifying objects and materials • pushes, pulls, position and motion of objects • living and non-living things • needs, structures and growth of organisms • objects in the sky • changes on earth and the effects on living things.
Science inquiry skills	• explore, be curious and wonder • ask questions and begin to investigate • describe what has happened • make and share observations • use evidence to support ideas.
Science as a human endeavour	• recognise aspects of science in everyday life • identify work associated with science in the community • care for the environment.

Figure 1: Australian National Curriculum for Science outlining years K through 2
(Source: National Curriculum Board, 2009)

The above science curriculum for Years K-2, typically ages 5-8, intends to utilize the age group's natural curiosity about the world around them through exploration and observation (National Curriculum Board, 2009). According to the Science Year 1 Satisfactory Work Sample Portfolio (2014), an example of work that students complete during these years to prove they have learned some of the skills above is property of materials of investigation. For this assignment, students "independently to investigate the properties of a range of everyday materials and then answered a number of questions regarding which material would be best for a particular purpose" (pg 10).

Science understanding	• properties and uses of materials • forces and motion • forms, use and transfer of energy • structures and functions of living things • life cycles of organisms • living things and the environment • changes on earth and in space • relationship between earth, moon and sun • earth's resources and their uses.
Science inquiry skills	• identify questions and predictions for testing • plan and conduct simple investigations • observe, describe and measure • collect, record and present data as tables, diagrams or descriptions • analyse data, describe and explain relationships • discuss and compare results with predictions • draw conclusions and communicate ideas and understandings.
Science as a human endeavour	• consider how science is used in work and leisure • become aware of science-related careers • recognise the effect of science and technology on our environment • be aware of the historical nature of science ideas.

Figure 2: Australian National Curriculum for Science outlining years 3 through 6
(Source: National Curriculum Board, 2009)

This science curriculum for Years 3-6, typically ages 8-12, is designed to give students the opportunity relate science to their life by exploring a broad range of science concepts (National Curriculum Board, 2009). An example of work completed during these years, as provided in the Science Year 4 Satisfactory Work Sample Portfolio (2014), is the design of an amusement park ride. The project entailed that students "design an amusement park ride that made use of contact and non-contact forces" (pg 3) with annotated diagrams.

Science understanding	*Physics and chemistry* • nature of matter, including particle theory • forms of energy, energy transfer and storage • forces and motion • acids and bases • metals and non-metals • elements, compounds and chemical reactions. *Biology* • cells and living things • the human body • ecosystems • theory of evolution and the diversity of living things. *Earth science* • structure of the earth and geological history • plate tectonics and geological phenomena • stars, galaxies and the universe.
Science inquiry skills	• formulate scientific questions or hypotheses for testing • design and conduct science investigations involving measurement and repeated trials • gather and organise data from a variety of sources • analyse and test models and theories based on the evidence available • explain and summarise patterns in data using science concepts.
Science as a human endeavour	• be aware of contemporary issues such as water and its management, climate change, stem cell research, nanotechnology, gene technology • apply scientific understandings to make responsible, ethical and informed decisions about issues • be aware of the nature of science and research of Australian scientists • appreciate that science provides rewarding careers • appreciate the diversity of people who have contributed to, and shaped the development of, science.

Figure 3: Australian National Curriculum for Science outlining years 7 through 10
(Source: National Curriculum Board, 2009)

In Years 7-10, typically ages 12-15, the curriculum introduces while refraining from overcrowding the curriculum, and teachers stress the accessibility of STEM careers (National Curriculum Board, 2009). One project completed under this curriculum, mentioned in the Science Year 9 Satisfactory Work Sample Portfolio (2014), is an investigative report on solar ovens. Students researched solar ovens and how they worked, designed, built, and tested their own, and documented their procedures and trends in data.

Through this brief investigation of the National Australian Science Curriculum, it is clear that the building blocks are in place. These specific topics and goals that students are expected to learn at each

year level, as is laid out by the curriculum, can easily be incorporated into engaging, interactive lessons. Here, there is an excellent opportunity for educators to pioneer new teaching strategies that excite students to pursue STEM beyond what is required of them.

Supplemental Materials G - Interview with Erin Ottmar

Considerations:
- Consider task lengths.
- Board games are a good approach since they foster natural collaboration.
  - Mastermind, 24, perceptual games, line games, morse code, and ink blots are also good options.
- Activities should be on the easier side if we want the youth to collaborate.
- Don't go in with the assumption that the Banksia youth will do what we want them to.
- Games are good for motivational aspects, but there needs to be a balance, otherwise there's too much which takes away from the main point of the experience.
- Don't make the experience only about the reward.
- Natural curiosity should be the focus, not any one academic topic.
- Incorporating technology has the possibility of taking the collaborative aspects away.
  - This also has the greatest opportunity of breaking.
- Things that are inherently rewarding to do, such as building a structure or unfolding a narrative, are the best sorts of activities to be doing.
  - Building components over time.
- Try to make the activities so that not just one person can complete them, and so tasks must be completed in order to unlock the next step.

Supplemental Materials H: Mystery Room Site Observation

Name	Theme	Type	# of Hints	Narrative
The Secret Society	War Times	Escape	Three	Since War times, there has always been a secret society of diligent men and women that have kept the United States safe from mayhem. Known only as "The Secret Society Escapists" they represent the greatest and the most intelligent the global world has to offer. With distinct powers of observation and deduction, they can solve any issue that may arise and escape any situation they face. For the first time in decades, you and your group will be able to join this amazing group of people. It won't be easy! You'll only have 60 minutes to complete the challenges to become the new members of the "Secret Society Escapist."
Area 51	Futuristic	Escape	Three	In an attempt to finally crack the lid open on AREA 51, you and your team of fellow journalists broke into the most secret military base on the planet. Unfortunately, while doing so, you inadvertently opened the containment cells for all of the "other-worldly" life forms that the government had cooped up there. Now, the base commander has issued the evacuation order and set the base's self-destruct system for 60 minutes. Get out before the timer gets to zero.
Starship Janus	Space Rescue	Task Completion	Unlimited	"The captain of the Janus has transmitted a desperate plea for help. The starship was on its way back from an important research mission on Vareidan when the leader of the Vareidan species initiated an attack that left Janus severely damaged. There is only one way to ensure the survival of the specimen; teleport aboard the ship, repair all life support systems and return the ship safely back to Earth. With just 60 minutes before the system fails completely, it is up to you and your team to secure the safety of this precious cargo".
Fallout	Nuclear Winter	Escape	Three	It's present day, but it isn't the present day you know. Imagine history changed; shattered. Imagine the Cold War, gone horribly, horribly wrong. The year was 1977 when the bombs fell. The Nuclear Winter that followed was long, grueling, and terrifying. Decades have since passed, and we have slowly recovered from the devastating blow. Very few buildings remain from that time except this fallout shelter which still stands. Untouched. A monument, or perhaps a tomb.

Supplemental Materials I - Participant Observation: Working with Youth

List observations into this form based on the following categories (include approximate age group of children with observation):
1. Learning methods
2. Interests
3. Potential challenges
4. Engagement

1. Learning Methods
   ● Some of the children actually want to work: one student's friends told him to just copy math answers and he really wanted to do it out himself: secondary
   ● Don't like complex manuals. Really turns them off. Manuals with visuals seems to work better
   ● If they don't get something turns them off. Need step by step instructions
2. Interests
   ● While working with them a bunch of them crowded around one child that was playing a computer game - Primary
   ● More interested in coloring in worksheet than actually doing the worksheet - Primary
   ● Some youth when asked what their favorite subjects were said Math-primary
   ● Some youth when asked about what they wanted to do said either artist or dentist-primary
   ● All ages seem really interested in american youtubers and hollywood stars
   ● One kid seems to like sciency stuff and mechanic jobs however not a career as its too hard. Wants to be a sports kid: 9-10 years old
   ● Two kids came in and went to electronics. One kid took over saying he needs to practice as its what he wants to do as a career: 8-9 years old
3. Potential Challenges
   ● Kids seem to get distracted easily - Primary School
   ● One had only been in Australia and learning english for two years - End of primary / beginning of secondary
   ● Kids are very aggressive with things that they are playing with so we need to be careful on the types of puzzles that we create and how durable they are
       ○ Kids tend to throw things around and don't care what they are throwing
       ○ Forcing doors shut on others: 9 year olds
   ● Competitive. Needs to always be the best. Puts down everyone
   ● Really scaterminded. Moves to different activities while in middle of things: 9 years old
4. Engagement
   ● Building structures with the dominoes - Primary School
       ○ Liked to build but then knock them down
       ○ Liked to copy each other
       ○ Liked to steal from each other

- One suggested everyone combine dominoes and build something together, but that didn't happen
- Some were possessive of their dominoes, others let them be taken
- Got very frustrated when structures fell over but were very proud when they built something cool
- Some were entertained by dominoes for a long time, others played for a second and then left to play soccer
- One girl that came in to play games 9 years old
  - Started with bugs. Split them out. Played with them for a bit
  - Moved to electronic circuits. Got frustrated when couldn't get figure out.
  - Moved to building things
  - Screams and talk really loud
  - One girl came in with a branch
  - Gives up on building things

Supplemental Materials J - Dragon Narrative

Introduction / Backstory

Participants enter computer room through the side door to find an enthusiastic and adventurous archaeologist dressed similar to Indiana Jones in the room. The archaeologist is standing at the front of the room with the projector on, but nothing on the screen. The main door out of the room is padlocked shut.

ARCHEOLOGIST - (excitedly addressing the children) Welcome, everyone! I'm so excited you're here! My name is Dr. Bones, and I'm an archeologist. I have just come back from an expedition digging up bones where I found the strangest thing… *a full dragon skeleton.*

Archeologist flips slides to show image of the dragon skeleton.

Through extensive research, I found that there were once hundreds of these magnificent creatures.

Archeologist flips slides to show image of many dragons in a field.

However, the dragons died off which is a sign that they were not able to fight off attacks from other creatures. My theory was that some mystical force took away the dragons' greatest defense mechanism… their ability to breathe fire.

Archeologist flips slides to show image dragon breathing fire.

As soon as the very thought had entered my mind, a portal for time-travel opened up right here in this very room. Being an adventurer, I went through...

Archeologist flips slides to show image of the tunnel.

On the other side of the portal, I came face to face with a wizard.

Archeologist flips slides to show image of the wizard.

The wizard explained that they had created the portal because they had made a grave mistake, and they needed help. They had put a spell on the dragons of their land, to take away their ability to breathe fire, because they kept accidentally burning down the wizard's house.

Archaeologist flips slides to show image of the dragons burning down a house.

This meant the dragons were unable to defend themselves and became extinct, a very sad fate. However, the spell didn't just cause the Dragon's fire to disappear, it also meant that all of the fire in the world disappeared, which caused many problems! The wizard tried to undo the spell, but it was created so that the person who cast the spell cannot undo it.

I attempted to help, but my specialty is in bones, not in fire, and to break a spell this powerful requires more than one talented, award-winning, archaeologist. So I have called upon you - the brightest and bravest of all of the explorers. I'm up to my neck in projects here in 2018 - I want you all to travel through the portal to the time of the dragons, find the wizard, and help get the dragons' fire back by creating a magical fire beacon.

Archeologist flips slides to show magical fire beacon.

The wizard said you'd need these tools. A flashlight, a potion recipes, a hook and this code for the portal (I keep it locked just in case someone tries to sneak through when I'm not looking!).

The participants use the code to open the lock to the portal and go through.

Don't forget that the portal can only be open for 20 minutes! Be sure to complete the puzzles, create the fire, and have the wizard give it to the dragon before time runs out!

Participants enter and crawl through the tunnel. Tunnel as light strobing and loud sounds playing.

Main Story - In the Time of the Dragons

Participants exit the tunnel on the other side in the time of the dragons. They come face to face with a sobbing wizard. The room is decorated to look like a mystical field with pleasant field music / outdoor noises playing.

WIZARD - Welcome! Bienvenue! My friend Dr. Bones told me he would be sending you. Thank you so much for coming to help me create fire for the dragons. I'm so sorry I took their fire breathing ability away, especially now that I know their sad fate, and the fate of the world.

I will need you help to create the fire beacon. There are three components needed to create fire. Does anyone know what they could be? (Get children to guess the components: fuel (in this case wood), oxygen, and some type of spark).

Excellent! You are ready to begin. I see you have the tools I gave the archaeologist - they will assist you. You can work together, or separately, but I will need two Adventurers to search through the dark cave and solve a puzzle to find the fuel, and an Alchemist (Potions Master) who will make a chemical reaction to create oxygen, and an Engineer to find the final spark. However, in order to do that, you will need access to water, for safety, in case the fire gets out of hand, so I have hid a key to the spark at the bottom of a well. Once you have all three of the components, place each on the fire beacon to create the fire. Then I will summon the dragon and give it back it's fire. Quick, you better get going, we don't have much time before the portal closes again!

The wizard points out each the puzzle areas. Participants go off and complete the puzzles either individually or together, depending on how they choose to do it.

As time goes on the music gets more intense and wizard gives time warnings.

Once the participants get to the final puzzle the music changes to an intense orchestra song. When the puzzle is completed the fog machine starts and the red/orange likes shine on it to make it look like fire.

You did it! Thank you so much! I will now call over the dragon so it can get it's fire back. This means it won't become extinct, and also that fire will be restored to all of the world!

Wizard walks over to the fog flame with a lighter torch, puts it into the flame, and takes it out of the flame lit. When she takes it out the fog flame goes off. An animated dragon appears and the Wizard lets the flame go out.

The dragon then breathes out flames. At the time all of the lights in the room turn red/orange. Once the dragon is done breathing fire all of the lights go out, except those in the tunnel.

Hurry everyone! Back to the tunnel before it turns off! Thank you so much for helping me and the dragons! You've all done marvelously!

The participants go back through the tunnel and come out in the computer room.

Conclusion

The archeologist is waiting for them on the other side.

ARCHEOLOGIST - You did it! You saved the dragons! Well done! *(Gets a phone call)* Unfortunately, you also changed the course of the history and I just found out that my house has been burnt down by a dragon… Hm… that will be a problem for next time. Nevermind, off you go to celebrate!

Supplemental Materials K - Dragon Room Puzzles

Unlocking the Portal

Description

The archaeologist would hand the fourth participant in the room a riddle and would direct them toward the way out of the room. The participants could either work together or just the one that received it could solve it. The riddle, when solved, would give the participants a number combination for unlocking the way out.

Required Materials
- Two small chains
- Command strips and hooks
- Number combination padlock
- Printed out and laminated riddle

Setup
a. Attach one command strip and hook each side of the door inside the computer room.
b. Hang one chain off of each hook.
c. Take the other end of the chains and put them through the padlock.
d. Be sure the archaeologist has the riddle which reveals the combination.

Procedure for Use
1. The participant with the riddle should first solve it and then that will give them the combination for the lock on the door.
2. The participant then enters the combination into the lock and it will open and they can take the chains off of the lock.

3. The participants can then go through the portal.

Reset Between Runs
- Put the lock back on the chain.
- Attach it to both sides of the chain once the participants are in the room.
- Close the door to lock them in the room.

Takedown
- Take the chain off of the wall with the lock and store it.

Water Puzzle

Description

This puzzle uses the the idea of flowing water and gravity and directing water flow. The children need to be able to determine which of the taps to turn to let the water flow from the top funnel to the bottom bucket. The main objective for this puzzle is to get the key out of the bottom bucket by filling it up enough to reach the key. This key opens a lockbox that contains an element for the fire beacon.

Required Materials
- Water wall (already constructed)

- Grey flexible tote
- Small plastic tote
- Wooden box with grate
- Key attached to wine cork
- Small red lockbox
- Spark rod for Fire Beacon
- Red wire hook
- Tarp

Setup
a. Be sure the archaeologist has the hook.
b. In the area designated on the visual room layout, place the tarp on the ground and place the water wall on top of it.
c. Place the Spark rod inside the small red lock box, make sure it is locked, and place the box next to the water wall.
d. Place the grey flexible tote to the left of the water wall so it catches water running out of open PVC pipes, and then fill it with water.
e. Place the key inside the small plastic tote, place the small plastic tote inside the wooden box with the grate, and fill it with enough water that the key is just out of reach.
f. Place the wooden box with the plastic tote inside under the lowest water tap and tie it to the leg of the water wall so the plastic tote cannot be pulled out.
g. Be sure the taps are in the correct position: first = open, second = closed, third = closed, fourth = closed.

Procedure for Use
1. The children should take the cup and start pouring the water into the top funnel.
2. As the water flows the participants must to turn the taps to the correct positions to make it flow the correct direction.
3. The must open all of the taps to the correct position so water flows into the bucket containing the key.
4. They must add enough water so the rise floats up to a level at which they can reach in with the hook provided to them by the archeologist and grab it.
5. They should then take the key and open the small red lockbox where they will find the Spark element needed to make fire / light the beacon.

Reset Between Runs
- Open the taps to let all of the water out.
- Return taps to original positions.
- Put the Spark rod back in the small red lockbox and lock it.
- Empty out some of the water from the small plastic tote so the key is just out of reach.
- Retrieve the wooden box with the plastic tote and key in it.
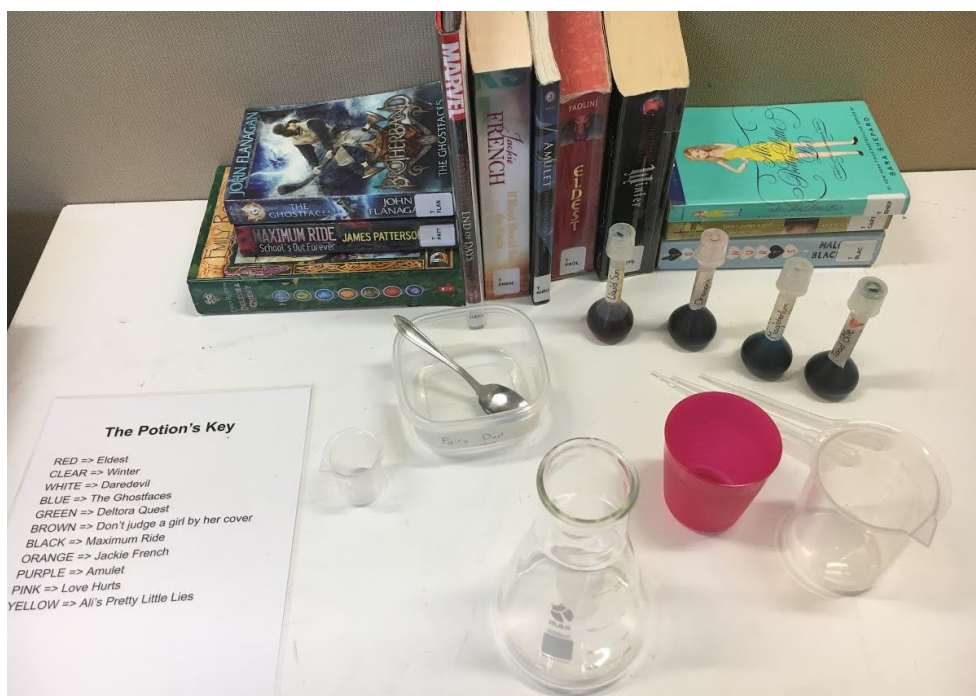- Give the hook back to the archeologist.

Takedown

- Once the room has finished, start by emptying all of the water out of the pipes by turning all of the taps to the initial position.
- Take the buckets of water either outside or to the sink and empty them and let them dry.
- Once everything is dry, return to appropriate place.

Potential Faults and Fixes

- Water does not flow into proper pipes or bucket.
  - Re-adjust pipes and/or bucket.

Potion Puzzle

The Potion's Key

RED => Eldest
CLEAR => Winter
WHITE => Daredevil
BLUE => The Ghostfaces
GREEN => Deltora Quest
BROWN => Don't judge a girl by her cover
BLACK => Maximum Ride
ORANGE => Jackie French
PURPLE => Amulet
PINK => Love Hurts
YELLOW => Ali's Pretty Little Lies

Description

This puzzle exposes the children to chemistry and chemical reactions. The must correctly follow the instructions to conduct a reaction between vinegar and baking soda with the additional element of food coloring. The color of the reacting material will lead to a certain book, as noted by a key, which houses one of the pieces needed for the fire beacon.

Required Materials

- Vinegar
- Food coloring
- Baking soda

- Pipettes
- Four 25ml volumetric flasks
- 25ml beaker
- 200ml Beaker
- Cup
- Bowl
- Spoon
- 500ml Erlenmeyer Flask
- Collection of books
- Hollowed out book
- Potion Instructions
- Potion Key
- Oxygen rod for Fire Beacon

Setup
a. Be sure to give the potion instructions to the archeologist.
b. Put some baking soda and the spoon in the bowl and label "Fairy Dust".
c. Put the food coloring into the 25ml volumetric flasks and label: Blue = "Blue Magisterium", Yellow = "Liquid Sun", Green = "Toad Bile".
d. Put ¼ cup of vinegar into the 200ml beaker and ¼ cup of vinegar into the cup and label both dragon tears.
e. Lay all of the above materials, the small beaker, the pipettes, and the 500ml Erlenmeyer Flask out on the table which should be placed in designated area.
f. Place the Oxygen rod inside the hollowed out book.
g. Stack the all of books on the table.
h. Place the Potion Key on the table.

Procedure for Use
1. The children will be provided the recipe for the potion (can be found in Puzzle Pieces Section) by the archeologist before the enter the tunnel, they will take that over the potion table.
2. They should closely follow the instructions, adding the correct amount of each element (food coloring, vinegar, baking soda) to the Erlenmeyer Flask in correct order.
3. Once all of the elements are added the chemicals will react and bubble, the children should take note of the color then use the key (can be found in Puzzle Pieces Section) provided to connect that color to a book title.
4. They should then look over all of the books, pick up the correct book, and open it.
5. Inside that book will be one of the element need to make fire / light the beacon.

Reset Between Runs
- Clean all of the beakers and cups out that had vinegar and baking soda in them.
- Make sure that all of the food coloring containers have enough in them.
- Make sure there is enough baking soda for the participants to use.
- Return the oxygen rod to the hollowed out book and put the books back in an orderly fashion.

- Set up all of the beakers and cups in an orderly fashion.
- Give the potion sheet back to the archeologist.

Takedown
- Once the room is complete, start by cleaning out all of the beakers and cups.
- Put all of the food coloring and baking soda back in their respective containers.
- Make sure the table is clean and everything is put back into the chemistry puzzle box.

Potential Faults and Fixes
- Flask/beaker breaks or goes missing.
  - Can be replaced by any sort of cup.
- The children do not follow the instructions to add the proper amount of each element, so the reaction does not happen or the color comes out wrong.
  - Wizard ushers them as to what color it should be and encouraged them to choose the correct book.

Cave Puzzle

Description

This puzzle helps the children with problem solving skills and being able to read and follow directions from a map. The map on the cave wall leads to a pile of rocks with riddles and shows them which riddle is the correct one. The children then need to solve the riddle which will lead them to the plant and that is where one of the fuel element of the fire beacon is located.

Required Materials
- Cave (already created)
- Map (already created)
- Blacklight flashlight
- Pieces of wood with riddle and symbols on them (already created, riddles can be in Puzzle Pieces Section)
- Wood rod for Fire Beacon
- Potted Tree

Setup
a. Be sure the archaeologist has the blacklight flashlight and that it is operable.
b. Unfold cave box and velcro box edges together and place it in the location designated on the layout diagram.
c. Position map on one of the cave walls.
d. Place the pieces of wood in the designated spot with the symbol side facing upward.
e. Place the potted tree in the designated area.
f. Hide the Wood rod in the potted tree.

Procedure for Use
1. The children should go into the cave box and shine the blacklight on the map.
2. On the map, there is a pile of wood with a lightning bolt symbol which the children should notice.
3. They should then follow the line on the map to the pile of wood across the room and find the piece of wood with the lightning bolt.
4. That riddle on that piece will lead the children to the potted tree located in the room.
5. The children should go over to the plant, search through it, and find the fuel element of the fire beacon.

Reset Between Runs
- Return the blacklight flashlight to the archeologist.
- Reorganize the pieces of wood so they are all back in the corner with the symbols up.
- Hide the Wood rod in the potted tree.

Takedown
- Start by making sure everything is out of the cave.
- Undo the velcro on the back of the box to remove the back plate.
- Undo the other velcro so that the box can fold up and be moved out of the room.

Potential Faults and Fixes
- Loss of box stability
    - Reinforce with more cardboard and tape.
- Faded ink on UV puzzles
    - Re-apply ink.

Light Beacon

Description

This puzzle uses the ideas of completing and electric circuit By inserting metal rods into slots in the front. By doing this, the user will complete a circuit, turning on lights as fog from a fog machine pumps out the top.

Setup
   a. Place the fire beacon in the room as indicated by the room layout diagram.
   b. Lift the top lid and aline the fog machine up with the box drawn on the inside shelf with the nozzle pointed towards the circular hole.

c. Feed the power cords and the remote cords (ends that will connect to the machine) through the circular opening in the back of the puzzle and then through the circular opening on the fog machine shelf.

d. Plug the cords into the machine and the other end into an outlet/ powerstrip.

e. Turn on the fog machine by flipping the red switch on the back of the fog machine.

f. Wait for the two red lights on the remote to turn red, this means it is warmed up.

g. Lock both the top and back doors.

h. Too much fog will set off the fire alarm, so it's a good idea to take the batteries out of the smoke detector.

Procedure for Use
1. Participants will insert the metal rods into the three designated slots on the front of the machine.
2. Once done two lights will turn on. At this point someone must press the button on the fog machine remote.
3. DO NOT HOLD DOWN BUTTON. Short pulses work best, otherwise you will fill the room with fog and set off fire alarms.
4. DO NOT GO OVERBOARD WITH SMOKE.

Reset Between Runs
- Return the puzzle back to its initial state.
  - Take all of the rods out for the other puzzles.
  - Make sure the fog machine is working and the lights are working.

Takedown
- Remove all of the rods from the puzzle and store them with the rest of the materials.
- Un-lock the top and back doors.
- Turn off smoke machine and disconnect power and remote cords.
  - Allow smoke machine time to cool down.
- Place the smoke machine and power cord/remote for smoke machine them in the top compartment.

Potential Faults and Fixes
- Rotten/ cracked/ splintered wood.
  - Replace broken piece of wood. The side walls and shelves were made from a composite wood sheet, the base was made from two by fours, and the box was made from scrap wood planks.
- Fog will not come out.
  - Ensure there is fog inside the machine.
  - Ensure the fog machine is aligned and all cords are connected.
  - Wait for lights to turn red (it has to heat up: 3 minutes).
- Lights won't turn on.
  - Ensure switches are all depressed until a faint click is heard.

- Ensure the batteries inside the lights are not dead: To replace carefully unscrew the back end of the flashlight and remove the battery pack. Each one takes 4 AAA batteries.
- Open the back door and ensure all wires are connected. If not, reconnect them.
  - For the switches just unscrew the screw, place wire underneath the screw head and tighten the screw.
  - For flashlights solder the wires the the back of the battery pack and wrap the other wire around the lanyard hole.
- Rewire the device.

Supplemental Materials L - Testing Form

Basic Logistics:

Observer's Name:_____ Date:_____

Room Theme: _____ Time Allotted: _____ Time Completed:_____

Number of Participants: _____ Age Range of Participants: _____

User Testing Observations - Functionality:

Puzzle #:
Assistance needed (Y/N)? _____

Did anything break?

Were the instructions clear enough?

Additional commentary:

User Testing Observations - Engagement:
Please tally number of occurrences while in room:

Get sidetracked from current task: _____

Write down observations on:

- Difficulties encountered:

- Body language:

- Emotional cues:

- Verbal cues:

User Testing Observations - Soft Skills:
Please tally number of occurrences while in room:

Argue/ fight over tasks & props with each other: _____

Write down observations on:

- Collaboration & teamwork:

- Following instructions:

- Communication:

Focus Groups - Questions to Ask the Participants:

- Did you feel like you were in the story's world? If not, why didn't you feel like you were? If yes, how did you feel like you were in the world?

- What was your favorite part?

- What was your least favorite part?

- Were the puzzles too hard? If so, which ones were the hardest?

- Were the puzzles too easy? If so, which ones were the easiest?

- Did you like the story?

- What stories would you like to see in the future?

- Did this experience remind you of any other experience you had in the past? If so, which ones?

Supplemental Materials M - Actor Observations

Anna:

General Comments:

"First of all – congratulations to you all! You put in a ton of work, vision, and energy, and it really paid off. It was so satisfying to listen to the exclamations of the kids as they went through the rooms, and how wholeheartedly they dived into the worlds created. The visuals looked great and the effort paid off. Some of my favourite comments were variations of "Is this real?" and "Are you a real archaeologist", as well as how well the children worked together on the puzzles. I overheard kids telling each other to "each take a rod" to put them in one by one into the fire beacon; there was often a sense of teamwork and togetherness."

Room Specifics:

"From the point of view of the archaeologist, this was great. The kids were generally attentive and interested in the narrative, with some children even offering to "help" the wizard, pre-empting my request! The slides worked well – they seemed intrigued and excited about the upcoming task. One group found the combination lock a bit tricky, but they worked it out in the end, which I think is a really practical and useful thing for them to learn. They also seemed to enjoy going through the tunnel a lot!

My only slight change might be in how I approach the end when they come back and are greeted about the archaeologist. I congratulated them, but then let them know that they changed the course of history and now my house was burnt down, which I think slightly confused some (not greatly, just in the sense that they thought they had "succeeded"). In saying that, I think it's also a good thing for children to think about this type of science fiction logic – that if you change the past, you change the future. It comes up a lot in pop culture/movies and fiction, and is reasoned. I think it might be more a scripting/delivery thing, which I can look at. I always ended with a "Well done! Now go and celebrate!" and they seemed happy enough."

Anso:

"This was a lot of fun! I thought the set and the aesthetic were excellent, and the children seemed to really relate to the character of the wizard. They were engaged in the puzzles and really wanted to complete them. The main thing that didn't really work was the potion that never turned the right colour. Maybe the recipe needs simplifying? Also I think what they had to do after they figured out the colour of the potion was not very clear, they didn't understand they had to look at the books.

When they searched through the cave they didn't really understand that they were looking for a map. They often didn't understand they had to read the riddle at the back of the piece of wood and leave the other ones alone.

The water puzzle worked quite well in general, however it was too high for some kids to reach the funnel, so maybe a stool to stand on is needed so they can reach? Overall, it was hard for them to understand what to do and I think they might need a bit more guidance. It was okay because I helped them, but I feel that I had to help them a bit too much and it would be nice if they could work things out by themselves a bit more."

Supplemental Materials N - Our Team's Observations

Basic Logistics:

Observers' Names:
- Puzzle 1: Laurel Higham; Puzzle 2: Katie Williamson; Puzzle 3: Paige Cox; Puzzle 4: All

Date: April 13, 2018

Room Theme: Dragon/ Fantasy

Time Allotted: 25 Minutes

Time Completed: 18 - 23 Minutes

Number of Participants: 3 - 4

Age Range of Participants: 7 - 12

Puzzle 1 - Potion Puzzle:

User Testing Observations - Functionality:

Assistance needed (Y/N)?
- Run 1:
    - Assistance was needed.
- Run 2:
    - Assistance was needed.
- Run 3:
    - Assistance was needed.

Did anything break? Any problems?
- Run 1:
    - Nothing broke, but the dimness and color of the lights made it hard to see the various colors for the puzzle.
- Run 2:
    - Nothing broke, but the dimness and color of the lights made it hard to see the various colors for the puzzle. Additionally, "dragon tears" (vinegar) is mentioned in the instructions, but was not labeled on the table, which caused some confusion.
- Run 3:
    - Nothing broke, but the lighting made the puzzle difficult.

Were the instructions clear enough?
- Run 1:

- Some of the participants needed help measuring out the correct amount of baking soda and determining which colors were correct. This resulted in mixing the red and blue dyes instead of yellow and blue.
- Run 2:
    - The participant tried following the instructions on their own, but ended up asking a lot of questions due to lack of confidence. Some of the participants didn't know where the ingredients were, where they were supposed to put the ingredients, and which book was the correct book.
- Run 3:
    - The participant was able to follow the instructions with the actor's guidance, but wasn't sure what some of the materials were.

Additional commentary:
- Run 1:
    - No additional commentary.
- Run 2:
    - Some more vinegar in the instructions might be needed. The current amount made for a rather underwhelming reaction.
- Run 3:
    - The participant could tell that the ingredient was vinegar, which took away from the immersive experience. The participant also knew the steps to take, but needed encouragement to actually complete them.

Puzzle 2 - Map Puzzle:

User Testing Observations - Functionality:

Assistance needed (Y/N)?
- Run 1:
    - Minor assistance was needed.
- Run 2:
    - No assistance was needed.
- Run 3:
    - Minor assistance was needed.

Did anything break?
- Run 1:
    - Nothing with this puzzle broke.
- Run 2:
    - Nothing with this puzzle broke.
- Run 3:
    - Nothing with this puzzle broke.

Were the instructions clear enough?
- Run 1:

- Initially, the participants just looked around the cave and left, so they weren't sure what they were meant to be doing. Once they were brought back into the cave and actually examined the puzzle, they understood what they were meant to do. The participants also couldn't quite figure out what they were meant to find from the riddle, and didn't understand that only one riddle was important.
- Run 2:
    - Yes, the participant quickly understood that they were meant to be finding a symbol and solving a riddle to find a piece of the fire beacon.
- Run 3:
    - The participants were distracted by some of the other things in the cave, so they didn't realize that the map was the important part. They also needed some help finding the correct symbol, but once they found this they were able to solve the rest quickly.

Additional commentary:
- Run 1:
    - No additional commentary.
- Run 2:
    - The wizard helped the participant, but it was probably unnecessary since the participant realized the correct symbol and figured out the riddle quickly.
- Run 3:
    - One of the participants in the room had watched the development team creating most of the puzzles and somewhat ruined aspects of the experience for the other participants.

Puzzle 3 - Water Puzzle:

User Testing Observations - Functionality:

Assistance needed (Y/N)?
- Run 1:
    - Almost no assistance was needed.
- Run 2:
    - Minor assistance was needed.
- Run 3:
    - Minor assistance was needed.

Did anything break?
- Run 1:
    - Nothing broke.
- Run 2:
    - Some minor issues with pipes leaking.
- Run 3:
    - Nothing broke.

Were the instructions clear enough?
- Run 1:

- For the most part, yes. The only assistance needed was in figuring out where to go; no assistance was needed with the puzzle itself.
- Run 2:
    - The instructions for the objective of the puzzle were clear enough, but minor assistance was needed with figuring out how the faucets worked and remembering the hook they were provided.
- Run 3:
    - The instructions for the objective of the puzzle were clear enough, but minor assistance was needed with figuring out how the faucets worked and remembering the hook they were provided.

Additional commentary:
- Run 1:
    - No additional commentary.
- Run 2:
    - No additional commentary.
- Run 3:
    - No additional commentary.

Puzzle 4 - Fire Beacon Puzzle:

User Testing Observations - Functionality:

Assistance needed (Y/N)?
- Run 1:
    - Some assistance was needed.
- Run 2:
    - Some assistance was needed.
- Run 3:
    - Some assistance was needed.

Did anything break?
- Run 1:
    - The metal rods weren't being correctly placed into their slots, so the switches weren't being pressed down. This caused a fair amount of confusion and broke part of the immersion. After another try, the participants were able to successfully press down the switches, but this was after trouble-shooting with the actor was done.
- Run 2:
    - There were no issues with the puzzle or the extra elements of the experience.
- Run 3:
    - There were no issues with the puzzle itself, but the smoke machine wasn't working for this run, meaning that the visual indicator of success was underwhelming.

Were the instructions clear enough?
- Run 1:
    - The participants didn't quite understand how to place the rods into the slots at first.

- Run 2:
  - There were no issues with the instructions.
- Run 3:
  - There were no issues with the instructions.

Additional commentary:
- Run 1:
  - Timing for the extra elements of the puzzle hadn't quite been figured out yet, so some immersion was broken because the lighting and smoke were a bit off-beat.
- Run 2:
  - No additional commentary.
- Run 3:
  - No additional commentary.

User Testing Observations - Engagement:
Please tally number of occurrences while in room:

Get sidetracked from current task:
- The participants got distracted by the excitement of the room at times, but were still fully engaged in solving the task at hand.

Write down observations on:

- Difficulties encountered:
  - Occasionally, the participants wouldn't listen to the full instructions from the actor in the room, and would instead run off to immediately try and solve a puzzle.

- Body language:
  - The participants were quickly moving around the room to complete tasks, and sometimes jumped up and down when they figured something out. There was also a clear sign of engagement when they sat still and listened to the archaeologist's lecture.

- Emotional cues:
  - Several of the participants felt bad when the wizard cried, showing some emotional engagement with the world. They were also thrilled when they thought that they helped return the dragons' fire.
    - Expressions of genuine concern and excitement.

- Verbal cues:
  - The participants asked the actors if they were real wizards and archaeologists, and made numerous comments about how they were excited to help the dragons.
    - "We need three rods to make fire."
    - "What made you so interested in dragons?"
    - "Are you a real wizard?"
    - "How do you do that with the crystal ball?"

User Testing Observations - Soft Skills:

Please tally number of occurrences while in room:

Argue/ fight over tasks & props with each other:
- There was minimal arguing throughout the three runs of the room. A few participants were arguing over what the key to the water puzzle was, and got it confused with the key for the potion puzzle. There was also a small amount of bickering about who should do what when working on the puzzle, but other than this there was no arguing.

Write down observations on:

- Collaboration & teamwork:
    - Aside from the water puzzle, the participants generally worked alone on the puzzles to begin with. However, once they were finished with their respective tasks, they were more than happy to help the other participants out. This was sometimes done with prompting from the actor, and sometimes without it.
        - "We completed this puzzle" rather than "I completed this puzzle".

- Following instructions:
    - The participants all tried to read and follow the instructions, but for the most part they did better with some added verbal cues from the actor in the room.

- Communication:
    - In one case, one participant took the role of the leader and started telling the others what to do, but no one seemed to mind, and they ended up being very successful in their endeavors. For the water puzzle specifically there were very strong instances of communication; one participant would turn the faucets and pour water while the other would give directions and announce how close the key was to floating to the top.

Supplemental Materials O - Pilot Day Focus Group Notes

Focus Groups - Group 1 (3 Girls, 1 Boy):

- Did you feel like you were in the story's world? If not, why didn't you feel like you were? If yes, how did you feel like you were in the world?
    - The participants did feel like they were in the world. They really wanted to help the wizard and the dragons.

- What was your favorite part?
    - The potion puzzle was the mutual favorite.

- What was your least favorite part?
    - The participants didn't like when the wizard cried. It was unexpected and made them feel a little scared.

- Were the puzzles too hard? If so, which ones were the hardest?
    - No, the puzzles were somewhat easy, but they did require enough logic thinking so that they weren't too easy.
    - The potion puzzle was a little confusing, especially since the lighting made the reaction's color look different than it was supposed to.

- Were the puzzles too easy? If so, which ones were the easiest?
    - The water puzzle and map puzzle were fairly easy, especially when compared to the potion puzzle.

- Did you like the story?
    - Yes, they thought the dragon story was fun.

- What stories would you like to see in the future?
    - Dinosaurs, unicorns, video games (Fortnite, specifically).

- Did this experience remind you of any other experience you had in the past? If so, which ones?
    - They had not experienced anything like it before.

Focus Groups - Group 2 (1 Girl, 2 Boys):

- Did you feel like you were in the story's world? If not, why didn't you feel like you were? If yes, how did you feel like you were in the world?
    - They did feel like they were in the world because they felt like they were really involved in the story.

- What was your favorite part?
    - This group liked the wizard, the potions, and how they had to get the key out of the fountain. They also enjoyed how the tunnel looked so different on the inside than the outside.

- What was your least favorite part?
    - They were a bit confused by the placement of the rods for the light beacon puzzle, but were pleased once the puzzle worked properly.

- Were the puzzles too hard? If so, which ones were the hardest?
    - The potion puzzle was difficult at first until it was explained more by the wizard.

- Were the puzzles too easy? If so, which ones were the easiest?
    - None of it was too easy; the puzzles were the right amount of difficulty for them to be fun.

- Did you like the story?
    - The participants did like the story.

- What stories would you like to see in the future?
    - Dinosaurs, how to avoid extinction, extinct animals.

- Did this experience remind you of any other experience you had in the past? If so, which ones?
    - They had not experienced anything like it before.

Focus Groups - Group 3 (1 Girl, 2 Boys):

- Did you feel like you were in the story's world? If not, why didn't you feel like you were? If yes, how did you feel like you were in the world?
    - The children felt like they were in the world; they really wanted to help the dragons get their fire back.

- What was your favorite part?
    - When the wizard revealed their real face.
    - The map puzzle.
    - The fact that some puzzles were more difficult than others; there was variation.

- What was your least favorite part?
    - When the wizard started crying; it made this participant feel bad for the wizard.

- Were the puzzles too hard? If so, which ones were the hardest?
    - None of the puzzles were too difficult for them to solve.

- Were the puzzles too easy? If so, which ones were the easiest?
    - The puzzles were not too easy; they believed that the puzzles were challenging enough.

- Did you like the story?
    - They did like the story. They really enjoyed going through the tunnel since they had seen the tunnel beforehand in the archaeologist's slides, then got to actually experience it.

- What stories would you like to see in the future?
    - More realistic subjects, wrestling, boxing.

- Did this experience remind you of any other experience you had in the past? If so, which ones?
    - One of the participants had done something like this for their cousin's birthday.

Supplemental Materials P - Dragon Room Overview

Theme:
- Time Travel, Fantasy, Magic

Basic Narrative:
- The children start off in the current, modern world. Here, they meet an archaeologist who gives them a presentation on dragons and the world that used to be. They find out that a wizard cast a spell which took the fire away from the dragons and, accidentally, the whole world, and that this caused the dragons to go extinct. If they want to reverse this, the children must travel back in time through a portal to confront the wizard and restore fire to the land. Once the presentation ends, the children solve a simple riddle to unlock the door to the time portal, then crawl through the portal to the past. They are greeted by a wizard, who tells the children what needs to be done in order to restore fire. The children then split up and solve a series of puzzles, each leading to a key element of fire. Once the three elements are obtained, the children are able to solve the final puzzle and light a fire beacon, symbolizing the restoration of fire. The children then see a video of a dragon, are congratulated by the wizard, and sent back through the portal to modern day. Here they are greeted again by the archaeologist who informs them of what they've done, then sends them on their way.

Puzzles:
- Portal Lock:
    - The archaeologist would hand the fourth participant in the room a riddle and would direct them toward the way out of the room. The participants could either work together or just the one that received it could solve it. The riddle, when solved, would give the participants a number combination for unlocking the way out.

- Water Puzzle:
    - This puzzle involves water flow and floatation. The children will need to pour water into the top funnel of the structure, then open and close faucets to direct the water flow downwards towards a wooden crate containing a key. The key will float higher as water is added. Once enough water has been added to the crate, one of the children can use the hook given to them by the archaeologist to lift out the key. This key will unlock the small lockbox next to the crate, revealing one of the components of fire.

- Map Puzzle:
    - This puzzle involves blacklights and fluorescent materials. The children will need to enter a cave and shine a blacklight on the map on one of the walls. The light will reveal a line on the map showing them where to go next, and a mysterious symbol. This line leads to a pile of wooden pieces on the other side of the room; each of these pieces of wood has a symbol on it and a riddle on the bottom. The symbol on the cave map correlates to the correct piece of wood. The riddle on this piece of wood leads the children to a tree, where one of the components of fire is hidden.

- Potion Puzzle:
    - This puzzle involves basic chemistry concepts such as combining materials in order to see a reaction. The children must follow a set of instructions to combine the correct amounts of vinegar, baking soda, and food coloring to create a colorful chemical reaction. They then checked a color key to see which book name their color correlated to, and looked at that physical book to see if it contained anything. The correct book contained one of the components of fire.

- Fire Beacon Puzzle:
    - This puzzle involves completing a basic circuit. The children will need to place all three of the components of fire into the slots given, pressing down on a switch and completing a circuit. Once the circuit is complete, red lights will turn on and shine up into the beacon, symbolizing the creation of fire.

STEM/ Educational Concepts:
- Element of Fire
    - Different Components of Fire
- Floatation
- Water Flow
- Chemistry
    - Measuring Ratios
- Blacklights

Soft Skills:
- Teamwork & Collaboration
- Communication
- Helping Others
- Following Instructions

DRAGON ROOM NARRATIVE

Introduction / Backstory

Participants enter computer room through the side door to find an enthusiastic and adventurous archaeologist dressed similar to Indiana Jones in the room. The archaeologist is standing at the front of the room with the projector on, but nothing on the screen. The main door out of the room is padlocked shut.

ARCHAEOLOGIST - (excitedly addressing the children) Welcome, everyone! I'm so excited you're here! My name is Dr. Bones, and I'm an archaeologist. I have just come back from an expedition digging up bones where I found the strangest thing… *a full dragon skeleton*.

Archaeologist flips slides to show image of the dragon skeleton.

Through extensive research, I found that there were once hundreds of these magnificent creatures.

Archaeologist flips slides to show image of many dragons in a field.

However, the dragons died off which is a sign that they were not able to fight off attacks from other creatures. My theory was that some mystical force took away the dragons' greatest defense mechanism… their ability to breathe fire.

Archaeologist flips slides to show image dragon breathing fire.

As soon as the very thought had entered my mind, a portal for time-travel opened up right here in this very room. Being an adventurer, I went through...

Archaeologist flips slides to show image of the tunnel.

On the other side of the portal, I came face to face with a wizard.

Archaeologist flips slides to show image of the wizard.

The wizard explained that they had created the portal because they had made a grave mistake, and they needed help. They had put a spell on the dragons of their land, to take away their ability to breathe fire, because they kept accidentally burning down the wizard's house.

Archaeologist flips slides to show image of the dragons burning down a house.

This meant the dragons were unable to defend themselves and became extinct, a very sad fate. However, the spell didn't just cause the Dragon's fire to disappear, it also meant that all of the fire in the world disappeared, which caused many problems! The wizard tried to undo the spell, but it was created so that the person who cast the spell cannot undo it.

I attempted to help, but my specialty is in bones, not in fire, and to break a spell this powerful requires more than one talented, award-winning, archaeologist. So I have called upon you - the brightest and bravest of all of the explorers. I'm up to my neck in projects here in 2018 - I want you all to travel through the portal to the time of the dragons, find the wizard, and help get the dragons' fire back by creating a magical fire beacon.

archaeologist flips slides to show magical fire beacon.

The wizard said you'd need these tools. A flashlight, a potion recipes, a hook and this code for the portal (I keep it locked just in case someone tries to sneak through when I'm not looking!).

The participants use the code to open the lock to the portal and go through.

Don't forget that the portal can only be open for 20 minutes! Be sure to complete the puzzles, create the fire, and have the wizard give it to the dragon before time runs out!

Participants enter and crawl through the tunnel. Tunnel as light strobing and loud sounds playing.

Main Story - In the Time of the Dragons

Participants exit the tunnel on the other side in the time of the dragons. They come face to face with a sobbing wizard. The room is decorated to look like a mystical field with pleasant field music / outdoor noises playing.

WIZARD - Welcome! Bienvenue! My friend Dr. Bones told me he would be sending you. Thank you so much for coming to help me create fire for the dragons. I'm so sorry I took their fire breathing ability away, especially now that I know their sad fate, and the fate of the world.

I will need you help to create the fire beacon. There are three components needed to create fire. Does anyone know what they could be? (Get children to guess the components: fuel (in this case wood), oxygen, and some type of spark).

Excellent! You are ready to begin. I see you have the tools I gave the archaeologist - they will assist you. You can work together, or separately, but I will need two Adventurers to search through the dark cave and solve a puzzle to find the fuel, and an Alchemist (Potions Master) who will make a chemical reaction to create oxygen, and an Engineer to find the final spark. However, in order to do that, you will need access to water, for safety, in case the fire gets out of hand, so I have hid a key to the spark at the bottom of a well. Once you have all three of the components, place each on the fire beacon to create the fire. Then I will summon the dragon and give it back it's fire. Quick, you better get going, we don't have much time before the portal closes again!

The wizard points out each the puzzle areas. Participants go off and complete the puzzles either individually or together, depending on how they choose to do it.

As time goes on the music gets more intense and wizard gives time warnings.

Once the participants get to the final puzzle the music changes to an intense orchestra song. When the puzzle is completed the fog machine starts and the red/orange likes shine on it to make it look like fire.

You did it! Thank you so much! I will now call over the dragon so it can get it's fire back. This means it won't become extinct, and also that fire will be restored to all of the world!

Wizard walks over to the fog flame with a lighter torch, puts it into the flame, and takes it out of the flame lit. When she takes it out the fog flame goes off. An animated dragon appears and the Wizard lets the flame go out.

The dragon then breathes out flames. At the time all of the lights in the room turn red/orange. Once the dragon is done breathing fire all of the lights go out, except those in the tunnel.

Hurry everyone! Back to the tunnel before it turns off! Thank you so much for helping me and the dragons! You've all done marvelously!

The participants go back through the tunnel and come out in the computer room.

<u>Conclusion</u>

The archaeologist is waiting for them on the other side.

ARCHAEOLOGIST - You did it! You saved the dragons! Well done! *(Gets a phone call)* Unfortunately, you also changed the course of the history and I just found out that my house has been burnt down by a dragon… Hm… that will be a problem for next time. Nevermind, off you go to celebrate!

DRAGON ROOM GAME PROGRESSION FLOW CHART

Backstory — Receive Items — Riddle Puzzle — Lock Combination — Open Door / Enter Portal

Meet Wizard

Potion Puzzle — Get Riddle — Retrieve Oxygen

Water Puzzle — Obtain Key — Retrieve Spark

Map Puzzle — Find Rock — Retrieve Wood

Circuit Puzzle — Create Fire — Exit Through Portal

Legend:
- = Given to participants
- = Puzzle to complete
- = Puzzle outcome
- = Task to complete
- = Puzzle outcome but leads to another task

Unlocking the Portal

Description

The archaeologist would hand the fourth participant in the room a riddle and would direct them toward the way out of the room. The participants could either work together or just the one that received it could solve it. The riddle, when solved, would give the participants a number combination for unlocking the way out.

Required Materials
- Two small chains
- Command strips and hooks
- Number combination padlock
- Printed out and laminated riddle

Setup
a. Attach one command strip and hook each side of the door inside the computer room.
b. Hang one chain off of each hook.
c. Take the other end of the chains and put them through the padlock.
d. Be sure the archaeologist has the riddle which reveals the combination.

Procedure for Use
1. The participant with the riddle should first solve it and then that will give them the combination for the lock on the door.
2. The participant then enters the combination into the lock and it will open and they can take the chains off of the lock.

3. The participants can then go through the portal.

Reset Between Runs
- Put the lock back on the chain.
- Attach it to both sides of the chain once the participants are in the room.
- Close the door to lock them in the room.

Takedown
- Take the chain off of the wall with the lock and store it.

Water Puzzle

Description

This puzzle uses the the idea of flowing water and gravity and directing water flow. The children need to be able to determine which of the taps to turn to let the water flow from the top funnel to the bottom bucket. The main objective for this puzzle is to get the key out of the bottom bucket by filling it up enough to reach the key. This key opens a lockbox that contains an element for the fire beacon.

Required Materials
- Water wall (already constructed)

- Grey flexible tote
- Small plastic tote
- Wooden box with grate
- Key attached to wine cork
- Small red lockbox
- Spark rod for Fire Beacon
- Red wire hook
- Tarp

Setup
a. Be sure the archaeologist has the hook.
b. In the area designated on the visual room layout, place the tarp on the ground and place the water wall on top of it.
c. Place the Spark rod inside the small red lock box, make sure it is locked, and place the box next to the water wall.
d. Place the grey flexible tote to the left of the water wall so it catches water running out of open PVC pipes, and then fill it with water.
e. Place the key inside the small plastic tote, place the small plastic tote inside the wooden box with the grate, and fill it with enough water that the key is just out of reach.
f. Place the wooden box with the plastic tote inside under the lowest water tap and tie it to the leg of the water wall so the plastic tote cannot be pulled out.
g. Be sure the taps are in the correct position: first = open, second = closed, third = closed, fourth = closed.

Procedure for Use
1. The children should take the cup and start pouring the water into the top funnel.
2. As the water flows the participants must to turn the taps to the correct positions to make it flow the correct direction.
3. The must open all of the taps to the correct position so water flows into the bucket containing the key.
4. They must add enough water so the rise floats up to a level at which they can reach in with the hook provided to them by the archaeologist and grab it.
5. They should then take the key and open the small red lockbox where they will find the Spark element needed to make fire / light the beacon.

Reset Between Runs
- Open the taps to let all of the water out.
- Return taps to original positions.
- Put the Spark rod back in the small red lockbox and lock it.
- Empty out some of the water from the small plastic tote so the key is just out of reach.
- Retrieve the wooden box with the plastic tote and key in it.
- Give the hook back to the archaeologist.

Takedown
- Once the room has finished, start by emptying all of the water out of the pipes by turning all of the taps to the initial position.
- Take the buckets of water either outside or to the sink and empty them and let them dry.
- Once everything is dry, return to appropriate place.

Potential Faults and Fixes
- Water does not flow into proper pipes or bucket.
  - Re-adjust pipes and/or bucket.

Potion Puzzle

Description

This puzzle exposes the children to chemistry and chemical reactions. The must correctly follow the instructions to conduct a reaction between vinegar and baking soda with the additional element of food coloring. The color of the reacting material will lead to a certain book, as noted by a key, which houses one of the pieces needed for the fire beacon.

Required Materials
- Vinegar
- Food coloring
- Baking soda

- Pipettes
- Four 25ml volumetric flasks
- 25ml beaker
- 200ml Beaker
- Cup
- Bowl
- Spoon
- 500ml Erlenmeyer Flask
- Collection of books
- Hollowed out book
- Potion Instructions
- Potion Key
- Oxygen rod for Fire Beacon

Setup
a. Be sure to give the potion instructions to the archaeologist.
b. Put some baking soda and the spoon in the bowl and label "Fairy Dust".
c. Put the food coloring into the 25ml volumetric flasks and label: Blue = "Blue Magisterium", Yellow = "Liquid Sun", Green = "Toad Bile".
d. Put ¼ cup of vinegar into the 200ml beaker and ¼ cup of vinegar into the cup and label both dragon tears.
e. Lay all of the above materials, the small beaker, the pipettes, and the 500ml Erlenmeyer Flask out on the table which should be placed in designated area.
f. Place the Oxygen rod inside the hollowed out book.
g. Stack the all of books on the table.
h. Place the Potion Key on the table.

Procedure for Use
1. The children will be provided the recipe for the potion (can be found in Puzzle Pieces Section) by the archaeologist before the enter the tunnel, they will take that over the potion table.
2. They should closely follow the instructions, adding the correct amount of each element (food coloring, vinegar, baking soda) to the Erlenmeyer Flask in correct order.
3. Once all of the elements are added the chemicals will react and bubble, the children should take note of the color then use the key (can be found in Puzzle Pieces Section) provided to connect that color to a book title.
4. They should then look over all of the books, pick up the correct book, and open it.
5. Inside that book will be one of the element need to make fire / light the beacon.

Reset Between Runs
- Clean all of the beakers and cups out that had vinegar and baking soda in them.
- Make sure that all of the food coloring containers have enough in them.
- Make sure there is enough baking soda for the participants to use.
- Return the oxygen rod to the hollowed out book and put the books back in an orderly fashion.

- Set up all of the beakers and cups in an orderly fashion.
- Give the potion sheet back to the archaeologist.

Takedown
- Once the room is complete, start by cleaning out all of the beakers and cups.
- Put all of the food coloring and baking soda back in their respective containers.
- Make sure the table is clean and everything is put back into the chemistry puzzle box.

Potential Faults and Fixes
- Flask/beaker breaks or goes missing.
  - Can be replaced by any sort of cup.
- The children do not follow the instructions to add the proper amount of each element, so the reaction does not happen or the color comes out wrong.
  - Wizard ushers them as to what color it should be and encouraged them to choose the correct book.

Cave Puzzle

Description

This puzzle helps the children with problem solving skills and being able to read and follow directions from a map. The map on the cave wall leads to a pile of rocks with riddles and shows them which riddle is the correct one. The children then need to solve the riddle which will lead them to the plant and that is where one of the fuel element of the fire beacon is located.

Required Materials
- Cave (already created)
- Map (already created)
- Blacklight flashlight
- Pieces of wood with riddle and symbols on them (already created, riddles can be in Puzzle Pieces Section)
- Wood rod for Fire Beacon
- Potted Tree

Setup
a. Be sure the archaeologist has the blacklight flashlight and that it is operable.
b. Unfold cave box and velcro box edges together and place it in the location designated on the layout diagram.
c. Position map on one of the cave walls.
d. Place the pieces of wood in the designated spot with the symbol side facing upward.
e. Place the potted tree in the designated area.
f. Hide the Wood rod in the potted tree.

Procedure for Use
1. The children should go into the cave box and shine the blacklight on the map.
2. On the map, there is a pile of wood with a lightning bolt symbol which the children should notice.
3. They should then follow the line on the map to the pile of wood across the room and find the piece of wood with the lightning bolt.
4. That riddle on that piece will lead the children to the potted tree located in the room.
5. The children should go over to the plant, search through it, and find the fuel element of the fire beacon.

Reset Between Runs
- Return the blacklight flashlight to the archaeologist.
- Reorganize the pieces of wood so they are all back in the corner with the symbols up.
- Hide the Wood rod in the potted tree.

Takedown
- Start by making sure everything is out of the cave.
- Undo the velcro on the back of the box to remove the back plate.
- Undo the other velcro so that the box can fold up and be moved out of the room.

Potential Faults and Fixes
- Loss of box stability
  - Reinforce with more cardboard and tape.
- Faded ink on UV puzzles
  - Re-apply ink.

Fire Beacon

Description

This puzzle uses the ideas of completing and electric circuit By inserting metal rods into slots in the front. By doing this, the user will complete a circuit, turning on lights as fog from a fog machine pumps out the top.

Setup
a. Place the fire beacon in the room as indicated by the room layout diagram.
b. Lift the top lid and aline the fog machine up with the box drawn on the inside shelf with the nozzle pointed towards the circular hole.

c. Feed the power cords and the remote cords (ends that will connect to the machine) through the circular opening in the back of the puzzle and then through the circular opening on the fog machine shelf.
d. Plug the cords into the machine and the other end into an outlet/ powerstrip.
e. Turn on the fog machine by flipping the red switch on the back of the fog machine.
f. Wait for the two red lights on the remote to turn red, this means it is warmed up.
g. Lock both the top and back doors.
h. Too much fog will set off the fire alarm, so it's a good idea to take the batteries out of the smoke detector.

Procedure for Use
1. Participants will insert the metal rods into the three designated slots on the front of the machine.
2. Once done two lights will turn on. At this point someone must press the button on the fog machine remote.
3. DO NOT HOLD DOWN BUTTON. Short pulses work best, otherwise you will fill the room with fog and set off fire alarms.
4. DO NOT GO OVERBOARD WITH SMOKE.

Reset Between Runs
- Take all of the rods out for the other puzzles.
- Make sure the fog machine is working and the lights are working.

Takedown
- Remove all of the rods from the puzzle and store them with the rest of the materials.
- Un-lock the top and back doors.
- Turn off smoke machine and disconnect power and remote cords.
    - Allow smoke machine time to cool down.
- Place the smoke machine and power cord/remote for smoke machine them in the top compartment.

Potential Faults and Fixes
- Rotten/ cracked/ splintered wood.
    - Replace broken piece of wood. The side walls and shelves were made from a composite wood sheet, the base was made from two by fours, and the box was made from scrap wood planks.
- Fog will not come out.
    - Ensure there is fog inside the machine.
    - Ensure the fog machine is aligned and all cords are connected.
    - Wait for lights to turn red (it has to heat up: 3 minutes).
- Lights won't turn on.
    - Ensure switches are all depressed until a faint click is heard.
    - Ensure the batteries inside the lights are not dead: To replace carefully unscrew the back end of the flashlight and remove the battery pack. Each one takes 4 AAA batteries.

- Open the back door and ensure all wires are connected. If not, reconnect them.
    - For the switches just unscrew the screw, place wire underneath the screw head and tighten the screw.
    - For flashlights solder the wires the the back of the battery pack and wrap the other wire around the lanyard hole.
- Rewire the device.

Room Layout

Major Props

Cave:
- To set up, velcro the front flaps together and then velcro the back on to it.
- Place the cave in the location designated on the layout diagram.
- Place the rocks inside the cave and drape vines to create a more realistic environment.

Tunnel:
- Unfold boxes so all three are open.
- Push boxes together so that the largest is on one end, the middle is slightly pushed inside the largest, and the smallest is slightly pushed inside the middle.
    - Should be set up like Largest - Middle - Smallest.
- Adjust flaps to cover open gaps, tape as needed.
- One end should be just outside the computer room door; the other end should be placed so that it sits just inside the curtains.
- Tape lights to the two upper edges of the length of the tunnel.
    - One strand should be used for each edge.

- Use basic clear Scotch tape for easy removal.

Beacon:
- Unlock the back and top of the beacon
- Place fog machine on the shelf in the top compartment. The nozzle should be facing the pvc pipe with the back corner aligned with the tape.
- Feed cords for the fog machine through the opening on the shelf and on the back wall
- Turn on the white LED light strip by pressing the button on the battery pack on the inside of the beacon. This takes 4 AAA batteries.
- Depress all three levers on the outside of the beacon. Lights should turn on. If not check the connections on the inside of the beacon and compare to the picture below. You might have to change the batteries in the lights. Unscrew the bottom of the lights inside the fire prop. Each takes 3 AAA batteries. The putty on the inside of the lights are needed to keep the battery pack in place.
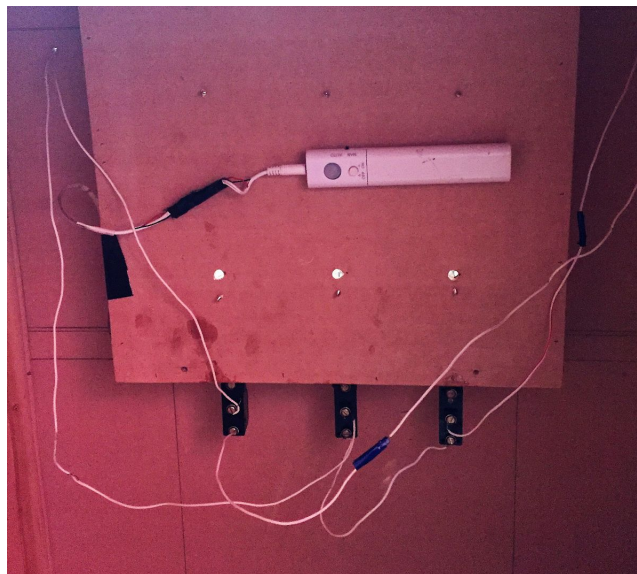
- Use fog machine once the lights inside the fire prop lights up in a dark room for the full effect.

Decorations / Atmosphere
- Play nature sounds on the speaker.
- Drape vines / plants throughout the space.
    - Looks best with a large amount of these.
    - Especially make sure to drape vines on the water puzzle and near the projector and speaker.

DRAGON ROOM PUZZLE PIECES

Water Puzzle Riddle:

To be safe from fires hot burn

Fill the bucket by giving the faucets a turn

Which raises a key from water's flow

Which unlocks the box to make sparks glow

Unlocking the Portal Riddle:

1 door to the past that opens today

But only **20** minute before it is too late

Then **5** years in the past you must stay

Be **4** I can schedule a re-open date

Cave Puzzle Riddles (First is correct one):

This is something with a bark,
But it doesn't have a bite,
With a lot of sun and rain,
It can grow to a great height

I have four legs, but I don't have feet,
I come in handy when it's time to eat

All shining and silver,
With a beautiful face,
You look into me,
And find this place

I have a round knob and also a lock,
Visitors may give me a knock

To solve the hunt you must get,
Into the room wired to the net,
Crammed with tech and full of code,
The clue is hidden in this abode

To solve this little fix,
Liquids, solids, gases mix,
Head to the place of some reaction,
To further this puzzle transaction

The Potion's Key

RED → Eldest
CLEAR→ Winter
WHITE → Daredevil
BLUE → The Ghostfaces
GREEN → Deltora Quest
BROWN → Don't judge a girl by her cover
BLACK → Maximum Ride
ORANGE → Jackie French
PURPLE → Amulet
PINK → Love Hurts
YELLOW → Ali's Pretty Little Lies

Wizard's Brew

❖ Using [dropper] put **2** [blue drop] DROPS **Blue Magisterium** into the [beaker]

 containing *Dragon Tears*

❖ Using [dropper] put **6** [yellow drop] DROPS **Liquid Sun** into the [cup]

 containing *Dragon Tears*

❖ Measure out **10ml** of *Fairy Dust* into the small,

 empty [beaker]

❖ Put the 10ml of *Fairy Dust* in the large [flask]

❖ **AT THE SAME TIME**, pour the [beaker] and the [cup]

 into the [flask] containing the *Fairy Dust*

❖ WHAT COLOR IS THE POTION? USE THE KEY.

Supplemental Materials Q - Pirate Room Overview

Theme:
- Pirate, Marine, Treasure

Basic Narrative:
- The children start off in one set area when a member of the Banksia staff comes in with a bottle containing an old map and a message that they found while cleaning out storage. The children follow the map and find that it leads to right outside the computer room. Here, they speak the words found on the map, and two small boats appear. The children climb into the boats and are then pulled into the childcare room. Once in the room, they speak with a pirate, who tells them their backstory and what exactly the situation is. The children look at the message that was in their found bottle and decode it using a cipher key provided to them by the pirate, revealing a set of riddles. The children follow each riddle to locate a key. Once all three keys have been obtained, the children must prove their bravery by walking a plank to where the treasure chest is. The chest contains small pirate toys and coins for the children, and a map for the pirate to use. Then the children return to their boats and leave the room.

Puzzles:
- Decoding a Caesar Cipher:
  - Plain vs Cipher:
    - A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
    - X Y Z A B C D E F G H I J K L M N O P Q R S T U V W

- Bermuda Triangle:
  - This puzzle involves compasses, navigation, and magnets. The children must use the compass to find an object to the East which messes with the compass' natural sense of direction; they must then use this object to unlock a special box in order to get the key.
  - Riddle (Plain vs Cipher):

You may have lost your way,
But there's still a chance,
Head towards the East and find the object
That makes your compass' needle dance.

You may have lost your way,
But there's still a chance,
*Head towards the **BXPQ** and find the object*
*That makes your **ZLJMXPP'** needle dance.*

- Shipwrecked:
  - This puzzle involves water density and buoyancy. The children find a clear container with a small shipwreck at the bottom; there's also a submerged pirate figure. The children need to add enough salt to the water in the container to create enough of a saltwater

mixture in order to get the pirate/bottle to float to the top where they can grab it. The key for the chest will be on this piece.
- Riddle (Plain vs Cipher):

Objects will sink when water is dense,
But salt can make them float,
Your friend is trapped at the bottom of the sea,
Find a way to free him from beneath the boat.

Objects will sink when water is **ABKPB,**
But **PXIQ** *can make them float,*
Your friend is trapped at the bottom of the sea,
Find a way to free him from beneath the boat.

- Land Ho!:
    - This puzzle involves using a flag key to determine which flags correlate with which letter. The kids will learn the international codes of communication for nautical exploration. They will determine that the flags spell out SAND and will then go over to the bin of sand that is in the room. A key in a small treasure chest will be buried in the sand and they have to dig it out.
    - Riddle (Plain vs Cipher):

Ships use signals to send messages,
These ones reveal where you should be,
Decode the flags and go the location,
Once there, you may dig for the key.

Ships use signals to send messages,
These ones reveal where you should be,
Decode the **CIXDP** *and go the location,*
Once there, you may **AFD** *for the key.*

STEM/ Educational Concepts:
- Cryptography
- Magnetism
- Water Properties
    - Buoyancy
    - Floatation
    - Water Density
- Cartography
- Navigation

Soft Skills:
- Teamwork & Collaboration
- Communication

- Following Instructions
- Problem-solving

PIRATE ROOM NARRATIVE

Introduction / Backstory

Children are all gathered in the THIS PLACE with one of the Banksia staff they know well.

BANKSIA STAFF MEMBER - *(curious, excited)* Hey! I was cleaning out one of the back closets and found this bottle. I've never seen this before and I have no idea where it came from! It looks like there's some sort of old paper inside of it. Would you guys want to take a look at it?

The staff member hands the bottle to the children. They open the bottle to see that it contains a map of Banksia, which leads them to outside of the computer room, and a series of encrypted riddles. A message on the map says:

> *"Once you reach the destination,*
> *Declare the words, 'We've come to parlay',*
> *A passage will unlock,*
> *And you can continue on your way"*

If the children don't know what 'parlay' means, explain that it means they're asking to speak.

The children follow the map to outside of the computer room and find it completely ordinary.

CHILDREN - We've come to parlay! *(prompt if necessary)*

Once the words are spoken, two boats appear from the computer room and stop in the hallway.

BANKSIA STAFF MEMBER - Look! Ships! I wonder where they lead? It looks like I probably won't fit... but you should get in and see where they take you! I'll be here waiting for when you return!

The children board the ships and are pulled forward towards the childcare room. Once in the room, the children see that it has been transformed into a pirate cove. As the boats come to a stop, the children exit the boats and see a pirate standing there.

PIRATE - (surprised, a little guarded but not aggressive) Shiver me timbers! How'd ye get here? How'd ye find this hideaway? I got marooned here by me crew, and nobody has been able to find this place for years.

Children answer that they found a map (prompt if needed). Pirate is excited and shocked.

A map?! Let me see!

Pirate gets map from children.

Aha! I know exactly who made this map! It was me best mate, Ridley! He must have made it so he could find his way back to me to save me from this doomed fate after me crew betrayed me. They're a greedy lot, ya see. They stole me ship and left me marooned here in this cove for eternity. It's mutiny, I tell ya! Ridley must not have been able to retrace his steps but I'm sure glad ye found the way!

The pirate briefly pauses.

...Did Ridley happen to leave anything else with the map?

Children reveal the coded riddles (prompt if needed). The pirate curiously glances at them.

AYE! Ye see these jumbled looking words? This is pirate code! These are just what I needed! Ridley must have hidden keys to that chest over there (*points to chest*) and left these messages to remember where they are.

Ye see, me crew taunted me and left a map of the way back to my home in the chest, knowing that I would never be able to open it. It's me only way out of this place, but it's locked up with not just one, but three locks! It be taunting me fer years, not being able to find those keys. However, with these clues and yer help I can open the chest and finally get me out of here.

First we are going to have to break Ridley's secret code, which can be done together, or separately, savvy?

The pirate fishes a cipher key out of their pocket and hands it to the children.

We need to use this guide to the pirate code, here!

The pirate gives the cipher key to the children. The children use the key to decode a few words in each riddle. These riddles will lead them to different puzzles in a few parts of the room. Once they figure out the riddles, the children will go off and complete the puzzles either individually or together, it is up to them which one.

The participants finish the puzzles and collect all three keys.

(happy) Ye've gotten all of the keys! I can taste the salty sea air already! *(a little more cautious)* Arg, but are ye brave enough to walk the plank and open the chest? Traverse it carefully, or ye might become shark bait! I'd do it meself, but sharks and I don't get along too well these days...

The children walk the plank and open the treasure chest.

Blimey! I never thought I'd see the day when this chest opened! Would one of ye care to hand me that map?

The children hand the map to the pirate. The pirate excitedly unrolls the map and hugs it to themself.

Now, in exchange for yer help setting me free, ye can each keep one gold coin from me treasure. I'd give ye more, but, ah… I be needing that gold to get home.

Conclusion

The children each take a small bit of the treasure for themselves. The pirate starts shooing them back towards the boats.

Well alas, this is where we be parting ways. Take the boats in which ye came! My map leads me elsewhere *(points other direction).* Fair winds and following seas, me harties! Perhaps our ships will cross ways some day!

The children exit on the boats and are pulled back into the hallway where they are greeted by the same staff member as before.

BANKSIA STAFF MEMBER - You're back! How was your voyage?

The children answer as the staff member leads them away from the boats.

Reset everything for next experience.

PIRATE ROOM GAME PROGRESSION FLOW CHART

Backstory	**Receive Map**	**Follow Map to Lobby**	**"We've come to Parlay"**	**Enter Room / Meet Pirate**

Decoding Puzzle	**Bermuda Triangle**	**Find Magnet**	**Retrieve Key 1**
	Shipwreck Rescue	**Obtain Message**	**Retrieve Key 2**
	Land Ho!	**Dig Through Sand**	**Retrieve Key 3**

Legend:

= Given to participants

= Puzzle to complete

= Puzzle outcome

= Task to complete

= Puzzle outcome but leads to another task

Walk the Plank	**Unlock Chest**	**Exit on Boats**

PIRATE ROOM PUZZLES

Message in a Bottle

Description

The message in the bottle will be the first clue that the students receive and they will need to be able to read the map and follow the instructions on it to get to outside of the computer room. Once they are inside of the room, the other three messages on the paper will be the riddles and the children will need to figure out these riddles to start to solve the other puzzles.

Required Materials
- Clear bottle (probably best to use plastic but one that looks like old glass)
- Printed out and laminated map
- Printed out and laminated messages
- Printed out and laminated cipher key

Setup
a. Roll up the map and three messages (message can be found in Puzzle Pieces Sections, map needs to be created), place in the bottle.
b. Give this bottle to the Banksia staff member.
c. Give the cipher key (cipher key can be found in Puzzle Pieces Section) to the pirate.

Procedure for Use

1. At the start of the experience, the Banksia staff member should give the short backstory and then present the bottle to the participants.
2. The participants should notice the map is of Banksia and follow it to outside of the computer room.
   a. They should also notice the three messages, but not do anything with them yet, as they don't have the cipher key.
3. Once they enter the room they should show the map and messages to the pirate (per the pirate's request).
4. The pirate will then give them the cipher code so they can decode the messages.
5. The messages will get them started on the next three puzzles.

Reset Between Runs
- Get the map and three messages back from the room.
- Roll them up together and place them in the bottle.
- Be sure the Banksia Staff member has the bottle.
- Be sure the pirate has the code key.

Takedown
- Collect all of the pieces of paper and put them in the bottle for safe keeping.
- Put the bottle away with the rest of the supplies.

Bermuda Triangle

Description
This puzzle involves compasses, navigation, and magnets. The children must use the compass to find an object to the East which messes with the compass' natural sense of direction; they must then use this object to unlock a special box in order to get the key.

Required Materials
- Compass
- Large magnet
- Lockbox with magnetic lock (could use one from infection room?)
- Key #1
- Cave and fake cave rocks
- Extra pirate-themed objects
    - Book
    - Globe
    - Bottles
    - Small boxes

Setup
a. Unfold cave box and velcro box edges together and place it in the location designated on the layout diagram.
b. Securely hide the magnet that will unlock the box inside one of the fake rocks.
c. Hide the fake rock among the others inside the cave.
d. Set up tables outside the cave, as directed by the layout diagram.
e. Layout the other pirate theme objects on these tables.
f. Place Key #1 inside the lockbox and make sure it's locked.
g. Put this box on the table with the other objects.

Procedure for Use
1. Using the cipher key, the participants must decode the coded words in the riddle that goes along with the Bermuda Triangle puzzle.
2. They will then use the compass that they are provided to go towards the east that will lead them to the cave.

3. Once they reach the cave they will need to find something in the cave (Magnet) that makes the compass change directions.
4. Once they find this, they will use it to unlock the box that can only be unlocked with a magnet.
5. Then they will receive the key and use this key for the final part with the chest.

Reset Between Runs
- Put the fake rock with the magnet inside back into the cave.
- Put Key #1 back into the lockbox and ensure it is locked.
- Tidy up all other objects on the tables.

Takedown
- Dismantle the cave.
- Put the key in a safe place.
- Pack up all of the materials.

Shipwrecked

Description

This puzzle involves water density and buoyancy. The children find a clear container with a small shipwreck at the bottom; there's also a submerged pirate (or small message in a bottle). The children need to add enough salt to the water in the container to create enough of a saltwater mixture in order to get the pirate/bottle to float to the top where they can grab it. There will be a clue on this piece which leads to the next key.
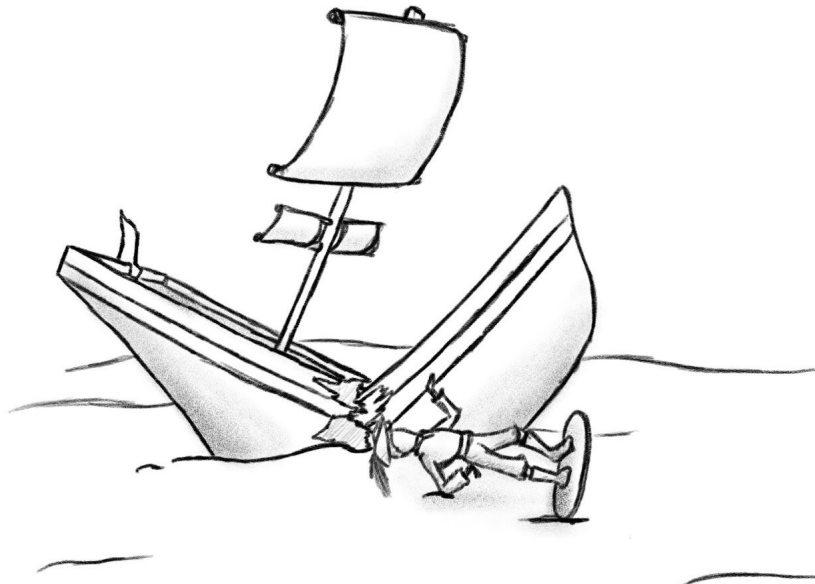
Required Materials
- Clear container
- Some sort of grate
- Skinny rod
- Water
- Salt
- Wrecked pirate ship (a decoration for an aquarium would work perfectly)
- Small figure of a person (very small, lightweight toy)
- Key #2

Setup
a. Put wrecked pirate ship decoration in clear container.
b. Attach the key #2 to the small figure.
c. Put small figure of person on bottom of clear container.
d. Fill clear container with water.
e. Put a grate over the container so participates can't just reach in and grab the figure off the bottom.
f. Place salt next to water container.

Procedure for Use
1. Using the cipher key, the participants must decode the coded words in the riddle that goes along with the Shipwrecked puzzle.
2. They should then go over to the water container and start adding salt.
3. As they add salt, they should stir to mix it in with the skinny rod.
4. They must added enough salt to make the figure with the key float.
5. Once the figure floats, the participant may reach in and grab the key.

Reset Between Runs
- Empty out the water from the container and replace with clean water.
- Reattach key #2 to the small figure and put in the bottom of the container.

Takedown
- Empty out the water and let everything dry.
- Put the key in a safe place.
- Pack up and store materials.

Land Ho!

Description
This puzzle involves using a flag key to determine which flags correlate with which letter. The kids will learn the international codes of communication for nautical exploration. They will determine that the flags

spell out SAND and will then go over to the bin of sand that is in the room. A key in a small treasure chest will be buried in the sand and they have to dig it out.
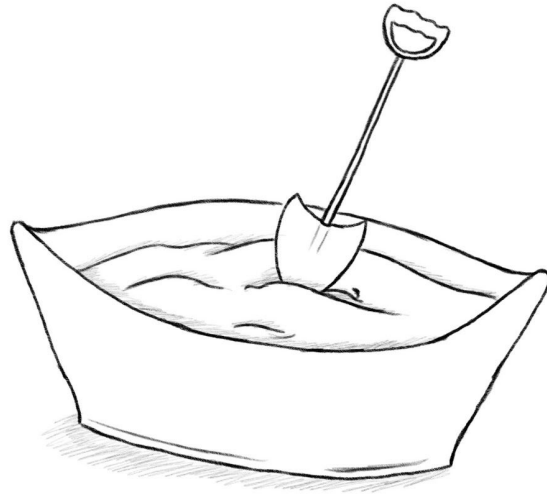
Required Materials
- Flags of code signals for S, A, N, and D (can be made out of paper)
- Print out and laminate Signal Flag Code -- https://goo.gl/images/hhb9y3
- Shallow plastic tote (grey flexible one from dragon room)
- Sand
- Mini treasure chests
- Small pirate-themed objects
  - Gold coin
  - Bead necklaces
  - Toy/ plastic marine life
- Key #3

Setup
a. Hang the signal flags on the wall in order in the designated location to spell out 'SAND'.
b. Hang the code under the letters on the wall.
c. Fill the plastic tote with sand.
d. Put Key #3 into one of the mini treasure chests.
e. Place small pirate-themed objects in the other mini treasure chests.
f. Bury all of the chests in the sand.
g. Place the tote in the location as noted by layout diagram.

Procedure for Use
1. Using the cipher key, the participants must decode the coded words in the riddle that goes along with the Land Ho! Puzzle.
2. They will then go over to the international code of signals and should use the key to determine that it spells out 'SAND'.

3. This should prompt them to go over to the tote full of sand.
4. They should dig through the sand, discovering the mini treasure chests inside.
5. They should continue digging until they find the mini treasure chest containing Key #3.

Reset Between Runs
- Put Key #3 back into one of the mini treasure chests.
- Put other small objects back into the other mini treasure chests.
- Bury all of the mini treasure chests back in the sand.

Takedown
- Take all of the mini treasure chests and objects out of the sand.
- Empty the sand out of the tote and place it where it is going to be stored (if going to be reused).
- Clean out the tote.
- Store all of the other objects.

Treasure Chest

Description
The participants in the room will need to be brave enough to walk the plank to get to the treasure chest and use the three keys that they collected from the other puzzles to open up the chest.
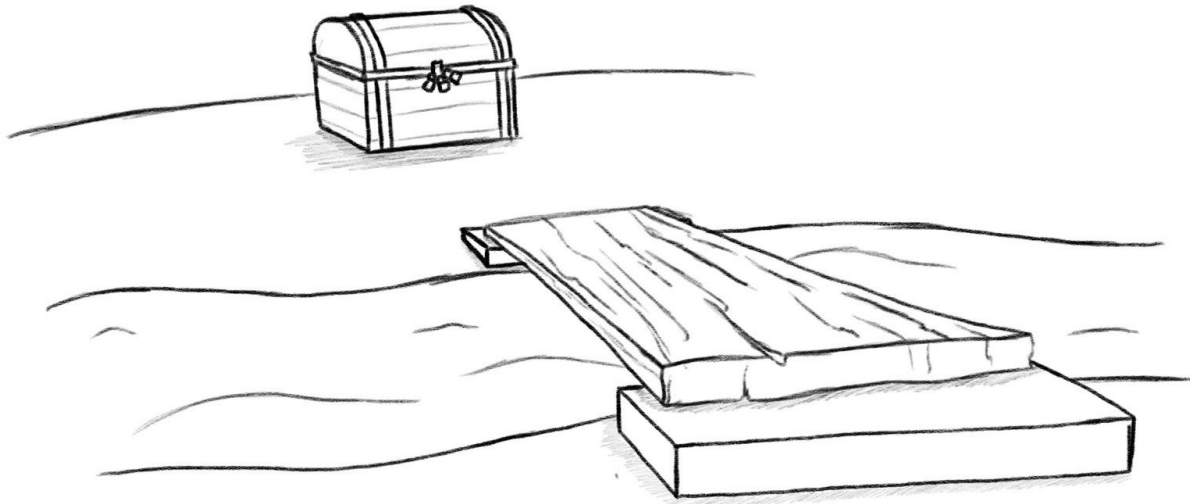
Required Materials
- Wooden chest
- Map providing pirates way out (needs to be created)
- Gold Coins
- 3 hasp and staples (attach to the chest)

- 3 locks and 3 keys (simplest for all three keys to work in all three locks)
  - Small locks with lightweight keys so the key floats for the Shipwreck Puzzle

Setup
a. Be sure all three keys are placed in the correct locations noted above.
b. Place the treasure chest in the correct location based on the room layout diagram.
c. Place the pirate's map and a bunch of gold coins in the chest.
d. Attach the locks to the hasp and staples and be sure they are locked.

Procedure for Use
1. Once all three of the keys are collected they participants should regroup with the pirate.
2. The pirate will explain how they must walk across the plank to open the chest.
3. They should then open the chest and give the pirate the map.
4. The pirate will then tell them that they can take a gold coin in exchange for helping.

Reset Between Runs
- Put the pirate's map back into the chest.
- Add more gold coins to the chest if necessary.
- Replace all three keys to where they belong, as noted above.
- Make sure all three locks on the chest are locked.

Takedown
- Make sure all of the keys are in a safe place.
- Pack up and store all materials.

Room Layout
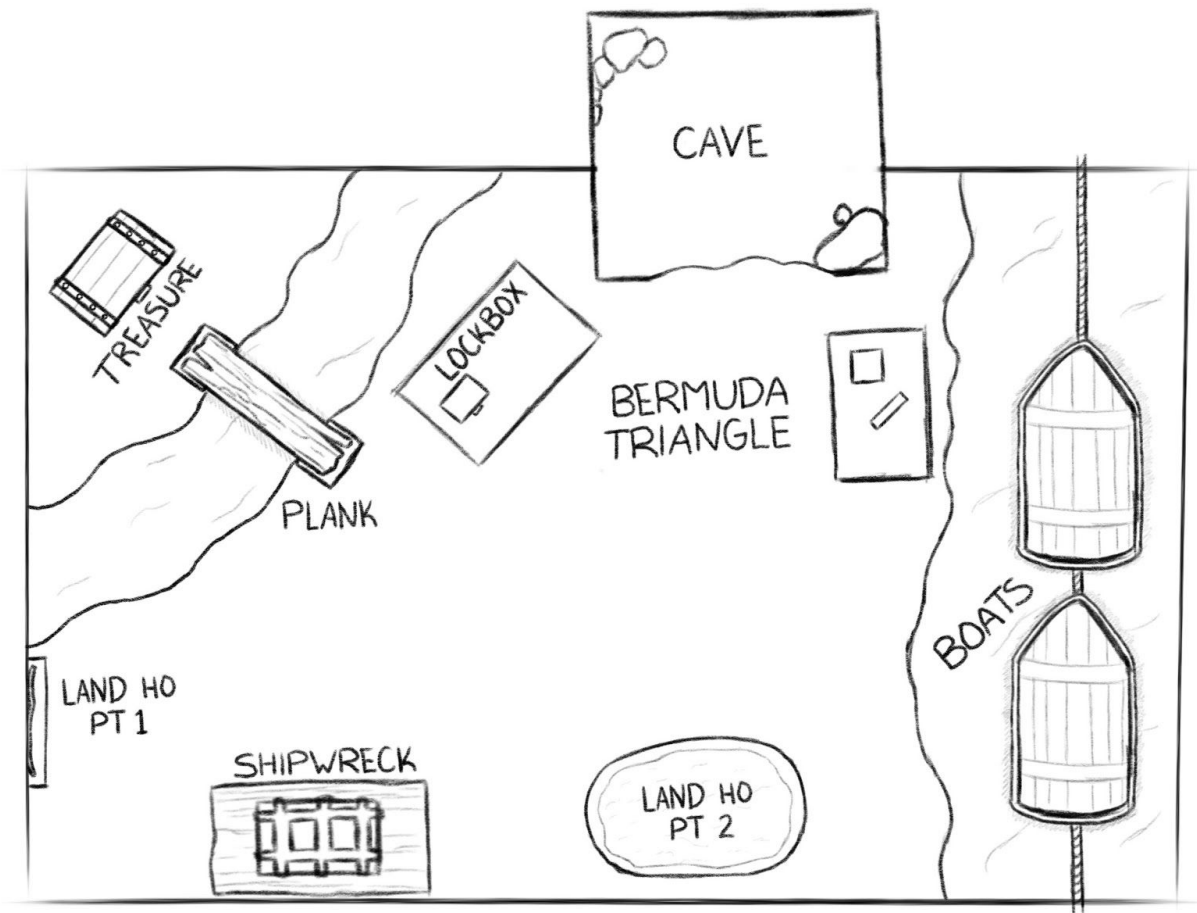
Major Props

Cave:
- Be sure to paint the cave to cover the drawings from the Wizard/Fantasy room.
- To set up, velcro the front flaps together and then velcro the back on to it.
- Place the cave in the location designated on the layout diagram.
- Place the rocks inside the cave and drape vines to create a more realistic environment.

Boats:
- Cut, shape, and paint large cardboard boxes to look like ships.
- Place these on top of small, flat carts.
    - The cardboard should extend to cover the wheels of these carts.
- Attach sturdy rope to each cart and make sure that they can be pulled together.
- http://hutchstudio.blogspot.com.au/search?updated-max=2011-07-12T13:32:00-07:00&max-results=7&start=21&by-date=false

- Start with the boats in the computer room, with the rope running through the childcare room to the person who will be pulling them in.
- Cover the floor where the boats will be in the room in a blue covering to make it look like the boats are in water.
- Could place bandanas or other pirate-themed wearable items in the boats for the children to wear.

Plank:
- Place a ocean tablecloth or some other blue covering on the floor in the designated area on the layout diagram.
    - https://www.discountpartysupplies.com.au/ocean-printed-plastic-tablecloth-seatwtc02.html
- Using gray paper, cut out shark fins and tape them to blue floor covering to look make it look like shark-infested waters.
- Place a cinder block on both sides of the water area, directly across from each other.
- Lay a wooden board on the cinder blocks to create a plank going over the water area.

Decorations / Atmosphere
- Run fog machine occasionally to create a misty, cove-like atmosphere.
    - Running the machine too often may set off a smoke alarm.
- Play cave sounds on the speaker: https://www.youtube.com/watch?v=Alj1CfrBdEQ&t=27s
- Drape vines / plants throughout the space.
    - Looks best with a large amount of these.
- Add other pirate-like decor. Some possible examples:
    - Faux seaweed:
        - http://www.halloweenforum.com/tutorials-and-step-by-step/121394-how-make-faux-sea-weed.html#post1358843
    - Pirate mast:
        - https://yvonnebyattsfamilyfun.wordpress.com/2012/04/21/pirate-party-ideas/
    - Netting:
        - https://www.discountpartysupplies.com.au/cargo-net-prop-seadecd08.html
        - https://www.discountpartysupplies.com.au/fish-netting-natural-seadecd09.html

Potential Pre/Post-room Activities
- Design a ship
    - Could be drawings or actual small ships with legos and corks.
    - http://www.planetsmarty.com/2013/10/design-and-build-boat-that-floats.html
    - https://kidssteamlab.com/lego-boat-engineering-project-for-kids/
- Dissolvable Treasure Chests
    - https://fun-a-day.com/pirate-science-fun-exploding-treasure-chests/

PIRATE ROOM PUZZLE PIECES

Messages in a Bottle:

<u>Bermuda Triangle</u>
You may have lost your way,
But there's still a chance,
Head towards the East and find the object
That makes your compass' needle dance.

You may have lost your way,
But there's still a chance,
Head towards the **BXPQ** *and find the object*
That makes your **ZLJMXPP'** *needle dance.*

<u>Shipwreck</u>
Objects will sink when water is dense,
But salt can make themf float,
Your friend is trapped at the bottom of the sea,
Find a way to free him from beneath the boat.

Objects will sink when water is **ABKPB,**
But **PXIQ** *can make them float,*
Your friend is trapped at the bottom of the sea,
Find a way to free him from beneath the boat.

<u>Land Ho!</u>
Ships use signals to send messages,
These ones reveal where you should be,
Decode the flags and go the location,
Once there, you may dig for the key.

Ships use signals to send messages,
These ones reveal where you should be,
Decode the **CIXDP** *and go the location,*
Once there, you may **AFD** *for the key.*

Decoding -- Cipher vs Plain:

```
X Y Z A B C D E F G H I J K L M N O P Q R S T U V W (cipher)

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ to decode

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z (plain)
```

Supplemental Materials R - Dinosaur Room Narrative

Theme:
- Dinosaur, Rescue, Build a Structure, Scavenger Hunt

Basic Narrative:
- The children are led into the computer room for debriefing. Here, they meet a ranger from Jurassic Island looking for new recruits to help take care of the dinosaurs in the park. The ranger tells them the basic jobs they need to do, and the children are given access key lanyards and dinosaur bandanas. They're then led into the childcare room, where the area is set up to look like a jungle control room with jungle and dinosaur noises playing in the background. The ranger is about to give them a tour of the facility, but suddenly the lights go out. One spotlight and some red lights come on to set the mood. The ranger says that the power from the generator has gone out, and that the dinosaurs are at risk since their enclosures need regulated temperatures powered by the generators, or else they can get ill. The ranger says that the children need to put together an audio distress beacon to send out a signal to headquarters on the mainland to let them know what's happened. In order to do this, the children first have to locate the parts of the audio beacon around the facility, solving puzzles along the way. Once all of the pieces are located, the children will then be able to build the audio beacon using a blueprint that the ranger provides. Once the audio beacon is built, the ranger will be able to turn on their walkie-talkie and receive communication from headquarters saying that power will be restored soon.

Puzzles:
- Sunken Keys:
    - This puzzle involves magnetism. The children are given a magnet and are directed towards a container full of a yellowish liquid which has a key inside. The container is attached to the floor, and there is a grate on the top so that no hands can get through to reach the key. The children must use the magnet to guide the key to the top of the container so that they can reach it. This key unlocks a nearby box which contains the base piece of the beacon - the central wiring box.

- Jigsaw Cipher:
    - This puzzle involves object assembly and cryptography. The children are given a simple puzzle that they need to solve. Once all of the pieces are put together, they'll discover an encrypted combination and a cipher guide. This code will unlock one of the boxes in the room and will lead to the middle piece of the beacon - the power core.

- Smoke & Mirrors:
    - This puzzle involves reversed characters, blacklights, and mirrors. The children will be directed towards a small pile of papers by the ranger and will be told that the researcher who filed these really likes using invisible ink and highlighters to jot down notes, and that they should keep an eye out for one of these. The children will be given a blacklight flashlight to find a combination on one of the papers. This combination will be written in

reverse, so that the only way to correctly see the numbers and letters will be by using the mirror close by. This combination will unlock a box with the final beacon piece - the audio dish.

- Sending a Signal:
    - This puzzle involves object assembly and basic engineering concepts. The children will have to follow paper instructions and images to set up the pieces of the audio distress beacon.

STEM/ Educational Concepts:
- Using combined scientific methods to problem-solve
- Magnetism
- Object Assembly
- Cryptography
- Engineering
    - Following designs
- Reflections
- Blacklights
- Radio Transmissions

Soft Skills:
- Teamwork & Collaboration
- Communication
- Task Management
- Helping Others
- Following Instructions
- Problem-solving

<center>**DINOSAUR ROOM NARRATIVE**</center>

<center>**<u>Introduction / Backstory</u>**</center>

The children are all gathered inside the computer room. A Ranger walks into the center of the room, carrying bandanas, lanyards, and a clipboard.

RANGER - *(friendly, but very official and to the point)* Good afternoon, trainees! My name is Harrison, and I'm here to get you started on the path to being Jurassic Island rangers! Now, who here likes dinosaurs?

The Ranger looks around the room at the participants and smiles. (The Ranger can ask a few questions about dinosaurs here if they so desire.)

Luckily, it looks like you're a determined bunch. Determination is one of the finest qualities that any park ranger could have! Now, let's get you started, shall we? Everyone take a lanyard and a bandana. If you're going to be my new trainees, you need to look the part!

The Ranger passes around lanyards and bandanas to each of the children. After the children have all received these, the Ranger goes over to the door.

Alright! Now, we need to head on over to the main Jurassic Island facility so I can start you on your tour!

The Ranger begins leading the children out the door towards the childcare room, still talking.

Jurassic Island is a fairly new place. I imagine that you youngsters have heard of the former Jurassic Park, or perhaps even Jurassic World, but this facility has been kept off the radar from public eye. The higher-ups don't really want any press giving us a bad reputation, you know?

The group approaches the entrance to the childcare room. The door is decorated to look like a giant wooden gate with the words Jurassic Island printed on it. The Ranger scans their lanyard on a fake scanner next to the gate. The Ranger then opens the door to the childcare room and leads the children inside.

Welcome to Jurassic Island!

The Ranger leads the children into the center of the room. Subtle jungle and dinosaur sounds can be heard all around. The lights are white throughout the room.

Main Story - The Jurassic Island Facility

This room is the first stop on our tour. It's the control hub for this entire facility and is where some of Jurassic Island's brightest minds work! Before I take you out to see our resident dinosaurs I just want to go over some safety features---

The lights in the room go out for a moment. Then, red lights come on around the room in addition to one bright spotlight. The Ranger looks around in confusion.

---well that can't be good.

The Ranger pulls out a walkie-talkie.

Hello? Mainland control? Can anyone hear me?

The Ranger waits for a few moments.

Hm… I'm not getting a response from the mainland base... If the power's out like I think it is, then we're all in a bit of trouble, including the dinosaurs. You see, our dinosaur friends need their enclosures temperature regulation to simulate the climates they would've been found in, and this is powered by the generators. Otherwise, the dinosaurs can get very sick, or worse...

The Ranger starts flipping through the papers on their clipboard, quietly muttering things like "No… not this… where is this silly manual…" before stopping on one of the last papers.

Now we're talking! In order for me to reach the mainland base with my walkie-talkie, we'll have to put together a simple audio distress beacon. I have the blueprint for it here, but it looks like we're going to have to search this room to actually find the pieces… luckily for us, the researchers who work in this room would have kept their pieces close to their workstations!

The Ranger pauses for a moment and looks around the room.

Alright, over there *(points to the desk with the Sunken Key puzzle)* is Dr. Grant's station. Knowing him, he probably hid the key to his piece of the audio beacon in plain sight. You might

have to get your hands dirty though… and I do mean actually dirty. That kook keeps a vat of dinosaur urine near him practically every day so he can test it for diseases…

The Ranger points at the desk next to Dr. Grant's (Smoke & Mirrors).

This station is Dr. Tran's. She's an amazing scientist, always testing out new materials. Huge fan of invisible ink, that one. You'll probably want to see if she has a flashlight anywhere.

The Ranger points at the desk across the room (Jigsaw Cipher).

Last, but certainly not least, is Dr. Hammond's desk. She's an incredible coder, and loves her puzzles and ciphers. I wouldn't be surprised if her combination lock has something to do with those. Now… we only have a little bit of time to find and put together this audio beacon, so we need to hurry. Check in with me once you find the pieces!

At this point, a twenty minute timer appears on the wall and begins to count down. The children begin solving the puzzles; the Ranger should provide hints along the way as needed. Once each piece is found, the Ranger will show the blueprints to the children.

Perfect! Now, let's take a look at this blueprint and see if we can piece this thing together so I can finally get a signal for my walkie-talkie.

The children put together the beacon according to the blueprint. The Ranger can help here as needed.

Conclusion

Yes! This looks like it'll work!

The Ranger walks over to the beacon and flips a switch near the top (this switch is just for show), then tries using their walkie-talkie again.

Hello? Mainland control? This is Harrison, can anyone hear me?

Someone outside of the room is holding the second walkie-talkie and responds.

MAINLAND - We read you loud and clear, Harrison.

RANGER - We've lost power all over the island, we need some help to fix the generator.

MAINLAND - We're on our way.

A few moments later, the red lights in the room turn white. There is a knock on the door and a mechanic comes in.

MECHANIC - Breakers got fried, huh? It'll take a while for me to get everything up and running again. Good thing you all called this in! Things could've gotten really serious with the dinosaurs' temperature regulators if no one had been here.

The Mechanic looks around the room at the children.

MECHANIC - You all should probably get out of here in case things get rough. We'll be sure to let you know how the dinos are doing.

The Ranger leads the children out of the room and gives them a small debriefing session back in the computer room.

RANGER - Well... I truly am sorry about your tour of Jurassic Island, but I can't thank you enough for helping me create that audio distress beacon! You really used so many different scientific methods to solve everything. Maybe you all should be Jurassic Island scientists instead of rangers... Well, now I have to run and see what needs to be fixed from this power outage.

The Ranger exits and returns to the childcare room. The experience is now finished.

DINOSAUR ROOM GAME PROGRESSION FLOW CHART
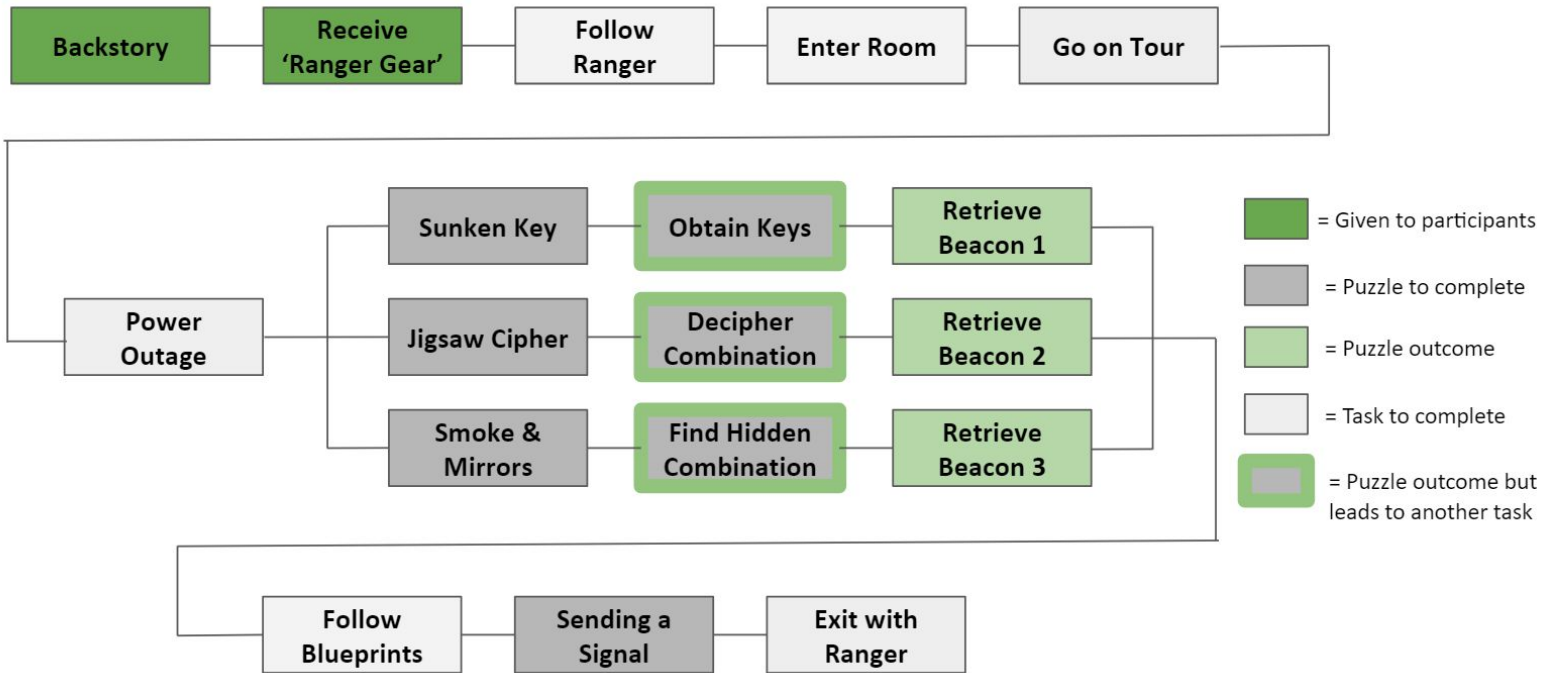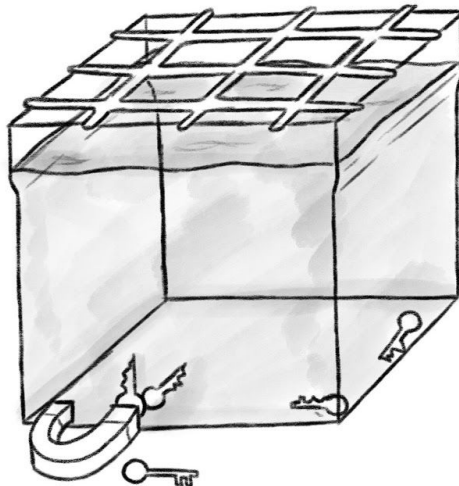
Sunken Keys

Description

This puzzle involves magnetism. The children are given a magnet and are directed towards a container full of a yellowish liquid which has a few keys inside. The container is attached to the floor, and there is a grate on the top so that no hands can get through to reach the keys. The children must use the magnet to guide the keys to the top of the container so that they can reach them. One of the keys unlocks a nearby box which contains the base piece of the audio beacon.

Required Materials
- Clear container
- Rope
- Water
- Yellow food coloring
- Magnet
- Keys (4 or 5)
- Lock
- Lockbox
- Audio beacon piece

Setup
a. Place the clear container on the ground next to the desk.
b. Tie rope around the grate, secure this to the desk.
   i. The container should not be able to be lifted off the ground.
c. Fill the container with water.
d. Put a few drops of yellow food coloring into the water and mix.

        i.   Make as yellow as desired.
- e. Place the beacon piece inside the lockbox.
- f. Close and lock the box.
- g. Place the keys inside the clear container.
  - i. Make sure to place the keys near the sides.
- h. Give the magnet to the Ranger.
- i. Put away unused food coloring.

Procedure for Use
1. The participants should be handed the magnet by the Ranger and given a verbal clue, leading them over near the container.
2. The participants should be able to see the key inside the container.
3. They then should try using the magnet to guide the keys up out of the water.
   a. The participants should be able to grab the keys once they're close enough to the top.
4. Once the keys are obtained, the participants should move over to the lockbox and unlock it using the correct key, receiving the beacon piece.
5. The participants should take the beacon piece to the center of the room.

Reset Between Runs
- Place the beacon piece back inside the lockbox.
  - Close this, and lock it.
- Place the keys back inside the container.
- Pour more water into the container if needed.
- Put more food coloring into the water if needed.

Takedown
- Unfasten the container from the desk.
- Empty out the water.
- Place the beacon piece with the rest of the audio beacon.
- Retrieve the magnet from the actor.
- Put away the rope and magnet.
- Store the keys and lockbox in a secure space.
  - Make sure to note which key is the correct one.

Jigsaw Cipher
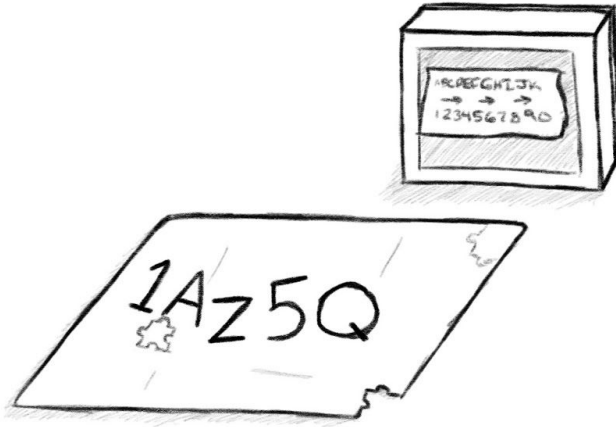
Description

This puzzle involves object assembly and cryptography. The children are given a simple puzzle that they need to solve. Once all of the pieces are put together, they'll discover an encrypted combination and a cipher guide. This code will unlock one of the boxes in the room and will lead to the middle piece of the beacon.

Required Materials
- Simple puzzle (around 50 pieces)
  - Encrypted message written out on the puzzle pieces.
  - A cipher guide should be either on the puzzle itself, or on the puzzle box.
- Combination lock
- Lockbox
- Audio beacon piece

Setup
a. Put together the puzzle.
b. Write out an encrypted combination on the completed puzzle.
   i. Make sure the decoded combination is the same combination set on the lock.
c. Place a cipher key on the puzzle box.
d. Take apart the puzzle and place this inside the puzzle box.
e. Set the puzzle box in the spot indicated on the room design plan.
f. Place the beacon piece inside the lockbox and close this.
g. Set the lockbox in the spot indicated on the room design plan.

Procedure for Use
1. From the backstory, the participants will know that they need to put together a puzzle in order to reveal a clue.
2. The participants should put together the puzzle, then begin deciphering.
   a. Hints might be needed to indicate that the cipher key is on the puzzle box itself.

3. After deciphering the code, the participants should look around the room to find a lock with the correct type of combination on it.
4. The participants should unlock this box and receive a piece of the beacon.

Reset Between Runs
- Take apart the puzzle and place it within its box.
- Place the beacon piece inside the lockbox.
- Lock this.

Takedown
- Take apart the puzzle and place within its box.
- Put this away.
- Place the beacon piece with the rest of the audio beacon.
- Store the combination lock and lockbox in a secure place.

Smoke & Mirrors
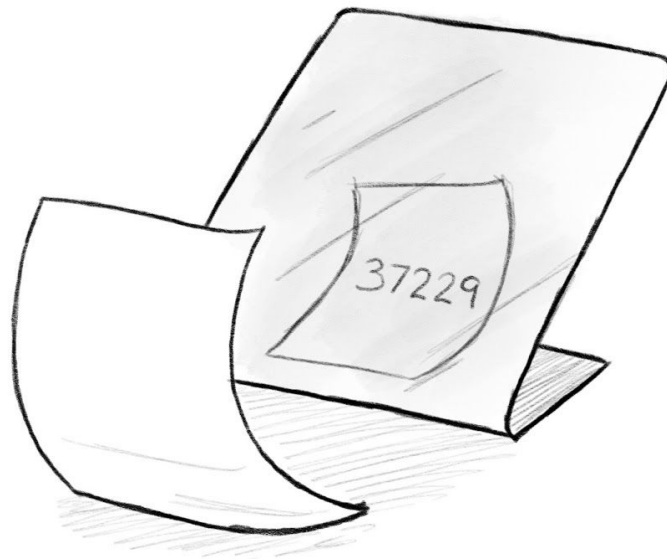
Description

This puzzle involves reversed characters, blacklights, and mirrors. The children will be directed towards a small pile of papers by the ranger and will be told that the researcher who filed these really likes using invisible ink and highlighters to jot down notes, and that they should keep an eye out for one of these. The children will be given a blacklight flashlight to find a combination on one of the papers. This combination will be written in reverse, so that the only way to correctly see the numbers and letters will be by using the mirror close by. This combination will unlock a box with the final beacon piece.

Required Materials
- Papers
    - Some of these should be black, some should have text printed on them.
    - Only one paper should actually have the combination written out.
        - Make sure that the combination is written so all letters and numbers are backwards and only legible using a mirror.
- Invisible ink/ highlighter
- Blacklight flashlight
- Mirror
- Combination lock
- Lockbox
- Audio beacon piece

Setup
a. Figure out what combination to use, then make sure the combination lock is set with that.
b. Write out the combination lock in invisible ink or highlighter so that it only looks correct when looked at with a mirror.
    i. Put away the ink/ highlighter when finished.
c. Set this paper, as well as the other papers, in the spot indicated on the room design plan.
d. Give the blacklight to the Ranger.
e. Place the mirror in the spot indicated on the room design plan.
f. Place the beacon piece inside the lockbox.
    i. Close this.
g. Place the lockbox in the spot indicated on the room design plan.

Procedure for Use
1. From the backstory, the participants will know that they need to sort through some papers and look for a secret combination.
2. The Ranger will give the blacklight to the participants and point them in the correct direction.
3. The participants should shift through the papers and easily find the mirrored combination.
4. The participants should then hold the paper up to the nearby mirror, and shine the blacklight once again to see the correct combination.
5. The combination should be put into the lock on a nearby lockbox.
6. This box will open and reveal the top piece of the audio beacon.

Reset Between Runs
- Place the papers back into a relatively neat pile.
- Place the mirror and flashlight back in their original positions.
- Place the audio beacon piece back in the lockbox.
- Lock this.

Takedown
- Gather the papers, mirror, and flashlight and put them away together.

- Place the beacon piece with the rest of the audio beacon.
- Store the combination lock and lockbox in a safe place.

Sending a Signal
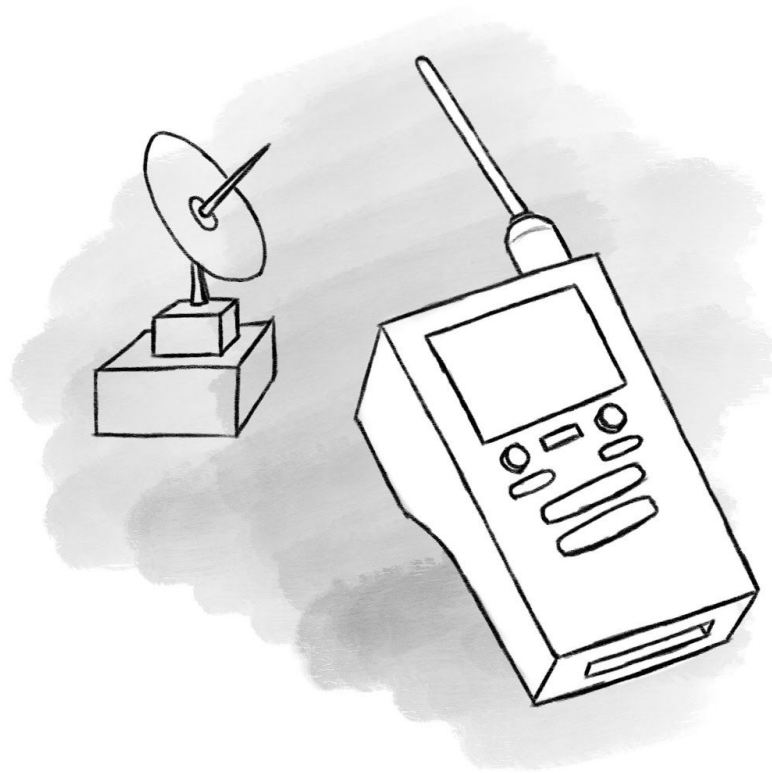
Description

This puzzle involves object assembly and basic engineering concepts. The children will have to follow paper instructions and blueprints to set up the pieces of the beacon.

Required Materials
- Blueprints
- 3 audio beacon pieces
  - Base - Central wiring box
    - This can be a box decorated to look like it is wrapped in wiring. There should be a slot on the top which allows for connection with the middle piece.
  - Middle - Power core
    - This can be a box decorated with lights and fake switches. There should be a small pole on the bottom for connection with the base piece, and a slot on the top which allows for connection with the top piece.
  - Top - Audio dish

- ■ This should be a large, plate-like piece; this can be created from plates, bowls, or anything that will get this type of shape. It should be decorated to look metallic, and should have an antenna coming out of its center. This should be able to connect with the middle piece.
  - ○ If desired, the pieces can also be connected using several magnetic strips.
- ● 2 walkie-talkies

Setup
   a. Put the paper blueprints on the clipboard.
      i. Cover this with several more papers.
   b. Give the clipboard to the Ranger.
   c. Place a beacon piece in each lockbox.
      i. The base piece (central wiring box) should be placed with the Sunken Key puzzle.
      ii. The middle piece (power core) should be placed with the Jigsaw Cipher puzzle.
      iii. The top piece (audio dish) should be placed with the Smoke & Mirrors puzzle.
   d. Lock these.
   e. Make sure the walkie-talkies both have batteries and are working properly.
   f. Give one walkie-talkie to the Ranger.
   g. Give the other walkie-talkie to someone who'll stay outside the childcare room.
      i. Test for distance to make sure the walkie-talkies will reach each other.

Procedure for Use
   1. The Ranger should try using the walkie-talkie, only to find that they cannot contact anyone.
      a. Walkie-talkies should be on during this, but the person with the walkie-talkie outside the room should not respond.
   2. During the story, the Ranger will locate the paper blueprints on their clipboard, then show it to the participants.
   3. The participants should find all three beacon pieces and bring them to an open area in the room.
   4. The participants should follow the designs on the blueprint to place the pieces of the beacon correctly.
   5. The Ranger will flip a switch on the beacon, then try using the walkie-talkie again.
      a. This time, the person on the other end will respond.

Reset Between Runs
- ● Take the beacon apart.
- ● Place a beacon piece in each lockbox.
  - ○ The base piece (central wiring box) should be placed with the Sunken Key puzzle.
  - ○ The middle piece (power core) should be placed with the Jigsaw Cipher puzzle.
  - ○ The top piece (audio dish) should be placed with the Smoke & Mirrors puzzle.
  - ○ Lock these.
- ● Turn off the walkie-talkies.

Takedown

- Take the beacon apart.
- Store the beacon pieces together.
- Turn the walkie-talkies off and store these together in a safe location.

DINOSAUR ROOM SETUP

Room Layout
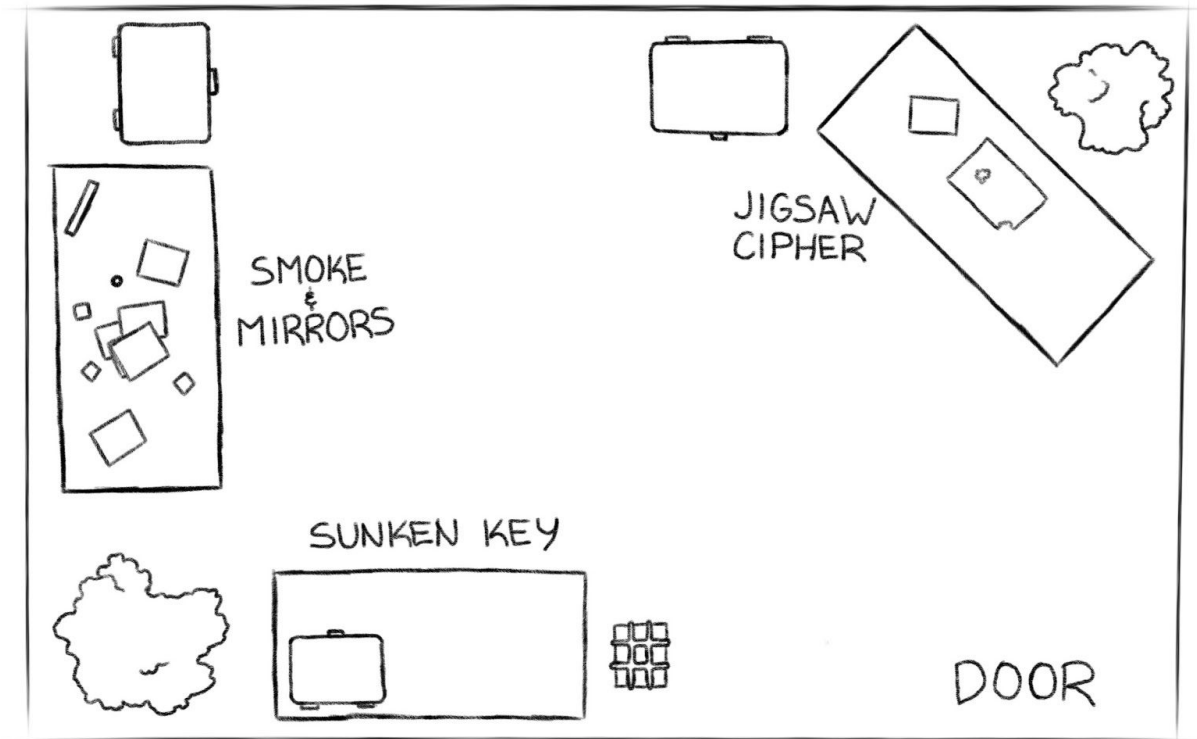
Major Props

Jurassic Island 'Gate':
- Find reference images online of gate designs.
    - Select the one which best fits the desired atmosphere.
- Use cardboard, paint, and paper to create the structure.
- Paint a small box to look like a scanner.
    - Place this right on the edge near the door to the childcare room.

Desks:
- Place the desks in the locations designated on the room layout diagram.
- Add regular office supplies to the desk surfaces, as well as inside the drawers if there are any.

Decorations / Atmosphere
- Play subtle dinosaur and jungle sounds on the speaker.
- Drape vines / plants throughout the space.
- Add standard office supplies throughout the room.
    - Try to make the space look well-used.

Potential Pre/Post-room Activities
- Design a dinosaur theme park.
- Create your own dinosaur.
- Thaw out dinosaurs.
    - https://happyhooligans.ca/melting-ice-with-salt-and-water/
    - https://littlebinsforlittlehands.com/frozen-dinosaur-eggs-ice-excavation-sensory-play/

Supplemental Materials S - Circus Room Overview

Theme:
- Circus, Carnival, Funhouse

Basic Narrative:
- The children start outside of the childcare room where there is a makeshift ticket booth set up. When the children walk up to the booth, a ticket seller pops up, greeting them. The children talk to the seller and discover that, in order to receive tickets to the circus, they need to help the ticket seller unlock their ticketbox by finding the object with the correct amount of magnetism. Once they find the object and unlock the box, the children receive their tickets and head inside the childcare room, which they find to be incredibly dark. Bright circus lights and circus music start playing, and the room lights up to reveal a circus tent with the ringmaster standing on a small platform in the center. The ringmaster greets the children and informs them of what's happening with the circus, and that they need the children's help to get it up and running for the next performance. The ringmaster assigns roles to each of the children and directs them towards activities in smaller tents set up around the room. As the children complete activities, the ringmaster turns on light boxes which correlate to the names of the activities. Once all of the light boxes have been switched on, the ringmaster will call all of the children back to the center and the "circus" will begin; a projected circus will start showing on one of the walls, and circus-related activities and popcorn will be given out.

Puzzles:
- Ticket Box:
    - This puzzle involves magnetism. The children will be given a small container of objects which the ticket seller says might unlock their ticketbox. The children will need to test each object with the box to see if they're magnetic enough to unlock it. Once the object with the correct amount of magnets is found, the box will open and the children will be able to receive their tickets.

- Bottled Balloons:
    - This activity involves basic chemistry and air pressure. The children will be given a few empty bottles, balloons, vinegar, and baking soda. They'll need to follow instructions to mix the ingredients together to create a chemical reaction. Once a few balloons have been inflated, the ringmaster will turn on a lightbox saying "balloons" to symbolize that the balloon activity has been completed. This puzzle is based off: https://littlebinsforlittlehands.com/balloon-baking-soda-vinegar-experiment-kids/.

- Faux Fireworks:
    - This activity involves creating basic chemistry mixtures. The children will be given an instruction sheet, various powders, a few canisters, and some blocks. They'll need to follow the instructions in order to mix together the correct powders and piece together the

blocks and canisters. Once the firework has been built, the ringmaster will turn on a lightbox saying "fireworks" to symbolize that this activity has been completed.

- Balancing Act
    - This activity involves basic physics concepts. The participants will be given a variety of stackable objects (blocks, bottles, cans, etc.) ranging in size and weight. They must stack up these objects to a certain marked height without the tower falling over. Once they reach the required height and the tower stays up, the ringmaster will turn on a lightbox saying "Balancing Act" to symbolize that the activity has been completed (it's okay if the tower falls after the light is on).

STEM/ Educational Concepts:
- Magnetism
- Air Properties
    - Expansion
    - Air Pressure
- Chemistry
    - Measuring
- Physics
    - Mass
    - Forces
    - Balance

Soft Skills:
- Collaboration & Teamwork
- Communication
- Helping others
- Following Instructions

Introduction / Backstory

The children are gathered outside of the childcare room where they see a makeshift ticket booth in front of the door. The children walk up to the booth.

TICKET SELLER - *(enthusiastic, but a little disoriented)* Oh! Welcome! I suppose you want some tickets to the circus? Let me get those for you!

The Ticket Seller bends down, shifting through various things in the booth, then pops back up with a box and a basket full of objects.

Hm… uh… alright, so, you are our first customers of the day and my supervisor locked this box last night. It seems as though they locked it in a new way, and I am not sure how to open it... The tickets are definitely in here, but could you possibly help me with unlocking it? I'll even give you the tickets for free! Although… please don't tell my supervisor about that.

The Ticket Seller hands the box to children along with the basket full of objects.

(*unsure tone*) I believe that it might have something to do with magnetism, but I could be wrong.

If children can't figure out how to open the box, offer other hints on magnetism.

The children open the ticket box. The Ticket Seller eagerly takes the box back and fishes out a few tickets.

(*enthusiastic*) Awesome! Thank you for doing that for me! Here are your tickets and you can now enter right through that door.

Main Story - The Circus

The Ticket Seller points towards the childcare room. The children walk into the room to find it completely dark. Then, lights and sound come on, and the room brightens to reveal the Ringmaster standing on a small platform in the middle of the room. The Ringmaster motions to the children.

RINGMASTER - (*energetic, larger than life*) Welcome one and all to the finest circus on the planet! Prepare to be amazed by acrobatics! Animals! And… (*Sinks down with a sad, depressing tone*) Ah, who am I kidding… nothing is working correctly and we have a big show tonight. All of the workers are sick and I have to set up and run everything by myself… (*More energetic*) But!! Now that you have arrived, you can help me so we'll actually have a show tonight! Yes! This is perfect! Well… that is if you're willing to help? Will you help me set up for the show tonight?

The children answer (hopefully yes).

Fantastic! As an added bonus, I will even let you be part of the circus when we are finished!

(*More serious tone*) Alright, so, to get started, I need to assign you to activities so we can get this done as quickly as possible.

The Ringmaster points to a random child as they are saying each role.

I need you to create the balloons we sell to the audience during the show. I need you to to build the fireworks that we light off during the finale. I need you figure out how the acrobat should stack the props for her balancing act. The rest of you can help with whichever one you please, but hurry because we want to get this done in time for the show!!

The children scurry off to the different puzzles and as they complete each puzzle, the ringmaster will light up the puzzle box corresponding to the correct puzzle the children finish.

Conclusion

Wow! That was fast! You all did an amazing job on helping me get the circus ready for tonight's performance!

The ringmaster corrals the children around them and the lights dim and focus goes onto the ringmaster in the center of the room.

(*In an announcer voice*) Gather round! Gather round! Are you ready to experience the show of a lifetime.

A circus show plays on the projector and circus-related activities are given to the participants such as hula hoops and juggling balls. The children play with the things as though they are in the circus. Popcorn may be given out depending on personal preferences.

CIRCUS ROOM GAME PROGRESSION FLOW CHART
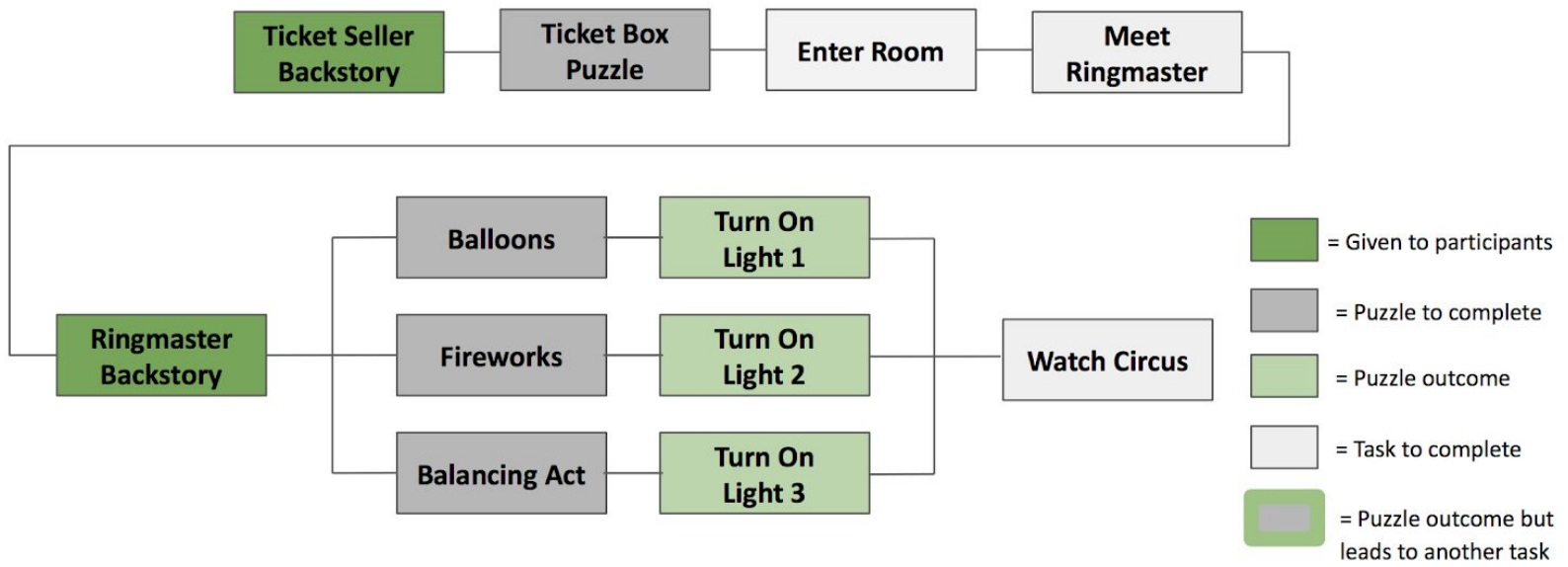
CIRCUS ROOM PUZZLES

Ticket Box
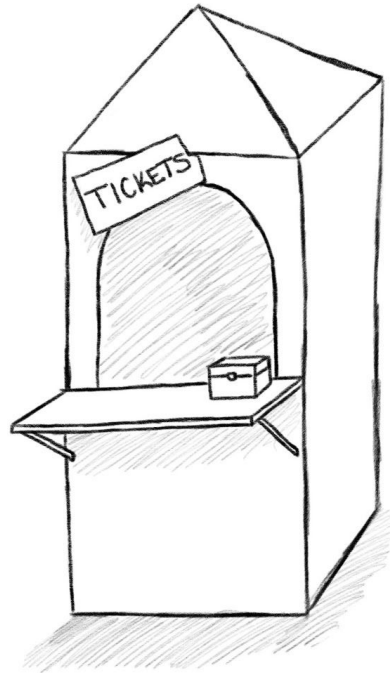
Description
This puzzle involves magnetism. The children will be given a small container of objects which the ticket seller says might unlock their ticket box. The children will need to test each object with the box to see if they're magnetic enough to unlock it. Once the object with the correct amount of magnets is found, the box will open and the children will be able to receive their tickets.

Required Materials
- Small magnetic lockbox
- Refrigerator magnets
- Large magnet
- Small objects which can easily be cut open or have magnets placed inside
- Small basket
- Roll of tickets
- Ticket booth

Setup
a. Place magnets within twenty small objects.
   i. Make sure to place the correct amount of magnets within four of the objects.
b. Place ten of these objects, including one with the correct amount, in the basket.
c. Open the lockbox with one of the other magnets.
d. Place the roll of tickets inside the lockbox, then close it.
e. Place the basket and lockbox inside the ticket booth.

f. Give an extra correct magnet to the Ticket Seller, just as a precaution.

Procedure for Use
1. At the start of the experience, the Ticket Seller should be hidden inside the ticket booth.
2. Upon hearing the children, the Ticket Seller will appear, and start trying to give tickets to the children, only to realize that the ticket box is locked and that the key has been misplaced.
3. The Ticket Seller will present a basket full of potential keys to the children, and will ask for their help to figure out which one can unlock the box.
    a. The children will then test out each object to see which one is strong enough to open the box.
4. Once the participants open the box, the Ticket Seller will hand out tickets.

Reset Between Runs
● Switch out a few of the magnetic objects, especially the one which actually unlocks the box.
● Place the desired objects in the basket.
● Place the roll of tickets back inside the lockbox.
● Close the lockbox.
● Place both items inside the ticket booth.

Takedown
● Collect all of the magnetic objects and place them back in the basket.
● Place the roll of tickets back inside the lockbox and close it.
● Place basket and lockbox with rest of room materials.

Bottled Balloons
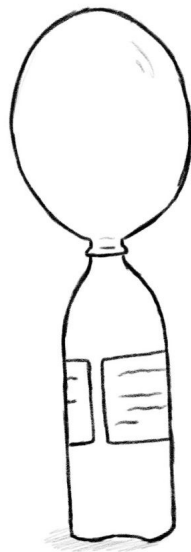
Description

This activity involves basic chemistry and air pressure. The children will be given a few empty bottles, balloons, vinegar, and baking soda. They'll need to follow instructions to mix the ingredients together to create a chemical reaction. Once a few balloons have been inflated, the ringmaster will turn on a lightbox saying "balloons" to symbolize that the balloon activity has been finished. It is based off this experiment: https://littlebinsforlittlehands.com/balloon-baking-soda-vinegar-experiment-kids/.

Required Materials
- Printed and laminated instruction sheet
  - Create the instruction sheet using the provided link above.
  - Some alterations will need to be made based on the bottle size.
- Empty bottles (250ml soda bottles)
- Paper
- Teaspoon
  - Can use a second teaspoon, as desired.
- Balloons
  - Standard size; miniature balloons won't show the reaction well enough.
- Vinegar
- Baking soda
- Table
- Tablecloth
- Lightbox

Setup
a. Place a table in the location indicated on the room layout diagram.
b. Place the teaspoon, bottles, balloons, vinegar, baking soda, and instruction sheet on the table.
c. Set up the lightbox so that it says "Balloons".
d. Place the lightbox in the location indicated on the room layout diagram.
    i. Make sure the lightbox has batteries.
    ii. Make sure the lightbox is turned off.

Procedure for Use
1. The participants should follow the instructions to set up a chemical reaction for the balloons.
    a. Create a small 'funnel' using a rolled piece of paper.
    b. Using the funnel, pour the vinegar into the bottle until the bottle is half-full.
    c. Measure out 2 teaspoons of baking soda.
    d. Using the funnel, pour the baking soda into the empty balloon.
    e. Stretch the balloon over the mouth of the bottle and make sure it stays attached.
    f. Lift the balloon up so that the baking soda falls into the vinegar.
    g. Swirl around the bottle a little bit to speed up the reaction.
    h. The balloon should blow up.
2. A specified number of balloons should be blown up.
    a. This is up to the Ringmaster.

3. The participants should show the balloons to the Ringmaster in order to complete the activity.
   a. Turn on the lightbox.

Reset Between Runs
- Throw away used balloons.
- Rinse out used bottles.
- Reorient instruction sheet.
- Turn off the lightbox.

Takedown
- Throw away all used balloons.
- Rinse out used bottles.
- Clean up any residue left by the activity.
- Store instructions and any unused materials together.
- Store lightbox with the other two lightboxes.

Faux Fireworks
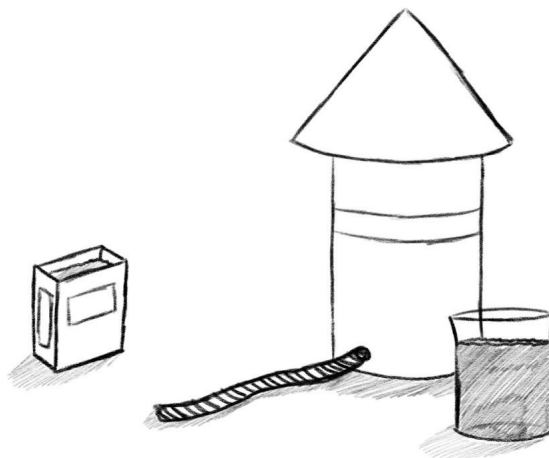
Description
This activity involves creating basic chemistry mixtures. The children will be given an instruction sheet, various powders, a few canisters, and some blocks. They'll need to follow the instructions in order to mix together the correct powders and piece together the blocks and canisters. Once the firework has been built, the ringmaster will turn on a lightbox saying "fireworks" to symbolize that this activity has been completed.

Note: *This puzzle is entirely fabricated, and will not teach the participants anything about creating legitimate fireworks. It is purely for teaching how to follow instructions, take measurements, create basic mixtures, and engineer simple structures.*

Required Materials
- Printed and laminated instruction sheet
  - Create this using any materials and amounts.
- Table
- Tablecloth
- Various powders
  - Cocoa powder, baking soda, baking powder, salt, sugar, etc.
- Measuring cup
- Bowl for mixing
- Canisters
- Blocks
- Rope

Setup
a. Place a table in the location indicated on the room layout diagram.
b. Place the materials and instructions on the table.
c. Set up the lightbox so that it says "Fireworks".
d. Place the lightbox in the location indicated on the room layout diagram.
    i. Make sure the lightbox has batteries.
    ii. Make sure the lightbox is turned off.

Procedure for Use
1. The participants should follow the instructions to set up the fireworks.
    a. The base of the firework should be built first.
    b. The powder mixture should then be created.
2. The participants should show the firework to the Ringmaster in order to complete the activity.
    a. Turn on the lightbox.

Reset Between Runs
- Take apart the firework.
- Discard used powders.
- Reorient instruction sheet.
- Turn off the lightbox.

Takedown
- Take apart the firework.
- Discard used powders.
- Clean up any residue left by the activity.
- Store instructions and any unused materials together.
- Store lightbox with the other two lightboxes.

Balancing Act
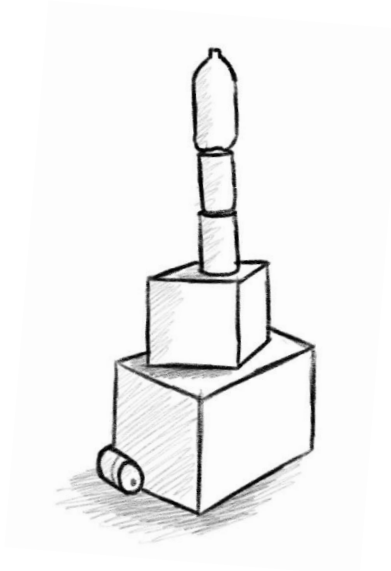
Description

This activity involves basic physics concepts. The participants will be given a variety of stackable objects (blocks, bottles, cans, etc.) ranging in size and weight. They must stack up these objects to a certain marked height without the tower falling over. Once they reach the required height and the tower stays up, the ringmaster will turn on a lightbox saying "Balancing Act" to symbolize that the activity has been finished (it's okay if the tower falls after the light is on).

Required Materials

- Printed and laminated instructions
  - Make sure this has the basic premise of the puzzle written on it.
- Small boxes
- Empty bottles
- Sand-filled bottles
  - Be sure to seal this with tape or glue.
- Empty cans
- Sand-filled cans
  - Be sure to seal this with tape or glue.
- Small wooden boards
- Height marker
- Lightbox

Setup

a. Make sure the objects are varying in weight and size.
b. Place the objects in the location indicated on the room layout diagram.
c. Place the height marker on one of the walls of the tent.
d. Place the instructions next to the height marker.
e. Set up the lightbox so that it says "Balancing Act".

    f.   Place the lightbox in the location indicated on the room layout diagram.
         i.   Make sure the lightbox has batteries.
       ii.   Make sure the lightbox is turned off.

Procedure for Use
1. The participants should follow the instructions to build a balanced tower of objects.
2. The participants should show the tower to the Ringmaster in order to complete the activity.
    a.   Turn on the lightbox.

Reset Between Runs
- Take apart the tower.
- If moved, place the objects back in the location indicated on the room layout diagram.
- Turn off the lightbox.

Takedown
- Take apart the tower.
- Place tower pieces in a box together.
- Take down the height marker and place with the tower pieces.
- Store materials and instruction sheet together.
- Store lightbox with the other two lightboxes.

CIRCUS ROOM SETUP

Room Layout
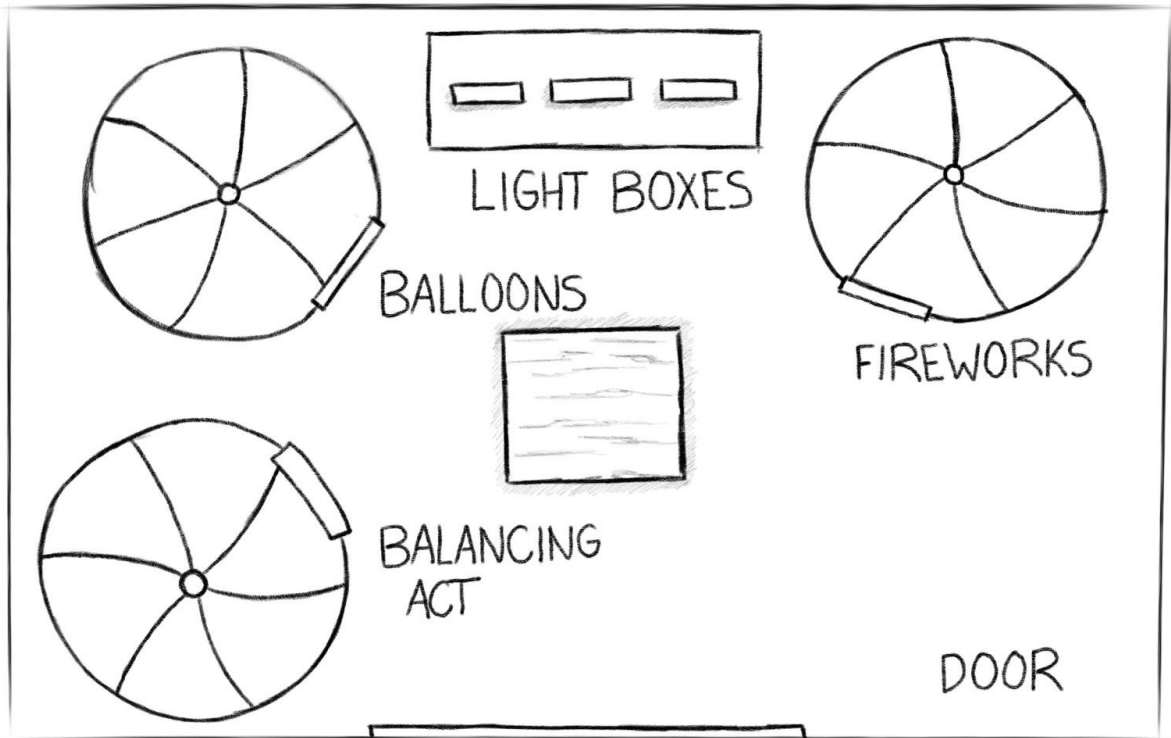
Major Props

Small Circus Tents:
- To set up, follow the package's instructions.
- Place the tents in the locations indicated on the room layout diagram.
- Decorate with additional streamers as desired.

Ringmaster's Platform:
- Purchase or build a relatively small wooden platform.
    - It should be large enough for a person to comfortably stand and spin around.
- Paint the platform red.
    - Or any other color, as desired.
- Place the platform in or near the center of the room, as indicated on the room layout diagram.
- Decorate with banners, streamers, and lights as desired.
    - The platform should stand out from the rest of the space, so more decorations are better.

Projector:
- Only use projector if desired for the ending; this is entirely optional.
    - Set up the projector so that it is facing an empty wall.

- Plug in to an outlet.
- Make sure that everything is working properly, and that the image is clearly displaying.
- Find footage of a circus performance to play.

Lightboxes:
- Be sure to purchase battery-powered lightboxes.
- Place in the location indicated on the room layout diagram.

Lightbox Table:
- Place along the wall in the location indicated on the room layout diagram.

Decorations / Atmosphere
- Play subtle circus music on the speaker.
- Drape streamers and banners around the space.
    - Looks best with a decent amount of these.
- Use colorful lights to give the room a fun atmosphere.

Supplemental Materials T - Room Setup Instruction Manual
Instructions for Setting up a Mystery Room

1. Curtains

Curtains are a key element for the room as they make the room dark. This is a very important aspect for immersion as it allows for you to change the entire atmosphere through the use of lights and sounds discussed later.

Picture of Curtains

Setup if Rails are in Place

1. Unfold the curtains carefully.
2. Make sure that the black side of the curtains is facing into the room.
3. Hang the curtains on the hooks that are in the ceiling. If already on the hooks, slide the curtains along the rails to enclose the room.

Setup if Rails are not in Place

1. Unpack the 3 meter by 3 meter canopy tent and set it up in the room. Only put it up to the second height option.
2. Unfold the curtains carefully.
3. Hang the curtains by cable tying them to the the rails on the canopy tent.

2. Electrical Wiring for Childcare Room

This allows for easier access to electrical power throughout the room, especially with the childcare room only having one outlet.

Figure 1: Extension Cord (Left Image)
Figure 2: Power Strip (Right Image)

Setup

1. Make sure that you plug the extension cord (Figure 1) into the wall on the door side of the childcare room and extend it to wherever power is needed in the room.
2. Plug in the power strip (Figure 2) into the extension cord to have more outlets in the same area.
3. Run all of the cables outside of the enclosure so that there are no cords inside the room.

3. Lights

The lights provide a light source for the room and also let you control the environment by making the room whatever color or pattern you want. This also helps with immersion.

Figure 1: Lights (Left Image)
Figure 2: Remote (Middle Image)
Figure 3: Wiring (Right Image)
Figure 4: Remote Instructions (Images Below)

Please read this manual carefully before using this controller.

- **Instructions for safety**

    Making sure you use the product perfectly and safely, please observe the instructions and warning on this manual. Operate cautiously and read these instructions carefully.

1. For installation, try to avoid strong magnetic fields and high-pressure areas.
2. Ensure that the wire is connected correctly and firmly in order to avoid short-circuit damage to parts and posing a fire hazard.
3. Please install controller in a well-ventilated place to ensure that the ambient temperature is moderate.
4. Before using this product, please check the DC power and voltage meet the product technical requirements; positive and negative polarity is defined consistent to the product.
5. Prohibit live wiring, check to confirm wiring is correct, if no short-circuit, then power!

Specifications

- Input power: DC12V
- Output signal: SPI signal
- Max load current: 5A
- Drive IC number: 20—100pcs
- Output power: 60W (12V)

(2)Descriptions for panel and remote controller keys:

Icon	Name of keys	Description
↑ ↓	up/down	Key in the static mode increases or decreases the LED brightness and IC number. Keys in a dynamic mode increase / decrease speed.
OFF ON	OFF/ON	Turn on or off the LED's
IC Set	IC set	Enter the IC configuration mode, press this key all the lights bright white
●	Opening	Static red, green, blue, yellow, green, purple, white Monochromatic water by the middle of the left / right push effect.

	Closing	The static mode of red, green, blue, yellow, green, purple, white monochrome water From both sides to the middle closing effect.
CS	Colour selection	Red, green, blue, yellow, cyan, purple, white seven kinds of monochromatic colour select.
C3	3 colour	Press this key to red, green, blue circulating flash, in a dynamic mode for flicker selection gradient colour.
C7	7 colour	Press this key for red, green, blue, yellow, cyan, purple, white rainbow circulating flash In a dynamic mode for gradient flicker selection.
C16	16colour	Red, green, blue, yellow, cyan, purple, white, orange, deep yellow, light yellow, light green, Light blue, dark blue, sky blue, blue and purple, magenta, choice of 16 colours
←1	Water left	Red, green, blue, yellow, cyan, purple, white color of eachk left the water effect.
1→	Water right	Red, green, blue, yellow, cyan, purple, white colour of each, right of water.
◐	Left gradient of shining	From the left to the right of each IC 3 flashes lights and gradually light up all IC after all the extinguishing effect.
◑	Shining right gradient	From right to left each IC3 flashes and gradually light effect.
←	Left total gradient of shining	From left to right each IC has 3 flashes lit after quenching, lit by out all IC after all the light effect.
→	Right full gradient flash out	From right to left each IC has 3 flashes lit , lit by out all IC after all the light effect.
←	Meteor left	Meteor across the left (dripping) effect.
→	Meteor right	Meteor across the right(driping) effect.
↻	water cycle	Around the water circulation effect.
Meteor	Meteor	The meteor from left to right to create a circulation effect.
Jmp	Gradient	Press this key transition effects, and press the CS button to choose colour, 3 colour, 7 Colour,16 color gradient effect.____

	Flicker	Press this key to flicker effect, and CS, press button can select monochrome, tri-colour,7 colour, 16 colour flicker effect.
	Automatic	All patterns of circulation.

4. Key sequence description

Any pattern color changes are needed to enter the static mode, choose a good colour after the choice of mode in order to achieve the desired results.

Troubleshooting

Failure	Analysis	Solution
No light	1. No power. 2. Reversed the polarity. 3. Wrong connection or poor contact.	1. Check the power 2. Make sure the polarity is right. 3. Re-check the wire connection.
Brightness of LED is not consistent	1. Input wire is too long to cause wire loss. 2. Diameter of wire is too thin to cause wire loss. 3. Power overload. 4. Controller overload.	1. Shorten wire or use loop circuit. 2. Calculate the current, and then replace thick wire. 3. Replace larger power. 4.Add a power amplifier

4 / 4

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WARNINGS

- Do not plug the light strips into each other or else the second one plugged in will not work.

Setup for Lights

1. Make sure that the curtains have already been hung in the proper spots in the room.
2. If the lights are already attached to the curtains, continue on to step 4.
3. If the lights are not attached, attach them by putting the velcro on the curtains together with the velcro on the lights and make sure that the end of the strip with the 4 metal prongs is on the side that goes to power.
   a. If the velcro is not attached yet use tape instead.
      i. Attach velcro to the curtains and the lights once time is available as it will make setup easier.
4. Once you have the lights up on the curtains, plug white cable from the strip into the white cable that is identical to it on the control box (Shown in figure 3 above).
5. Make sure all of the control boxes from each strip of lights are close enough together so that one remote can control all of the control boxes.
6. Then, plug the black power cable into the control box (both shown in figure 3 above) and plug the power cable into an outlet.
7. Once this is done, you can now use the remote shown in figure 2 above and the instructions on how to change the colors of the lights is shown in figure 4 above.

Potential Problems and Solutions

Problem:

Light Strips are not the same color or same pattern as each other.

Solution:

Unplug all but one strip. Adjust the light on that strip. Do the same thing for all affected light strips. Then, before switching them again, ensure that the receivers are close enough together that the remote can control them all at once

4. Sound

The speaker can be used to create an atmosphere in the room by using sound effects and music to fully immerse the participants.

Figure 1: Bottom of the Speaker.
Charging port is the back port and headphone port is the front port. Hanging loop is in the middle.

Figure 2: Top of Speaker
Power button is in the middle and pairing button is the button behind the power button.

Figure 3: Volume Control

WARNINGS
- Make sure that the speaker is secured using a hook and command strips to the ceiling. It is expensive and will break if falls
- Do not get the speaker wet
- It can get really loud; do not hold directly to your ears. It is also not good for the speaker to be playing loudly for a long period of time

Setup

1. Charge the speaker the night before by plugging the charging cable into the charging port (Figure 1).
2. Just prior to event, turn on the device by pressing the power button on the bottom of the device (Figure 2).
3. Next, link the device to your bluetooth device. Press and hold the button pair button on the bottom of the speaker (Figure 2). Select the UE MEGABOOM on your device. See instructions for your own device on how to link.
   a. You can link multiple devices to the speaker, but only one will play through the speaker at any given time. The speaker will pause music from a different device when music from a new device is played
4. Test the speaker and adjust the volume of the sound. You may have to adjust the volume on the speaker using the volume control buttons (Figure 3).
5. If there is not already a hook in the center of the room on the ceiling, place a 2kg command strip hook on the ceiling in the center of the room
   a. Depending on the location, use duct tape to reinforce the command strip.
6. Hang the speaker by the hanging loop (Figure 1) on the hook in the center of the room.

Potential Problem and Solutions

Problem:
　　No sound
Solution:
　　Speaker disconnected. Reconnect your device
Problem:
　　Cannot find device to pair
Solution:
　　Ensure that you have pushed and held the pair button until you hear the tone. If it still does not appear, try turning on and off your device.
Problem:

Speaker is not playing the song clearly

Solution:

Ensure that the song is a high quality recording. If it is then check to see if the sound output from your device is not set to cut out either the bass, midrange, or treble. If these fixes do not work then you have a bad connection with the speaker. Disconnect from the speaker and forget the device. Then reconnect. If this still does not fix the problem, use a different device.

5. Projector

Projectors can be used to create images on the curtains and can be connected to a laptop that is outside of the room.

Figure 1: Top View of Projector (Left Image)
Figure 2: Front View of Projector (Middle Image)
Figure 3: Straps used to Secure the Projector (Right Image)

Figure 4: Back of Projector/VGA port (Left Image)
Figure 5: Side of Projector/Power Port (Right Image)

Figure 6: Computer Cable (Left Image)
Figure 7: Power Cable (Right Image)

Setup

1. Attach power cord and connection cords (HDMI or VGA depending) to projector.
2. Plug in the other ends of the cords to the wall and to your computer
3. Turn on the projector and your laptop
4. Secure projector to a surface.
   a. If necessary, use the straps in figure 2.
   b. Depending on the location of projector, it might have to be positioned upside down in order for the image to appear in the correct spot. If this is the case you will need to flip the image on your screen (Ctrl+Alt+down arrow).
   c. The lens should be pointing toward a black or white curtain.
5. Adjust the zoom and the focus of the projector. See specs of the projector for more information. Typically the adjustment controls for these things are next the lens
6. Guide the wires outside the mystery room enclosure
   a. Make sure wires are out of the way. It is best if the wires are up on the ceiling.
   b. Tape down any wires and use decorations to hide them and the projector

Potential Problems and Solutions

Problem:

Image will not appear.

Solution:

Check all cable connections and the source for the projector. If all is normal, try powering down both the projector and the computer.

Problem:

Image is upside down.

Solution:

Flip the screen on your laptop (Ctrl+Alt+down arrow).

6. Fog Machine

The fog machine can be used to create a new environment in the room or can be used as a specific aspect of a puzzle such as fire.

Figure 1: Fog Machine

Figure 2: Top View (Left Image)
Figure 3: Fog Compartment and Hose (Middle Image)
Figure 4: Fog Liquid (Right Image)

Figure 5: Power Cord (Left Image)
Figure 6: Back Panel (Middle Image)
Figure 7: Remote (Right Image)

Setup
1. Connect both the power cord (Figure 1) and the remote control (Figure 2) into the back of the device into their respective slots (Figure 3)
2. Unscrew the white plastic lid and ensure that it is filled with fog liquid. Ensure that the hose (Figure 6) inside this compartment is not above the fog liquid (Figure 6).
3. Plug in the device and turn on the power switch. The switch should turn red at this point.
4. Wait for both indicator lights on the remote to turn red. This should take about three minutes.
5. Once the indicator lights are on press the button on the remote. This should dispense fog.

Potential Problems and Solutions

Problem:

Smoke is not coming out of the smoke machine.

Solution:

Wait 5 minutes to ensure that it heats up. If problem still persists, turn off machine and ensure that there is enough fog liquid in the machine and that the hose inside the fog compartment is not above the fog liquid.

7. Puzzles/Props

At this point bring in the rest of the puzzles and props needed for the room. If using anything like sand or water, put a tarp underneath it to prevent it from going on the floor. Its beneficial to use some type of decoration to hide wires and cords that are present in the room.

8. Tips
- Prop open the door to the outside and turn on a fan if possible. It gets really hot inside the mystery room with everything set up and turned on.
- The neater you keep the electrical wires the easier it will be to break down.
- Practice using lights, sound, fog machine, and projector so that transitions are smooth.
- Put a tarp under any puzzle that involves water or other liquids. This will save you time in the clean up process.

Recommendations

- Design of the game objectives narrative, game flow, and puzzles, albeit four separate steps, should be done simultaneously. All four steps are closely related and the design process should promote the interaction between steps.

- Wait several iterations prior to bringing back an old puzzle and change some aspect of the puzzle besides just the narrative behind it. For instance, if you are reusing the water flow puzzle, alter the necessary path required to get to the well. Reusing puzzles week after week does save money, however, it comes with its downfalls. Reusing puzzles tends to disengage the participants. Since they have seen the puzzle before, they already know how to solve it. Because of this, the participants will just simply solve the puzzle and not engage with the narrative. They may even relate the puzzle to the last experience that used it, breaking immersion.

- Test everything prior to the live run.

"Tell me and I forget, teach me and I may remember, involve me and I learn"

- Benjamin Franklin

WPI

Banksia Gardens Community Services

Worcester Polytechnic Institute

IQP Project for Banksia Gardens Community Services Center

Prepared By: Cory Brolliar, Paige Cox, Michael Oswald, Katherine Williamson

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MYSTERY ROOM DESIGN

Design Process

Overview

Mystery rooms provide a great opportunity to engage participants and teach them new skills and concepts in a fun environment. This section walks through the design process outlined in Figure 1.

Physical Parameters

Determine where the mystery room is going to be located and how long the experience is going to last.

Target Demographic

Determine participants' prior knowledge. This includes knowledge of the topic and procedures, social skills, and soft skills. In addition, get a sense for the general dynamic of the group. With this information, determine a group size that fits the room size and the participants' personalities.

Objectives

Given the knowledge of the group, determine what you want the participants to get out of the experience. Set goals for soft skills (leadership, team work, communication) and conceptual and procedural knowledge (STEM related concepts).

Theme/Narrative

Come up with a theme for the room. A good theme is something that the participants can engage with and find interesting. Given the theme and the learning objectives, the next step is to develop a narrative. This narrative should complement the learning objectives and inspire the participants to complete the tasks at hand. The narrative is what gets the students to engage in the activities. The use of an actor or actors can also add to the narrative and can be very useful in fully immersing the children. A basic outline of a narrative can be seen in Figure 2.
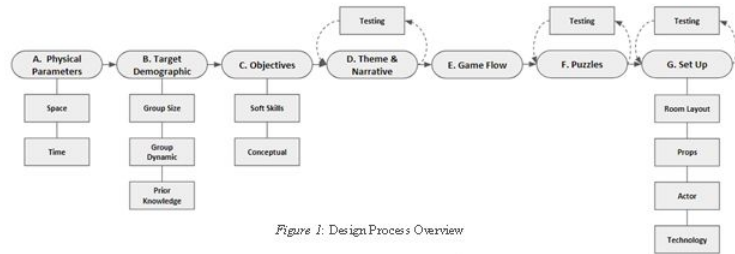

Figure 1: Design Process Overview

Game Flow

Create a general plan for how you want participants to complete tasks. This does not include designing puzzles, but merely how the puzzles should flow into each other in accordance with the narrative. A good game flow consists of both linear flow, where one puzzle leads into another, and nonlinear, where several puzzles branch off from each other and then recombine later in the experience. An example of this is shown in the Figure 3.
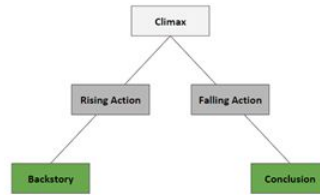

Figure 2: Narrative Flow Chart

Puzzles

Design and develop the puzzles to be used in the room. The puzzles should reflect the learning objectives and help guide the participants through the narrative. The puzzles should force the participants to think about how to solve them but at the same time be easily understood with minimal to no instruction. Hints should also be pre-determined in case the participants get confused.

Set Up

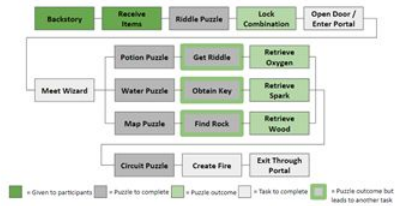Determine how the room is to be set up. This includes the placement of props and puzzles, sound, lighting, and other technological effects.

Figure 3: Example of Game Flow