WORCESTER POLYTECHNIC INSTITUTE

Supplemental Materials

for

"A means to foster STEM interest: A mystery room at Banksia Gardens Community Services"

D Term 2018

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Sponsor:
Banksia Gardens Community Services

An Interactive Qualifying Project submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

Table of Contents

Part A — Author Contributions*

- **Abstract**
  - Writing: All
  - Editing: All
- **Introduction**
  - Writing: All
  - Editing: All
- **Background**
  - Writing: All
  - Editing: All
  - Graphic: LH
- **Objectives**
  - Writing: All
  - Editing: All
- **Methods**
  - Writing: All
  - Editing: All
  - Methodology Figure: LH
  - Objective 3 Methods Figure: LH
  - Infection Room Narrative Arc Figure: All
  - Puzzle Flowchart Figure: All
  - Puzzle Organization Figure: SB
  - Time Dilation Graph: SB
- **Future Designs and Recommendations**
  - Writing: All
  - Editing: All
  - Baking Theme Narrative Arc Figure: All
  - Baking Room Puzzle Flow Figure: All
  - Baking Room Floor Plan Figure: All
- **Conclusions**
  - Writing: All
  - Editing: All
- **Pilot Day Roles**
  - Observations: LH, AW
  - Focus Groups: SB
- **Team Roles**
  - Designer: LH
  - Editor: AW
  - Project Managers: SB, LH

*SB = Shreeja Bhattacharjee; LH = Laurèl Higham; AW = Amelia Wilson

Part B — Bloom's Taxonomy

Bloom's Taxonomy of Educational Objectives is a multi-tiered scale to assess student expertise and to aid in selection of classroom techniques. Educators use the model as a guide in defining practices and goals to use with their students. The original scale, developed in the 1950's, uses three taxonomies which measure knowledge-based, skills-based, and affective goals (Bloom, 1956). Within the taxonomies, levels are listed in increasing complexity, as students must achieve the lowest levels before the higher ones. At higher levels, students are given more autonomy in their education, which is an essential element in student motivation. Figure 1 represents the levels within the three taxonomies.

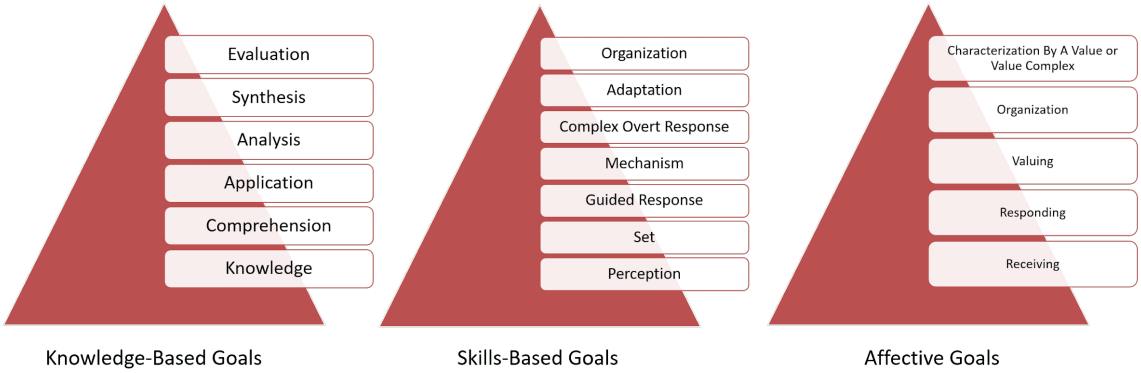

Figure 1: Bloom's Taxonomy Metric

The levels of knowledge-based goals are: knowledge, comprehension, application, analysis, synthesis, and evaluation. The purpose for the knowledge-based goals is for students to learn and process material in a procedural and conceptual manner. Knowledge is the recognition of terms, ideas, and theories (ibid.). Comprehension is the ability to translate, interpret, and extrapolate information (ibid). Application is the ability to apply general principles to concrete situations. Analysis is the separation of complex ideas into its constituent parts and the understanding of the relationship between parts (ibid.). Synthesis is the construction of ideas and concepts from multiple sources to create integrated solutions to problems (ibid.). Finally, evaluation is the ability to judge ideas using evidence and rationalizations (ibid.).

The skills-based goals are: perception, set, guided response, mechanism, complex overt response, adaptation, and organization. Skills-based goals are designed to evaluate how a student goes about their assigned work. Perception is the use of sensory cues to guide actions (ibid.). Set is the demonstration a readiness to perform the task (ibid.). Guided response is the knowledge of steps required to complete the task (ibid.). Mechanism is the ability to perform the task in a proficient manner (ibid.). Complex overt response is a greater ability to perform the task in a proficient manner (ibid.). Adaptation is similar to the complex overt response, but the student also can modify procedure to account for new situations (ibid.). Finally, organization is the creation of new tasks through the incorporation of the learned material (ibid.).

The last set of goals, affective-based goals, are receiving, responding, valuing, organization, and characterization by a value or value complex. The affective taxonomy seeks to promote students' values, attitudes, and interests about a topic. Receiving is the demonstration of willingness to participate in the learning activity (ibid.). Responding is pursuing the activity for pleasure (ibid.). Valuing is the appreciation for the activity (ibid.).

Organization is the ability to compare values from the activity (ibid.). Characterization by a value or value complex is the adoption of a long-term consistent value system (ibid.).

Through these learning goals, educators can describe to the degree how they expect students to understand and use concepts or demonstrate skills. The broad definition of these goals allow for their application across many subjects and lesson plans.

Part C — WPI Institutional Review Board Approval

WORCESTER POLYTECHNIC INSTITUTE

Worcester Polytechnic Institute IRB# 1
HHS IRB # 00007374

4 April 2018
WPI IRB File: 18-0313

Re: IRB Expedited Review Approval: File 18-0313 "A means to foster STEM interest: Implementing a mystery room at Banksia Gardens Community Services"

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 4 April 2018 until 3 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

Part D — Parent Consent Forms

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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: _____

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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*

Part E — Focus Group Protocol

Focus Group Guide – March - May 2018

Instructions for Interviewers

This script is meant to serve as a guideline for conducting focus groups with the students at Banksia Gardens Community Services. While this script contains specific questions and activities to be answered and presents them in a suggested order, you need to judge when conducting your focus group which questions and activities to present. Aim to cover all of the questions and activities included here; however, the focus groups will be short so that the students do not lose focus, probably 15 - 20 minutes.

You should tape record your focus groups as long as the parents/guardians of the students consent to this and you believe it won't bias the group. In addition, make sure you jot down notes during the interview, and write up a detailed summary as soon as you return from the group. Since interviewers will attend a focus group together, one person can direct the focus group while the other jots down notes.

General Information

To be completed by the interviewer before arriving for the focus group.

Student Names: _____

Location of Focus Group:
_____

Date of Interview:_____

Name of Interviewer(s): _____

Reminders

You will need to make a decision at the beginning of the focus group about which questions and activities to prioritize and how to cover the most important topics based on the time constraint due to students' attentiveness.

At the end of the focus group, be very appreciative and thank the students for participating. Remember, these questions are presented in a suggested order, but let the conversation flow naturally. Prompt answers to these questions by engaging the students in the activities.

Introduction
Hey everyone, we're [names] and we want to know how to make the mystery room more fun.
Questions and Activities:

1. What did you like about the room?
2. What was your favorite part?
    a. Have students put the picture of the puzzle into the box
3. What did you not like about the room?

4. How much did you like the story?
    a. Have students put a red, yellow, or green card into the box
5. What parts were hard?
    a. Have students put the picture of the puzzle into the box
6. Would you play this room again with new puzzles?
7. How long do you think you were in here?
    a. Have students shade in an hourglass coloring page

Conclusion

Thanks for your help! We hope to see you in another room soon.

Part F — Study Group Observations

Friday, March 16

Observer	Age Group	Group Size	Interested By	Uninterested By	Triggers	Learning Style	Strengths	Weaknesses
Amelia	Year 5	1	-Differences between US/AU -Generally responsive to questions when asked	-Didn't seem to want to do school work, wanted to go play in the circus room instead	Was afraid the other boy would come back and bully him again	Probably audio- seemed to respond better to verbal communication	Calm temperament (seemed to understand that his behavior was better than bullies')	Writing/spelling ability
Laurel	1-4	5	Coloring, playing guess what I wrote on the board, chocolate	"Hate school, hate my teachers"	Name-calling, stealing items	Maybe visual?	Very active	Destruction of others' property, did not respect staff authority
Shreeja	Level 5; 12	3;1	Food, bullying others; Math and english	Chemistry	(Sadness) People stealing/destroying stuff parents bought for them;	Talking and doing	Calm/kindness; If given prompts/concept explain can understand	Spelling, planning ahead; reading/following directions in order

Tuesday, March 20

Observer	Age Group	Group Size	Interested By	Uninterested By	Triggers	Learning Style	Strengths	Weaknesses
Amelia	Year 9	1	-schoolwork? Seemed eager to complete work and didn't complain -used a smartphone/headphones after completing her assignment	-expressed that videos made it difficult for her to understand, she would rather see things written out	N/A	Visual- when asked she said she would prefer reading a passage rather than watching a video (was completing a video assignment)	-Good thinking skills -calm temperament -interested in what she was doing/stayed focused	-seemed to have a bit low writing ability, considering age
Laurel	Year 4	1	Sports	N/A	N/A	Had taken learning styles quiz, resulted in kinesthetic	Mathematics, breaking numbers into place values, was a focused learner who chose her gamified assignment based on the highest points it would give her	Spelling / written sentence structure
Shreeja	Year 6	1	Youtube, travel, lawyer, teacher	N/A	N/A	N/A	Can recognize patterns, does well with prompts,	Division

Wednesday, March 22

Observer	Age Group	Group Size	Interested By	Uninterested By	Triggers	Learning Style	Strengths	Weaknesses
Amelia	Year 11	1	N/A	The younger kid next to him who was trying to be distracting	N/A	More visual, seemed to understand better when I wrote things down rather than said them verbally	Had a good understanding of the (math) material, just didn't understand the way some questions were worded	Understanding verbal explanation
Laurel	Year 1	2	Colors, drawing	Finishing the challenging homework	N/A	One student was visual, the other auditory	Numbers, days of the week, colors	Reading English language, identifying animals
Shreeja	Year 5, Year 2	1, 1	Soccer, playing with friends, food; running	Doing difficult problems in homework	Noises/friends around him break his concentration super fast	Not visual; I think kinesthetic ?	Can copy actions/methods Can add 3 digit numbers in head (slowly); can't read basic words like 'in'	Easily distracted, can't do word problems of a question but can do the mathematical version of it; tried to get me to sign off on her book without reading it

Tuesday, March 27

Observer	Age Group	Group Size	Interested By	Uninterested By	Triggers	Learning Style	Strengths	Weaknesses
Amelia	Year 1	1	Reading, simple math	Math she couldn't understand	N/A	Likely visual	Read and wrote extremely well considering age (and compared to others)	Didn't want to focus on stuff that was more difficult/kept fidgeting
Laurel	Year 4	1	Roblox Game, Bowling	Did not want there to be homework	N/A	Auditory	Using the abacus to solve addition problems	Easily distracted by other kids, could read words but could not identify meaning of vocabulary, couldn't add without aid of blocks and abacus
Shreeja	Year 5	1	Playing soccer with friends	Math	N/A	Visual	Still willingly suggested doing a math sheet even though he had no homework for math (took up some of his free time to do it). He just didn't want to miss out on playing with friends.	Wanted to play soccer more than they wanted to do math

Part G — Immersive Experience Observations

Room: Deep Space, March 16, 2018

Observer	Theme / Narrative	Puzzle Types	Hint Types	Duration	Physical Activity	Space Use	Things to Use	Things to Avoid
Amelia	Space/trying to escape from a situation/narrative depended on our choices	-Knowing Greek gods/roman equivalent -Logic puzzle -search for objects (robot!)	Information from AI: had to ask specific questions, AI wouldn't give direct answers	~1 hr	Simple other than crouching/crawling	Good use of small space, -cool decor that added to the theme -door dividing two rooms	-Keys used in multiple places -something to signal start/immersive experience	-technologically advanced -fragile equipment
Laurel	Stuck in a spacecraft that is running out of fuel, AI doesn't remember what happened	Logic based on process of elimination, search for objects / tools that fit, lots of magnet locks	Unlimited hints from AI, could ask in many different formats, gave clues to location of tools / what to think about	~1 hr Got boring at some points	Crawl into small space	Divided room into 2 parts with door, crawl space, other tunnels for robot to drive into	Tools that could be used in multiple puzzles, voice activated technology to make experience immersive, team members using different tools at same time to make it work	Dependent on voice activated technology to work, separation of the group was traumatizing

Shreeja	Space/Betrayal. Space odyssey references	Find ___ Use x in x and y Need team work	Pictures on the tools would prompt thoughts- moon, binoculars	~1hr	Laurel crawled a lot	Silver foil on walls Things on wall/ground- use different levels (ceilings/floor add in?) Can separate people into 2 places	Lights off in beginning to signal start Rover was cool References Various levels	Things that require lot of attention, things that are more written/need extra info Scary/betrayal concept do *not* traumatize the kids Red herrings Searching mindlessly can be boring

Immersive Experience: Avengers S.T.A.T.I.O.N., March 23, 2018

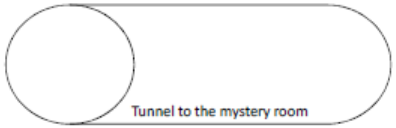
Observer	Theme / Narrative	Puzzle Types	Hint Types	Duration	Physical Activity	Space Use	Things to Use	Things to Avoid
Amelia	Recruited to become an Avenger, have to go through "training" A bit of a narrative/story at the beginning, but not throughout			1.5 hours	Walking through the rooms, strength test & the weird "become Ironman" thing	Lots of rooms to go through. All "learning styles" integrated- visual with the screens, kinetic with the props and audio w/ music/SFX	External cues- sound/light	Relying on technology to engage people rather than actual human interaction
Laurel	Marvel Avengers: You had been recruited by the agency to become an Avenger. Story was presented at beginning and end, but not during the experience			1.5 hours	Walking around, had a test your strength and wave at the screen activities	Long winding line of exhibits	Strong use of light and sound cues	Felt more like a museum than an "immersive experience"

Shreeja	Avengers: Trainee to possibly become part of Avengers. Was only there at beginning and end, in between was just mainly information			1.5 hrs	Walk around, play computer simulation game, try physical strength	Many rooms, almost exhibition/museum styled	Bright, vivid colors, giving each item a space. Cool technology. Nice visuals (and even kind of auditory).	Wasn't immersed, felt like gallery show/looking at paintings. Too much reading. At some point someone commented, "I stopped reading when I realized they were trying to get me to learn." This is important note to not give so much information so as to break player immersion.

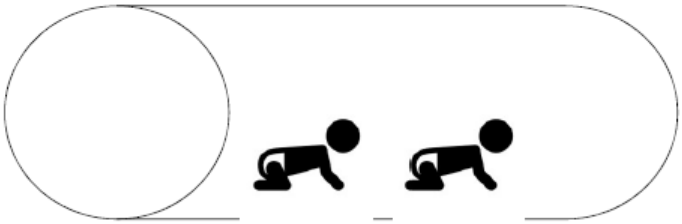
Part H — Infection Mystery Room Development

1. Storyboard

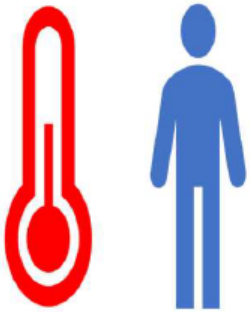
Doctor gives students background, has them prep by washing and donning lab coats and hair nets
Doctor asks students what they believe will happen to the body during an infection and presents the immune system's response is how a body naturally heals itself



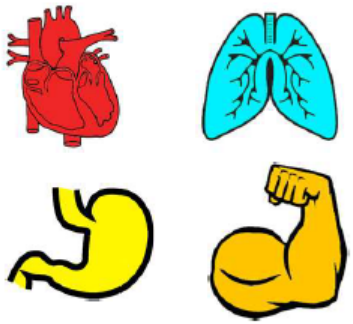
Coughing sound cue plays as students crawl to the mystery room



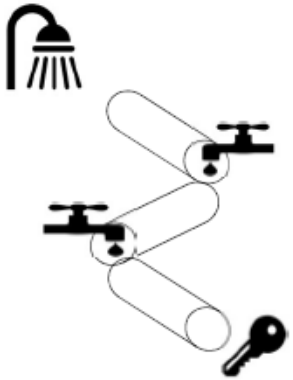
Neuron welcomes students in, shows them around the room with the thermometer and body map



Neuron shows students the 4 parallel puzzles: circulatory, respiratory, digestive, and muscular. Students solve puzzles with hints from Neuron



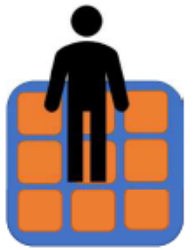
Circulatory puzzle has students get water to flow into a box to release a key



Respiratory puzzle has students search through “mucus” for a key

Digestive puzzle has students sort healthy food objects for a key

Muscular puzzle has students follow a dance mat’s instructions for a key



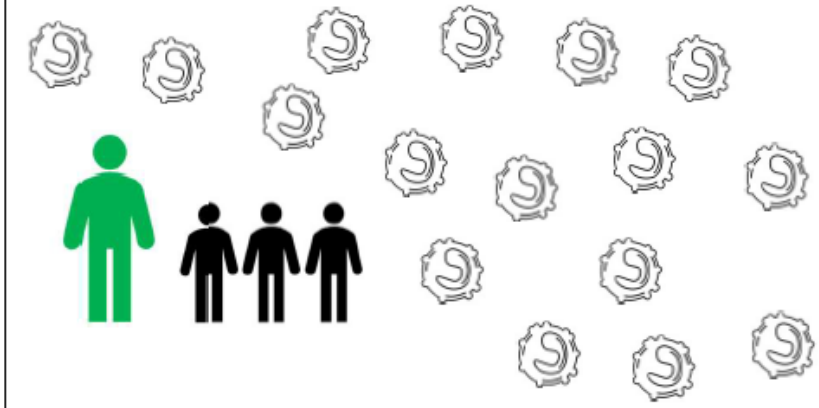
Neuron tells students that the nervous system is under attack and that it feels very weak and can't be of much help

Students must use keys obtained to unlock box holding nervous system puzzle

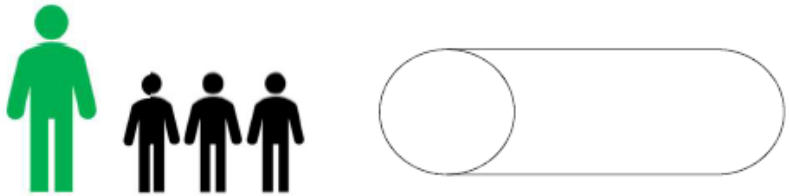
Students must dig through the brain for the clues for the next puzzle, while avoiding too much buzzing, which will hurt the Neuron

Neuron returns and congratulates them, brings them to the immune system lock box to complete the final puzzle

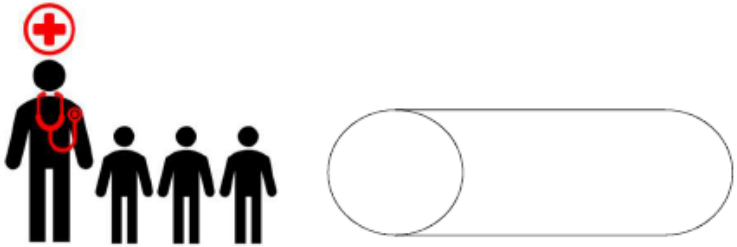
Students unlock the box and white blood cells fill the room



Neuron congratulates them and sends the students back through the throat



Doctor receives the students on the outside of the body, congratulates them for healing the body and takes their protective clothing



2. Script

- Background
    - Doctor
        - "You're here on a mission. Your friend is sick and needs your help to get better!!"
        - "To stay safe from the virus, I need to check if everyone is healthy enough to enter the body. Let me check your throat and ears."
            - Checks throat and ears
        - "What's important to keep in mind when people are sick?"
            - Eventually get on topic of sanitary practices
        - "Sanitize your hands, put on the gloves and the coat. Then you will be ready to enter the throat!"
            - Have kids use toy sink (and hand sanitizer), put on costumes
- Enter the room
    - Neuron
        - "You've traveled through the bloodstream to get up to brain and the body's command system. You can see on the body map and thermometer that the person has a fever and high heart rate!"
    - Involved crawling through tunnel which will have coughing sound/pictures of bacteria in throat/red inflammation
- Neuron leads to Body Map and Fever Thermometer
    - Neuron
        - "I'm a Neuron, and my job is to send messages to parts of the body from the brain. I need help contacting each of the organs so that they can heal. Help me unlock each of the organs so that we can release white blood cells to go fight the infection before time runs out!"
        - "Does anyone know what a white blood cell is?"
            - Let kids attempt to answer
        - "White blood cells are like the body's warriors, looking to combat sickness and keep a body healthy!"
        - "If you look around the brain, you can see where to contact the different organs. You can work together or separately to open these systems."
- Circulatory
    - Neuron
        - "We need to get blood flow to the heart! _____'s heart rate sounds strange...it's really fast :/ Can you pump more blood to the heart?"
    - Puzzle
        - Water puzzle with water dyed red. "Blood" is pumped to the heart (the bucket) and key is found.
            - Youth manipulate different tubes so water pours into an empty bucket with a grate on top. Once bucket is full, key floats up to the top and can be retrieved.

- Respiratory
    - Neuron
        - "The lungs are congested, increase the airflow to make breathing easier! Do you know what's in the lungs there?"

                - Kids attempt to answer??
                - “It’s mucus yuccckkkk!!”
        - Puzzle
            - Dig through mucus/slime in lungs to get key
- Muscles
    - Neuron
        - “Poor (name of friend/operator)’s muscles are achy. Let’s see if we can try a few stretches/exercises to help out!”
    - Puzzle
        - Play a round of dance mat game
        - If time, allow for all 4 kids to try the game
        - Have them check under the mat for the key
- Digestive
    - Neuron
        - “(name) doesn’t have much of an appetite. Try out each food to see which is the best choice to get his/her diet back on track!”
    - Puzzle
        - Sort through foods. Find the best food and use it to unlock the box (foods have magnets inside, only the OJ has enough to open the box)
- Nervous
    - Neuron
        - “Oh no! The infection is attacking the nervous system. I’m afraid I can’t help you very much. Try using what you’ve collected so far…. I don’t feel so good…...”
        - Gets weak
    - Puzzle
        - Unlock nervous system puzzle box using the keys from previous puzzles
        - Electrical puzzle
            - Neuron
                - “Electrical pulses are how I communicate with the body. Too many of them will overload the body though! Be careful not to buzz too much!”
        - Game of operation
            - Retrieve numbers for the immune box combination. Some sort of intuitive pattern on the numbers to indicate their order
- Neuron gets better
    - Neuron
        - “Great job at beating the infection in the nervous system! Let’s go contact the immune system to release the white blood cells to the whole body!”
- Immune
    - Neuron
        - First give them a minute to think about it. “What did the last puzzle give you that can help you here?”
    - Puzzle
        - Use combination from nervous system puzzle to unlock the box (have to turn wheel to the right after combination is put in)

        - Quietly close box before about 10 seconds pass (to avoid the beeping)
    - Resolution
        - Success:
            - Neuron
                - "You have successfully released the white blood cells into the bloodstream! (name) will now be able to fight the virus and stay healthy!"
            - Release lots of ping pong balls
        - Failure:
            - Neuron:
                - "Unfortunately, (name) will have to live with the virus for a couple days and won't be able to go outside and play with you!"
    - Outside of body
        - Kids crawl through throat (if successful, the bacteria has been removed, if not, the bacteria remains)
        - Doctor congrats them and takes their coats

3. Preliminary Room Layout

Part I — Infection Mystery Room Pilot Day Pictures

1. Room Layout

2. Participants


00:
Pause

Part J — Infection Mystery Room Pilot Day #1 Evaluation

1. Observations

Observation Sheet

Date: 4/13/18
Session Time: Group 1
Observer's Name: Amelia

#1 General Notes:
-they liked the mucus
-dance mat didn't work but actor intervened well (asked them multiplication and addition questions- they would say the answer out loud and then step on the correct numbers)

Pinpointed Notes:

#2 Points of excitement:
-dance mat

#3 Points of distress:
-lost one of the keys (actor made a point of holding onto all the keys after this group)

#4 Points of confusion:
-didn't know too much about what neuron asked re: white blood cells
-Took awhile to get a grasp of the digestive puzzle (knew what the correct food was, but couldn't figure out how to use it to get the box open)

#5 Points of frustration:
-being unsure of how to open the digestive box
-picking out the pieces from the neuron puzzle (some of them slipped/it was also difficult due to the room being dark)

#6 Points of trying to "hack the system":
-mentioned they already did the water puzzle, but didn't mind completing it again

#7 Any moments of conflict? If so, when?
-deciding which food was healthy (one thought it was the chicken)
-taking turns with the Operation game

Observation Sheet

Date: 4/13/18
Session Time: Group 2
Observer's Name: Amelia

#1 General Notes:

-working on different puzzles at the same time (specifically the water puzzle (heart) and dance mat)
-dance mat works correctly now
-even though one of the participants knew the code from testing, the other kids seemed to ignore her and wanted to go through all of the puzzles the correct way
- we modified how the locks were fastened to the nervous system puzzle
-Previously, the cord was very tight and Anna gave feedback that it was difficult for them to remove it and open the box. So, we made the cord more loose. It was loose enough that the lid of the box could be taken off without unlocking any locks, but Anna said the kids seemed motivated enough to want to complete the room, so they wouldn't try to open it prematurely.

Pinpointed Notes:

#2 Points of excitement:

#3 Points of distress:
-key from the heart puzzle wasn't replaced

#4 Points of confusion:

#5 Points of frustration:
-having to leave the room without completing the neuron puzzle (Anna ended the game after the participants' repeated attempts to open the combination box)

#6 Points of trying to "hack the system":
-previous puzzle tester remembered the code to the immune system lockbox and tried to open it from the beginning

#7 Any moments of conflict? If so, when?

Observation Sheet

Date: 4/13/18
Session Time: Group 3
Observer's Name: Amelia

#1 General Notes:
-one of the children mentioned something about using a "lolly" when the actor prompted them about how to heal a sore throat
-teamwork on the water puzzle (collaborative effort- one participant offered to take turns with another)
-opened food box relatively easy (compared to the first group)

Pinpointed Notes:

#2 Points of excitement:
-opening the white blood cell box

#3 Points of distress:
-concerned the mucus was real

#4 Points of confusion:
-whether or not it was necessary to wear gloves

#5 Points of frustration:
-wanting to take turns with the Operation puzzle

#6 Points of trying to "hack the system":
-they spent a couple minutes trying to figure out if Anna had been in the other room (asked her if she was the wizard)

#7 Any moments of conflict? If so, when?
-fighting over who would put in the final immune system code- this was resolved by each child picking/entering a number

2. Focus Group Notes

GROUP 1

How did you enjoy the room?
- Good

Was it harder (than dragon room)?
- Yes
- Way harder

Like about it?
- Everything
- Blood
    - one didn't like the blood but also liked it at the same time

Which puzzles did you like the most?
- They liked the ones they did the most

What did you not like?
- Nothing

Which puzzle did you like the least?
- Brain
    - Didn't like the brain because it's so hard
    - Everyone wanted a chance to do the brain so everyone only got one chance but wished they had more
    - Too stressful

Would you play this game again with new puzzles?
- Yes
- Definitely

How long do you think you were in there?
- Most thought 20min, one thought 30min but then agreed with 20min

Ages: 9, 11, 12, 12

GROUP 2

How did you enjoy the room?
- Good
- I got wet because of him
- Key disappeared -- some issue with the key

Like about it?

- Liked the blood

What did you not like?

- I cracked the code and there were no white balls in it but I did it again and there were balls in it
- She didn't let us kind the key ourselves
- They weren't able to get to all of the puzzles

They all kind of ran away and did not answer any of the questions

GROUP 3

How did you enjoy the room?

- Good

Like about it?

- Liked all of it
- I liked everything

Which puzzles did you like the most?

- Liked one of them because it was "mysterious"
- Like seeing the blood
- "They weren't easy, they weren't hard"

How long do you think you were in there?

- 10 minutes

Ages: 10 turning 11

3. Feedback From Actors

Anna (Neuron):

There were some really excellent things going on here. Kids were really into the world, and the very last group in particular were both excited and determined to work together to get the puzzles done. They even reminded me at the end to take the temperature down, and were able to tell me what white blood cells were when asked them at the end of the trial.
I think there's room for improvement in a few areas. The water puzzle was great, the kids were interested, but a couple of times they overfilled it and it did get pretty messy. This was hard to oversee when everything else was going on.

The lungs puzzle was excellent! Kids loved sorting through the mess, and providing the jar for 'medical waste' was a good idea. The groups all seemed to be interested in the body map, and wanted to remove the 'virus particles' as they completed each puzzle, but because they were wearing gloves, and had sticky hands from the lungs puzzle, they couldn't always do this and I had to help. It was also hung a little high for them to reach everything.
The dance puzzle had an issue with the first group, but I think that might have been my fault with turning it off by accident when I was supposed to turn it on. The kids "succeeded" at this puzzle when they worked together, which one group did, however the others were a bit rushed and didn't listen to my explanation very well.

The game of operation was very difficult because the kids had gloves on (I told them to remove them) and because the pieces of paper kept slipping down the back of the game board. I would recommend that gloves are only made available in the brain, for the lung puzzle. I think making it quite easy and blu-tacking the bits of paper in the holes would mean the task of not touching the sides (and getting buzzed) would be more of the challenge. The gameboard also needs to be in a larger tub, as it got stuck.

The digestive puzzle was a good one, once I had learned that I had to give more assistance with it. The first group ran out of time, but I think I could have helped them more.
In the chaos of things, a couple of times some things were forgotten in the 'reset' of the room (i.e. a key in the heart puzzle and white blood cells in the safe). Perhaps a checklist could be created to tick things off as they are done? It's hard to remember everything when there's a quick turnaround.

Two of the group were very set on 'winning' (this could be the nature of having a 'timer' on) and wanted to rush through the puzzles. I decided to hide the nervous system puzzle and the 'white blood cell safe' so that they could concentrate on the other puzzles first, otherwise they become over excited and wanted to do everything at once. I think that worked better, and overall, I think that it would be easier for the kids and actor if there was an order to how they had to approach the puzzles. I.e. They had to start with the heart, then go to the lungs etc. This way the actor could both explain the puzzle properly and supervise if there's any mess etc. as they go.

I also think that more information could be given by the doctor initially, on the body/virus and what the kids need to do. By the time the kids came through to the neuron they were pretty excited and didn't always want to listen. Maybe a body map and thermometer could be made up for the doctor too, who could explain some of the background of what the virus does

to the body, and also give them clear instruction about how they have to unlock each organ, and what white blood cells do. So that when they come into the brain, after a short intro from the neuron, they can get into the puzzles.

What worked with the Dragons room was that the archaeologist gave a lot of background to the story, and told the kids exactly what they had to do, so that if the kids didn't listen to what the wizard they still got the story. This would be an easy change, just giving the doctor part of the neuron's script.

As an actor, I was also aware of my lack of knowledge about the theme of the body/infection, which made it harder to improvise. I suggest that actors do a little research on the systems beforehand they undertake the role (my feedback to myself!).

I know that sounds like a lot, but making changes as we went really improved the kids' experience, and by the last group we saw how effective the room was, and how much kids learnt.

My overall feedback for the project would be to have another go at the Infection room, on Tuesday 24th. I think that while the Dragons room has room for improvement, the Infection would be better served by a second run, after some changes are made.

Anso (Doctor):

The infection room was fine on my side. The only thing I would modify would probably be starting from the other room so no one hangs out in the lobby and they're more immersed in the activity from the start.

Part K— Infection Mystery Room Pilot Day #2 Evaluation

1. Observations

Observation Sheet

Date: 4/24
Session Time: Group 1 (~4:45pm)
Observer's Name: Amelia

#1 General Notes:
-kept asking the neuron what she was/really wanted to figure out what was going on
-interested in science
-definitely better to have the actor lead them through the puzzles linearly (as opposed to letting them roam free)
-good teamwork: took turns with both the neuron Operation puzzle and entering the final code

Pinpointed Notes:

#2 Points of excitement:
-excited to get keys
-glad when they opened the food box

#3 Points of distress:

#4 Points of confusion:
-asked what was in the heart/water puzzle (seemed to believe it was real blood)
-accidentally turned dance puzzle on/off (kept hitting the "start" button)

#5 Points of frustration:

#6 Points of trying to "hack the system":

#7 Any moments of conflict? If so, when?
-a little bit of tension before they decided to take turns with the neuron puzzle

Observation Sheet

Date: 4/24
Session Time: Group 2 (~5:20pm)
Observer's Name: Amelia

#1 General Notes:
-the children looked eager to enter the throat/tunnel (smiled a little bit)
-Anna is doing great with giving instructions/encouraging teamwork, etc.
-the oldest kid sort of stepped back and tried to help only when really needed (seemed a bit uninterested/bored)
-asked the neuron plenty of general questions about the science aspects (shows they were interested)

Pinpointed Notes:

#2 Points of excitement:
-dance game
-opening white blood cell box (and when the other white blood cells came "from above")

#3 Points of distress:

#4 Points of confusion:
-thought that the burger was the healthy food at first

#5 Points of frustration:

#6 Points of trying to "hack the system":

#7 Any moments of conflict? If so, when?
-trying to take turns with entering the final immune system code

Observation Sheet

Date: 4/24
Session Time: 1
Observer's Name: Laurèl

#1 General Notes:
Started at 4:48
First 4 puzzles completed at 5:02
Finished at 5:10 (32 minutes)

- Younger students, needed more help from Neuron
- Neuron asked students what they are looking to release to fight the disease and they respond white blood cells
- Students were not tall enough to do the water puzzle
- When they get to the digestive puzzle student excitedly exclaims "That's where the stomach is!"
- Anna experienced time dilation, as this was the longest experience but thought it was really short

Pinpointed Notes:

#2 Points of excitement:
- Students excited by water puzzle "it's flowing!"
- "Oohs" and "aahs" when the stomach box is opened
- Students jumped up and down when white blood cells were thrown in room

#3 Points of distress:

#4 Points of confusion:
- Students thought they needed to still look for keys after getting to the electrical puzzle

#5 Points of frustration:
- After first 3 puzzles completed, 4th student was sad that everyone had a chance to get a key but him

#6 oints of trying to "hack the system":

#7 Any moments of conflict? If so, when?
- Stepping on each other's feet during the dance mat
- Repeated "I want to do it" during the electrical puzzle

Observation Sheet

Date: 4/24
Session Time: 2
Observer's Name: Laurèl

#1 General Notes:
Started at 5:25
First 4 puzzles completed at 5:34
Finished at 5:41 (16 minutes)

- Students ask Neuron if it is a white blood cell
    - Neuron leads them into what its role is and that they are looking for white blood cells
- Students not tall enough for the water puzzle
- Student asks "why are there toys in the brain?"
- Students make "blech" sounds over the mucus
- 1 student took a phone call during the room

Pinpointed Notes:

#2 Points of excitement:
- Students got really excited when white blood cells were thrown in
    - They weren't expecting it and they went from very neutral expressions to excited

#3 Points of distress:

#4 Points of confusion:

#5 Points of frustration:

#6 Points of trying to "hack the system":

#7 Any moments of conflict? If so, when?
- Distributing the numbers to type in the final code for the immune system box

2. Focus Group Notes

GROUP 1

How did you like the room?

- Very good
- "I've been in here before" -- talking about office

What was you favorite part of the room?

- The balls

Which puzzle did you like most?

- "This is really hard" (choosing just one favorite puzzle)
- "I want to pick all of them"
- "I didn't like the brain, it was kind of shocky"
- "I love the balls, I love this one"

- One with ping pong balls
    - The balls were inside it and then they popped out
    - One mention that it was white blood
- Lung Puzzle
    - Like playing with mucus
    - "That happens to your lungs when you are sick and you have to take it out"
- Dance Puzzle
    - "Sometimes you get to step on people's feet, I like that"
    - The person whose foot got stepped on did not like it
- Health Food
    - Cereal the healthy food

Which puzzle did you not like?

- Hated the brain one cause it keep making loud noise
- Didn't like the sticky one -- "I liked it and hated it" because it was sticky

What part was hard?

- The stickers on the human body
    - Was a bit too high
- She was a human, not a green person

Would you play this room again?

- Yes
- "When will you be doing these rooms again?"

How long do you think you were in there?

- 5 minutes (2)
- 1 hour
- 20 minutes

How old are you?

- 6, 5, 8, 7

One thing you learned about the human body?

- "Need to unlock the white blood so you can feel better and the white blood can fight the bad stuff"
- "Need to eat healthy food"
- "I'm in grade 3, I already knew everything about this whole room. There's two types of blood cells and one fights diseases." What color is the good one? "Green"

GROUP 2

How did you like the room?

- Good
- "I love it", "Love it"

What was your favorite part of the room?

- Everything about it
- "The last part where you open it up and it goes like boom"
- The blood
- I thought they came out of space or something like that -- really fascinated as to where the balls came from (two of them thought it came from a machine)

Which puzzle did you like most?

- I love the one that I did
- Immune Box -- everyone loved it
    - The surprise part
    - I like how the balls came down
    - "And there was even smoke"
- Mucus Puzzle
    - It was really jiggly
    - It was really hard to found the key
- Blood
- Brain
    - When you touch it it made sounds

Which puzzle did you not like?

- I didn't like the dancing so much
- The weird alien thing, she looked freaky
- Older kid thought it was too easy
- The Blood Puzzle
    - You scoop the blood
    - It's hard to take out the key
    - I couldn't reach it
    - Too easy
- Dancing
    - Too easy
    - Not exciting
- Some Other one
    - It was hard to take out the key
- "I didn't like all of them" -- I don't think he was serious

What part was hard?

Would you play this room again?

- Yes
- If it was more difficult and challenging -- older kid

How long do you think you were in there?

- One hour
- 10 or 12 minutes
- 13 minutes
- 25 minutes

How old are you?

- 8, 7, 11, 15

One thing you learned about the human body?

- White blood cells fight the virus
- Same as above

3. Feedback from Actors

Anna (Neuron):

I think the room worked really well on the whole. Obviously the younger kids needed a lot more help, however, they were very engaged in the process.

I think as a follow up exercise, it could be useful to include some fun fact sheets/quizzes/find-a-words etc. on infection in the body, at the end of the Mystery Room so that the educational content of the room could be gone over in more detail/without the time constraints etc. I think some of the kids had some real takeaways from the material, in the room itself, but others might benefit from some quiet time looking over what they did and what it means in a larger sense. I.e. you could have a fun sheet with pictures of the room itself, and the characters/actors, as well as the real body and infection, so they make the links between what they did and what actually happens with a virus attacks a body's cells.

Part L — Baking Mystery Room Script

- Introduction
  - "Hi, I'm Claude Croissant, world renowned baker. I'm so glad you're here, today is the day of a huge baking competition! Unfortunately, my award-winning cookie recipe has been hidden from me! I suspect that one of my competitors, Belot Beignet, came in here and tried to sabotage me. We'll have to figure out where he hid the ingredients and my recipe...then hurry to make the cookies!"
  - "Ah, but of course, what sort of bakers would you be without an apron and hat! We also need to make sure our hands are clean before we handle the ingredients."
  - Give aprons and hats, use hand sanitizer
  - Sound cues: French bakery noises
- Puzzles
  - Radio Puzzle
    - "Belot Beignet seems to have locked up a few of the ingredients in this box, but I see no way of opening it…"
    - "There are a lot of cookbooks here, I suspect there is something hidden in one of them. Hmmm...maybe the radio has a clue!"
    - Students listen to clue and find correct cookbook, which has a magnet inside
    - "Wonderful! Now we can open this locked box"
  - Measurement Puzzle
    - "There's scribbles all over this paper, and I can't read the combination of the box that holds some of the ingredients!"
    - "I don't keep any rubbers/erasers in my kitchen, but we can easily make one! Let's measure the correct amount of each ingredient."
    - Students measure out a 3:1 ratio of talcum powder to silicon.
    - "Great! Carefully erase all of these markings to get the combo and unlock the box!"
    - Students erase on the paper and use that combination to unlock the box and get out the ingredients.
  - Scale Puzzle
    - "Belot Beignet changed the combination of my safe, so I can't get to my secret recipe! One of these weights has the correct combination, we just need to figure out which one!"
    - Students test out weights until they find the one that matches the weight marked off on the scale
    - "Great job! Let us take this combination to my safe!"
    - Students use the combo on the weight to unlock the lockbox and retrieve the recipe
- Post Puzzles
  - Following recipe
    - "Now that you have my secret recipe, let's follow it and get them ready for the competition!"
    - Students follow the recipe to mix together the ingredients
  - Putting in oven

        - "Good job, let's put them in the oven to bake now!"
- Conclusion
    - If won
        - "Thank you so much!!! Because of your help, we were able to make the cookies in time for the competition. Of course with my super secret special stunning recipe, we naturally won first place. Would you like to try some of these cookies?"
        - Kids shout "Yes!"
        - Cookies materialize out of thin air
        - Let kids try cookies
    - If failed
        - "Thank you for your help. Unfortunately, I still don't have all the ingredients I need to make chocolate chip cookies so I won't be able to enter the competition this year. That's okay, I'll just practice for next year.

Part M — Deliverables

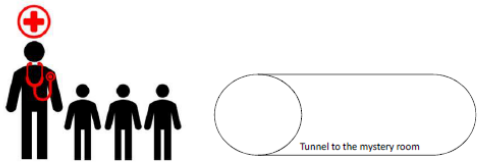
1. Infection Mystery Room Manual

Manual to set up and run the Infection (Flu) Mystery Room

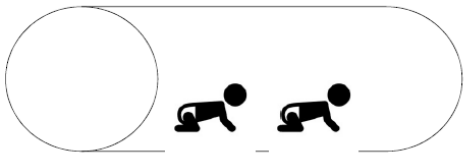
Table of Contents

Storyboard

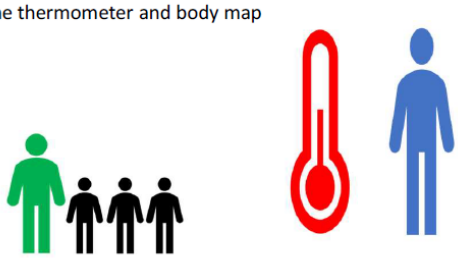
Doctor gives students background, has them prep by washing and donning lab coats and hair nets
Doctor asks students what they believe will happen to the body during an infection and presents the immune system's response is how a body naturally heals itself



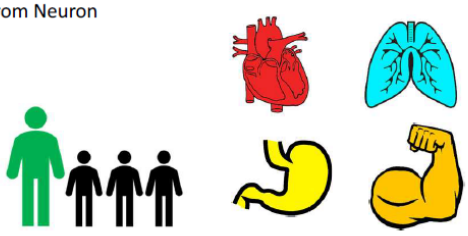
Coughing sound cue plays as students crawl to the mystery room



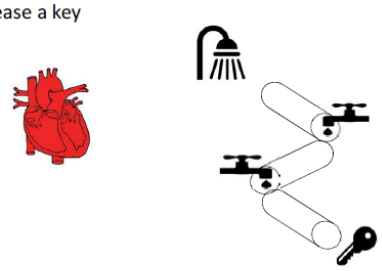
Neuron welcomes students in, shows them around the room with the thermometer and body map



Neuron shows students the 4 parallel puzzles: circulatory, respiratory, digestive, and muscular. Students solve puzzles with hints from Neuron



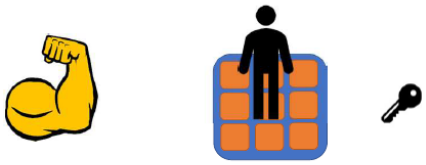
Circulatory puzzle has students get water to flow into a box to release a key



Respiratory puzzle has students search through "mucus" to find a key within the lungs

Digestive puzzle has students sort healthy food objects from unhealthy food objects to release a key from a locked box

Muscular puzzle has students follow a dance mat's instructions then find a key under the mat



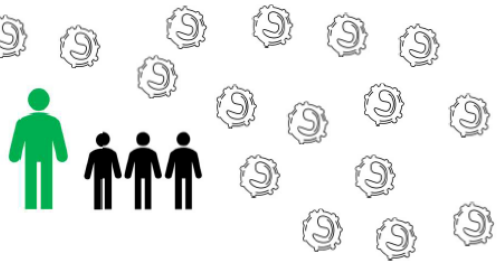
Neuron tells students that the nervous system is under attack and that it feels very weak and can't be of much help

Students must use keys obtained to unlock box holding nervous system puzzle

Students must dig through the brain for the clues for the next puzzle, while avoiding too much buzzing, which will hurt the Neuron

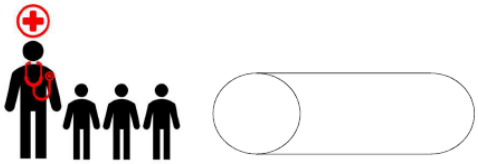
Neuron returns and congratulates them, brings them to the immune system lock box to complete the final puzzle

Students unlock the box and white blood cells fill the room

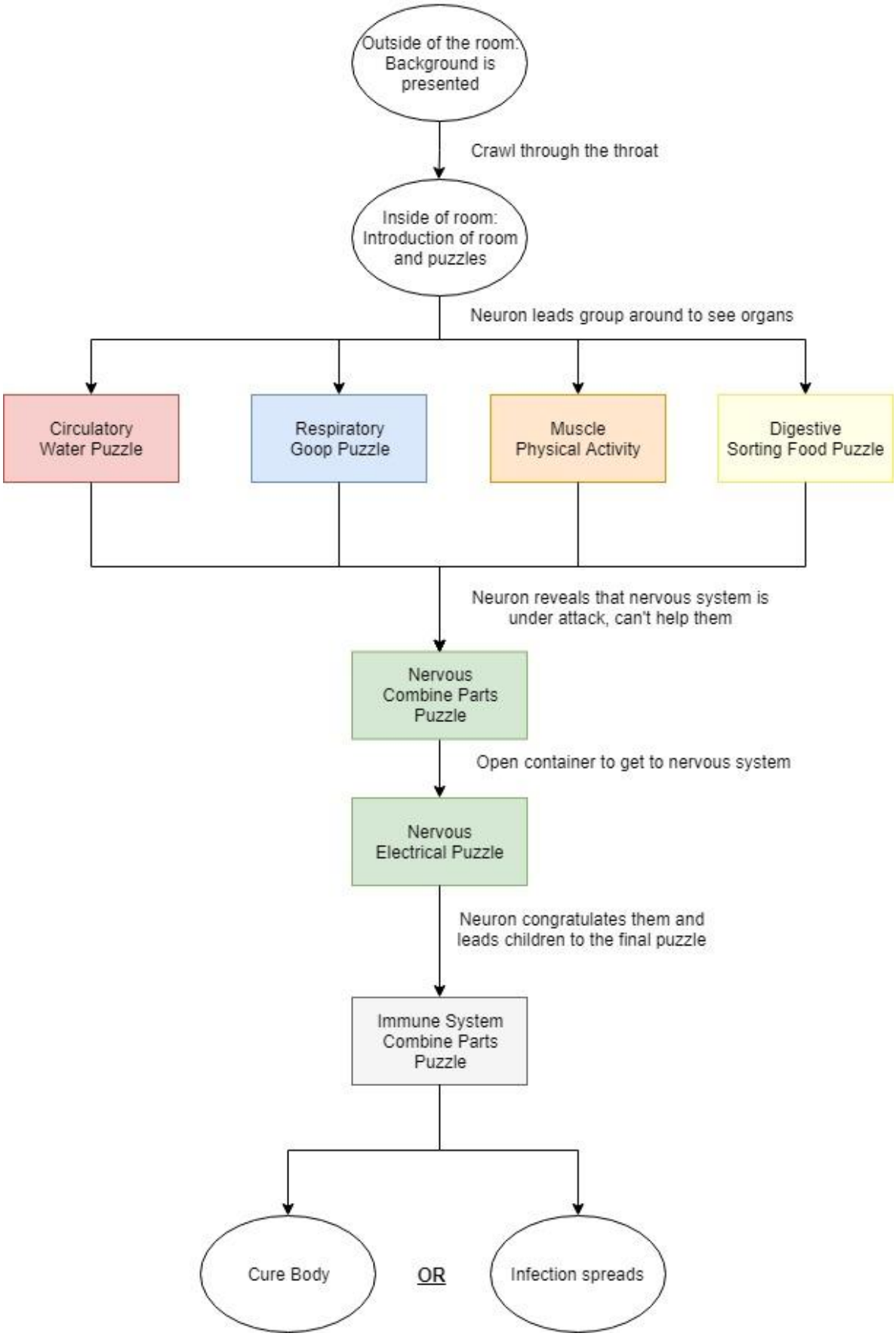


Neuron congratulates them and sends the students back through the throat

Doctor receives the students on the outside of the body, congratulates them for healing the body and takes their protective clothing



Puzzle Flowchart



Background Information for Actors
*depending on age, incorporate more or less material

Doctor:

- Use body map to point out the different systems to students (so that they are familiar with them when they enter the room)
- Discuss difference between bacteria and a virus, ask if they know what is it?
    - Difference is that viruses are smaller.
    - Bacteria are cells, viruses are not
    - Viruses need a host to survive. Antibiotics don't work for a viral infection (you can only treat the symptoms). Viruses are "non-living."
        - More information: https://www.diffen.com/difference/Bacteria_vs_Virus
    - The friend has been infected with the common flu, which is a virus

Neuron:

- When students enter the room
    - Acknowledge cough, ask why the friend might be coughing?
    - Make note of rapid heartbeat
        - (see Youtube link below)
- Circulatory Puzzle
    - Erratic heart rate is caused by fever and dehydration. Additionally, "the heart accelerates the rate at which it beats so as to facilitate the circulation of oxygen and immune cells which are needed to initiate the healing process."
        - More information: http://www.md-health.com/Elevated-Heart-Rate-When-Sick.html
- Respiratory Puzzle
    - We're now going to remove the mucus from the lungs, similarly to how taking cough medicine works! Some cough medicines work by stopping the cough, but others help clear out mucus by causing coughing.
    - "Mucus is like a gelatin, a sticky substance the function of which is to lubricate and also to filter," says Dr. Ellis. It's made by cells in membranes that run from your nose to your lungs. While you swallow most of it without noticing, what's left behind keeps your airways moist so that they work properly.
    - "When you're sick, your body doesn't necessarily produce more mucus. But when you're sick or experiencing an allergic reaction, you'll notice a change in its consistency"
        - More information: https://www.everydayhealth.com/mucus/
        - https://www.everydayhealth.com/cold-flu/everything-you-ever-wondered-about-mucus-and-phlegm.aspx
- Muscular Puzzle

    - The body sends white blood cells to fight infection rather than keep muscles repaired from day-to-day use. This lack of continual repair leaves muscles feeling sore and achy.
        - More information: https://www.avogel.co.uk/health/immune-system/flu/symptoms/aching-joints/
- Digestive Puzzle
    - Caused by impaired sense of smell. Also, when sick the body wants to dedicate all resources to fighting the virus (if you ate, the body would have to dedicate resources to digesting the food).
    - This is why simpler, high carb food is better (because it is easier to digest and requires less of the body's resources).
- Nervous Puzzle
    - "To achieve long distance, rapid communication, neurons have evolved special abilities for sending electrical signals (action potentials) along axons."
        - More information: http://www.mind.ilstu.edu/curriculum/neurons_intro/neurons_intro.php

Script

- Background
    - Doctor
        - "You're here on a mission. Your friend is sick and needs your help to get better!!"
        - They've been infected with a virus because they caught the flu. Do any of you know what a virus is?
        - "To stay safe from the virus, I need to check if everyone is healthy enough to enter the body. Let me check your throat and ears."
            - Checks throat and ears
        - "What's important to keep in mind when people are sick?"
            - Eventually get on topic of sanitary practices
        - "Sanitize your hands, put on the gloves and the coat. Then you will be ready to enter the throat!"
            - Have kids use toy sink (and hand sanitizer), put on costumes
- Enter the room
    - Sound cues
        - Coughing sound, ends shortly after students arrive (see Youtube link below)
        - Rapid heartbeat
    - Neuron
        - "You've traveled through the bloodstream to get up to brain and the body's command system. You can see on the body map and thermometer that the person has a fever and high heart rate!"
- Neuron leads to Body Map and Fever Thermometer
    - Neuron
        - "I'm a Neuron, and my job is to send messages to parts of the body from the brain. I need help contacting each of the organs so that they can heal. Help me unlock each of the organs so that we can release white blood cells to go fight the infection before time runs out!"
        - "Does anyone know what a white blood cell is?"
            - Let kids attempt to answer
        - "White blood cells are like the body's warriors, looking to combat sickness and keep a body healthy!"
        - "If you look around the brain, you can see where to contact the different organs. You can work together or separately to open these systems."
- Circulatory
    - Neuron
        - "We need to get blood flow to the heart! _____'s heart rate sounds strange...it's really fast. Can you pump more blood to the heart?"
    - Puzzle

        - Water puzzle with water dyed red. “Blood” is pumped to the heart (the bucket) and key is found.
            - Youth manipulate different tubes so water pours into an empty bucket with a grate on top. Once bucket is full, key floats up to the top and can be retrieved.
    - Sound cues
        - Upon finishing, reduce the heartbeat to a steady rate (see Youtube links below)
    - Visual cues
        - Upon finishing, Neuron lowers temperature
        - Upon finishing, students remove the virus from the body map
- Respiratory
    - Neuron
        - “The lungs are congested, increase the airflow to make breathing easier! Do you know what’s in the lungs there?”
            - Kids attempt to answer??
            - “It’s mucus yuccckkkk!!”
    - Puzzle
        - Dig through mucus/slime in lungs to get key
    - Visual cues
        - Upon finishing, Neuron lowers temperature
        - Upon finishing, students remove the virus from the body map

- Muscles
    - Neuron
        - “Poor (name of friend/operator)’s muscles are achy. Let’s see if we can try a few stretches/exercises to help out!”
    - Puzzle
        - Play a round of dance mat game
            - If mat failure, ask students maths questions
        - Have them check under the mat for the key
    - Visual cues
        - Upon finishing, Neuron lowers temperature
        - Upon finishing, students remove the virus from the body map
- Digestive
    - Neuron
        - “(name) doesn’t have much of an appetite. Try out each food to see which is the best choice to get his/her diet back on track!”
    - Puzzle
        - Sort through foods. Find the best food and use it to unlock the box (foods have magnets inside, only the healthy food item has enough to open the box)
    - Visual cues

        - Upon finishing, Neuron lowers temperature
        - Upon finishing, students remove the virus from the body map
- Nervous
    - Neuron
        - “Oh no! The infection is attacking the nervous system. I’m afraid I can’t help you very much. Try using what you’ve collected so far…. I don’t feel so good…...”
        - Gets weak
    - Puzzle
        - Unlock nervous system puzzle box using the keys from previous puzzles
        - Electrical puzzle
            - Neuron
                - “Electrical pulses are how I communicate with the body. Too many of them will overload the body though! Be careful not to buzz too much!”
        - Game of operation
            - Retrieve numbers for the immune box combination. Some sort of intuitive pattern on the numbers to indicate their order
    - Visual cues
        - Upon finishing, Neuron lowers temperature
        - Upon finishing, students remove the virus from the body map
- Neuron gets better
    - Neuron
        - “Great job at beating the infection in the nervous system! Let’s go contact the immune system to release the white blood cells to the whole body!”
- Immune
    - Neuron
        - First give them a minute to think about it. “What did the last puzzle give you that can help you here?”
    - Puzzle
        - Use combination from nervous system puzzle to unlock the box (have to turn wheel to the right after combination is put in)
        - Quietly close box before about 10 seconds pass (to avoid the beeping)
    - Resolution
        - Success:
            - Neuron
                - “You have successfully released the white blood cells into the bloodstream! (Our friend) will now be able to fight the virus and stay healthy!”
            - Throw the remaining ping pong balls into the room

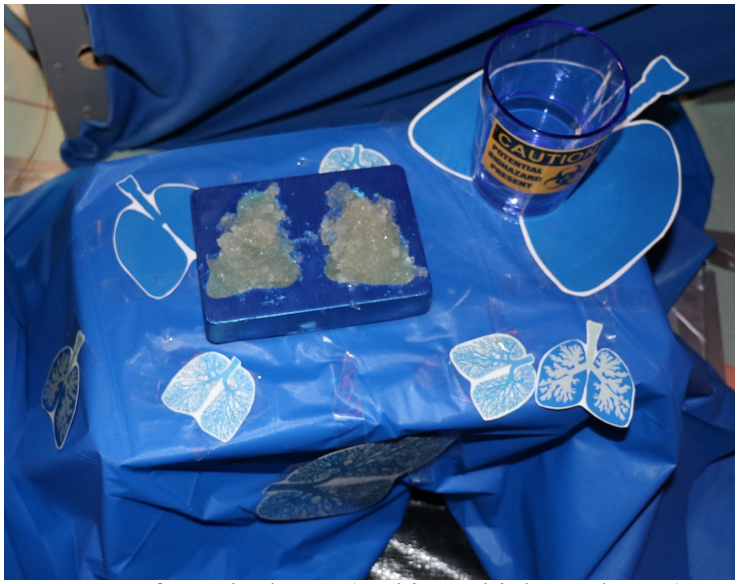
                - Puff fog machine
                    - Fog machine cannot run for an extended time due to safety concerns. Only puff the machine once for about 1 second.
            - Failure:
                - Neuron:
                    - “Unfortunately, (our friend) will have to live with the virus for a couple days and won’t be able to go outside and play with you!”
    - Outside of body
        - Kids crawl through throat (if successful, the virus has been removed, if not, the virus remains)
- Doctor congrats them and takes their coats
- Students enter debriefing period

Puzzles

Circulatory System

Students must open the right faucets until the “blood” runs into the grated, bottom box. To open a faucet, you turn it left. When there is enough “blood” in the grated box, the red key attached to a cork will float up.

Respiratory System



Students must remove mucus from the lungs (and into “biohazard” cup) to obtain blue key

Muscular System

Students must complete a level of the dancing game, and then find the orange key in a taped on small pouch under the mat. The actor will supervise them and instruct them to look under the mat once the game is completed.

Digestive System

Students must sort the healthy food from the unhealthy food, the healthy food item has enough magnets that when it is placed on the red dot, will unlock the magnetized lock. To open the box, you have to place the healthy food and once you hear the click, you lift the healthy food upwards and the box lid should come up too. Once the box is opened, students will obtain a yellow key.

Nervous System Locked Box

Students must use the keys obtained to unlock the 4 locks corresponding to the respiratory, circulatory, digestive, and muscular systems (color-coded). The color to body systems are as follows: respiratory- blue, circulatory- red, digestive- yellow, muscular- orange. Each lock has the organ it corresponds to painted on in the respective color.

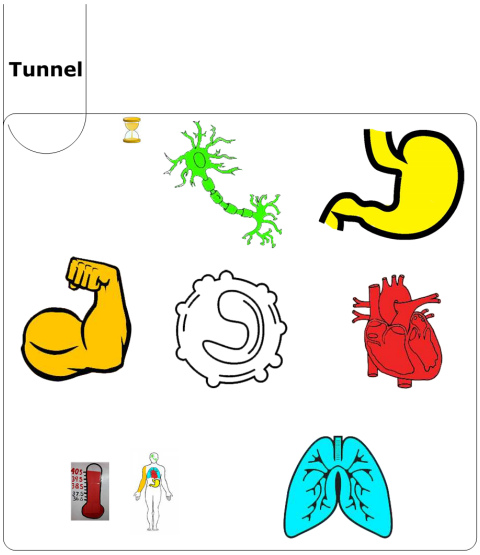
Nervous System Electrical Puzzle

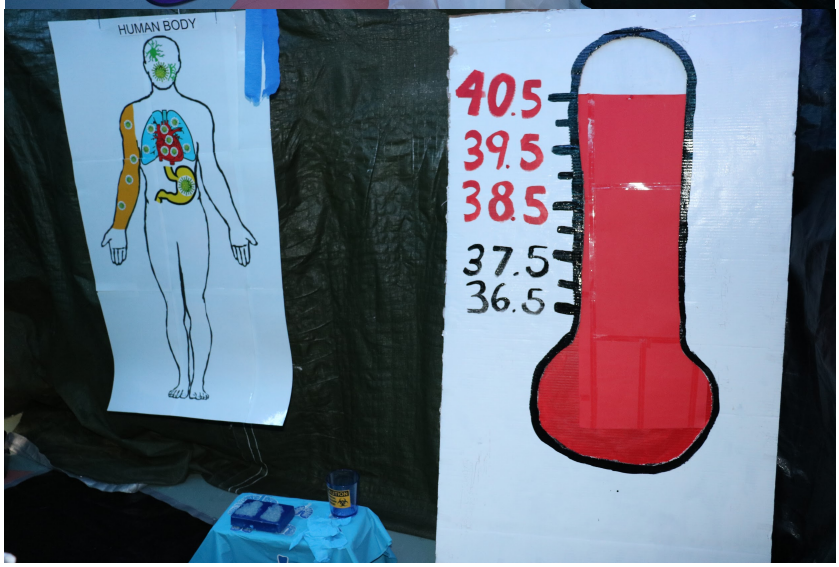
Students must use the tongs to pick out slips of paper that contain the final code. The front side of the slips spells "BODY" and the backside of the slips contain 1928.

Immune System

Students use the final code (1928) obtained from the Electrical Puzzle to unlock the box. Instructions on how to reset the password are in a small manual within the storage box where the Immune System Safe box is stored.

Room Layout





Setup

For lights, curtain, and speaker setup please see MANUAL

Sink

- ❑ Sink
- ❑ Gloves
- ❑ Hair nets
- ❑ Doctors coats
- ❑ Hand sanitizer

Tunnel

- ❑ Laminated virus
- ❑ Tape
- ❑ Lights

1. Set up the entrance to the room in another secluded area.
    a. This entrance includes the sink and the costumes for the participants. The doctor will greet the participants at this room.
2. Run the tunnel from where this room is into the mystery room
3. Tape the virus to the walls of the tunnel
4. Set the lights in the tunnel to red
5. Soundscape when students enter room:
    a. Coughing: https://youtu.be/Qp09X74kjBc

Heart Puzzle

- ❑ Water Puzzle
- ❑ Bin that holds the blood
- ❑ Grated Bucket
- ❑ Red key with cork
- ❑ Red Streamers
- ❑ Laminated Heart Cut Outs
- ❑ “Blood”
- ❑ Red hook
- ❑ Red tablecloth

1. Put the red key (which should be attached to a cork) into the grated bucket
2. Fill the bin with the “blood”
3. Wrap the red streamers around the pipes
4. Hang the red table cloth behind the puzzle
5. Tape hearts to the puzzle
6. Soundscape:

a. Slow heartbeat: https://youtu.be/3do5nUV-hl8
b. Fast heartbeat: https://youtu.be/2FYkCjafomA

Recipe for blood

- ❑ Tub of water
- ❑ Red paint
- ❑ Cocoa powder

Combine all three and mix until desired color and consistency is achieved. The water should still be able to flow easily through the faucets of the puzzle. Red paint gives the redness of blood while the cocoa powder stops the red from being too bright and increases the thickness of the mixture.

Lung Puzzle

- ❑ Lungs
- ❑ Blue Key
- ❑ Blue tablecloth
- ❑ Biohazard Disposal Cup
- ❑ Laminated lung cut outs
- ❑ Mucus

1. Put blue tablecloth down
2. Tape lungs to the table cloth
3. Put key in a lung
4. Fill lungs with mucus
    a. Prepare the mucus 8 hours to a day before the mystery room
5. Hang blue streamers

Recipe for mucus:

- ❑ Water
- ❑ Gelatin powder
- ❑ Agave nectar

Complete the day before mystery room is to be run. Prepare boiling water and put in bowl. Stir in 25 grams of gelatin powder. Then add 2 tablespoons of agave nectar and stir until everything is mixed well. Leave mixture in fridge for at least 3-4 hours minimum (more than that is also fine). Remove bowl from fridge and using fingers, smush the gelatin until the desired consistency is achieved. Remove bowl from fridge 4-5 hours before running room to give adequate time for the mucus to soften.

Stomach Puzzle

- ❑ Stomach Box
- ❑ Yellow Key
- ❑ 4-6 pieces of unhealthy food

- ❑ 1 piece of healthy food
- ❑ Yellow tablecloth
- ❑ Yellow streamers
- ❑ Laminated stomach cut outs
- ❑ Magnets

1. Put key in lock box
2. Stick stomachs around area
3. Put yellow tablecloth down
4. Hang yellow streamers
5. Arrange food items with box

Muscles Puzzle

- ❑ Dance Mat
- ❑ Orange tablecloth
- ❑ Orange streamers
- ❑ Laminated muscle cut outs
- ❑ Orange key

1. Turn on the mat
2. Hide key in pocket underneath the “START” button
3. Hang orange tablecloth on wall
4. Hang orange streamers
5. Tape muscles on wall and mat

Neurological Puzzles

- ❑ Box
- ❑ Lock cable
- ❑ 4 locks
- ❑ Operation game covered by picture of brain
- ❑ Clues within operation game
- ❑ Green tablecloth
- ❑ Green streamers
- ❑ Laminated green neurons

1. Put the operation board into the box
    a. Make sure the “B/1” “O/9” “D/2” “Y/8” green papers are in the board
    b. Fill the remaining slots with unmarked green papers
2. Wrap lock cable around the box, secure with 4 locks. Make sure cable is locked tight enough that the lid won't come off accidentally.
3. Put out green tablecloth. Place box on green tablecloth.

4. Hang streamers. Additionally, it is possible to decorate the box with green streamers.
5. Tape neuron images

Immune Puzzle

- ❑ White ping pong balls
- ❑ White tablecloth
- ❑ White streamers
- ❑ Lock box
- ❑ Fog machine

1. Fill the immune puzzle box with 18 ping pong balls
    a. Remaining ping pong balls are to be stored outside of the room to be thrown into the room when the puzzle is completed
2. Close the box
    a. If the code **1928** does not open the box, the instructions to reset the code are located in the storage box for this puzzle
3. Put out white table cloth
4. Hang white streamers
5. Prepare fog machine
    a. Fill the machine with the included liquid.
    b. Turn on the machine, it takes about 3 minutes to heat up
    c. Press the button for only 1 second at a time, as excess fog creates a safety hazard

Timer

- ❑ Projector
- ❑ HDMI cable
- ❑ Laptop

1. Project this timer: https://www.online-stopwatch.com/eggtimer-countdown/ set to 20 minutes. If using timer, make sure to zoom in enough so the actual amount of time is hidden from the participants.

Body Map

- ❑ Body map
- ❑ Laminated virus
- ❑ Cup to remove laminated virus
- ❑ String
- ❑ Hole puncher

1. Hang the body map low enough for participants to reach it
2. Tape virus to the map

3. Give the cup to the actor playing the Neuron

Thermometer

- ❏ Thermometer base
- ❏ Red sliding paper
- ❏ Red pushpin

1. Set the thermometer to 40.5 at the beginning of the session.

Reset

Costumes

- ❑ Add new gloves and hair caps
- ❑ Have the lab coats in the beginning room

Decor

- ❑ Reset temperature to 40.5
- ❑ Add virus to body map
- ❑ Add virus to tunnel
- ❑ Reset timer to 20 minutes
- ❑ Turn lights in tunnel red

Lung Puzzle

- ❑ Return key
- ❑ Add mucus
- ❑ Clean mucus cup

Circulatory Puzzle

- ❑ Add blood to tub
- ❑ Remove blood from the grated box
- ❑ Return key

Muscular Puzzle

- ❑ Return key
- ❑ Turn on the mat

Digestive Puzzle

- ❑ Return key
- ❑ Rearrange food items

Neurological Puzzles

- ❑ Return neurological puzzle to box
- ❑ Lock all four locks tightly

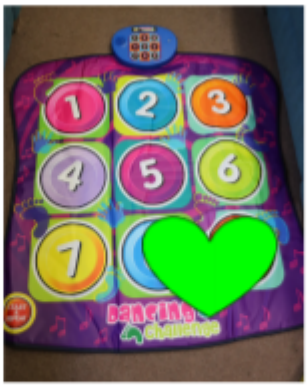
Immune Puzzle

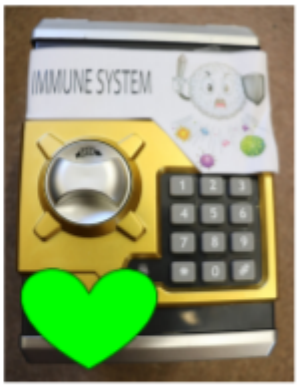
- ❑ Add ping pong balls back into box
- ❑ Close box
- ❑ Remove other ping pong balls

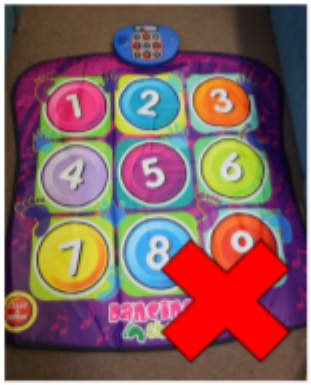
Evaluation Tools

Questions to ask in focus group:

1. What did you like about the room?
2. What was your favorite part?
    a. Have students put the picture of the puzzle with the green heart over it into the box
3. What did you not like about the room?
4. How much did you like the story?
    a. Have students put a red, yellow, or green card into the box
5. What parts were hard?
    a. Have students put the picture of the puzzle with the red X over it into the box
6. Would you play this room again with new puzzles?
7. How long do you think you were in here?








STEM-Related Questions to Consider Asking

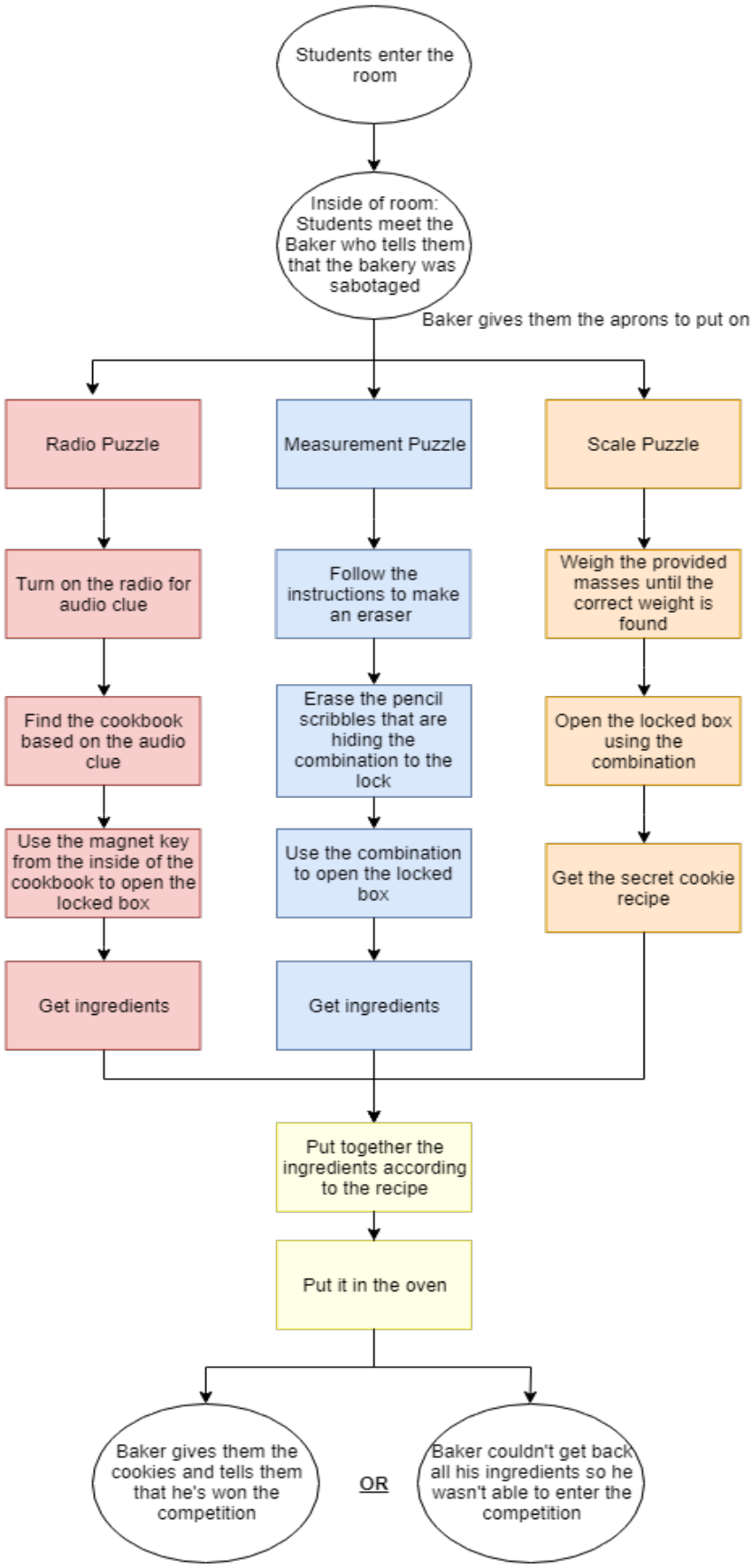
1. What is the function/purpose of white blood cells?
2. What is the difference between bacteria and viruses?
3. How does an infection affect the heart? The lungs? The muscles? The stomach?
4. What is the function of a neuron?

2. Baking Mystery Room Manual

Manual to set up and run the Baking Mystery Room

Table of Contents

Puzzle Flowchart



Script

- Introduction
    - “Hi, I’m Claude Croissant, world renowned baker. I’m so glad you’re here, today is the day of a huge baking competition! Unfortunately, my award-winning cookie recipe has been hidden from me! I suspect that one of my competitors, Belot Beignet, came in here and tried to sabotage me. We’ll have to figure out where he hid the ingredients and my recipe...then hurry to make the cookies!”
    - “Ah, but of course, what sort of bakers would you be without an apron and hat! We also need to make sure our hands are clean before we handle the ingredients.”
    - Give aprons and hats, use hand sanitizer
    - Sound cues: French bakery noises
- Puzzles
    - Radio Puzzle
        - “Belot Beignet seems to have locked up a few of the ingredients in this box, but I see no way of opening it…”
        - “There are a lot of cookbooks here, I suspect there is something hidden in one of them. Hmmm...maybe the radio has a clue!”
        - Students listen to clue and find correct cookbook, which has a magnet inside
        - “Wonderful! Now we can open this locked box”
    - Measurement Puzzle
        - “There’s scribbles all over this paper, and I can’t read the combination of the box that holds some of the ingredients!”
        - “I don’t keep any rubbers/erasers in my kitchen, but we can easily make one! Let’s measure the correct amount of each ingredient.”
        - Students measure out a 3:1 ratio of talcum powder to silicon.
        - “Great! Carefully erase all of these markings to get the combo and unlock the box! The friction between the eraser and the paper will remove all of the pencil markings. Does anyone know what friction is?”
            - Wait for student responses
            - “If you want to feel the friction yourself, rub your hands together! Do you feel them warming up?”
        - Students erase on the paper and use that combination to unlock the box and get out the ingredients.
    - Scale Puzzle
        - “Belot Beignet changed the combination of my safe, so I can’t get to my secret recipe! One of these weights has the correct combination, we just need to figure out which one!”

        - "Notice how they are all the same size, but they don't all weigh the same! These objects have different densities. Does anyone know what density is?"
            - Wait for student responses
            - "Density is how much stuff is inside an object. More precisely, it's how much space an object takes up, or its volume, compared to how much matter it contains, or its mass."
        - Students test out weights until they find the one that matches the weight marked off on the scale
        - "Great job! Let us take this combination to my safe!"
        - Students use the combo on the weight to unlock the lockbox and retrieve the recipe
- Post Puzzles
    - Following recipe
        - "Now that you have my secret recipe, let's follow it and get them ready for the competition!"
        - Students follow the recipe to mix together the ingredients
    - Putting in oven
        - "Good job, let's put them in the oven to bake now!"
- Conclusion
    - If won
        - "Thank you so much!!! Because of your help, we were able to make the cookies in time for the competition. Of course with my super secret special stunning recipe, we naturally won first place. Would you like to try some of these cookies?"
        - Take cookies out of hiding spot
        - Let kids try cookies
    - If failed
        - "Thank you for your help. Unfortunately, I still don't have all the ingredients I need to make a chocolate chip cookie so I won't be able to enter the competition this year. That's okay, I'll just practice for next year!"

Puzzles

Radio Puzzle:

- Program radio to have recorded message. Recorded message: “Maddie Macaroons is here to talk to us about her award winning cookbook _____. Tell us Maddie, what gave you the inspiration to come up with the recipes in this cookbook?” “Well _____ is filled with recipes from my childhood...”
- Said cookbook has a space cutout in the middle hiding the magnet key. Magney key has a picture of a cookie and the locked box has the same picture of the cookie (where the lock should be placed).

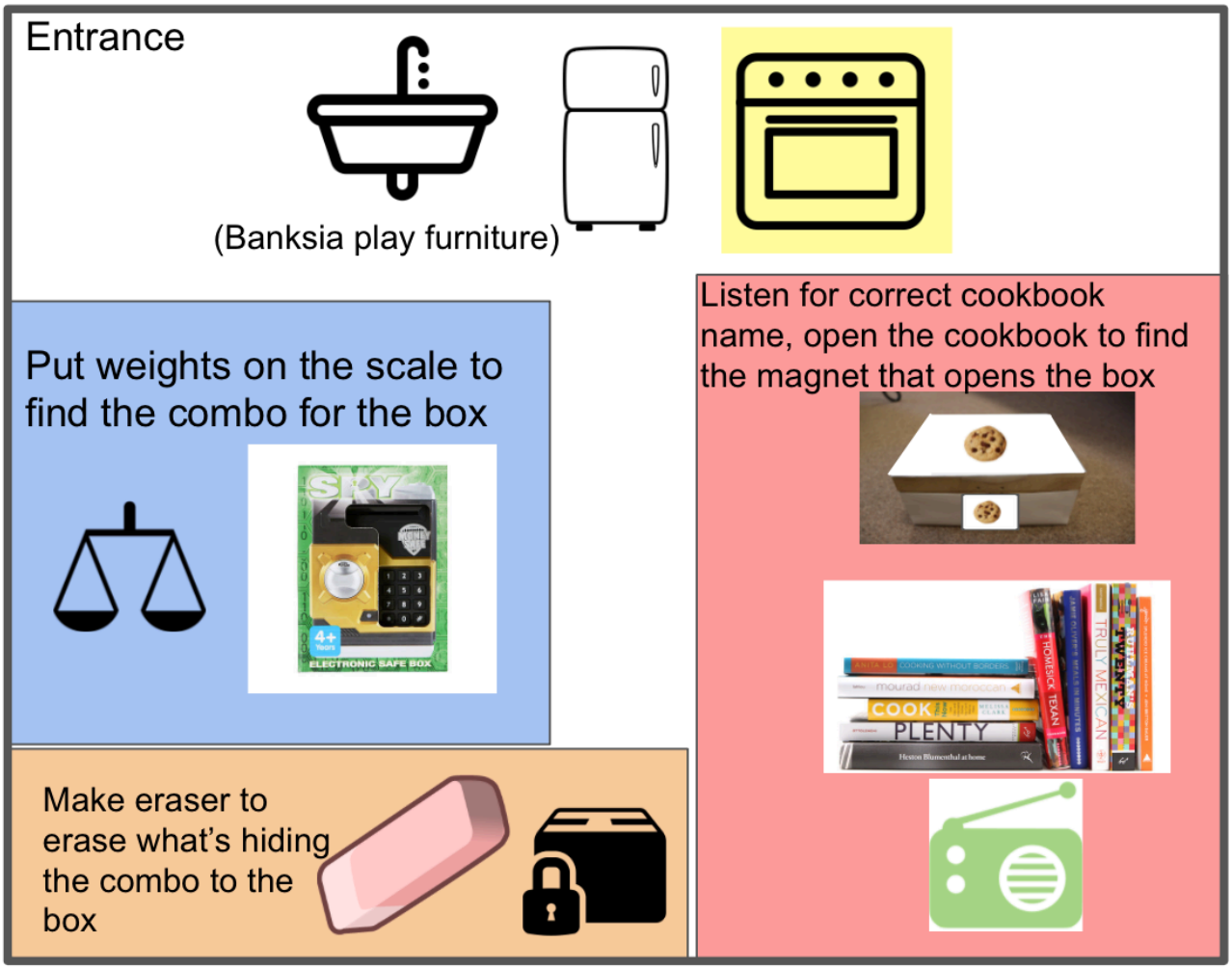
Measurement Puzzle:

- Sheet of paper with a code written on it (permanent marker), with pencil scribbles making it difficult/impossible to read
- Students measure out a 3:1 ratio of talcum powder to silicon (from printed instruction sheet).
- This mixture creates an eraser that can be used to erase the pencil that has been scribbled over the code
- Students use this code for the alphabetic lock

Scale Puzzle:

- Kitchen scale with a target weight listed/marked off. Assorted weights next to it, all with 4-digit codes on them.
- Students place the weights on the scale and find which weight matches the target weight.
- The matching weight has the code that will unlock the recipe safe.

Room Layout


Entrance
(Banksia play furniture)
Put weights on the scale to find the combo for the box
ELECTRONIC SAFE BOX
Listen for correct cookbook name, open the cookbook to find the magnet that opens the box
COOK
PLENTY
Make eraser to erase what's hiding the combo to the box

Setup

Decor

- ❑ Put toy sink, fridge, and oven in room
- ❑ Project image of inside of bakery and of Belot Beignet's graffiti
- ❑ Play sounds of French bakery
- ❑ Have aprons ready for participants

Radio Puzzle

- ❑ Turn radio on
- ❑ Have it ready to play the recording
- ❑ Put magnet key inside the cookbook
- ❑ Arrange cookbooks on table
- ❑ Put ingredients in magnet lock box

Measurement Puzzle

- ❑ Put out instruction sheet
- ❑ Put out clue
- ❑ Put out talcum powder and silicon
- ❑ Put ingredients in lock box and lock the cable

Scale Puzzle

- ❑ Put out scale with marking on the desired weight
- ❑ Have correct combo on that specific weight
- ❑ Put out weights
- ❑ Put secret recipe inside the combo safe

Post Puzzles

- ❑ Have bowl to "mix" ingredients in
- ❑ Hide cookies in room

Reset

Radio Puzzle

- ❑ Have radio ready to play the recording
- ❑ Put magnet key inside the cookbook
- ❑ Put ingredients in magnet lock box

Measurement Puzzle

- ❑ Scribble over clue
- ❑ Put out talcum powder and silicon
- ❑ Put ingredients in lock box and lock the cable

Scale Puzzle

- ❑ Put secret recipe inside the combo safe

Post Puzzles

- ❑ Take ingredients out of bowl
- ❑ Hide new cookies in room

STEM-Related Questions to Consider Asking

1. What is friction? Can you demonstrate it?
2. What does density mean? How is it different from mass?
3. Which did you like best: looking for clues? Listening for clues? Or feeling for clues?