Group 4 VRLE Final Project

Andrea Compton
Joel Jenkins
Shangman (Eunice) Li

Audience

Learners, grades 3-12, under-grads and above, are the audience for this learning activity. Participants need to possess basic motor skills and generally good visual acuity to complete each objective.

The overall activity does not currently comply with Common Core accommodation standards for learners with disabilities. Learners with disabilities may be able to interact with this simulation with assistance from a partner.

Primary Goal/Objective:

After instruction, the learner will use a VR-driving simulator to maneuver a wheeled rover on the surface of Mars to collect samples for analysis.

Secondary Goals/Objectives:

1. After instruction, the learner will demonstrate fundamentals of space travel, tools used for exploration, effects of space on the human body, and history of Mars rover. *(Andrea – lecture)*
2. After instruction, the learner will practice using a virtual reality simulation to prepare for the sample gathering mission on the surface of Mars. *(Joel – activity)*

3. After instruction, the learner will control Mars rover smoothly, gather data from surface and atmosphere, present their reflection of the full experience of Journey to the Future. *(Eunice – lab)*

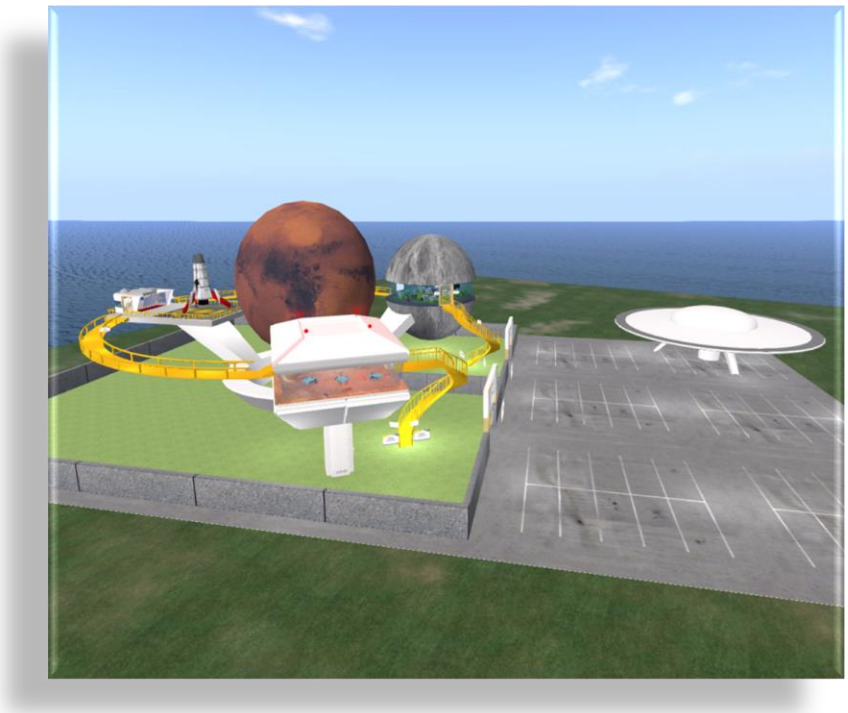
We based our rooms and objectives on William Horton's Absorb, Do, and Connect activities as outlined in his book *Elearning By Design* (Horton, 2006.). This fits the lecture, activity, and lab recommendation in the project instructions. This also fits well with the **Discovery Learning** model (Bruner, 1961).

In the first room, learners are employing the Learner Management and Information Analysis and Interpretation principles as they research and explore topics to prepare for space flight. They will rotate through collaborative learning stations to research and learn about topics related to space travel.

In the second room, they are employing all five principles of Discovery Learning (Problem Solving, Learner Management, Integrating and Connecting, Information Analysis and Interpretation, and Failure and Feedback) as they use VR simulation and interactive activities to connect with the concepts and materials they have researched and absorbed in the first room. Here, learners prepare for various tasks of a mission through virtual reality simulation.

In the final room, learners again employ all five principles of Discovery Learning as they operate a model of a Mars rover and use tools to collect atmospheric and surface samples during exploration. Here learners get hands-on experience similar to a lab.

The culmination of these activities a very experiential learning environment in VR where it would not be feasible in a classroom due to cost, access, and safety regulations. The learning in this space can be adjusted to the learner's pace, it promotes autonomy and independence, and it encourages collaboration among learners and with the "guides" in each room.



Andrea's Room: Mission Orientation (the first stop)

This room is the lecture/absorb room. The objective for this room is:

After instruction, the learner will demonstrate fundamentals of space travel, tools used for exploration, effects of space on the human body, and history of Mars rover.

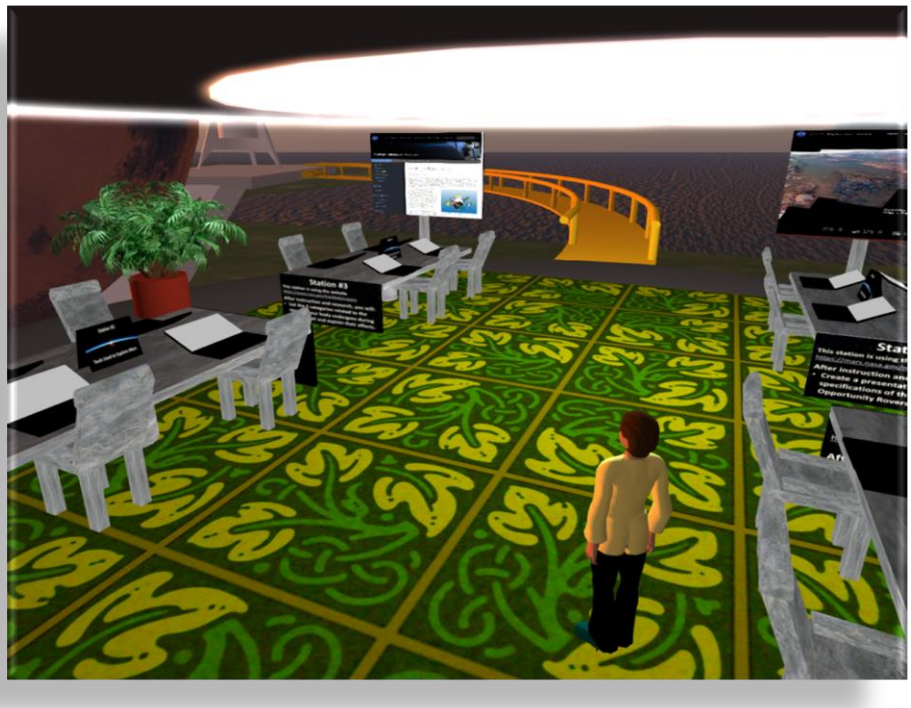
This room is designed for the avatar or an NPC to be present as a guide and to answer questions as learners progress through the stations and assessments. There are four stations in the room where they will rotate to research and learn more about the following:

- ***Fundamentals of Space Flight***
- ***Tools Used to Explore Mars***
- ***Effects of Space Travel on the Human Body***
- ***History of Mars Rover***

At each station there is also an assessment to ensure that the learner has successfully gained the knowledge needed to move on to the next room. Those assessments are as follows:

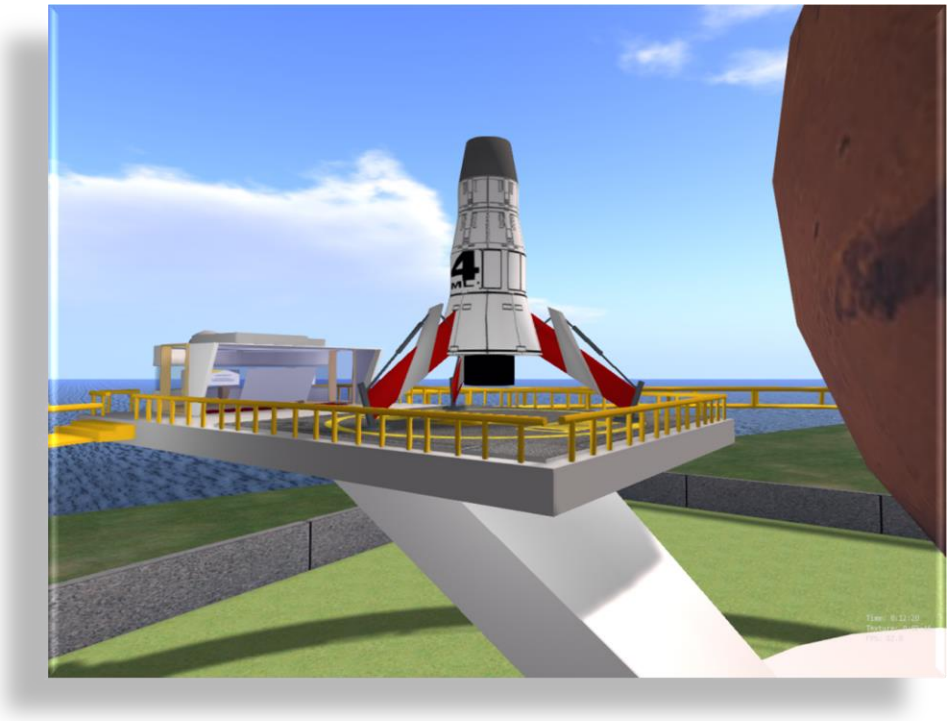
- ***Fundamentals of Space Flight***
  - ***Demonstrate the fundamentals of space flight by passing a quiz with a minimum of 90%***
- ***Tools Used to Explore Mars***
  - ***Name and describe 10 tools used in collecting data in space exploration.***
- ***Effects of Space Travel on the Human Body***
  - ***List the 5 categories related to the stress your body undergoes during space travel and explain their effects.***
- ***History of Mars Rover***
  - ***Create a presentation of the features and specifications of the Spirit and Opportunity rovers.***

At each station, there is a tent card on the table with the station number so that the learner knows where to begin. At the end of the station there is a sign to let them know what they are researching and what their assessment is in order to complete their work at that station and move to the next station. There is a media board attached to each station with the website where they will be doing their research and laptops at each seat so that they may research, take notes, and complete their assessments individually.




Station #1

Joel's Room: Simulation Training (the second stop)

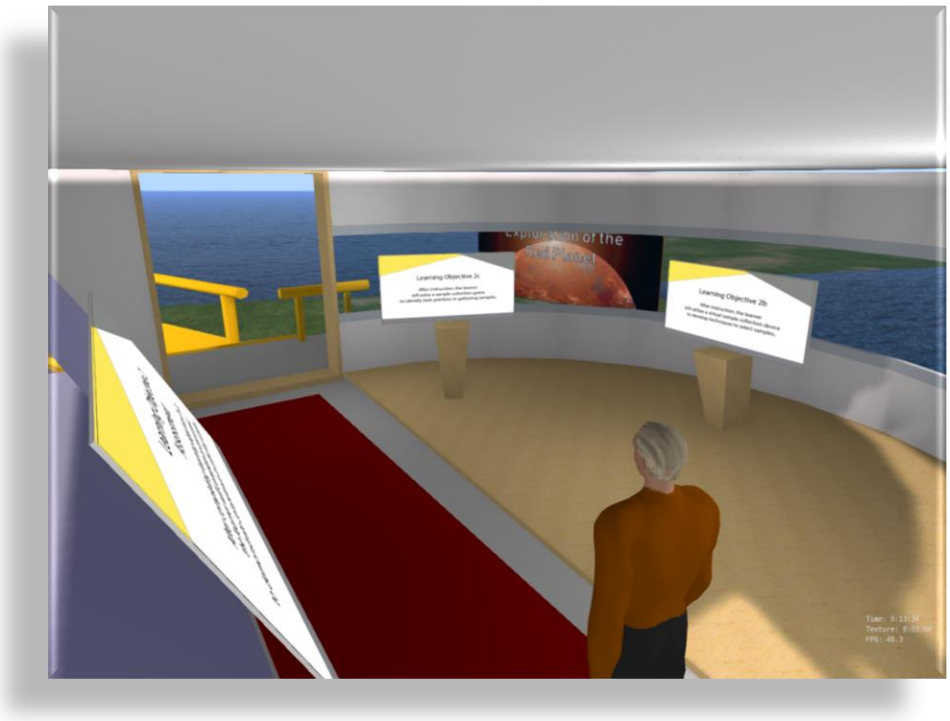


This space is the do/connect room. The area is designed to create the sensation of preparing for the journey to Mars using mission preparation.

The virtual space is comprised of three activities and an assessment. The environment provides a "safe [space], encouraging practice to prepare learners to apply learning in the real world" (Horton, 2006) through play, discovery, and practice.

The primary learning objective here is:

> After instruction, the learner will practice using a virtual reality simulation to prepare for the sample gathering mission on the surface of Mars.



The first station (2a) has the learner create a plan to collect samples on Mars. They use map-reading skills and knowledge of geology obtained in the first learning space to create a plan for collecting samples on the planet's surface using a rover. Horton states, "Discovery activities do not present ideas, but lead learners to discover ideas on their own... transform trial-and-error into trail-and-aha learning."

The second station (2b) has the learner practice collecting samples using a virtual model of the equipment they will operate on the planet. Here, Horton's methodology (2006) is applied so that the learner will strengthen and refine their skills, to "give learners an opportunity to exercise newly acquired abilities."

The last station (2c) is a game that simulates a sampling mission with a virtual rover. Horton shows that games serve two purposes: "to provide practice of a skill or to provoke discovery of knowledge." The game played at 2c prepares the learner for the actual mission they will encounter on Mars.

The learner completes a mini-assessment before exiting this space. The assessment is comprised of 3-5 questions based on the activities they just completed at stations 2a-2c.

Per Horton, the learner is asked to complete the assessment prior to leaving this area to achieve three purposes:

1. Let learners gauge progress toward their goals.
2. Emphasize what is important and thereby motivate learners to focus on it.
3. Let learners apply what they have been learning—and thereby learn it more deeply.

The learner is encouraged to repeat the previous learning activities if they achieve less than 80% proficiency in the assessment. Otherwise, they are free to “lift-off” and proceed to the Mars rover environment, the third stop in the module.

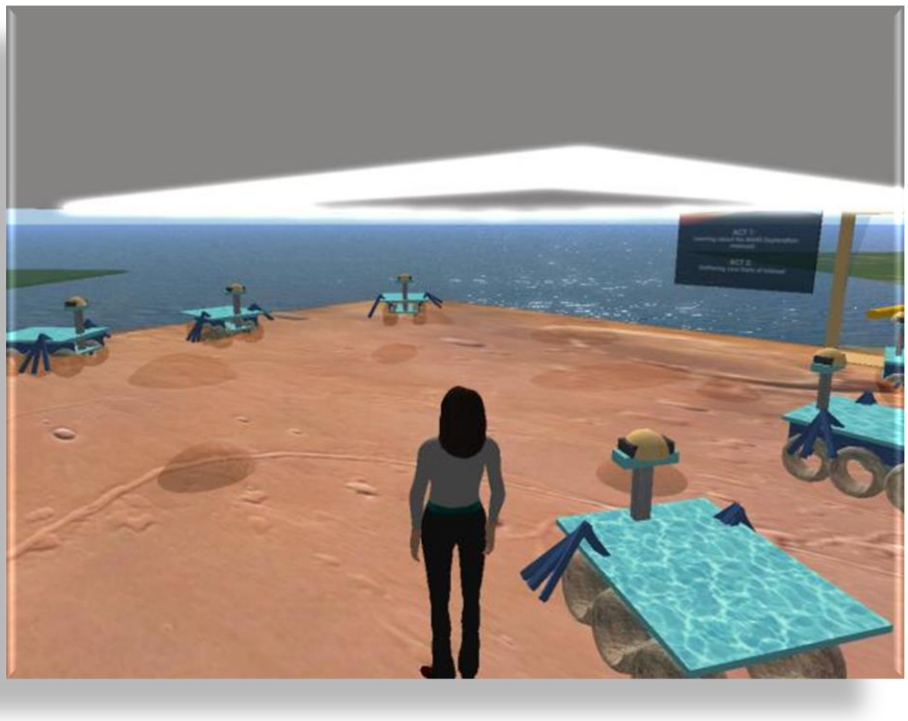
Eunice's Room: Rover Sample Retrieval (the third stop)

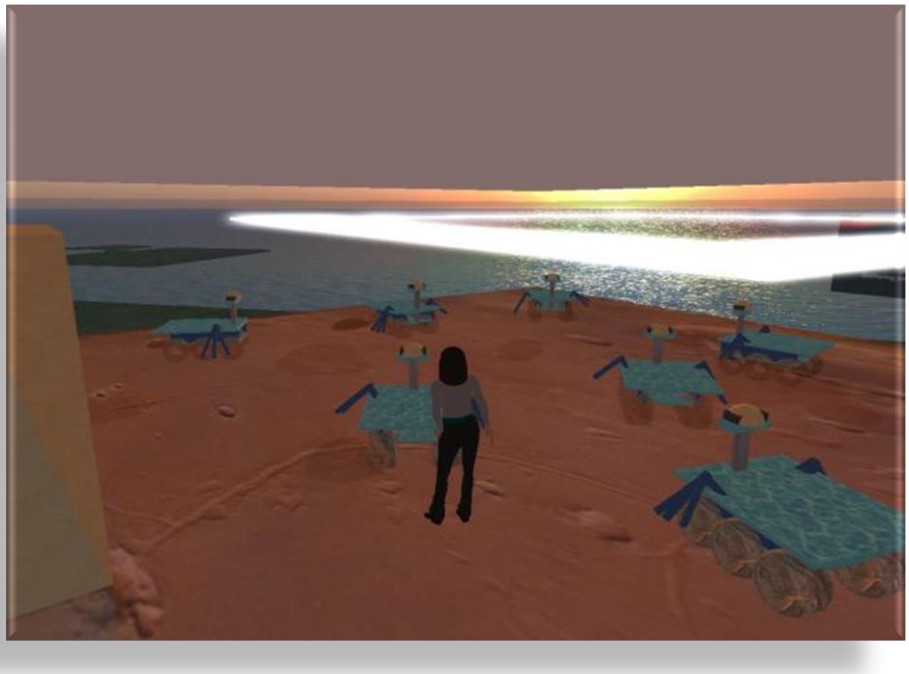
The station here is the Connect Stage, which is designed for the participants to have virtual hands-on experience about driving on the surface of Mars. There are a total of three activities that are included in the Connect Stage. Among these activities, *Activity 1(Ponder): Learning about the Exploration Manuals* and *Activity 2(Research): Gathering Your Data of Interest* are taking place in this space, while *Activity 3(Learner stories): Demonstration* will be taken place at the Absorb Room/Space, enabling the whole experience to be more integrated and cohesive. Before moving to the Activity 3, learners are required to complete the survey. Below are the screenshots of each activity and the corresponding objectives:

1. After instruction in Activity 1, learners will be able to **recognize the direction accurately on Mars and demonstrate the correct way to operate Mars Rover theoretically.**

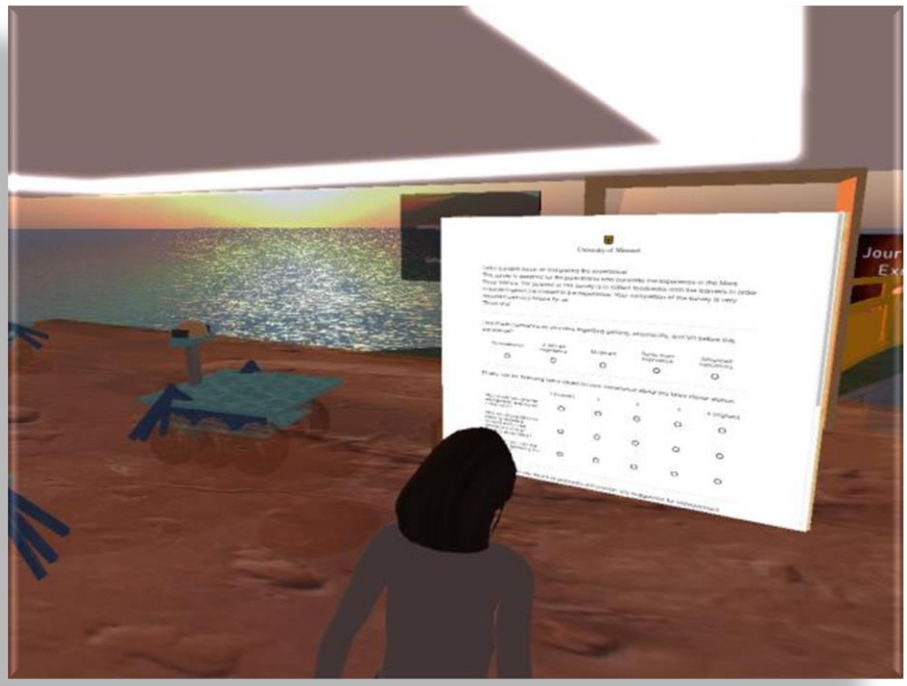
The tutorial video is being placed at the *entrance area* of the station. From the video, learners will learn about how to identify the direction as well as the basic principles of controlling the Mars Rover.

2. (a) After instruction in Activity 2, the learner will be able to **apply and utilize the operation on the Mars Rover as well as the research method that learnt in the previous stations to collect data systematically** regarding the oxygen elements or geology of Mars, including the surface, crust, and interior.

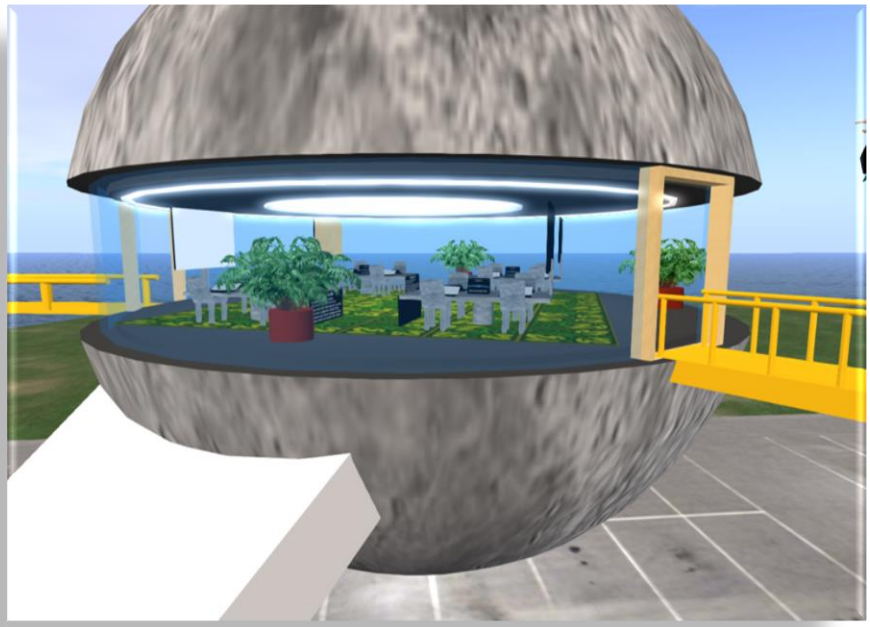




2. (b) After the activity 2, learners are required to complete a satisfaction survey regarding the Mars Rover experience. The survey is being placed in the back of the tutorial video.



3. In the instruction in Activity 3: learners will present a **5-min presentation** at the FIRST STATION regarding **the reflection of the whole experience**.



Group meetings

Our meetings were conducted via Zoom. Eunice, Andrea, and I participated to collaboratively design, edit, and refine our project for presentation.

Our first task was to agree to a team contract that governed our roles and responsibilities. Next, we divided tasks among each other, following a schedule posted in our group project document hosted on Google.

We met over the course of a week to coordinate and discuss our efforts toward the project. Below is a link to an edited clip of our meetings.

https://youtu.be/I_ZB2uat3p8

Conclusion

How does this experience come from (the birth of the Red Planet Experience)?

The design of this experience is based on the previously built individual VRLE from each of the group members: Andrea developed a professional and collaborative lecture room, Joel created a fine and sophisticated spaceship model, and Eunice built a creative and innovative VR driving simulator. To better integrate the designs from three different spaces, we decided to have a common topic which would encompass all three around Joel's space theme. That led to converting Eunice's driving simulators into Mars rover simulators, and Andrea's space could be converted to the lecture space to learn about and prepare for the activities and lab connected to space exploration to Mars. After the settling on the topic, we decided to adopt William Horton's Absorb-Do-Connect learning model (2006) as well as the Discovery Learning Model from Jerome Bruner (1961).

How does Absorb-Do-Connect integrated to our goals and objectives?

In Dr. Horton's model, activities are selected to "provoke learning experiences" (p. 51). There are three types of learning activities: Absorb, Do, and Connect. *Absorb* activities allow the learner to "absorb" knowledge. Examples might be reading assignments or listening to a lecture. *Do* activities require the learner to 'do' something with the knowledge. *Connect* activities help the learner connect the knowledge to previous experience which improves long-term retention. In Andrea's station, the facilitation in provides fundamental knowledge to support learner's activities later (e.g. knowledge about Mars and data collection), which is a reflection of the Absorb activity. In Joel's station, he blends the Do and Connect components, as learners create, plan, and learn about how to collect samples. In Eunice's station, she Connects components, and learners are required to utilize the knowledge they learned in the previous two rooms in order to complete the activity.

How does Discovery Learning Model integrate into the experience?
Discovery Learning was introduced by Jerome Bruner and is a method of Inquiry-Based Instruction. This popular theory encourages learners to build on past experiences and knowledge, use their intuition, imagination and creativity, and search for new information to discover facts, correlations and new truths. Through the experience, the learners will complete each activity followed by some instructions, at the same time, they will explore the whole island by themselves and obtain the knowledge through it.

Challenges We Experienced
Joel: I was extremely happy with the ability to import .DAE files and images into OpenSim. Many of our modules' elements were constructed in Cinema 4D and imported using the build-function. This gave us flexibility and opportunities beyond the basic build features available in Firestorm to design the module.

The principle challenges I encountered were limitations with navigation and working with objects within OpenSim and Firestorm. Not having administrator rights to SISLT 7, I was unable to look into the software to detect the cause of errors. I also found myself constantly frustrated with the navigation, particularly when objects became unavailable due to placement. These idiosyncrasies are inherent with the technology and are in no way a reflection on Dr. Xu, Jhon, and Hao's excellent work in setting up the environment for us.

Andrea: a) I had worked with Second Life just briefly several years ago but had never designed anything, so this was all a new experience. The building of objects in Firestorm had a learning curve, but I felt it came to me fairly quickly considering the level of objects being built and time allotted. However, I feel that the learning curve with Blender will be much steeper. b) I still struggle with trying to create a true virtual experience as opposed to recreating a traditional learning environment in a virtual space. I want to apply the theories better to the virtual learning environment in the future as I expand on what I've learned in this course.

Eunice: a) Technical issue: as a newbie in creating and manipulating 3D objects, the creation process is rather slow and difficult for me; b) Hardware issue: the RAM of my computer is quite small. Many times as I was working in FireStorm, the computer shut down my programs or software, so I had to restart the computer again and again to make sure it ran smoothly; c) Experience: it was difficult to blend three different projects under the same umbrella at the very beginning.

What We Did Well and What Could Have Been Improved

Done well:

- We tried to think outside the box in creating our rooms instead of having traditional rooms/buildings.
- We had a lot of fun brainstorming and thinking big, and we wanted to be creative while also meeting the objectives.
- It was very nice to hear several compliments when we were presenting the project about the design of each station and the instructional ideas during the mini conference. We were very excited about the project, and there were great projects presented during the mini conference. Hopefully everyone has this under their "done well" section if they have one.

Could Have Been Improved:

- Eunice's would have like to have been able to make her Mars Rover able to be driven by the avatars
- Andrea would have like to have been able to connect the laptops to shared Google docs for collaborative documents or presentations. After the mini-conference and seeing other group presentations, scripts could have been developed to give audio instructions at each station for what learners should complete and where to go next.
- Joel felt the simulation training elements would benefit from a thorough design so as to reflect their operation.

The prospect of the future design

a) The set up and the presentation of the Assessment Session in each station
b) The area most likely to benefit from a version 2.0 of the module would be a gamification of learning. The layout of the elements already lends itself to a first-person adventure. Adding elements such as these will make the module more of a game:
    - Access to rooms being granted contingent to completing a task or achieving a minimum score in a learning activity.
    - Discovery of information using maps and devices.
    - Demonstration of learning concepts using simulations and animation.
    - Interaction with a virtual ground controller who will help the learner through the module.
    - Using the rovers in a Mars simulation - think Star Trek's Holodeck.
    - The ability to explore other locations and mysteries on Mars after completing the initial learning tasks.

References

Horton, W. (2011). *E-Learning by Design*. Retrieved from https://proquestcombo-safaribooksonline-com.mcpl.idm.oclc.org/9780470900024

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