

ROVER ON OVER:

TABLE TOP ROLE PLAYING GAME

*Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi
Mason*

Table of Contents

<i>Rover on Over: Rules and Game Play</i>	3
<i>Materials</i>	4
<i>Rationale</i>	4
<i>How and why does it fit the Museum of Flight?</i>	5
<i>Primary Audience Served</i>	6
<i>Frequency of Program</i>	6
<i>Anticipated Costs</i>	7
<i>Min/max Number of Participants</i>	8
<i>Learning Goals</i>	8
<i>Learning Theory and Models</i>	8
<i>Resources</i>	10
<i>Evaluation</i>	11
<i>Figure 1</i>	11
<i>Challenges</i>	13
<i>Successes</i>	14
<i>Revision</i>	15
<i>Appendix A: Player Sheet - 'Walimpy' Multi-Planet Rover</i>	17

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

<i>Appendix B: Player Sheet – Rover Parts</i>	18
<i>Appendix C: Environments and Encounter Tables</i>	24
Uist - Moon Environment	24
Skye III - Planet Environment	26
Kadaklan - Gas Giant Environment	28
<i>Appendix D: Table Layouts</i>	30
<i>Appendix E: Welcome Sign</i>	32
<i>Appendix F: Team, Age, and Time Signage</i>	33
<i>Appendix G: Rover on Over Sign</i>	34
<i>Works Cited</i>	35

Rover on Over: Rules and Game Play

One team member will serve to direct players to the three games by giving them their player sheets and balancing the ongoing games. The other three team members will each run one of the following environments:

- Exoplanet (emphasis on archaeology/biology)
- Gas Giant (emphasis on atmospheric science)
- Exomoon (emphasis on geology)

At each game table, the GMs will have a planet sphere. This will serve to anchor the game in something visible. The players will receive a partially pre-made character sheet. They will have the opportunity to determine what specialty they have (which will give them one ability and a +1 to either the SCIENCE or MOVE ability), but the rover part and base SCIENCE or MOVE will be prefilled. Players will roll 1d6 and add their ability score (and potentially a specialty bonus). If the total is 2-4, the result is a marginal success; if the total is 5-7, the result is a success; if the total is 8+, the result is an exceptional success.

Each game is designed for 4-6+ players. At 6+, two rovers will be exploring the space body simultaneously. Each game is over after four encounter rounds and lasts a maximum of 8 minutes. The inciting incident is a Mission Control Communique (Rolled on Table 1). The players will then decide how to respond. The GM can then either roll or select an appropriate geography encounter (Table 2) and an object encounter (Table 3) to occur as the rover responds to the Mission Control Communique. The game is over when the rover has responded to the Mission Control Communique and an End Condition Scenario is either rolled or chosen by the GM (Table 4). Sessions are designed such that players can drop in and out over the course of a game and such that each game lasts approximately 5 minutes but no more than 8 minutes.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

When players are done, they are invited to color in their rover diagram and the environment they imagine they were in.

Materials

- Six-sided dice for players
- Player character sheets (printed)
- Pencils and colored pencils/crayons
- 3 foam orbs of different colors
- Stickers or tack
- Encounter tables (spreadsheets) for GMs
- Three tables at which to run games
- Benches for players to sit at
- "Mission Accomplished" stamps or stickers

Rationale

Group members had been brainstorming different ideas on and off since the start of the quarter, trying to come up with something that would both fit with the Museum of Flight's needs as well as our own skills and interests. Following the trip to the Challenger Learning Center we began toying with the idea of holding simulated missions for children. Roleplaying is a commonly utilized tactic in museums as seen in activities such as the Brooklyn Museum's Top Secret International (State I) (Small). Given some of the group's background with tabletop roleplaying games (Dungeons and Dragons, World of Darkness, Honey Heist, etc.) and with improvised performance, we thought that a streamlined RPG would be an interesting way to engage children in thinking about space exploration and what it entails while making it feel exciting and interactive with minimal expense. It is worth noting that roleplaying in museums can at times be problematic (such as the Conner Prairie slavery re-enactment) by putting participants in uncomfortable situations (Lewis). Because our program was space exploration-focused, sensitive topics were easily kept out of our roleplay. We made the conscious decision to eliminate the possibility of a failure scenario and to tell the players that they were controlling the rover from a remote

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

location, thereby removing the potentially emotionally challenging possibility of death in space. Children would not have to make testy political decisions or simulate traumatic experiences during their rover journey.

How and Why Does This Program Fit the Museum of Flight?

The Museum of Flight is a large independent nonprofit air and space museum with over 175 air and space craft, thousands of artifacts, rare photos, and a world-class library. Their vision is “to be the foremost educational air and space museum in the world.” Their mission statement follows:

The Museum of Flight exists to acquire, preserve and exhibit historically significant air and space artifacts, which provide a foundation for scholarly research and lifelong learning programs that inspire an interest in and understanding of science, technology and the humanities.

Additionally, the Museum of Flight is currently hosting the Smithsonian Institution and National Air and Space Museum’s traveling exhibit Destination Moon: The Apollo 11 Mission. This exhibit was created to celebrate the historic flight that first put man on the moon in the 1960’s; taking you back with original artifacts and interactives.

When considering creating a public program for the Museum of Flight, this special exhibition shaped the content that was to be incorporated within the program. Programs were to focus on space, the space race era and culture, and space exploration in general. After some brainstorming the program was inspired by the Challenger Learning Center: Expedition Mars to be adapted to an accessible table top role-playing game. The parameters of the game were set to offer realistic encounters on fictional planetary objects, beginning with Uist (Moon), moving to Skye III (Earth-like), and ending with Kaldaklan

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

(Gas Giant). We also found the program to be scale-able to fit the museum's mission of lifelong learning, and cultivate critical thinking, problem solving, communication, and collaboration skills.

Primary Audience Served

The primary audience for this program is children and teens ages 7-15. The game requires players to be able to pull on some critical thinking skills and general understanding of board games. Additionally, it requires some abstract thinking, which is a hard concept for some younger kids to understand; namely younger children are still learning the difference between fiction and reality. This was an important consideration and concern for the game, because there is still so much unknown about space. Upon actual facilitation of the program, the team discovered Rover on Over is also a good fit for intergenerational learning. The program calls for collaboration, which open avenues for family play of the adults in the group are comfortable playing, and have the ability to sit and play for ten minutes. For intergenerational learning to be successful the group make-up must be balanced to fit the needs to younger ages as well.

Frequency of Program

Rover on Over was set to run in 7-10-minute, discrete sessions, which we saw was a correct estimate for the players who moved beyond the coloring tables to the game tables. While this program was not designed for drop in programming, it was tested in a drop-in environment therefore we operated within what seemed like a manageable time frame for participants. Rover on Over could run for 15-30 minutes sessions to allow for more in-depth exploration and learning. For the purposes of this assignment there are three planetary objects to explore, for a total of about 30 minutes if a participant decided to work through the whole galaxy. We only had a few repeat players working through two rounds. After coloring was introduced to accommodate younger audiences, coloring times varied from just taking a sheet for the road to coloring multiple rovers, and some repeat visits.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Anticipated Costs

The Rover on Over Program is free for the public to use and build upon. This program was created with the intention of being a free program, costing the participant only museum admission. Anticipated costs are minimal for materials, approximately \$50.00. However, the program requires at least one facilitator per 6-8 participants, and one facilitator to help prep teams for their upcoming game. If the intention is to have multiple games at one time, there will need to be more in-game facilitators, also called Game Masters or GMs. This cost is dependent on the museum's intention for the program and their staffing capacities.

<i>Figure 1</i>			
Item	Link	Price	Total
6-Sided Dice	Pack of 100	\$9.99	\$9.99
Player Sheet	In-house; Printing Services Prices Vary	-	-
Foam Ball	120, 3 Size	\$7.99	\$17.98
Push Pins	500 Colored Map Push Pins	\$5.99	\$23.97
Mission Complete Stamp	1 Mission Complete Stamp, Multi-Color	\$9.49	\$33.46
Chairs	In-house	-	-
Tables	In-house	-	-
Crayons, Markers, Colored Pencils	In-house, or 264 Bulk Crayons	\$15.98	\$49.44
Tax	Seattle - 10.1%	\$4.99	\$54.43
Total			\$54.43

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Min/Max Number of Participants

Each game can function with a minimum of one participant though they are designed for four participants at a time and can hold up to six. Given that up to three games can be run simultaneously, the total number of participants that can be served at one time is eighteen.

Learning Goals

1. Players will learn what rovers do on unexplored planets/moons/space bodies.
2. Players will practice communication and collaborative storytelling.
3. Players will practice teamwork.

In the spirit of exploration and scientific advancement of the Apollo 11 Mission, each Rover on Over session seeks to promote the skills necessary for a successful earth or space mission. Furthermore, players will learn about modern rover missions in the context of fictional locations to extend the timeline of American space exploration to today and to the future. In designing every aspect of this program, we consistently returned to our learning goals. They anchored our review of literature and of learning theory.

Learning Theory and Models

This program primarily relies on constructivist theory. Players are instructed in the rules of both the game and the world of the rovers and they construct meaning and understanding with the game master (GM) over the course of the encounter. Participants are presented with a problem and must come up with a solution. The effectiveness of their solution immediately impacts their game allowing them to try more effective solutions in subsequent problems. Participants are permitted to play multiple games and can incorporate their experiences from the previous games into new ones. They develop collaborative story-telling skills as they transform incoming information in concordance with their

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambly, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

existing knowledge of the world of the game. The success of the mission (and stamping of their character sheet with “Complete” or “Mission Accomplished”) validates their construction of meaning.

Tabletop roleplaying games are fundamentally social. The construction of meaning and understanding is facilitated by interactions with other people. The environment of the game (both real and imagined) exerts influence on the players, and for those unfamiliar with the mechanics of this kind of gaming the GM plays an important role in mediating the influence of the environment on the players and the players’ influence on the environment. For those unfamiliar with RPGs and children who have less developed storytelling and problem-solving skills, the zone of proximal development serves an especially appropriate model for understanding how this learning occurs. The GM can serve as a mentor figure for less-experienced participants by establishing what collaborative storytelling looks like, suggesting things to consider when solving a problem, and encouraging the development of decision-making skills. The GM’s familiarity with the game becomes a source of learning for participants. Additionally, inexperienced participants may benefit from the experiences of other players within their game. Because this program emphasizes teamwork, more experienced players may take the lead in the game, directly helping less-familiar players through the process.

This social constructivist model of learning maps on to a “5E” instructional design structure: players engage, explore, explain, extend, and evaluate. Engagement occurs at the introductory table where they are introduced to the idea of role-playing through the character sheet and accompanying coloring activity. Players are also assessed for prior understanding at this stage to see if they are prepared for the tabletop roleplaying experience. Exploration occurs in the mission control communique that establishes their task for the session. Explanation occurs when players are asked to process that inciting incident and tell the GM how they respond. Extension occurs in the iteration of exploration and explanation over the encounters in the game. Evaluation is woven into the extension as the GM

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

responds to the players' input and tells the next part of the story. Evaluation also occurs at the moment of introduction. If the potential player is not able to engage with the tabletop game experience, the learning goals of communication and rover knowledge occur in the coloring activity where they think about the parts of the rover and in what kind of environment the rover might be successful.

Based on this theory foundation, we furthermore drew on examples of best practices for child and family, or intergenerational, education in museums. Whereas in intergenerational learning the caregiver occupies the role of more knowledgeable mentor bringing the child through the zone of proximal development, in this set up the GM occupies that role. We discovered in the course of running the program that the presence of caregiver with child at the game table added another element, but we will discuss that further later in this document. In particular we drew on The USS Constitution Museum's Engaging Families best practices booklet. In constructing the character sheet, we drew on existing one-page tabletop games, like Honey Heist, for formatting and elements in line with the USS Constitution Museum's "Less is more" and "Lighten up" approaches. We reduced text to the bare minimum necessary and worked for a fun, light, conversational tone in running the games. We furthermore employed their conversational, multi-outcome design strategies when thinking about how to design encounters to accomplish our stated learning goals.

Resources

The program is designed to rely on four facilitators: one to assign participants their roles and prepare them for the game and three to run each game. It is possible to run this program with as few as one facilitator (who both assigns participants their roles and runs the game) though this setup is not ideal for an environment where a large quantity of participants is quickly cycling through the program.

This program requires the created game system in order to run. It also needs some printed version of the rules and types of rover parts for participants to refer to as they play the game as well as

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

one die for each player. The program requires enough space for the three GM's to manage their players without the games running into each other. Preferably the games will be physically positioned in such a way that people seeking to participate will have to encounter the player director before being able to approach the GM's. Foam spheres were used in the implementation of the program to demonstrate to participants the location of their rover on a planet, but this resource is not necessary for the program to be run.

Evaluation

A formal evaluation of this program would require the program be running at full capacity for a number of months. It would take place at the end of each program session, and ask in depth questions surrounding their experiences in conjunction with intended learning outcomes. Formal evaluation could also be conducted on the program facilitators. Performing both evaluations would give a holistic understanding of the successes and weaknesses of the program. For the purposes of implementation, informal evaluation of the program facilitators was conducted. Game masters were asked about their experiences, (i.e. what worked, did not work, what had to be changed on the fly, etc.) and information was included in this paper as documentation. We discussed informal evaluation of participants for anecdotal feedback, but it was not conducted. however, we found the feedback from game facilitators often included the anecdotal evidence of experiences from participants. Below are examples of informal evaluation questions for participants:

Figure 2		
Learning Objective	Evaluation Question	Answer

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

<p>Players will learn what rovers do on unexplored planets/moons/space bodies.</p>	<p>Can you tell me something that was different on each mission?</p> <p>How did your rover adapt to changes in the environment?</p> <p>When is a time you went somewhere new? What was different about it? How did you have to adapt?</p> <p>What about those environments remind you of places here on earth?</p>	
<p>Players will practice communication and collaborative storytelling.</p>	<p>Do you feel like communication was important for this mission? Why or why not?</p> <p>If you had not successful communication, what do you think would have happened?</p> <p>How would you communicate if...you lost all sound transmission? You met someone who spoke a different language?</p> <p>How do you think astronauts communicate with rovers once they are on their planets?</p>	
<p>Players will practice teamwork.</p>	<p>Could you have done this mission alone? Why is teamwork important?</p> <p>What about working with a team made this mission easier?</p> <p>How does diversity make your team work better?</p>	

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Challenges

The first challenge came in the design of the game. RPGs tend to be very time consuming, can have complicated rules, and are difficult to manage with large numbers of players. Given that we wanted to serve as many participants as possible, we needed to problem solve a way to have games run very quickly. It was also important that the game was easy for children to pick up quickly; long complicated rules would not only lengthen the game time and limit the number of participants we could serve, but could become frustrating enough for children to leave the program in favor of something else. We spent a great deal of time deliberating on solutions for these issues before coming to the game system that was implemented in the program.

In designing the game, one of the challenges we came across was drawing a rover diagram suitable for the game. Coloring in the diagram had been part of the planned activity since the beginning, and so a picture of an actual Mars or lunar rover would be unsuitable. Furthermore, since the game was designed for children, we wanted the rover diagrams to be both simple- and thus easy to understand and color in- as well as visually appealing. Initially we had designed two rovers, one for the surfaces of Uist and Skye III and one to traverse the gaseous atmosphere of Kadaklan. The logistics of printing not just separate sheets for the different rover parts but different sets for different rovers proved to be a bit much, and so we merged the designs to add wings to the land rover diagram.

Once we began running the game, we found that another challenge was scaling the game down for one or two players. We had accounted for the possibility of many children wanting to play simultaneously, but not really for very few. Since we only had one player at a time, one of the facilitators frequently stepped in to play alongside them. In the immediate term this seemed to fix the problem- all the children who played left seeming to have enjoyed their experience- but ultimately, we were still adjusting on the fly to an unforeseen challenge.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Since many families in attendance had children of different ages, we found that parents were occasionally reluctant to let their older children stop for an activity that was inaccessible to their younger children. We did miss out on a few players this way, but we adapted by inviting younger children who might not be suited for the game itself to sit and color in rover diagrams, either just for their own amusement or to keep them occupied while older siblings played the game proper.

Although this was not a problem with the game itself so much as our logistical planning, we found that we had some trouble funneling visitors along the right path to our activity. We had set the table with markers and character sheets further away from other programs, with the intention of intercepting visitors to teach them how to play before sending them along to the game tables. In practice, many visitors believed this table to be a separate activity altogether. Our expectations of how guests would be coming into the side gallery did not reflect realities on the ground as people exiting the Apollo exhibit through its gift shop were funneled into the side of our area. Because we had few players space was not at a premium, luckily, but we did sometimes have people sitting down at our tables not to play but simply to rest after having seen the exhibit.

Successes

Although we had fewer players than we had anticipated, those children who did play the game seemed to have a good time. Presented with the challenges and obstacles we had written into the game, they assessed the capabilities of their rovers and developed solutions to these problems, in keeping with the desired outcomes of the game. While most players only stayed for one game a few played multiple games, and we ended up playing at least one game in every setting.

We had designed the game to be played by children, but we found that some of our players brought parents and guardians along with them into the game. In some cases, this took the form of a parent playing with them, and in others a caretaker simply sat beside them to give encouragement and

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

advice. Unintentional though it was, we were excited by our game's capacity to foster intergenerational ties and cooperation.

To accommodate younger children and those who were hesitant to dedicate time to the game, we put additional emphasis on the color ability of our game sheets. Many children eagerly approached our table of markers and happily colored a picture of a rover without even being aware that there was a game attached to the sheet they were coloring. In this way we were able to accommodate a wider audience and contribute to these younger children's museum experience. Facilitators were able to incorporate alternative learning goals into the coloring--keeping the activity somewhat structured. Children would be introduced to the concept of a rover, could connect their picture to the real rover in the exhibit, and were encouraged to consider what planets their rover could travel to and how it could mechanically travel there.

Revision

We created this RPG with the purpose of playing it with as many participants as possible in a limited time frame. Participants may have become more invested in the game (and thus feel more accomplished in their successes) if the games were run for longer periods of time in a more focused group. Rather than having many five-minute adventures, fewer games that ran for thirty or even sixty minutes could have been more engaging for guests while better covering our learning goals. Communicating, problem-solving, and storytelling are all skills that are not so easily developed in a five-minute session. This is not to say our program failed to meet these learning goals, just that longer games we could have met those goals better. Were we to re-implement this program we would aim to have much longer games with fewer participants in a setting where players knew there would be role-playing games, rather than host the program in high-traffic, drop-in style festival.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Different settings would lend themselves better to these longer games. Our first thought, informed in part by playtesting the game with camp staff from the Museum of Flight, was that running the game with summer camp students would lead to a deeper and more rewarding experience. For one thing, this would be a captive audience who would have more time to devote to the game. For another, these would be players who already know one another and who would thus be able to cooperate more effectively in teams. Another potential setting would be an event aimed at the so-called “YoCos,” many of whom have had experience playing tabletop RPGs and might therefore need less guidance in learning the game. The more structured nature of such an event would allow would-be players to sign up for games ahead of time, ensuring full complements of players and ample time for guests to familiarize themselves with the rules.

A further revision we would consider moving forward, especially in light of our desire for longer games, would be the addition of failure into the mix. In our current design, there is no fail state, only varying degrees of success. We made this design choice because we wanted to ensure a positive experience for children that left them feeling empowered and excited about space exploration. With a longer format and a more structured environment, the possibility of failure would add a greater sense of stakes for the players and would open the door to more problem-solving and teamwork as the players work together to find alternate solutions to challenges after initial setbacks.

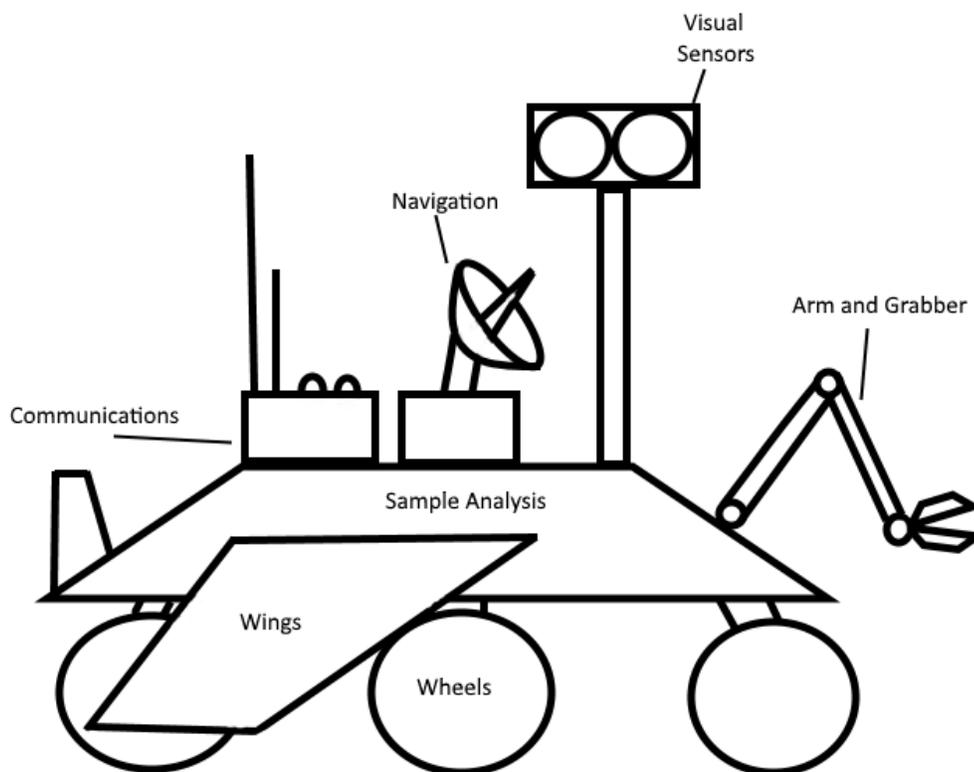
© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Appendix A: Player Sheet - 'Walimpy' Multi-Planet Rover

What role do you play?

You can color in the part of the rover you control on the mission here! After your mission, you can draw in the environment you've explored as well:



© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Appendix B: Player Sheet – Rover Parts

Rover on Over: Wheels or Wings

<p>Science: <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Move: <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p>	<p>Specialty:</p> <table style="width: 100%;"> <tr> <td style="width: 50%;">1. Chemistry</td> <td style="width: 50%;">4. Physics</td> </tr> <tr> <td>2. Biology</td> <td>5. Mechanics</td> </tr> <tr> <td>3. Geology</td> <td>6. Computer</td> </tr> </table>	1. Chemistry	4. Physics	2. Biology	5. Mechanics	3. Geology	6. Computer
1. Chemistry	4. Physics						
2. Biology	5. Mechanics						
3. Geology	6. Computer						

Today, you'll be controlling the wheels or wings of the rover! These help the rover move around the planet, whether driving over unexplored terrain on a planet or moon or flying through the unknown in the upper layers of the atmosphere of a gas giant.

What kind of specialty do you think works best with that role? Select from the table below:

Specialty and Special Ability
<p>1. Chemistry: the science of the materials that make up the world and the universe. Add +1 <input checked="" type="checkbox"/> to your science. If you want to use chemistry to enhance an action, call out "Chemistry!" This will let the team re-roll a Science check.</p>
<p>2. Biology: the science of organisms. Add +1 <input checked="" type="checkbox"/> to your science. If you want to use biology to enhance an action, call out "Biology!" This will let the team re-roll a Science check.</p>
<p>3. Geology: the science of the physical structure of planets and rocks. You can add +1 <input checked="" type="checkbox"/> to <i>either</i> Science or Move. If you want to use geology to enhance an action, call out "Geology!" This will let the team re-roll whichever ability you chose to add a <input checked="" type="checkbox"/> to in.</p>
<p>4. Physics: the science of energy and matter. You can add +1 <input checked="" type="checkbox"/> to <i>either</i> Science or Move. If you want to use physics to enhance an action, call out "Physics!" This will let the team re-roll whichever ability you chose to add a <input checked="" type="checkbox"/> to in.</p>
<p>5. Mechanics: the physical workings of the rover. Add +1 <input checked="" type="checkbox"/> to your move. If you want to use mechanics to enhance an action, call out "Mechanics!" This will let the team re-roll a Move check.</p>
<p>6. Computer: the technological workings of the rover. Add +1 <input checked="" type="checkbox"/> to your move. If you want to use computer to enhance an action, call out "Computer!" This will let the team re-roll a Move check.</p>

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambles, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

In the game, to act: roll one die and add the number of  you have in the skill you're using. Your special ability allows you to give a boost to the team! Call out that you're using your special ability to let a teammate roll again.

Rover on Over: Antenna

Science:    <input type="checkbox"/> Move:   <input type="checkbox"/> <input type="checkbox"/>	Specialty: 1. Chemistry 2. Biology 3. Geology 4. Physics 5. Mechanics 6. Computer
--	---

Today, you'll be controlling the antenna of the rover! The antenna communicates the results of your exploration back to mission control, broadcasts the voice of the rover on the planet, and receives different kinds of waves outside the visual spectrum.

What kind of specialty do you think works best with that role? Select from the table below:

Specialty and Special Ability
<p>1. Chemistry: the science of the materials that make up the world and the universe. Add +1  to your science. If you want to use chemistry to enhance an action, call out "Chemistry!" This will let the team re-roll a Science check.</p>
<p>2. Biology: the science of organisms. Add +1  to your science. If you want to use biology to enhance an action, call out "Biology!" This will let the team re-roll a Science check.</p>
<p>3. Geology: the science of the physical structure of planets and rocks. You can add +1  to <i>either</i> Science or Move. If you want to use geology to enhance an action, call out "Geology!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>4. Physics: the science of energy and matter. You can add +1  to <i>either</i> Science or Move. If you want to use physics to enhance an action, call out "Physics!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>5. Mechanics: the physical workings of the rover. Add +1  to your move. If you want to use mechanics to enhance an action, call out "Mechanics!" This will let the team re-roll a Move check.</p>
<p>6. Computer: the technological workings of the rover. Add +1  to your move. If you want to use computer to enhance an action, call out "Computer!" This will let the team re-roll a Move check.</p>

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambles, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

In the game, to act: roll one die and add the number of  you have in the skill you're using. Your special ability allows you to give a boost to the team! Call out that you're using your special ability to let a teammate roll again.

Rover on Over: Arm & Grabber

<p>Science:   <input type="checkbox"/> <input type="checkbox"/></p> <p>Move:    <input type="checkbox"/></p>	<p>Specialty:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1. Chemistry</td> <td style="width: 50%;">4. Physics</td> </tr> <tr> <td>2. Biology</td> <td>5. Mechanics</td> </tr> <tr> <td>3. Geology</td> <td>6. Computer</td> </tr> </table>	1. Chemistry	4. Physics	2. Biology	5. Mechanics	3. Geology	6. Computer
1. Chemistry	4. Physics						
2. Biology	5. Mechanics						
3. Geology	6. Computer						

Today, you'll be controlling the arm & grabber of the rover! Together, they help collect samples for study.

What kind of specialty do you think works best with that role? Select from the table below:

Specialty and Special Ability
<p>1. Chemistry: the science of the materials that make up the world and the universe. Add +1  to your science. If you want to use chemistry to enhance an action, call out "Chemistry!" This will let the team re-roll a Science check.</p>
<p>2. Biology: the science of organisms. Add +1  to your science. If you want to use biology to enhance an action, call out "Biology!" This will let the team re-roll a Science check.</p>
<p>3. Geology: the science of the physical structure of planets and rocks. You can add +1  to <i>either</i> Science or Move. If you want to use geology to enhance an action, call out "Geology!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>4. Physics: the science of energy and matter. You can add +1  to <i>either</i> Science or Move. If you want to use physics to enhance an action, call out "Physics!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>5. Mechanics: the physical workings of the rover. Add +1  to your move. If you want to use mechanics to enhance an action, call out "Mechanics!" This will let the team re-roll a Move check.</p>
<p>6. Computer: the technological workings of the rover. Add +1  to your move. If you want to use computer to enhance an action, call out "Computer!" This will let the team re-roll a Move check.</p>

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

In the game, to act: roll one die and add the number of  you have in the skill you're using. Your special ability allows you to give a boost to the team! Call out that you're using your special ability to let a teammate roll again.

Rover on Over: Visual Sensor Array

<p>Science:    <input type="checkbox"/></p> <p>Move:  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p style="text-align: center;">Specialty:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1. Chemistry</td> <td style="width: 50%;">4. Physics</td> </tr> <tr> <td>2. Biology</td> <td>5. Mechanics</td> </tr> <tr> <td>3. Geology</td> <td>6. Computer</td> </tr> </table>	1. Chemistry	4. Physics	2. Biology	5. Mechanics	3. Geology	6. Computer
1. Chemistry	4. Physics						
2. Biology	5. Mechanics						
3. Geology	6. Computer						

Today, you'll be controlling the visual sensor array of the rover! You are the eyes of the rover and communicate visual information back to mission control.

What kind of specialty do you think works best with that role? Select from the table below:

Specialty and Special Ability
<p>1. Chemistry: the science of the materials that make up the world and the universe. Add +1  to your science. If you want to use chemistry to enhance an action, call out "Chemistry!" This will let the team re-roll a Science check.</p>
<p>2. Biology: the science of organisms. Add +1  to your science. If you want to use biology to enhance an action, call out "Biology!" This will let the team re-roll a Science check.</p>
<p>3. Geology: the science of the physical structure of planets and rocks. You can add +1  to <i>either</i> Science or Move. If you want to use geology to enhance an action, call out "Geology!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>4. Physics: the science of energy and matter. You can add +1  to <i>either</i> Science or Move. If you want to use physics to enhance an action, call out "Physics!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>5. Mechanics: the physical workings of the rover. Add +1  to your move. If you want to use mechanics to enhance an action, call out "Mechanics!" This will let the team re-roll a Move check.</p>
<p>6. Computer: the technological workings of the rover. Add +1  to your move. If you want to use computer to enhance an action, call out "Computer!" This will let the team re-roll a Move check.</p>

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

In the game, to act: roll one die and add the number of  you have in the skill you're using. Your special ability allows you to give a boost to the team! Call out that you're using your special ability to let a teammate roll again.

Rover on Over: Sample Analyzer

<p>Science:    <input type="checkbox"/></p> <p>Move:  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Specialty:</p> <table style="width: 100%;"> <tr> <td style="width: 50%;">1. Chemistry</td> <td style="width: 50%;">4. Physics</td> </tr> <tr> <td>2. Biology</td> <td>5. Mechanics</td> </tr> <tr> <td>3. Geology</td> <td>6. Computer</td> </tr> </table>	1. Chemistry	4. Physics	2. Biology	5. Mechanics	3. Geology	6. Computer
1. Chemistry	4. Physics						
2. Biology	5. Mechanics						
3. Geology	6. Computer						

Today, you'll be controlling the sample analyzer of the rover! Located in the belly of the robot you can do a variety of tests to learn more about objects and materials found on planets and moons.

What kind of specialty do you think works best with that role? Select from the table below:

Specialty and Special Ability
<p>1. Chemistry: the science of the materials that make up the world and the universe. Add +1  to your science. If you want to use chemistry to enhance an action, call out "Chemistry!" This will let the team re-roll a Science check.</p>
<p>2. Biology: the science of organisms. Add +1  to your science. If you want to use biology to enhance an action, call out "Biology!" This will let the team re-roll a Science check.</p>
<p>3. Geology: the science of the physical structure of planets and rocks. You can add +1  to <i>either</i> Science or Move. If you want to use geology to enhance an action, call out "Geology!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>4. Physics: the science of energy and matter. You can add +1  to <i>either</i> Science or Move. If you want to use physics to enhance an action, call out "Physics!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>5. Mechanics: the physical workings of the rover. Add +1  to your move. If you want to use mechanics to enhance an action, call out "Mechanics!" This will let the team re-roll a Move check.</p>
<p>6. Computer: the technological workings of the rover. Add +1  to your move. If you want to use computer to enhance an action, call out "Computer!" This will let the team re-roll a Move check.</p>

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambale, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

In the game, to act: roll one die and add the number of  you have in the skill you're using. Your special ability allows you to give a boost to the team! Call out that you're using your special ability to let a teammate roll again.

Rover on Over: Navigation

Science:  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Move:    <input type="checkbox"/>	Specialty: 1. Chemistry 2. Biology 3. Geology 4. Physics 5. Mechanics 6. Computer
---	---

Today, you'll be controlling the navigation system of the rover! You help keep the rover on track because mission control is too far away to tell the rover exactly when to turn, stop, and go.

What kind of specialty do you think works best with that role? Select from the table below:

Specialty and Special Ability
<p>1. Chemistry: the science of the materials that make up the world and the universe. Add +1  to your science. If you want to use chemistry to enhance an action, call out "Chemistry!" This will let the team re-roll a Science check.</p>
<p>2. Biology: the science of organisms. Add +1  to your science. If you want to use biology to enhance an action, call out "Biology!" This will let the team re-roll a Science check.</p>
<p>3. Geology: the science of the physical structure of planets and rocks. You can add +1  to <i>either</i> Science or Move. If you want to use geology to enhance an action, call out "Geology!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>4. Physics: the science of energy and matter. You can add +1  to <i>either</i> Science or Move. If you want to use physics to enhance an action, call out "Physics!" This will let the team re-roll whichever ability you chose to add a  to in.</p>
<p>5. Mechanics: the physical workings of the rover. Add +1  to your move. If you want to use mechanics to enhance an action, call out "Mechanics!" This will let the team re-roll a Move check.</p>

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambles, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

6. **Computer:** the technological workings of the rover. Add +1  to your move. If you want to use computer to enhance an action, call out “Computer!” This will let the team re-roll a Move check.

In the game, to act: roll one die and add the number of  you have in the skill you’re using. Your special ability allows you to give a boost to the team! Call out that you’re using your special ability to let a teammate roll again.

Appendix C: Environments and Encounter Tables

Uist - Moon Environment

Uist is the moon of Skye III, roughly the size of Earth’s moon. Although barren, it still has many secrets to uncover. Your rover will land on Uist to survey its minerals, examine foreign geological material, and investigate past volcanic activity on the surface.

Mission Prompts	<ul style="list-style-type: none"> • A mysterious source of radio waves has been detected on the surface. • You need to explore a geological feature discovered by a previous mission in more detail. • You need to explore an object discovered by a previous mission in more detail. • An unusual radioactive signature was discovered. • You need to map a fissure on the surface. • You need to map a crater on the surface. 			
Geography Challenge	Geography	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)
	A deep ravine			
	An oddly shaped crater			
	An uncharted cave			
	A mountain whose height was recorded incorrectly			

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

	<table border="1"> <tr> <td>A volcano</td> <td rowspan="6">You discover information but must remain in the area of the geography challenge.</td> <td rowspan="6">You discover information and make it through the geography challenge</td> <td rowspan="6">You make it through the geography challenge and discover additional information</td> </tr> <tr> <td>A plateau</td> </tr> <tr> <td>A steep incline</td> </tr> <tr> <td>Quicksand</td> </tr> <tr> <td>A dust storm</td> </tr> <tr> <td>Tracks from a previous mission</td> </tr> </table>	A volcano	You discover information but must remain in the area of the geography challenge.	You discover information and make it through the geography challenge	You make it through the geography challenge and discover additional information	A plateau	A steep incline	Quicksand	A dust storm	Tracks from a previous mission				
A volcano	You discover information but must remain in the area of the geography challenge.	You discover information and make it through the geography challenge				You make it through the geography challenge and discover additional information								
A plateau														
A steep incline														
Quicksand														
A dust storm														
Tracks from a previous mission														
Object Challenge	<table border="1"> <thead> <tr> <th>Object</th> <th>Marginal Success (1-4)</th> <th>Success (5-7)</th> <th>Exceptional Success (8+)</th> </tr> </thead> <tbody> <tr> <td>A radioactive rock</td> <td rowspan="6">You discover information but must remain in the area of the object challenge.</td> <td rowspan="6">You discover information and make it through the object challenge</td> <td rowspan="6">You make it through the object challenge and discover additional information</td> </tr> <tr> <td>A shiny rock</td> </tr> <tr> <td>A fossil</td> </tr> <tr> <td>Scrap metal from a lost mission</td> </tr> <tr> <td>Crystals</td> </tr> <tr> <td>Interesting lava formation</td> </tr> </tbody> </table>	Object	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)	A radioactive rock	You discover information but must remain in the area of the object challenge.	You discover information and make it through the object challenge	You make it through the object challenge and discover additional information	A shiny rock	A fossil	Scrap metal from a lost mission	Crystals	Interesting lava formation
Object	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)											
A radioactive rock	You discover information but must remain in the area of the object challenge.	You discover information and make it through the object challenge	You make it through the object challenge and discover additional information											
A shiny rock														
A fossil														
Scrap metal from a lost mission														
Crystals														
Interesting lava formation														
Mission Resolutions	<ul style="list-style-type: none"> • A crashed satellite. • A new rock formation not previously mapped. • The “black box” of a lost rover. • A rock or fossil left by a meteor impact. • New geological information revealed by rock layers. 													

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

	<ul style="list-style-type: none"> • Ice.
--	--

Skye III - Planet Environment

The planet of Skye III falls within the “Goldilocks zone” of its solar system, making it a prime candidate for supporting life. Even better, satellite surveys indicate there is water on the surface and vegetation! Your rover will land on the surface and search for signs of life.

Mission Prompts	<ul style="list-style-type: none"> • An interesting, repeating pattern has been detected on the surface by an orbiting satellite. • Satellite surveys have determined that a particular geographic feature is a lakebed. Search nearby for signs of life. • An earlier rover mission found some regularly shaped stones that may have been formed by intelligent beings. • Unusual soils have been discovered by a previous mission, go check it out. • We need to know more about the kinds of vegetation on the surface. • We lost contact with a previous mission before it could send back the final results of its research. Check near its last known location to recover the mission log and see if you can repair the rover. 																
Geography Challenge	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Geography</th> <th style="width: 25%;">Marginal Success (1-4)</th> <th style="width: 25%;">Success (5-7)</th> <th style="width: 25%;">Exceptional Success (8+)</th> </tr> </thead> <tbody> <tr> <td>Thick vegetation blocks your path.</td> <td rowspan="6" style="vertical-align: middle; text-align: center;">You discover information but must remain in the area of the geography challenge.</td> <td rowspan="6" style="vertical-align: middle; text-align: center;">You discover information and make it through the geography challenge</td> <td rowspan="6" style="vertical-align: middle; text-align: center;">You make it through the geography challenge and discover additional information</td> </tr> <tr> <td>An unmapped canyon lies between you and your goal.</td> </tr> <tr> <td>An undiscovered cave.</td> </tr> <tr> <td>A rockslide!</td> </tr> <tr> <td>A stream.</td> </tr> <tr> <td>A river.</td> </tr> </tbody> </table>				Geography	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)	Thick vegetation blocks your path.	You discover information but must remain in the area of the geography challenge.	You discover information and make it through the geography challenge	You make it through the geography challenge and discover additional information	An unmapped canyon lies between you and your goal.	An undiscovered cave.	A rockslide!	A stream.	A river.
Geography	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)														
Thick vegetation blocks your path.	You discover information but must remain in the area of the geography challenge.	You discover information and make it through the geography challenge	You make it through the geography challenge and discover additional information														
An unmapped canyon lies between you and your goal.																	
An undiscovered cave.																	
A rockslide!																	
A stream.																	
A river.																	

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Object Challenge	Object	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)
	A regularly shaped flint.	You discover information but must remain in the area of the object challenge.	You discover information and make it through the object challenge	You make it through the object challenge and discover additional information
	Charred wood.			
	Regularly shaped stones.			
	Plants growing in rows.			
	A coprolite			
Mission Resolutions	<ul style="list-style-type: none"> • There may have once been structures built by intelligent life here! • Evidence suggests settlement on the shores of a lake! • You found bacteria. With enough time, these simple organisms could evolve into something more complex. • You recover a lost mission! 			

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Kadaklan - Gas Giant Environment

The gas giant Kadaklan has storms the size of Africa swirling across it and rings to rival Saturn's. Your rover has been sent to Kadaklan to investigate the composition of its rings, the formation of its storms, and conditions beneath its outer atmosphere.

Mission Prompts	<ul style="list-style-type: none"> • An interesting storm has formed • Readings suggest the planet's rings might have frozen water • Anomalous readings suggest there are some unique gasses other than basic H and He. Find out more! • Orbital scans suggest precipitation. Go investigate! • Radiation scans indicate the potential for this planet to have once been a brown dwarf star. find out more! 																
Geography Challenge	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Geography</th> <th style="width: 25%;">Marginal Success (1-4)</th> <th style="width: 25%;">Success (5-7)</th> <th style="width: 25%;">Exceptional Success (8+)</th> </tr> </thead> <tbody> <tr> <td>Turbulence</td> <td rowspan="6" style="vertical-align: middle;">You discover information but must remain in the area of the geography challenge.</td> <td rowspan="6" style="vertical-align: middle;">You discover information and make it through the geography challenge</td> <td rowspan="6" style="vertical-align: middle;">You make it through the geography challenge and discover additional information</td> </tr> <tr> <td>Weather has interfered with navigation equipment</td> </tr> <tr> <td>Those clouds look dangerous, navigate around a storm.</td> </tr> <tr> <td>Winds have blown you or your target off course!</td> </tr> <tr> <td>Lightning</td> </tr> <tr> <td>Difficulty pulling away from the gravity of the</td> </tr> </tbody> </table>				Geography	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)	Turbulence	You discover information but must remain in the area of the geography challenge.	You discover information and make it through the geography challenge	You make it through the geography challenge and discover additional information	Weather has interfered with navigation equipment	Those clouds look dangerous, navigate around a storm.	Winds have blown you or your target off course!	Lightning	Difficulty pulling away from the gravity of the
Geography	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)														
Turbulence	You discover information but must remain in the area of the geography challenge.	You discover information and make it through the geography challenge	You make it through the geography challenge and discover additional information														
Weather has interfered with navigation equipment																	
Those clouds look dangerous, navigate around a storm.																	
Winds have blown you or your target off course!																	
Lightning																	
Difficulty pulling away from the gravity of the																	

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

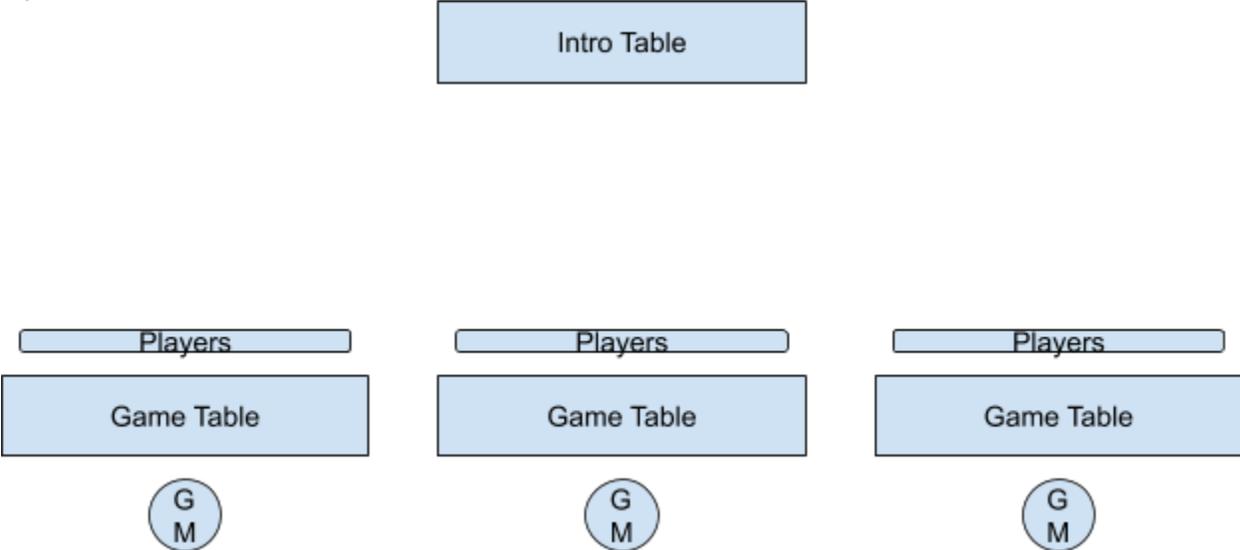
	planet to explore the rings.			
Object Challenge	Object	Marginal Success (1-4)	Success (5-7)	Exceptional Success (8+)
	Asteroid in orbit.	You discover information but must remain in the area of the object challenge.	You discover information and make it through the object challenge	You make it through the object challenge and discover additional information
	Isolated gas pocket.			
	Anomalous Air Pressure Readings			
	Odd temperature readings.			
Mission Resolutions	<ul style="list-style-type: none"> • This is a new storm! The air currents that are forming it are fascinating, given the planet's composition. • Yes! There is water in the rings, albeit frozen! • This may be an ice giant as opposed to a gas giant (Neptune was once thought to be a gas giant but isn't anymore) • It's raining ammonia • You've discovered a unique element. • You've discovered something solid in the upper atmosphere. • It is more likely that the planet was once a star. 			

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

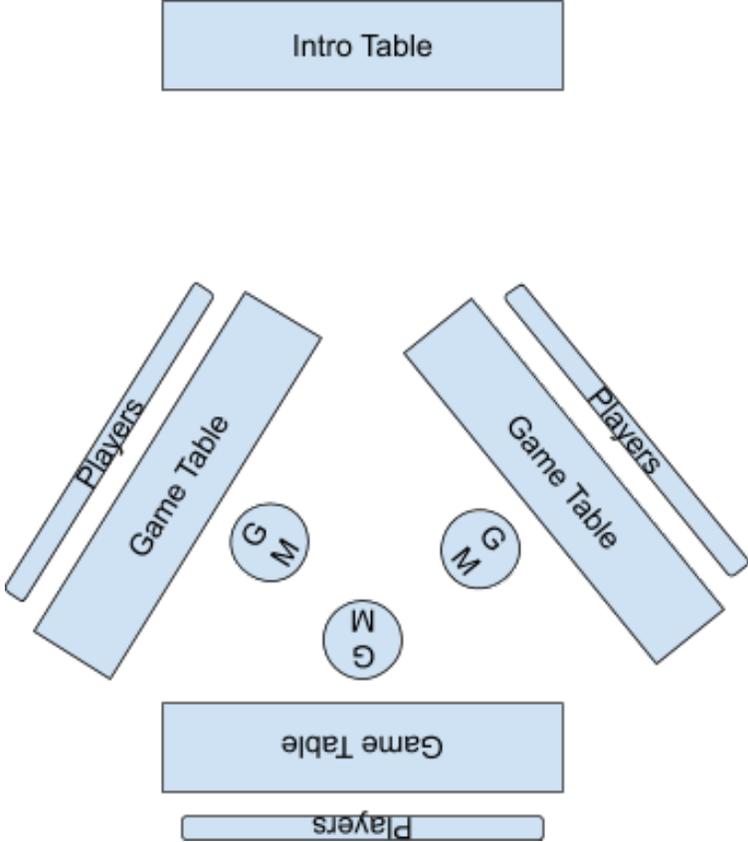
This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Appendix D: Table Layouts

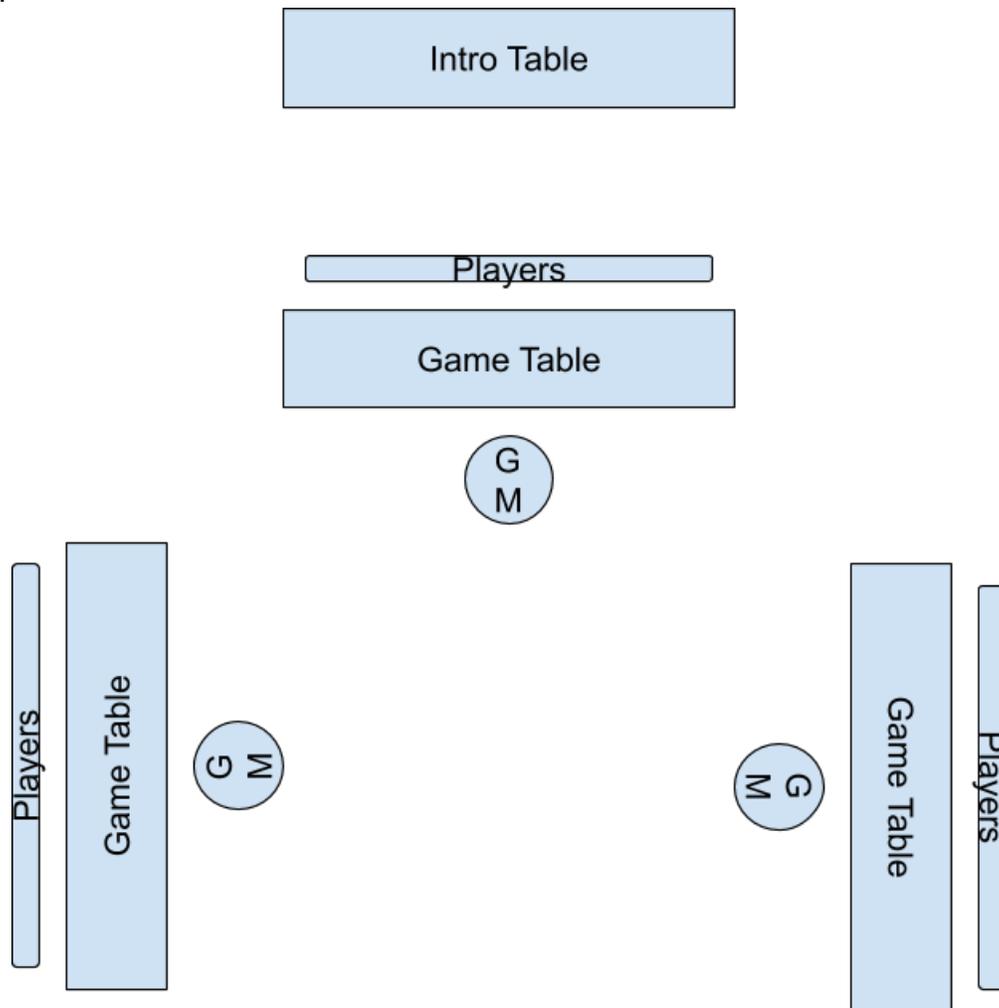
Option 1:



Option 2:



Option 3:



© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Appendix E: Welcome Sign

Welcome Scientists!

In this game, you'll be exploring a distant world from the comfort of Earth. You'll need to work together as a group to interact with the planet to learn it's secrets. Each of your specialties contributes to the mission in unique ways.

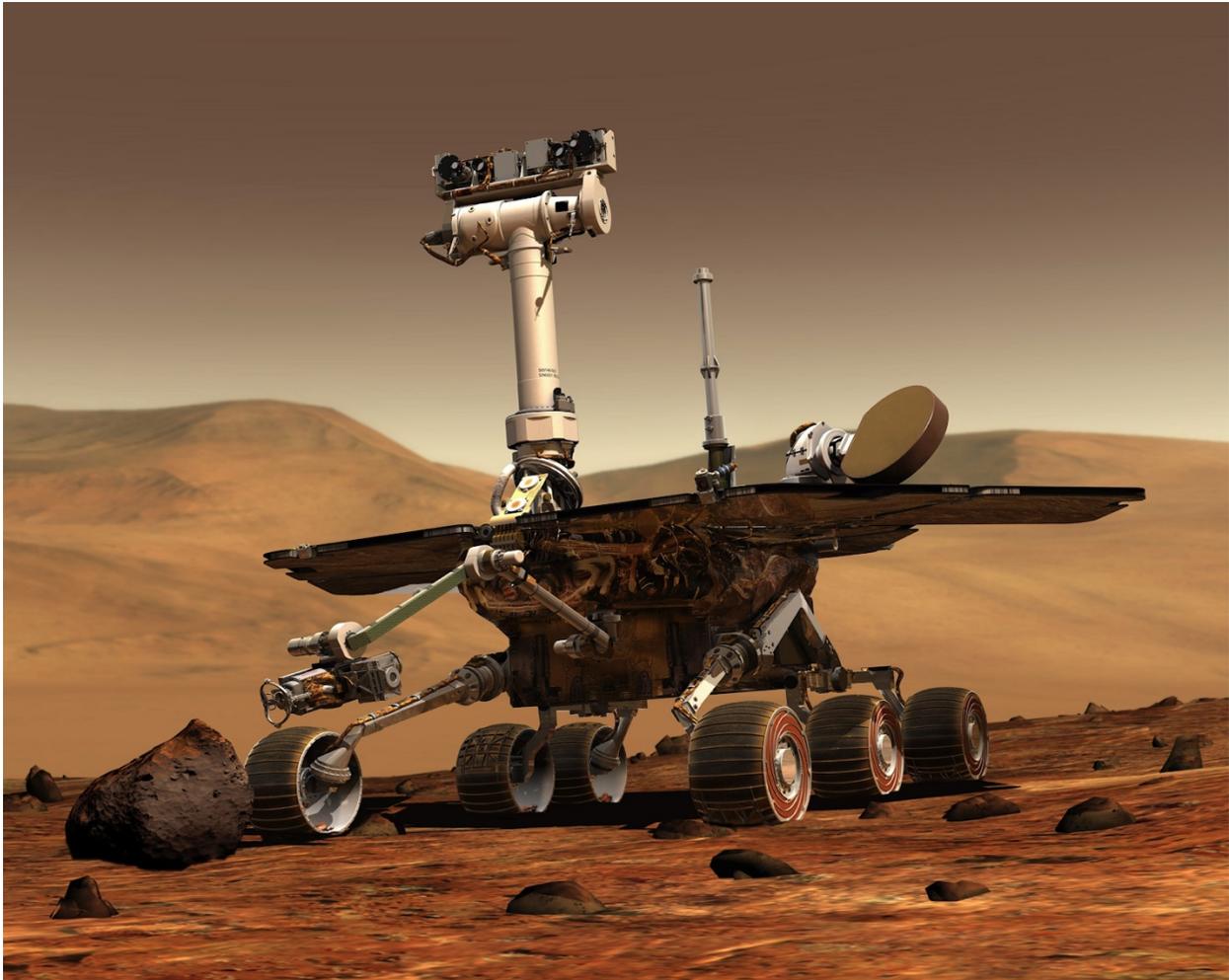


Image Credit: NASA

How to play:

Roll one die and add the number of points you have in the skill you are using (*Move or Science*). Your special ability allows you to give a boost to the team. You must call out that you are using your specialty to add the bonus to another players roll.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Appendix F: Team, Age, and Time Signage

This is a collaborative team activity.

Teams consist of 4-6 players.

Please be advised this activity will take 7-10 minutes.

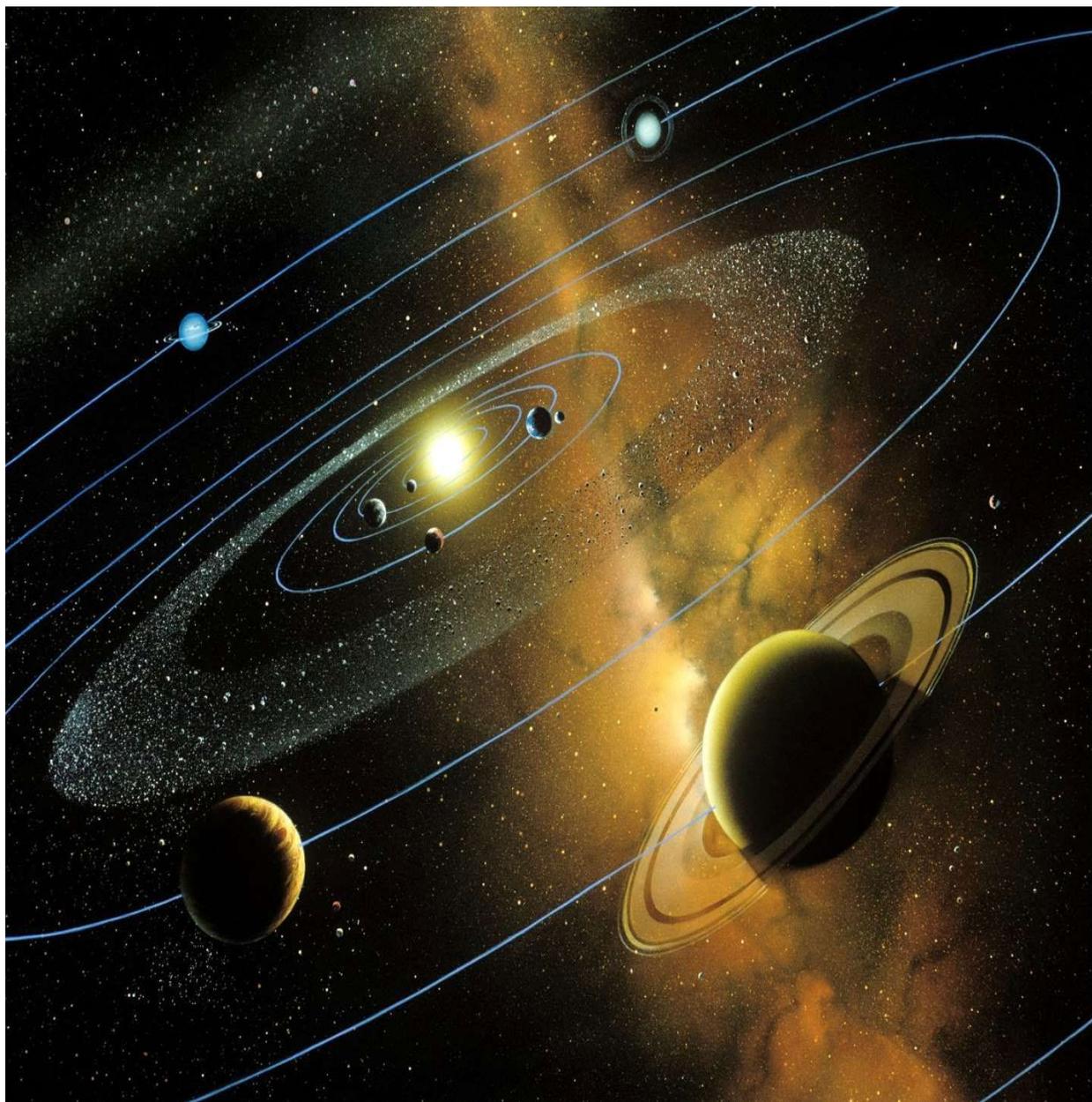
Recommended for ages 7 and up.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Appendix G: Rover on Over Sign

Rover on Over!



© Getty Images

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lambie, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.

Works Cited

- Lewis, O. "Conner Prairie Slavery re-enactment Draws Criticism" *Indystar*, August 6, 2016. Accessed June 9, 2019 at <https://www.indystar.com/story/news/2016/08/06/conner-prairie-slavery-re-enactment-draws-criticism/82987036/>
- Margolis, Seth. "Public Programs - Week 1: Museum Education - Impact and Practice, Educational theories, Audience learning perspectives, Education as customer service." presented at The University of Washington, April 4, 2019.
- Phillips, D.C. (1995). The good, the bad, and the ugly: The many faces of constructivism. *Educational Research*, 24(7), pp. 5-12.
- Small, Z. "Training to Be a Spy at the Brooklyn Museum" *Hyperallergic*, January 10, 2017. accessed June 9, 2019 at <https://hyperallergic.com/350277/training-to-be-a-spy-at-the-brooklyn-museum/>
- USS Constitution Museum. (2018). *Engage Families: A Guide to Family Engagement in Exhibits and Programs*. Retrieved from: http://engagefamilies.org/wp-content/uploads/dlm_uploads/2018/05/Engage-Families-Booklet.pdf
- Vygotsky, L.S. (1978). *Mind in society: The development of psychological processes*. Boston, MA: Harvard College, pp. 19-57 and 79-91.

© 2019 by Isabelle Dunne, L.E. Eames, Michael Lowry Lamble, and Brandi Mason.

This work is licensed under the Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/4.0/>.