A JOURNEY THROUGH THE SOLAR SYSTEM: OUTREACH AT THE ARKANSAS CENTER FOR SPACE AND PLANETARY SCIENCES. W. T. Bryan,Arkansas Center for Space and Planetary Sciences, University of Arkansas (Fayetteville, AR 72701; wbryan189@yahoo.com).

Introduction: Students at the Arkansas Center for Space and Planetary Sciences at the University of Arkansas not only perform science experiments aimed at resolving the mysteries of the universe, they also make it a point to share their knowledge, experiences, and passion with schools and the general public. Lingle Middle School in Rogers, Arkansas is one of these schools. Their students visit the University of Arkansas multiple times during the school year. Each time they do, the students are presented with new material covering some aspect of space and planetary science or space exploration. Once a year, the teachers at Lingle Middle School organize and put on an outdoor classroom. The fifth and sixth grade students visit different stations, each one focusing on a different topic. In 2012, the Arkansas Center for Space and Planetary Sciences' station at the outdoor school took the students on a mission through the solar system. The objective was to combine the classes' previous lessons into an activity that would reinforce those lessons, introduce new information about the solar system and space exploration, encourage teamwork and communication among the students, and excite students about the STEM fields.

Background: During the 2011-2012 school year, students from Lingle Middle School visited the University of Arkansas twice. Both times they were given a presentation from the graduate space science program. The students were taught about the size of the planets, solar systems, stars, galaxies, and the universe. Helping drive the lesson home were scaled objects and distances, which brought things down to sizes understandable by the students. For example, if the students are told that 1 million earths would fit inside the Sun, they might not be able to fully comprehend that, but if they are told that if the Sun were 44 inches across, the Earth would be the size of a marble (about 0.5 inches), the likelihood of visualization and comprehension is greater. Later presentations taught the students about geology and how the planets differ in their compositions. The students were also taught about manned space exploration and the complicated nature of it.The outdoor school was an opportunity for the graduate students to try something new that would help the students combine the lessons into a memorable and exciting experience.

Procedures: A scaled solar system was created using basic craft supplies from a large retail store. The planets' sizes were based upon the presentation given to the students that stated if the Sun were 44 inches across, the Earth would be about half of an inch in diameter (Table 1). Upon arriving on site, the planets were spaced out using a different scale (Table 2). The distance scale can be changed depending on space and time availability. At each location, clues about key aspects of the planet were placed to teach something important and exciting about the body (Figures 1 and 2). The students recorded the clues through detailed note taking and photography and discussed the clues' possible meanings.

Body	Scaled Diameter (inches)	Object Used
Sun	44	Large Inflatable Ball
Mercury	0.013	Metallic BB
Venus	0.475	Marble
Earth	0.5	Large Marble
Jupiter	5.63	Styrofoam craft ball
Saturn	4.75	Styrofoam craft ball
Uranus	2.01	Raquetball
Neptune	1.95	Raquetball

Table 1: The planets were scaled relative to one another and familiar objects that approximated those sizes were used.

Planet	Distance from Sun (AU)	Scaled Distance (feet)
Mercury	0.4	1.9
Venus	0.7	3.5
Earth	1	5
Mars	1.5	7.5
Jupiter	5.2	26
Saturn	9.5	47.5
Uranus	19	95
Neptune	30	150

Table 2: The approximate distances from the Sun were used to space the planets from each other. 150 feet between the Sun to Neptune was the maximum attainable distance in the activity's location.

Before entering the scaled solar system, a mission briefing occurred at "Mission Control". Students volunteered for the jobs of commander, navigator, and

mission specialists 1-4. The commander had the job of deciding what planet to move to and when based off of the time constrictions. The navigator possessed a map of the current positions of the inner planets and guided the group from planet to planet. Two of the mission specialists were note-takers and recorded the clues and suspected hypotheses about the importance of each clue. One of the other mission specialists used a camera bought for the event and took pictures of what the other team members thought was important. The final mission specialist wore colored glasses to simulate the use of filters on detectors to learn about different aspects of each planet. The remaining students in the group had the job of identifying the important clues and suggesting what the clues meant.

Figure 1: Earth, represented by the large marble was accompanied by a piece of granite, fossilerious limestone, and cratered sand.

Figure 2: Neptune, 145 feet from the Earth, was represented by a racquetball and had a cup of ice and fan as its clues.

The representative of the graduate program performed the role of CapCom and only helped the students through the rough areas and give demonstrations when necessary. After "re-entry" and return to Mission Control, the crew had a debriefing with the CapCom. A crew photo was taken before the group left. Each mission from the initial briefing to de-briefing and crew photo fit in the 50 minute time allotted. Each group was between 10 and 15 students.

Conclusions: The response from the students and teachers indicated that the event was a complete success. The information was conveyed in such a way that the students could reinforce what they had learned during previous visits with the Space Center as well as learn new facts. The setup of the event allowed the students to gain a sense of how space exploration is accomplished by only having a couple of clues and having to make educated guesses about what the clues meant. The last objective of the event was to encourage teamwork and conversation among the students. The activity, which incorporated multiple fields of science and engineering, gave the students an lesson into the space science and exploration fields and encouraged them to pursue their interests in those areas.

The scaled solar system has been used multiple times since with different groups ranging in age from kindergarten to sixth grade. The activity typically follows a presentation about the sizes of things in the solar system and universe that has been used by the graduate program's outreach team for many years. The activity can be varied based on the needs, space, and time availability for the groups being presented to.

The scaled solar system is still relatively new but based upon the feedback received from the students and teachers who experienced it, it has a long life ahead of it. It will continue to be modified and improved to teach, encourage, and excite students about space and planetary sciences.

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