FACULTY AND STUDENT PERCEPTIONS OF LEARNING ON A SPHERICAL DISPLAY SYSTEM -Preliminary Results from an Exploratory Analysis-
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Objective
Conduct a preliminary, exploratory analysis to characterize:
- The use of a spherical display system, Science on a Sphere (SOS), in the JMU curriculum;
- The nature and application of SOS use;
- Instructors’ perceptions of the challenges and benefits of using SOS for undergraduate education; and,
- Future research needs.

Abstract
James Madison University in Harrisonburg, Virginia, is one of the few institutions to incorporate SOS in formal, undergraduate education. This poster provides examples of JMU’s use of SOS for undergraduate education over the past three years. This poster discusses the undergraduate audiences (including general education students, pre-service teachers, and geology majors), the types of visualizations employed for JMU’s climate education, pedagogical practices of JMU instructors, faculty comments on benefits and challenges with utilizing SOS for college-level lessons, and recommendations for future research. As an example of the pedagogy-related findings that are presented, multiple faculty members use handouts with guiding questions for discussion and note-taking and show each visualization multiple times. An example of an approach is to present the SOS visualization in the dark with the students’ full attention on SOS. The second and third replications of the visualization are interactive, with the lights dimmed and the projection occasionally paused for discussion so that the instructor could gauge the students’ learning in real time, address any possible misconceptions, and answer questions. As an example of the challenges and benefits addressed by this poster, faculty responses to SOS visualizations are presented along with the implications of these responses for teaching about climate with SOS.

Data Collection Methodology
The sources of data for this poster were the authors’ experiences teaching with SOS and results of a survey administered to those registered to access the SOS Theater at JMU. There are approximately 95 registered users of SOS at JMU, and some of those users conduct teaching or outreach using SOS. Other SOS applications include scholarship and student special studies. The survey was developed to address the following questions:
- How many JMU faculty members utilize SOS in college courses?
- What courses and departments incorporate SOS?
- What material is being presented on SOS?
- What challenges to using SOS are faculty members encountering?
- What are the pedagogical impacts of using SOS?
- How do faculty members perceive SOS contributes to student learning?
- What is the student response to SOS?

In early January 2014, the survey was distributed. Preliminary results are reported here.

Science On a Sphere (SOS) is a spherical display system developed by the National Oceanic and Atmospheric Administration (NOAA) primarily to educate the public about Earth System Science. A computer-projector system displays data sets on a six foot diameter, spherical “screen” creating a variety of images such as animated visualizations of Earth processes based on satellite data, static solar system images such as Earth’s moon, or specially-created narrated movies (see Figure 1). The standard SOS Theater configuration is shown in Figure 2. Over 100 installations of SOS have been completed internationally, primarily at museums, and over 33 million people annually see a SOS display according to NOAA.

Pedagogical Approach
The following pedagogical approach is used by at least three faculty members:
1. Use SOS to reinforce course content (or skills) and learning goals.
2. Provide context for what students will see on SOS.
3. Orient students with the data being projected.
4. Show the data sets/simulations multiple times.
5. Assign tasks to stay engaged (see worksheet example)
6. Include a follow-up assessment.

Figure 3: Climate model displayed on SOS.

Findings
Program Use:
SOS is used in courses across multiple departments, including Integrated Science and Technology, Geology and Environmental Science, and Interdisciplinary Liberal Studies (the pre-service teacher major at JMU). It is also used in the general education curriculum in Cluster 3: The Natural World. There is evidence of considerable use of SOS for outreach and informal education.

Data Sets Used:
Data sets the respondents reported using include global climate change models (including the HADLEY and GFDL models), the Earth at night, astronomical data, circulation models, weather data, and SOS “movies”. Five respondents used climate-related data sets.

Summary of SOS Benefits:
Respondents’ perceptions included that:
- SOS provides a unique way to incorporate technology/visualization.
- It reinforces the educational use of technologies.
- It allows information to be presented in less time than in a traditional lecture.
- It leads to better content retention.
- While Google Earth or other visualizations could have been used, the level of student enthusiasm with SOS is greater.
- Students are interested.

Effect on Student Learning:
- One respondent stated that students displayed high performance on a worksheet used with SOS.
- Several respondents reported that students were engaged.
- No formal evaluation results about student learning with SOS were reported.

Challenges to Using SOS:
One or more respondents indicated that:
- There is a desire for more social science content.
- Functions, such as misaligned or non-functioning projectors, non-adjustable lighting, and tethered SOS controls are areas for improvement. There is not an indication these prevented faculty from using SOS.
- The location and capacity of the SOS Theater limit some use.

Further Research Questions
Research questions the authors are beginning to examine include:
- What are students’ perceptions of learning with SOS, and how do those compare to faculty perceptions?
- How does student learning with SOS compare to learning with other technologies?
- How does SOS use in formal education measurably affect student learning about climate?
- Are there student reactions to SOS other than enthusiasm, such as the anecdotally noted anxiety or confusion?
- What are the best pedagogical practices for using SOS?