

## STScI E/PO IMPACT

After dissemination of our products, STScI generally has no direct access to students to confirm that the intended outcomes are achieved in the classrooms. This type of *summative evaluation* requires the cooperation of our partners. Various evaluation types are appropriate for different purposes and may include a “quasi-experimental design that compares test scores of program participants with students in matched comparison groups...or a descriptive study, incorporating such techniques as surveys.”<sup>1</sup> There are three ways that STScI uses to assess the impact, or establish the quality or effectiveness, of our products:

- Learning outcome study
- Impact study/followup
- Incorporation by state departments of education, school districts, and professional education associations.

We discuss each in turn in the sections below.

### Learning Outcome Study

The learning outcome study comes closest to a “controlled experiment” in the classical sense: One group of students is taught a lesson *with* materials developed by STScI, and a second “control” group is taught *without* those materials. Analysis of the results reveals the impact of the materials. These types of assessments have been done only rarely by STScI for a variety of reasons - They are quite expensive for the limited OPO budget (~\$60k), they require students and teachers that are not within the control of STScI, and such tests can be rather disruptive. Similar impediments are acknowledged by the US Department of Education, which recommends combined formative and summative evaluations to meet multiple demands<sup>1</sup>.

STScI commissioned an external evaluator, Mid-continent Research for Education and Learning (McREL), to perform a learning-outcome study of Planet Impact. This was a quasi-experimental design that used pre-and post-assessments to measure the impact of *Planet Impact* materials on student learning. McREL found a statistically significant improvement indicating that “the average student’s performance in the treatment group would be 13 percentile points higher than the average student’s performance in the control group on a standardized test.”<sup>2</sup> The difference between the average pre- and post-score was “highly statistically significant.”<sup>2</sup>

STScI’s informal education products are developed using the same model as the formal education products. Cornerstone Evaluation Associates is in the process of completing an

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<sup>1</sup> Evaluating Online Learning: Challenges and Strategies for Success, US Department of Education, 2008

<sup>2</sup> A Study of the Effects of Space Telescope Science Institute’s Planet Impact Curriculum: Final Evaluation Report, Mid-continent Research for Education and Learning, 2004, pp.10-11

evaluation of our Library exhibit, *Visions of the Universe*. Preliminary results of an evaluation by Cornerstone Evaluation Associates LLC demonstrate an increased interest in astronomy books with a ~30% (TBR) increase in book check-out rates following the exhibit.

### **Impact Study/Followup**

This is by far the most common form of impact study. In order to follow up on where, how and why OPO education products are used, we do interviews and surveys on an ongoing basis with a statistically significant subset of venues that use our materials. A map of these venues is shown below. OPO education materials are used throughout the United States, more widely than our ongoing sampling of ~1400 venues (including more than 200 colleges, 300 school districts and 100 informal science education venues.) These are sufficient to assure that these materials remain useful and effective.

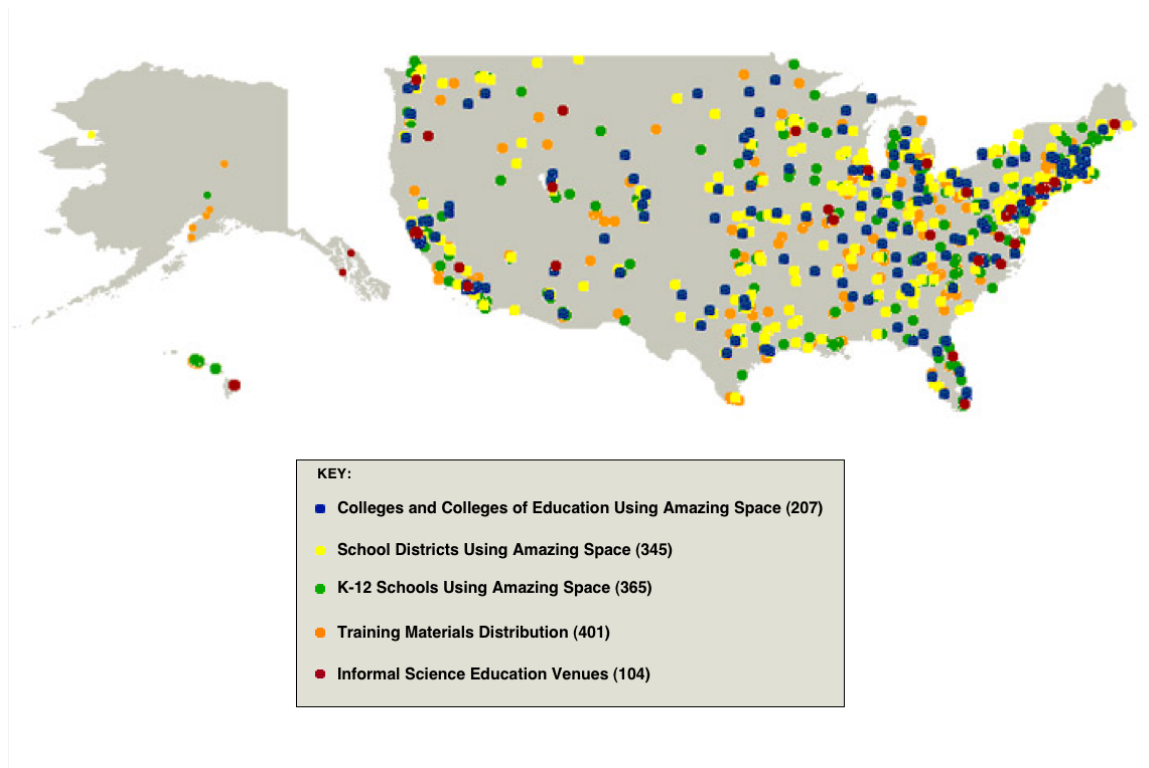


Figure 1 STScI carries out an ongoing program of interviews and surveys of over 1400 representative venues (including colleges, school districts and science centers) that use STScI's education products, giving evidence that these materials remain useful and effective.

### **Incorporation by a State Department of Education**

Incorporation by a state department of education represents the “gold standard” in validating the quality of our products and establishing impacts.

*More than half the state departments of education in the United States use our materials as an incorporated or recommended element.*

Below are examples:

- STScI's *Amazing Space* website is integrated into Ohio's **required** pre-service educator training program, reaching **over 20,000** pre-service educators annually.
- STScI's *Amazing Space's Telescopes from the Ground Up* is integrated into South Carolina's grade 8 standards, reaching an estimated **55,000** students annually.
- *Amazing Space* is defined in the "Astronomy and Space Exploration" section of Louisiana's Comprehensive Curriculum for Grade Eight Science, reaching about **52,000** students annually.
- *Amazing Space* is identified as a Core Curriculum Internet Resource for all grade 6 students in the state of Utah, reaching an estimated **45,000** students annually. An illustration of what is involved in adoption by a state department of education is summarized in the box below.

**Sample data for impact study follow-up:  
Use by a State Department of Education**

**Who** – Utah State Office of Education

**Users** – 6<sup>th</sup> grade students (~ 55,000 per year)

**Identified Resource** – Hubble Deep Field Academy online activity

**How it is used** – Identified as a Core Curriculum Internet Resource for all grade 6 students in the Utah Elementary Science Core Curriculum.

**About the Utah Elementary Science Core Curriculum:** The Elementary Science Core Curriculum describes what students should know and be able to do at the end of each of the K–6 grade levels. It was developed, critiqued, piloted, and revised by a community of Utah science teachers, university science educators, State Office of Education specialists, scientists, expert national consultants, and an advisory committee representing a wide variety of people from the community. The Core reflects the current philosophy of science education that is expressed in national documents developed by the American Association for the Advancement of Science, the National Academies of Science.

**Criteria for selection and use:**

- Matches Utah state education science standards, e.g.,
  - Standard 3060-05: Students will begin to investigate the nature of the universe.
  - Standard 3060-0501: Explain the relationship of the vastness of space to objects found in space.
  - Standard 3060-0502: Explain how scientific development changes knowledge of space.

- The philosophy of Utah's core curriculum is that students should be active learners. It is not enough for students to read about science; they must do science. They should have hands-on, active experiences throughout the instruction of the science curriculum. While doing the Hubble Deep Field Academy activity, students are active learners. Like scientists, they explore the HDF image, make observations, inquire, formulate and test hypotheses. They record, analyze data, report, and evaluate findings throughout the activity, and compare their results to astronomers' results.

As testament to the quality of our education products, 27 state departments of education have adopted our materials: 9 as incorporated, and 18 as recommended resources. They are listed below:

<b>Incorporated use of STScI materials</b>	<b>Recommended use of STScI materials</b>
Michigan	Hawaii
Alaska	North Carolina
South Carolina	Vermont
Utah	Virginia
California	Washington
Georgia	Arkansas
Kentucky	Colorado
Louisiana	Delaware
Texas	Florida
	Maine
	Maryland
	New Jersey
	Idaho
	Kansas
	Massachusetts
	Mississippi
	New Mexico
	New York

**Table 1 State Departments of Education that incorporate or recommend use of STScI education materials.**