Evaluation of Mad Science®: Educational Science Enrichment for Children

Char Associates
Montpelier, VT

Executive Summary

Mad Science is a leading provider of educational science enrichment to elementary school-aged children around the world. In fall 2005, The Mad Science Group® commissioned an evaluation study with Char Associates, an independent research group in Montpelier, Vermont, to assess the educational impact of Mad Science on school children in the United States.

This national study examined whether exposure to Mad Science positively affects children's interest in, and understanding of, science, as compared to children who have not had exposure to Mad Science.

Background and Methodology:

The educational impact of Mad Science on school children was assessed by selecting a random sample of third grade students representing four regions across the United States. Classrooms within each region were randomly assigned by the evaluation team to either "Experimental" (Mad Science) or "Comparison" (Non-Mad Science) groups. The study's final sample consisted of a total of 470 students, from 28 third grade classrooms (14 Experimental and 14 Comparison) in seven elementary schools.

Geographic Site	**Experimental Group (Mad Science)**	**Comparison Group (Non-Mad Science)**	**Total Classrooms**
US (Northeast) (Western New England)	2 classrooms *(29 students)*	2 classrooms *(26 students)*	4 classrooms *(55 students)*
US (Midwest) (St. Louis, MO)	4 classrooms *(81 students)*	4 classrooms *(81 students)*	8 classrooms *(162 students)*
U.S. (West) (Las Vegas, NV)	4 classrooms *(62 students)*	4 classrooms *(70 students)*	8 classrooms *(132 students)*
U.S. (South) (Austin, TX)	4 classrooms (*65 students)*	4 classrooms *(56 students)*	8 classrooms *(121 students)*
Total across sites	**14 classrooms (237 students)**	**14 classrooms (233 students)**	**28 classrooms (470 students)**

Our evaluation addressed the following primary research questions:

Did students who participated in Mad Science experience significant change in:

- *Science content knowledge specific to the Mad Science presentations?*
- *Interest in science?*
- *Positive attitudes about science?*
- *Overall views of science?*

and,

Did students who participated in Mad Science experience significantly greater change than comparison students in these same four science areas?

The main evaluation instruments consisted of pre- and post-test written student questionnaires that assessed children's interest in and attitudes toward science, and their understanding of science content and concepts addressed in the tested Mad Science (MS) units.

All Mad Science (experimental) classrooms received an identical series of two 60-minute MS science presentations, spaced roughly two weeks apart. The two presentations featured space science from a MS/NASA unit (#2: *Atmosphere and Beyond* and #8: *Living in Space*), and were delivered by the regular Mad Science franchisee instructor.

All experimental and comparison classrooms were administered the pre-test survey at the beginning of the study, and administered the post-test survey approximately three weeks later. The Mad Science experimental classrooms also received the two MS space science presentations during the intervening weeks. All data collection for the study was conducted in late winter/early spring 2006 (February – April 2006).

Analysis of the surveys involved both quantitative and qualitative data analysis. Students' pre and post-tests were examined using descriptive statistics (means and frequencies), and t-tests of both composite means and individual item means. Qualitative content analysis entailed coding open-ended prose items for major issue and content themes, which were then quantified to identify predominant themes.

MAJOR FINDINGS

Among the study's major findings, this national study revealed that exposure to Mad Science significantly increased:

- Students' knowledge of science content and concepts;
- Students' interest in engaging in science-related leisure activities;
- Students' enjoyment of science and view that science is fun; and
- Students' view that most people should learn about science.

We also found that students more positively inclined towards science were more likely to experience greater gains in the science content knowledge following their Mad Science visits.

Students found the Mad Science visits fun and highly engaging, and desired longer and more frequent Mad Science visits to their classrooms.

Each of these areas of impact is described below.

Increased science knowledge: Exposure to Mad Science significantly increased students' knowledge of science content and concepts. After receiving the Mad Science visits, pilot

(experimental) group students significantly increased their content knowledge of science information related to the Mad Science lessons, as indicated in their post-tests ($p < .001$). Comparison group students experienced no real gains in their science content knowledge.

Pilot students experienced significant gains between pre- and post-tests for 7 out of the 8 science content items. After experiencing the Mad Science visits, significantly more students now understood that:

- Air takes up space;
- Air has weight;
- Space shuttles must deal with very hot and very cold temperatures in space;
- Colorful skies at sunset are due to dust particles in the Earth's air;
- Spacesuits which do not control for air pressure would cause an astronaut to expand and swell up like a balloon; and
- Astronauts train underwater before going into space because people don't weigh much in both water and in space.

Increased interest in science-related leisure activities: Students experiencing Mad Science subsequently expressed significantly higher levels of interest in engaging in science-related leisure activities, specifically related to space ($p < .05$). Science interest was assessed through interest in various leisure activities, such as different articles they might read in a children's magazine, activity kits they might purchase at a toy store, or places they might most like to visit.

Regarding the individual interest items on their post-tests, students in the pilot group expressed a significantly increased level of interest in:

- reading about stars and planets;
- reading about space travel;
- buying activity kits to make models of space stations; and
- visiting a mountain top to look at stars at night.

Positive science attitudes: Our pre-tests revealed that a high proportion of both pilot and comparison group students began the study with generally positive attitudes towards science. Most students in both groups viewed science as interesting and involving doing activities, and as easy and fun. Many agreed with statements concerning the importance and relevance of learning science.

There were no significant changes overall in science attitudes between students' pre- and post-test scores, nor between pilot and comparison group students. This lack of substantial change could be due to a possible ceiling effect, given students' already positive level of science attitudes and there being relatively little room to move upwards in the rating scale in the post-test.

Pilot students, however, did indicate significantly more positive attitudes towards science for a subset of individual items on their post-test surveys. Following their MS visits, students were more likely to indicate to agree both that they *liked science* and *thought most people should learn about science* ($p < .01$). The gains for these two

statements between pre- and post-test surveys were also significantly higher for the pilot students than the comparison group students ($p < .05$).

Pilot students, after receiving their Mad Science visits, were more likely to have a favorable view of their *abilities in science*. On their post-tests, they were more likely to disagree with the statement that "no matter how hard I try, I cannot understand science." This response, however, did not appear as a significant group difference between pilot and comparison group students.

Pilot students were also significantly more likely to describe *science as fun* ($p < .0001$), a difference that was significantly higher than that of comparison group students ($p < .01$).

Relationship between science attitudes and gains in science knowledge: There was an inter-connection between students' prior view of science and their gains in content area science knowledge. Based on regression analysis on pilot students, we found that students who displayed more positive views of science prior to exposure to Mad Science showed significantly more change in their content area knowledge overall than pilot students who reported less positive views of science prior to exposure. Thus, students who were more positively inclined towards science were more likely to experience greater gains in the science content knowledge following their Mad Science visits.

Favorite aspects of Mad Science visits: Students particularly enjoyed the active, hands-on science of Mad Science. When asked what they liked best about the Mad Science visits, students most commonly indicated (produced by 18% of the pilot students) that they liked either the hands-on activities or the experiments. As one student expressed, "Through Mad Science, I found out science isn't just studying or looking in a book."

Humor and the zany personality of the Mad Science host were also favorite qualities of the visits. A number of students (13%) specifically mentioned liking their Mad Science host, particularly for his or her humor or the fact that the visits were very funny.

When asked how Mad Science could be improved, one fourth (25%) stated that they thought Mad Science was good just the way it was, and had no specific suggestions for improvement. Many students simply wanted the Mad Science visits to last longer, occur more often, or feature more activities or experiments.

In summary, this national study found Mad Science to be an educationally enriching science experience for children. Exposure to Mad Science increased students' knowledge of science concepts and content, their interest in engaging in science-related leisure activities, and their views of science as an appealing and worthwhile endeavor.

Further information on the study can be obtained from:

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