

How Long Are Students Able To Retain Material Learned Through Inquiry-based Activities?

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Abstract: Inquiry-based instruction increases motivation in students to learn and allows them to retain the information learned better than students who are taught using traditional lectures. I attempted to determine how long eighth grade science students could retain information concerning comets learned through several inquiry-based activities. I gave the students a pre-test before beginning the activities and three post-tests at two-week intervals after completion of the unit. The students' average test scores were significantly higher on the post-tests than the pre-test. Also, the average score for the second post-test was significantly higher than for the first post-test. I believe this difference is the result of a confounding variable - the students participated in a space mission (also an inquiry-based activity concerning comets) at the Challenger Learning Center after the first post-test, but before the second one. Because of this confounding variable, I was unable to determine how long the students were able to retain the information I had taught them.

Introduction:

Both the U.S. Department of Education and the National Science Foundation (1992) endorse the use of inquiry-oriented instruction in science, which engages students in the investigative nature of science, with the focus being on the active search for knowledge or understanding (Haury 1993). Teachers that integrate inquiry-based, hands-on learning activities on a regular basis in their classes have students who consistently out-perform students whose teachers do not use inquiry-based activities (Stronge 2002). Research findings demonstrate that students who are taught using inquiry-based instruction are more motivated to learn and are better able to retain the materials and concepts studied than students who are not (Science House). I attempted to determine how long eighth grade science students could retain information concerning comets learned through several inquiry-based activities.

Methods:

Before beginning my inquiry-based activities concerning comets, I had the students take a pre-test (see Appendix A), which consisted of eight questions concerning comets, such as identifying the parts of comets, the types of comets, and the materials that make up comets. I then taught the students three inquiry-based activities related to comets: making a dry ice model of a comet; making a model of Aerogel, a substance used to catch comet particles in space for study; and using red cabbage juice to determine acidic substances from basic ones. After completion of the activities, I gave them their first post-test, which was exactly the same as the pre-test. Two weeks later, the students participated in a space mission at the Challenger Learning Center. They were given their second post-test approximately two weeks after their space mission. Their last post-test was given two weeks after that.

I compared the students' average scores on the pre- and post-tests using Tukey's test from an Analysis of Variance (ANOVA) using the Statistical Analysis Systems (SAS) package (SAS Institute 2001).

Results:

I found statistically significant differences in the students' average test scores. The students' average scores on each of the three post-tests (62.8, 73.1, and 70.6, respectively) were significantly higher than that of the pre-test (16.5; $F=168.3$, $P=0.0000$). Additionally, the students' average score on the second post-test (73.1) was significantly higher than that of the first post-test (62.8; $F=168.3$, $P=0.0000$).

Discussion:

By the presence of a statistically significant difference between the average test scores of the pre-test and the first post-test, I can conclude that the students learned the material I taught them concerning comets using inquiry-based activities. However, I cannot make a conclusion concerning how long the students were able to retain the information I had taught them due to the presence of a confounding variable. The students participated in a space mission at the Challenger Learning Center after taking the first post-test, but before taking the second post-test. I noticed that the students' average test score for the second post-test was significantly higher than that for the first post-test. I would have thought that the average score on each subsequent post-test would have decreased slightly, if anything. I attribute the significant increase in the average test score on the second post-test to the students' participation in the Challenger Learning Center space mission. Even though the space mission is a confounding variable, it is an encouraging result because the space mission is an inquiry-based activity on comets. Thus, the significant increase in the average score for the second post-test demonstrates that inquiry-based activities aid students' in retaining information. However, because this is a confounding variable, I cannot determine how long the students may have retained the inquiry-based material I taught them had they not participated in the space mission.

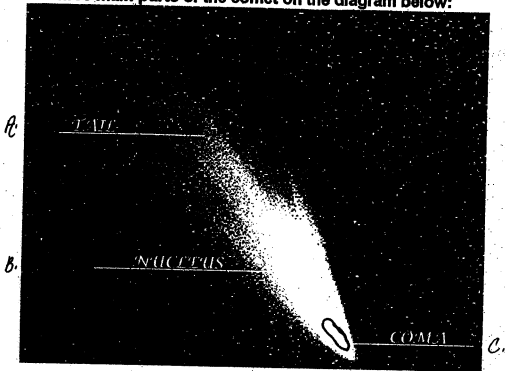
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Comets: What do you know?
Pre and Post Test Answer Key

Note: Pre and Post tests are provided to gauge understanding of comet-related concepts. We suggest that you do not grade the pretest but use it to compare to the post test so students can see the results.

Label the three main parts of the comet on the diagram below:



Answer the following questions in complete sentences.

1. What do comets orbit around?

*Comets orbit around the sun.
Tail fees away from the sun.*

2. What types of "ingredients" would you find in a comet?

The "ingredients" found in a comet are ice, rock/dust, and gas.

3. How does a comet get its name?

Comets are usually named after their discoverer.

4. Where do comets come from?

Scientists believe that most comets originate in the Oort Cloud.

5. How often do comets appear?

All comets are different based on their eccentricity or orbital path around the Sun.