

Professional Development Grant
Improving the College Introductory Astronomy Survey Course for
Non-Science Majors Through Active Learning: A Tier I Workshop.

A. Title Page

B. Restatement of problem researched or creative activity

The professional development workshop I completed was called *Improving the College Introductory Astronomy Survey Course for Non-Science Majors Through Active Learning: A Tier I workshop*. The goal of this workshop was for participants to become familiar with learner-centered teaching and assessment materials, as well as how to implement them in their college astronomy courses. The course summarized issues in teaching astronomy at the introductory level and how research-based instructional strategies can be implemented to improve student learning.

C. Brief review of the research procedure utilized

This was not a research project. I attended a professional development workshop from July 13-15, 2007. During this workshop, a number of instructional activities for teaching astronomy were discussed, along with research data that support their effectiveness.

D. Summary of findings

A number of interesting topics were covered in the first section of the professional development workshop. First we discussed what should be the main goals for an astronomy course: understanding of big ideas (as opposed to factoids or irrelevant concepts), understanding of how science is done (also known as the nature of science), developing of positive attitudes and life-long learning of astronomy, and discriminating between astronomy (a science) and astrology (a pseudo-science). A discussion on the proper role, advantages, and limitations of lecture as a teaching strategy followed.

In addition, the presenters explained how deeply held (yet incorrect) beliefs about astronomy sometimes get in the way of learning astronomy. Misconceptions occur when there are inconsistencies between what students believe to be true and the correct information. This is known as the "misconceptions model" of student learning. We also discussed the "primitives model" of science learning, generalization that we develop early in our lives and that we use, sometimes incorrectly, to explain nature. This section concluded with four fundamental results about cognition and learning: (a) learning requires mental efforts, (b) new knowledge must be linked to previous mental structures, (c) learning is context-dependent, and (d) the social nature of learning.

The second part of the workshop went into detail about several strategies that can be implemented in large enrollment science sections, such as effective questioning, surprise quizzes (graded and ungraded), in-class writing, think-pair-share, small group interactions, group debates, and whole group discussions.

During the third and last part of the workshop the presenters allowed the group to work on several activities using curricula such as *Lecture Tutorials for Introductory Astronomy* (moon phases, looking at distant objects, celestial motion, and Doppler shift, among others) and *Life in the Universe* (geologic and biologic time, defining the habitable zone, among others).

E. Conclusions and recommendations

Overall, I think the workshop was a very educational experience, with many interesting and valuable strategies that can be implemented in my physical science classes, especially during the astronomy section. I highly recommend this workshop for science faculty, both novice and experienced, who are interested in improving student learning through research-based science teaching methods.