

Attracting and Training Future Teachers with Project-Based Instruction

V. Margoniner, A. Sisneros, G. Kennedy
Department of Physics and Astronomy, California State University Sacramento

Abstract

Giving STEM-oriented students a chance to participate in project-based instruction of a general education astronomy class will turn them on to the excitement of teaching, which will increase the desperately short supply of highly qualified physics teachers. The general education students will also benefit by experiencing more authentic scientific inquiry than is typical in a general education class by receiving more support and direct feedback from students in the field.

Structure

We assigned students in an introductory level astrophysics lecture course at Sac State to research a topic of their choice, pertinent to the curriculum, and develop a prototype piece of learning media. We utilized resident physics majors as Learning Assistants (LAs) to help give more focused attention to the students' needs as well as intermediaries

between the many groups and the instructor. This not only provided a quality learning environment for the mostly non-science students in the class, but also placed physics majors in the realm of learning through teaching.

Instructor

Dr. V. Margoniner

Learning Assistants

A.J.

Glen

Kevin

El

Students

Team 1
Team 2
Team 3
Team 4

Team A
Team B
Team C
Team D

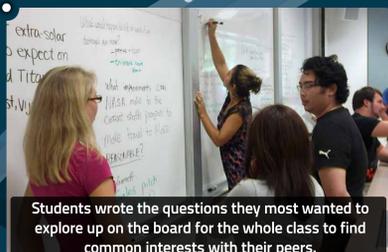
Team I
Team II
Team III
Team IV

Team W
Team X
Team Y
Team Z

The groups worked directly with their LA, while the instructor monitored progress with all the groups and coached the LAs in teaching strategies.

Brainstorming

The students worked through an intense day of open brainstorming where all were encouraged to share their ideas of interest. We instructed the class to think of both a project idea (i.e. life on Titan, extraterrestrial aurorae, etc.) and also a product (i.e. book, board game, video, etc.). This allowed everyone to open their minds to new ideas of science as well as compare their interests to their classmates. The instructor and the LAs fueled discussion and kept the focus on the scientific method.



Students wrote the questions they most wanted to explore up on the board for the whole class to find common interests with their peers.

Group Forming

Using their common interests as a guide, we formed the students into teams of 3-5 members. The LAs then chose their teams based on requests from the students, as well as their own interests in the topics. In this way, the Learning assistants became teachers-in-training for their teams, and the class students received more direct focus throughout the learning process.



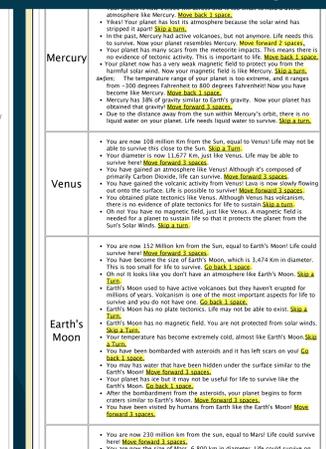
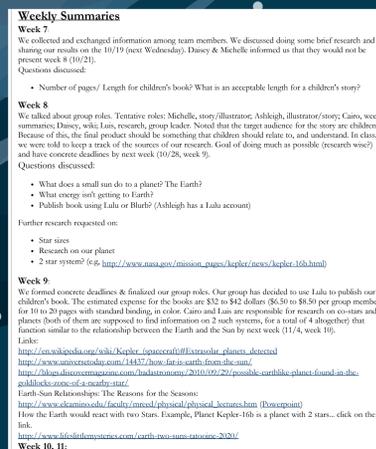
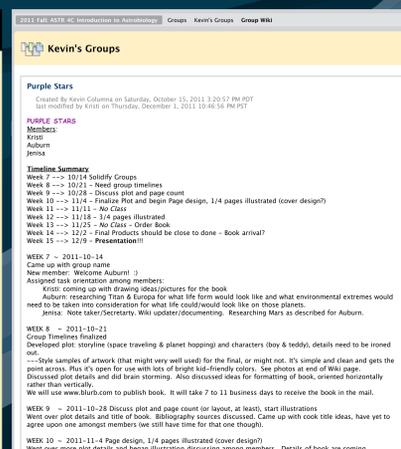
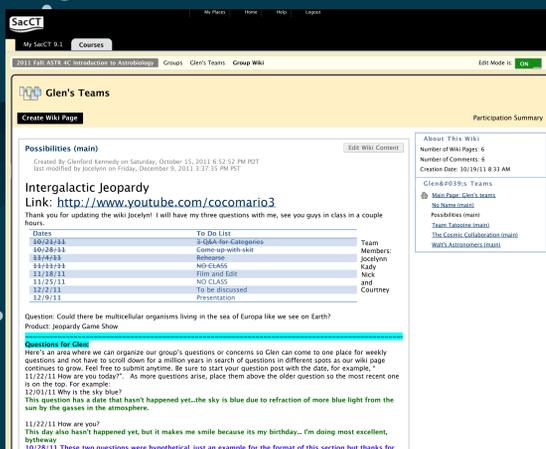
A newly formed group works out their project schedule.



Learning assistants standing by at the beginning of a class period.

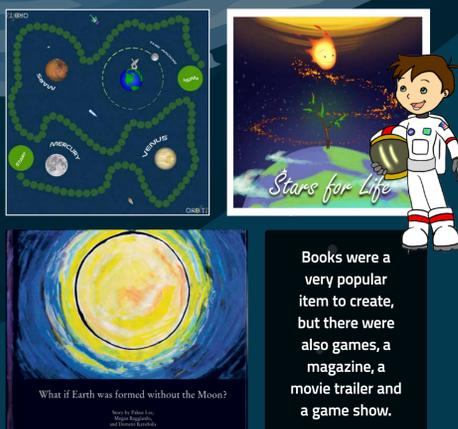
Documentation

We weighted a major part of the project grading on documentation of the research process. The teams recorded their progress in the online BlackBoard wikis where the LAs could monitor and mentor the groups throughout the project.



Products

Groups developed a wide range of items. There were a number of books designed including non-fiction, science fiction, and children's stories. There was a board game based on finding a habitable zone, and a movie trailer for a sci-fi film about colonizing Europa. There was even an astronomy based musical compilation! It was a great display of science through creativity.



Books were a very popular item to create, but there were also games, a magazine, a movie trailer and a game show.

Celebration

On the last day of class we held an event, open to the public, to both allow the students to celebrate their new science learning, as well as share their products with the university community. We gave all students and guests of the event votes to award to their favorite products and presented medals as prizes to the winners. Naturally, these awards were simply for fun and had no bearing at all on the final grades.



Above: Medal Design By Landry L. Blume © 2011
Upper Right: One of the medal-winning groups poses with their LA and Instructor.
Right: Group shot of the instructor with the LAs.



Feedback

Quote from a Learning Assistant: "I've gone through years of school where I was expected to do projects, but I've never been in a class where the students were so enthusiastic about it, and rarely where the focus seemed more about learning what the students want to learn."

Quote from a student: "The project was not too essential to the course itself, but I did learn a lot and had fun researching the project. It made me go out to look for information and interesting topics that I normally would not go out of my way to find."

And beyond...

We are continuing our study into the benefits of project-based instruction this semester. With the feedback we received from the students and learning assistants, we are working to make the structure even better. We hope to implement this format in other physics courses.



http://webpages.csus.edu/~vemargon/LA/index.html
Learning assistants: Arthur Sisneros, Glenford Kennedy, Kevin Columna, El-iza El Henson, Kavindu Dhanapala
Funding provided by Google and the Sacramento State College of Natural Sciences and Mathematics