Science Student Attitude Survey
PRISM Grant Independent Research
Action Research Project
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Mindy S. Fehr

Student Attitude Index Survey – Ethnobotany & Other Plant Uses
Action Research
Mindy Fehr (& Marcia Rickey)
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To determine whether student attitudes toward science and learning were affected by the presence of a graduate student and updated curriculum in the classroom, a survey was developed. The survey contained questions to gage student attitude in several areas. Students responded to each statement using a scale that ranged as follows: strongly agree, agree, disagree, strongly disagree, no opinion. The survey was administered prior to the beginning of the unit, and then again after the unit was completed. SPSS was used to complete a statistical pre-post analysis. The analysis indicated that very little change in student attitude was accomplished over the time period of the ethnobotany unit.

For several months prior to the start of our Ethnobotany unit, Marcia and I met periodically to discuss what exactly we wanted to include in the unit, how we would vary it for the different classes involved, and how much time the project would take. We decided to carry out the unit during the last two weeks of school prior to Christmas vacation. We divided up tasks to be completed, but Marcia really did the majority of the organization and planning. She used several parts of the unit in other schools prior to the time that we used them, so she perfected protocols and presentation as she went along. As we solidified our plan, we collected the materials and worksheets that the students would need for the unit and then created a packet that we handed out to each student at the beginning of the unit. Marcia and I planned on team-teaching the unit, with Marcia taking the lead the majority of the time since she had already completed most of the activities more than once. We ended up presenting the unit a little differently, however, as Marcia's grandmother passed away and she was unable to be at school for the first part of the unit.

A couple of days prior to the start of the unit, I gave the students a brief overview of the unit and discussed with them who Marcia was and how she would fit into the

classroom. At this point, they had not met her, but I simply wanted to prepare them ahead of time for how the unit would be formatted. I handed out the survey that Marcia had developed and gave the students some time to complete it. At this point, many of them had just heard the term ethnobotany and really had little idea what we would be working with in the coming weeks.

We started the unit with a short slide show about the medicinal uses for plants of the Peruvian rain forest. I had previously taken a trip to Peru and learned about several plants that scientists were investigating in the Peruvian rain forest, so I used my slides to focus student attention and interest. I used the slide show to tie in to the students' first assignment, which was a poster project about a medicinal plant. We provided the students with several potential websites and a few print reference materials in the computer lab as 'jumping off' places for their research. Students were given 1½ days in class in the computer lab to start their project and were expected to finish the work outside of class.

The initial classroom lab experience stemmed from the ethnobotany poster project. We discussed antibacterial properties of plant materials and that of garlic in particular. Students chose plants that they hypothesized might have antibacterial properties and then brought in samples to test. We gave the students a protocol for setting up yogurt cultures to look at antibacterial properties of the plant material. Each group of students then tested garlic, a known antibacterial, a control, and their chosen plant. The groups set up a scale for the 'chunkyness' of their samples and observed the samples each day for several days.

During the time that students were observing their samples, we assigned a reading about historical and cultural uses of plants as medicines and conducted a classroom discussion. Students led and participated in the discussion, which focused on differences between modern and past medicinal practices.

Students in the Advanced Biology class then carried out a simulated lab in which they 'investigated' the rain forest looking for potential medicinally useful plants, used chromatographic and electrophoretic 'data' to identify useful compounds, and 'tested' the plants in medical trials. In the Biology I classes, students looked at the uses of plants as dyes and tested differing variables as they actually used plant materials to dye cotton socks.

The final phase of the unit involved the students presenting their poster about their medicinal plant in a simulated poster session. Marcia and I went to each poster and discussed the project with each student individually. Students were also required to evaluate and question each other, resulting in an exchange of ideas and content knowledge.

Immediately following Christmas vacation, we administered the post surveys. We wanted to leave a small amount of time between the end of the unit and student survey response in order to keep the process as similar as possible from school to school.

Throughout the unit, student interest and response was high. I received a very positive reaction from the students. I felt that there was a heightened interest and involvement on the part of each student. This was pretty amazing, given the time of year. Typically, I see that students are 'shutting down' in the time before Christmas vacation. While there were still a few students who seemed to adopt this mentality, the vast

majority of the students stayed motivated and involved in the day-to-day classroom activities. This was probably due to the fact that the activities required students to develop and lead in a direction of their own interest, and that the topics discussed could easily be connected to the students' everyday lives.

The survey we administered looked at student attitudes on various issues by presenting statements which the students responded to using the scale we provided. (Survey attached – see appendix A) The first set of questions dealt with student attitudes toward and/or understanding of science as a process in the 'real world'. The next grouping of questions dealt with the presentation of science material in the classroom , and the final grouping of questions examined plants and their uses.

I quantified the surveys using a scale of 1-5, 5 indicating 'strongly agree' and 1 being 'no opinion'. Data for each survey was entered into an Excel database. Data for the classes at Clinton and Chenoa high schools was used in addition to the data we gathered. Using SPSS, Jeff Helms helped me carry out a statistical analysis of the data, examining the relationship between pre- and post- unit responses with a t-test.

Only two statements from the survey showed any significant relationship under analysis. Statement 3 on the survey, "Scientists should not criticize each other's work.", had a mean of 3.62 in the pre-survey and a mean of 3.08 in the post-survey. This indicated that more students disagreed with the statement post-unit. Given that peer review and critique is an important and necessary part of the scientific process, we can say that the unit helped students to better understand the process of science in the 'real world'.

The second statement that showed a significant relationship was statement 12, "I learn why science is important to society in my science classes." The pre-unit mean was 3.47, and the post-unit mean was 3.02. This indicates that students tended to disagree more with the statement post-instruction. It seems that students were unable to make the connection between the activities and instruction in the classroom and their importance to science in the 'real world'.

Two other statements seemed to indicate a potential trend in the data. The first was statement 14, "I enjoy designing my own experiments." The pre-instruction mean for the statement was 3.22, while the post-instruction mean was 2.97. This indicates that students disliked designing their own experiments more after the unit. It would be interesting to investigate the reasons for an increase in student negative response to experimental design. Students seem to be responding negatively to an increase in their level of responsibility for their own learning.

The second statement indicating a potential trend was statement 19, "Some plants might have medicinal purposes, but given the number of plants that exist, it is impossible to identify which plants might have medicinal uses." The pre-unit mean for the statement was 3.04, and the post-unit mean was 2.83. This indicates that students were more likely to disagree with the statement post-instruction, or that they believed it is indeed possible to identify plants with medicinal uses. This makes an interesting note that the students seem to be grasping the basic scientific concepts and content that are central to the unit. The pre- and post- responses to this statement and statement 3 together lead one to believe that students are at least making content gains.

It might be significant to consider the nature of high school students when examining this data and its analysis. For example, in the 'typical' high school classroom, there are always a few students bound and determined to dislike every topic presented. Such a student is likely to pick a single answer at random for the entire survey or answer using a 'pretty pattern', rather than giving time and attention to each statement. This would definitely affect the final outcome of the survey data. Granted, the responses are averaged, and the mean is used in determining significance, but enough students of this mentality would easily skew the overall data result. One might select a smaller particular group of students to survey rather than surveying the entire class in order to avoid this problem.

In general, the research here seems to indicate that the ethnobotany unit presented in the classroom had little effect on student attitudes and understanding. It might be interesting to implement the pre- and post- surveys at the beginning and end of an academic year. This would provide more time for a change in attitude to be accumulated, and might be a better indication of whether science instruction has the ability to correct student misconceptions about the nature of science.

Illinois State University PRISM Program
Student Opinion Survey:

General Introduction: The ISU PRISM program is a three-year program during which chosen teaching fellows assist in high school classrooms (NCHS, Chenoa, Clinton, Gridley, BHS). The teaching fellows are graduate students at ISU in biology, chemistry and mathematics. The teaching fellows work in collaboration with the classroom teacher to improve science learning and high school education.

Purpose: This survey serves as an internal evaluation only for the ISU PRISM program. All responses are anonymous and confidential.

Circle your response to the statements below. Please be honest in your answers.

SA= Strongly Agree A= Agree D= Disagree SD= Strongly Disagree NO= No Opinion

1. Scientists are interested in improving their explanations of natural events.	SA	A	D	SD	NO
2. One important use of a scientific theory is to predict future events.	SA	A	D	SD	NO
3. Scientists should not criticize each other's work.	SA	A	D	SD	NO
4. If a researcher accurately reports his or her results, other researchers should accept the results without question.	SA	A	D	SD	NO
5. Once scientists have developed a theory, they should stick together to prevent others from saying it is wrong.	SA	A	D	SD	NO
6. Scientists must be willing to change their ideas when new information becomes known.	SA	A	D	SD	NO
7. Scientists are always changing their minds about things, therefore no one knows is the best answer.	SA	A	D	SD	NO
8. I enjoy when my teachers lecture.	SA	A	D	SD	NO
9. I enjoy when we do hands-on activities in class.	SA	A	D	SD	NO

10. I enjoy doing science experiments.	SA	A	D	SD	NO
11. I would rather do a science experiment than hear a lecture about science.	SA	A	D	SD	NO
12. I learn why science is important to society in my science classes.	SA	A	D	SD	NO
13. I enjoy science experiments when the steps are all told to me or written down.	SA	A	D	SD	NO
15. I enjoy designing my own experiments.	SA	A	D	SD	NO
16. Plants are important to humans.	SA	A	D	SD	NO
17. Agricultural crops are important to humans, but other plants are less important.	SA	A	D	SD	NO
18. Using plants for medical purposes is not very scientific.	SA	A	D	SD	NO
19. It is important to preserve plants because a scientist might find a medicinal use for this plant someday.	SA	A	D	SD	NO
20. Some plants might have medicinal purposes, but given the number of plants that exist, it is impossible to identify which plants might have medicinal uses.	SA	A	D	SD	NO

21. My favorite subject in school is:
    a. computer classes
    b. english / literature
    c. math
    d. science (biology, chemistry, or physics)
    e. social studies
    f. drama/ art/ theater
    g. other, please specify:
    _____.

22. One thing that my teachers or I could do to help me learn science better is:

_____

_____

_____

23. When I think of a scientist, I think of:

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