Project Abstract

Tuttle Middle School was built into hill a covering an entire city block (approximately 7 acres) that has been, over vast amounts of time, a tropical ocean, a deciduous forest, crop fields, and finally, the site of two separate school buildings. Students were challenged to answer the question, "How will your part of Tuttle change from August to May?" In the end, students compared data from each of the four building sides and extrapolated reasons for/if significant differences.

Students chose an area of the property, used a hula hoop, transected an area, marked the exact spot of their position using GPS, and gathered data for the soil, air and water (snow) if applicable in September, November, January, March and May of the 2010-2011 school year. Students used Vernier probes, Datamate software, and TI-73 graphing calculators to collect data for the following characteristics; Soil pH, temperature and moisture; air light, temperature, and relative humidity; and water temperature and pH.

Students then used satellite data on topographical, elevation, and soil for the property (provided by Crawfordsville's GIS Coordinator) to assist with their explanations of air, water and soil differences. In May 2011, students studied and compared their data for the four sides and offered explanations for differences and similarities. Students also photographed their transect each time data was taken. All five photographs were sequentially and chronologically arranged on foam board in May 2011. Students then used their sequences for the Photovoice piece of this project.

Program's philosophy

This project encompasses one main philosophy. I firmly believe that teaching using the interdisciplinary Problem Based Learning (PBL) strategy is unequivocally the best. This particular PBL presents a question about which data can be collected on the school grounds so transportation is necessary.

Program's goals

This project had 3 overarching goals.

1. Presented students with a historical, interdisciplinary real world problem that can be solved using the ground they walk on every day they walk on Tuttle Middle School property.
2. Required students to go outside (which is where science classes should be taught) and collect data using portable technology.
3. Students solved a question with problematic or non-distinct answers.

Program's objectives

1. Students became competent using multiple types of technology', several Vernier probes, TI-73 graphing calculators, digital cameras, and color printers. (Speed of data collection decreased from 135 minutes to approximately 90 minutes from the first to last collection).
2. Students used math skills to present their findings (line graphs)
3. Students explained results, extrapolated data, and determined reasons for extrinsic data
4. Students learned methods to ensure data accuracy; measured more than once, compared data to other groups in similar settings

5. Students learned to work in groups and share tasks
6. Students compared and contrasted the data collected from areas around Tuttle (old athletic field, area with coniferous trees, footpaths, area near the railroad tracks still used today, area near runoff from parking lot, area that used to be a flower garden)

How has the applicant implemented project

August 2010	Presentation of introductory powerpoint, administered pretest, introduced probe usage, began explanation terms pH, relative humidity; collected baseline data, determined acceptable parameters, chose transect, photograph area and printed picture
September 2010	Collected second set of data, reviewed terms, compared data; photographed area and printed picture
January 2011	Collected third set of data on the coldest school day of the year, reviewed terms, compared data; photographed area and printed picture
March 2011	Collected fourth set of data, reviewed terms, compared data; photographed area and printed picture
May 2011	Collected fifth and final data, drew graphs, extrapolated information; photographed area and arranged sequentially on foam board; wrote Photovoice piece; administered posttest. Examples of final projects are available on request.

Program data collection technology in science teaching practices

Data from the 17 pre and post test and final survey indicates that students significantly improved. On a scale of 1-5, the average score on the pretest for all students was 1.7. The average score on the posttest was 4.1. Entire sets of score are available upon request.

Impact these activities have had on student learning

The final survey given gave me definite impacts on learning. I will list a few specific student comments. All comments are available up on request.

- "I hated science before 6th grade. Now I really like it."
- "We got to miss class and go outside to collect data"
- "I learned how to use really cool probes"
- "I learned that where I am, the air temperature can be different"
- "I learned that I sometimes have to use math in science class"
- "I had to teach my group members when they didn't get something"
- "I learned that the calculators really do work after we lose them in the snow for over an hour"
- "I learned science is really cool"

Describe the evolution of these practices in the classroom, school and community.

When this project was initially designed, I included CO2, 02 and UVA AND UVB sensors. However, due to limited finances and equipment availability, I chose to use the sensors of which I had multiples.

Since this is the first year, I chose to individually implement the project.

Now that I have learned from mistakes and modified the requirements, I am prepared to share with all teachers who would like to participate via Edmodo.com ☺

I have watched my students quickly adapt to data collection, become much more proficient at analyzing their data, and teach other students the procedures. I have capitalized on this because many students are switched to other science teachers at the semester due to scheduling conflicts.

Innovations that will be implemented if the application is awarded

1. I will be creating a lesson to use with my 7th grade students based on our new state standards and textbooks just adopted. I begin the year with the study of soil so the probes will focus on gathering data for soil moisture, temperature, pH, and conductivity.
2. This activity will be modified and presented to those studying at our local Sugar Creek Nature Park http://www.sugarcreeknaturepark.com to use when visiting with groups.
3. I will invite the 2 other county middle schools to complete this project and we will compare results.
4. I will expand data to be collected using more Vernier probes- CO2, 02, and UVB if funding can be secured. We will present findings to other classes and the school board

**This project is based on the Problem Based Learning product development

Project Idea: Students will be introduced to the changing seasons via data collection from a variety of points on Tuttle Middle School property from August to May.

Grade Level: 6th grade

Goals

1. Students will be presented students with a historical, interdisciplinary real world problem that can be solved using the ground they walk on every day they walk on Tuttle Middle School property.
2. Students will be to go outside (which is where science classes should be taught) and collect data using portable technology.
3. Students will solve a question with problematic or non-distinct answers.

Objectives

1. Students became competent using multiple types of technology', several Vernier probes, TI-73 graphing calculators, digital cameras, and color printers. (Speed of data collection decreased from 135 minutes to approximately 90 minutes from the first to last collection).
2. Students used math skills to present their findings (line graphs)
3. Students explained results, extrapolated data, and determined reasons for extrinsic data
4. Students learned methods to ensure data accuracy; measured more than once, compared data to other groups in similar settings
5. Students learned to work in groups and share tasks
6. Students compared and contrasted the data collected from areas around Tuttle (old athletic field, area with coniferous trees, footpaths, area near the railroad tracks still used today, area near runoff from parking lot, area that used to be a flower garden)

Driving Question: How Will Your Part of Tuttle Change from August to May?

Entry Event: Students will take a tour of Tuttle Middle School property discussing the topographical features, flora, fauna, and man-made structures.

Procedure:

1. Participate in the Entry Event
2. Complete the 17 question pre/post test.
3. View the power point discussing the history of Tuttle Middle School property (built into hill covering an entire city block (approximately 7 acres) that has been, over vast amounts of time, a tropical ocean, a deciduous forest, crop fields, and finally, the site of two separate school buildings. The original building was mostly of brick and limestone and faced south; the second is primarily limestone with some brick and faces west. The four streets surrounding the school (Elm,

Wallace, Chestnut and Franklin) exhibit diverse land usage such as housing, an athletic field, businesses and tennis courts)

4. Choose transect with a hula hoop and a GPS system
5. Photograph area and take data for the following characteristics (soil moisture, temperature and pH; air temperature, light, relative humidity; and water temperature and pH).
6. Gather data for the soil, air and water (snow) if applicable in August, October, January, March and May of the 2010-2011 school year. Soil characteristics to be tested are pH, temperature and moisture. Air characteristics to be tested will be light, temperature, relative humidity, CO2 and O2. Water characteristics to be tested include temperature and pH.
7. In May, sequentially arrange all 5 month's photographs on one side of a piece of foam board
8. Graph the following sets of information and put on other side of foam board
    a. Air temperature verses soil temperature
    b. Vernier probe relative humidity verses Weather Bug relative humidity
    c. Soil moisture
9. Write the Photovoice piece
    a. Describe your area in as much detail as possible (GPS reading, street intersection, direction on Tuttle's property
    b. How area has changed from August to May.
    c. How your hypothesis matched with actual event
10. Take posttest (same as pretest
11. As a class, discuss the 4 sides' data and extrapolate reasons for/if significant differences.

Assessments:

Formative

Journal entries
Appropriate data collection
Informal evaluation of group members and collaboration
Increased speed of data collection

Summative

Completed foam board with pictures, graphs and Photovoice piece

Authentic Audience:

Class members, other teachers, entire school (posted posters in hallways).

Indiana Content Standards:

6.1.1 Explain that some scientific knowledge, such as the length of the year, is very old and yet is still applicable today. Understand, however, that scientific knowledge is never exempt from review and criticism.

6.1.2 Give examples of different ways scientists investigate natural phenomena and identify processes all scientists use, such as collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses* and explanations, in order to make sense of the evidence.

6.1.3 Recognize and explain that hypotheses are valuable, even if they turn out not to be true, if they lead to fruitful investigations.

6.1.6 Explain that computers have become invaluable in science because they speed up and extend people's ability to collect, store, compile, and analyze data; prepare research reports; and share data and ideas with investigators all over the world.

6.1.7 Explain that technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information.

6.1.8 Describe instances showing that technology cannot always provide successful solutions for problems or fulfill every human need.

6.2.2 Use technology, such as calculators or computer spreadsheets, in analysis of data.

6.2.3 Select tools, such as cameras and tape recorders, for capturing information.

6.2.5 Organize information in simple tables and graphs and identify relationships they reveal. Use tables and graphs as examples of evidence for explanations when writing essays or writing about lab work, fieldwork, etc.

6.2.6 Read simple tables and graphs produced by others and describe in words what they show.

6.2.8 Analyze and interpret a given set of findings, demonstrating that there may be more than one good way to do so.

6.3.5 Use models or drawings to explain that Earth has different seasons and weather patterns because it turns daily on an axis that is tilted relative to the plane of Earth's yearly orbit around the sun. Know that because of this, sunlight falls more intensely on different parts of Earth during the year (the accompanying greater length of days also has an effect) and the difference in heating produces seasons and weather patterns.

6.5.2 Evaluate the precision and usefulness of data based on measurements taken.

6.5.4 Demonstrate how graphs may help to show patterns — such as trends, varying rates of change, gaps, or clusters — which can be used to make predictions.

21st Century Learning Skills:

- Develop, implement and communicate new ideas to others effectively
- Incorporate group input and feedback into the work
- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes
- Solve different kinds of non-familiar problems in both conventional and innovative ways
- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
- Evaluate information critically and competently
- Use information accurately and creatively for the issue or problem at hand
- Use technology as a tool to research, organize, evaluate and communicate information
- Utilize time and manage workload efficiently
- Monitor, define, prioritize and complete tasks without direct oversight
- Know when it is appropriate to listen and when to speak
- Conduct themselves in a respectable, professional manner