

Kathleen M. Poe
Fletcher Middle School

Action-Research Plan

Area of Focus: Meeting the curricular needs of the science student while using reading supplemental books as a strategy to do so.

Research Question: Can a work of literature with emphasis on a science theme be additional supplement text to teach students about a specific science topic?

Literature Review: I suspect strongly that the science teachers are using their district curriculum guide as the sole determiner of instructional framework for teaching. That is, the curriculum guide becomes the "cookbook" for teaching without noting the needs of the individual child in a whole group setting. Teachers do not find it an easy task to adjust the instruction to meet the needs of the students when they are having difficulty reading the science text as is.

But there is a growing interest on the part of teachers to help their students to succeed in the science classroom. "Reading-to-Learn and writing-to-learn Science Activities for The Elementary School Classroom." Larry D. Yore, et. al., AETS Conference Proceedings. October 2, 1997.

"Many elementary school teachers realize that more and more -on activities is not the solution to unsatisfactory science literacy."

So no one is denying that inquiry-based hands-on science is important. This approach helps the students to make connections between what they are learning and experiencing.

"Today, systemic reforms like Science-Parents, Activities and Literature (Science PALs) in the Iowa City Community School District are attempting to implement science as inquiry focused on dispositions to construct understanding, big ideas, values and values and informed opinions; and the communication strategies to inform and persuade others.. Science PALs uses children's literature as assessment platforms and as springboards inquiry. Furthermore, numerous connections have been made among science and the language arts."

Reading is an area of a great deal of discussion, concern and not just the current educational "buzz word." Active Assessment for Active Science. Hein, G.E. and Sabra, P. 1994.

"Reading, identified as the backbone of education in the United States, receives more instructional time than any other area. Science on the other hand is often short-changed."

It is the expectation of the middle school teacher that the students should have gotten their reading skills from the elementary schools via the familiar topics and story format of the basal readers. And thus it is not the job of the science content area teachers to teach reading and science too.

Science teachers do feel the frustrations of having students not knowing how to read content area texts. Because of this frustration in the lack of critical reading skills and because the teachers themselves are not trained in teaching content area reading skills, many science teachers resort to telling their students what they are to know and not requiring them to read from the text. While there is a growing interest in developing the relationship between science and the teaching of reading, it is in the area of reading comprehension and not learning to read. “The value of teaching reading in the context of science and mathematics.” Lawrence Flick and Norman Lederman. School Science and Mathematics. 2002.

“Reading comprehension is the goal of reading. It is the employment of high level thinking to infer the meaning of text, consider implications, and decide on applications. Scientific inquiry in science education and the posing and solving of problems in mathematics education embody the higher level purposes in these subject areas.”

There are several purposes for reading. Students learn to read so to be better informed, to be able to complete a task, and for the pleasure of reading. Can you imagine how powerful a piece of literature can be if it was used to engage and motivate students to explore a science topic? During that exploration, students can be engaged, motivated and reading so to perform hands-on activities and doing so helping them to understand difficult science content material commonly found in their texts. Thus the science lesson with a literary component can be used to build proficient readers and problem-solvers.

Variables: Four science classes of approximately 100 males and females taking a 6th grade science course using the school district’s curriculum.

Interventions: One teacher will teach from the book/district’s curriculum guide and the other teacher will use the book/district’s curriculum guide and a supplemental literary work to teach the unit on Electricity and Magnetism. (Total of 2 teachers)

Time line: During the third unit of the science curriculum when all of the school district’s 6th grade science students are in the same Electricity and Magnetism unit given in the school district’s curriculum guide.

Resources:

County adopted science text, Prentice-Hall’s Electricity and Magnetism

County adopted curriculum guide

Common science end-of-unit test

Fictional work The City of Ember

Teacher made test for those students reading The City of Ember.

Synopsis of the fictional book:

The City of Ember Jeanne DuPrau

One of 10 books selected for Florida’s list of recommended Sunshine State books and recently won the statewide poll of students as their favorite book in school year 2004-2005.

Ember is a city in eternal darkness in Earth’s underground cavern. The only available light is produced by an increasingly unreliable electrical system. The light ends at the edges of town or the “ends of the known civilization.” Residents are concerned about the periodic power failure that produces frequent blackouts. The source of the power is an old generator that is falling apart after 243 years of use (exceeding the predictions of machine failure at 220 years).

Not only is electrical system falling apart but other systems as well. The stockpile of food and essentials that lasted for hundreds of years is beginning to run out. People are beginning to recycle clothing and making attempts to grow food using the unreliable light source as their grow light.

Side note: The main characters (and heroes) are two 12-year old....a boy and a girl that sixth grade readers can identify as being similar in ages

Data Collection

Upon on the conclusion of the third quarter unit on *Electricity and Magnetism* the students were given an end-of-the-unit test created under the joint sponsorship of the University of North Florida and the Duval Country Public School District Science’s Department. The four classes were similar in team structure (2-man team with one teacher teaching both math and science) and having similar class times. And in addition both teachers were required to use the same textbook and curriculum guide containing the Sunshine State Standards and the school district’s Benchmarks.

Tests do indicate some statistical differences with the classes using a piece of literature in which the science lesson was developed around showing a higher average score. Neither teacher was given the opportunity to view the end-of-unit test in advance.

| | |
|----------|--------|
| Class 1A | 78.5 % |
| Class 1B | 76.42% |
| Class 2A | 72.96% |
| Class 2B | 71.07% |

An average of 5.45% difference between the two 6th grade academic teams on a 20-multiple choice question test in an FCAT test format with a moderate to high cognitive complexity levels

Teacher Made Test---- Short/Extended Response

Further examination of the students came in an essay response test that required the student demonstrate connections between scientific concepts of magnetism and electricity and their comprehension of the fictional work The City of Ember. The questions were not the typical questioning about the book's plot, characters or theme but the students' understanding of the underlying science concepts.

The questions are given below and the points given for each correct answer.

1. In the book, the residents were very much afraid of the blackouts that were occurring more and more. Why were they afraid? (2 points)
2. What are the common causes of most blackouts in our communities? Give several possible explanations. (3 points)
3. A machine that converts mechanical energy into electrical energy is very often called? (1 point)
4. What common natural force is used to make electrical energy in our cities' power plants? (2 points)
5. What mechanical energy in the book is used to make Ember's electricity? (2 points)
6. Name the alternative energy source that was used in the book to make Ember's electricity? (1 point)
7. What alternative energy source would not be of any use in the city of Ember? Why? (3 points)
8. Why isn't the city cold when the machine they had was not used to make heat? What other possible alternative energy source might be used instead? (3)
9. Do you think fossil fuel was used to provide energy for the city's machine? What could be the reasons for using or not using it? (3 points)
10. What do you think will happen to the city of Ember? Be specific in your details. Could that happen to our city? (5 points)

For a total of 25-points.

Test Results by questions

| Points Given | Zero | 1 | 2 | 3 | 4 | 5 | Average |
|--------------|------|----|----|----|----|---|--------------|
| Question 1: | 1 | 1 | 1 | 15 | 23 | 1 | 2.500 |
| Question 2: | 2 | 3 | | | | | 2.370 |
| Question 3: | 1 | 39 | | | | | 0.970 |
| Question 4: | 4 | 36 | | | | | 0.900 |
| Question 5: | 10 | 17 | 13 | | | | 1.075 |
| Question 6: | 14 | 26 | | | | | 0.650 |
| Question 7: | 5 | 4 | 16 | 15 | | | 2.025 |
| Question 8: | 13 | 9 | 11 | 7 | | | 1.300 |
| Question 9: | 8 | 14 | 14 | 9 | | | 1.775 |
| Question 10: | 7 | 12 | 8 | 9 | 2 | 2 | <u>1.825</u> |
| | | | | | | | 15.390 |

61.56% of the 25 points

Possible reasons for outcomes: question designs that left students unclear on what was being asked of them; subjective test using teacher-made rubric and students' unfamiliarity in taking an short/extended response test that relies on the students' ability to make connections between a literary work and informational text.

Short/Extended Response Test Development

The questions were written also with the thought of the state's Florida Comprehensive Assessment Test (FCAT) in mind so to reinforce Sunshine State Standards/Benchmarks

The standards in boldface are the annually assessed Benchmarks.

SC.A.2.3.3 The student knows that radiation, light, and heat are forms of energy used to cook food, treat diseases, and provide energy.

SC.B.1.2.1 The student identifies forms of energy and explains that they can be measured and compared.

SC.B.1.3.2 The student knows that energy cannot be created or destroyed, but only changed from one form to another.

SC.B.1.3.4 The student knows that energy conversions are never 100% efficient.

SC.B.2.3.2 The student knows that most of the energy used today is derived from burning stored energy collected by organisms millions of years ago.

SC.C.2.3.2 The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.

SC.D.2.3.3 The student knows the positive and negative consequences of human action on the Earth's systems.

SC.G.2.3.1 The student knows that some resources are renewable and others are nonrenewable.

Reading strategies used to teaching reading in the science content area

Connecting background knowledge before, during and after reading.

Identifying the most important ideas and themes.

Asking questions about text, self and author's purpose and point of view.

Clarifying sections that are unclear and confusing.

Creating mental images during reading.

Drawing inferences from texts, using prior knowledge and textual information.

Teacher's Reflections

"If I had to do my life over again I would...." is probably the main thought throughout this action-research project. Looking back, I would do the following to strengthen, enhance, or reinforce reading in the science content area.

1. Have a timed reading assignment with a writing prompt to better assess the reading and writing capabilities of my students and not assume that my students are all at least "in the same ball park" with regards to reading skills.
2. I would have the students to keep all writings about the book in a portfolio along with the above mentioned reading assignment.
3. I would do a preconception quiz on what the students do know about the concepts of Electricity and Magnetism.
4. On the last day, I would ask the students to again take the same timed reading assignment and writing prompt so to use it as a "yardstick" to measure growth.
5. I would have the students themselves reflect what they learned and to describe their reactions when they look at the "before" writing samples and compare it to their writing sample at the end of the unit of study.
6. I would also incorporate the use of concept mapping to get the students to connect scientific concepts (i.e. magnetism and electricity).