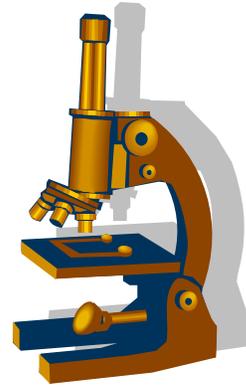


Improving Middle School Students' Attitudes towards Science



John McCoy

Westerville City Schools

Keywords

science attitudes, content literacy, SIRI, newspapers in education

Abstract

My focus was to increase 8th grade students' interest in science through reading about and discussing current findings, research or discoveries in science. An initial science attitude survey was administered; then students read news articles on current issues in science. The reading strategies utilized were part of the Ohio State Institute for Reading Instruction (SIRI). A post survey was conducted at the conclusion of the research, and pre and post surveys were compared. The surveys along with student interviews indicated a slight improvement in student attitudes toward science and some success in promoting content area literacy.

Table of Contents

My Class	2
Science Attitudes	2
The Science Attitudes Survey	3
SIRI Reading Strategies	4
Newspapers in Education.....	5
Findings and Discussion	7
References.....	9

My Class

I teach in the Westerville City School district, a large urban fringe district just to the northeast of Columbus, Ohio. With 14,142 students (in the '05-'06 school year), it is the 10th largest district in central Ohio. The district is currently rated as “effective” by the state, based on the number of Ohio Performance Standards met (Ohio Department of Education, 2006).



My school spans grades 6-8 and serves 891 students. Of those students, 15.4% of our population is African-American, and other minorities are present in much smaller percentages. Our most notable changing district demographic is an increasing number of English as Second Language (ESL) students. We now have ESL students in our building for the first time this school year.

I teach five periods of 8th grade science each day to 135 total students for an average of 27 students per class. I have all 8th grade learning disabled (LD) and ESL students, currently numbering 31 and eight respectively. This is my 8th year of full time teaching, with seven of those in the Westerville district.

For this project, I focused on my third period class, a group numbering 28 students with nine identified as LD, two ESL, and one Severely Emotionally Disturbed (SED). Since my third period class was a very diverse group, both academically and socially, I felt they represented a good cross section or sampling of my students and our building.

As is true for many students this age, this class seemed predisposed to focus on the negative aspects of school, and they did not seem to grasp the importance of life skills like reading. In an informal survey, 70% indicated they never read a newspaper or read it less than once per week. As one of my students put it, “*I don’t like reading the newspaper;*” with another adding “*this is so boring!*”

During my years of teaching I’ve been bothered by negative attitudes held by a lot of students. As a science teacher, I wondered whether there was anything I could do to have a positive influence on my students’ attitudes toward science and school.

Science Attitudes

Recent research regarding public attitudes towards science and technology shows negative trends in these areas, unfortunately. Data indicate that interest in science and technology news seems to have declined between 1996 and 2002 (National Science Board, 2004). Students are less likely to believe math and science help improve people’s lives, or that by taking science courses in school, they will be better equipped to contribute to society (Gilroy, 2002).

Most pupils see science as an unpopular school activity. In addition, as pupils get older, their enthusiasm for science declines (Jarvis & Pell, 2002). Younger students express more positive attitudes about science than older students do, and “intermediate (middle) school students expressed significantly more negative attitudes than did either elementary or high school students” (Greenfield, 1997, p. 261).

Negative attitudes toward science in school lead to a lack of basic knowledge later. Although Americans express strong support for science and technology, they are not very well informed. Neither Americans nor Europeans got high marks on a 2001 quiz designed to measure their knowledge of science (National Science Board, 2004).



A scientifically uninformed, uneducated, or apathetic public can lead to poor decision-making regarding important future scientific opportunities and challenges. Critical issues like stem cell research, genetic engineering, space exploration and proper management of the Earth’s limited resources depend on informed citizens with positive attitudes toward science.

Improving student science attitudes is an important first step in changing some of these trends, and there are some positive signs. The vast majority (91%) of the public agrees that it is important that young people have a grasp of science and technology (British Association for the Advancement of Science, n.d.). In addition, 96% of the American public believes that it is either very or somewhat important for the country to encourage more young people to enter careers in science and technology (Virginia Commonwealth University, 2001).

A *Columbus Dispatch* (2006, January 16) article reported on a recent poll conducted by MIT on teenagers’ attitudes towards technology that showed teens also have high hopes for technology and what it might bring during the next decade. Teenagers think science and technology could help solve the world’s problems. They believe new inventions will be able to overcome issues such as unclean water, hunger, disease, and pollution. If we are to make all these things happen, “it’s the young people who are going to have to do it” (C5).

It will have to start with improved science attitudes.

The Science Attitudes Survey

The purpose of my project was to determine if reading and discussing news articles that contained current findings, research or discoveries in science could positively impact students’ interest level in science.

To find out, I first developed a science attitudes survey. I pulled questions I felt were appropriate for my project from three science attitude surveys: the *Survey of Public*

Attitudes (2001), the *Survey of Attitudes towards Astronomy* (Zeilik, n.d.), and *Europeans, Science, and Technology* (2001).

I administered this survey to my 3rd period class to obtain their beginning interest level in science. Then, once each week for six weeks, the class read and discussed a current article on science and technology. I called these activities “Science in the News”. In these weekly activities, we utilized three different reading strategies I had learned about through Ohio’s State Institute for Reading Instruction (SIRI). These reading strategies were designed to help “students overcome the challenges they face in content reading and writing” (Allen, 2004).

Each week, right after we completed our “Science in the News” activities, I administered a short weekly survey to collect additional data on each individual article and reading strategy.

Finally, after reading and discussing the six articles, I gave students their initial science attitude survey back and asked them to complete the same survey again, which served as my post-survey.

In order to discover what my students were thinking, I interviewed a focus group of four students twice, once at the halfway point (after 3 weeks), and then again at the end of the project. Of the four students (2 boys, 2 girls) in the focus group, grade averages ranged from A to D+, two were LD, and one was ESL. Most of the quotations from students used in this paper come from these focus group sessions.

SIRI Reading Strategies

Once I decided to try to improve science attitudes through the reading of current science news articles, I realized immediately that I could incorporate reading strategies I’d learned through Ohio’s State Institute for Reading Instruction (SIRI).



“SIRI is a state-sponsored professional learning opportunity for Ohio teachers that encourages “shared conversations” around reading development and provides teachers with foundational knowledge and strategies that are research based” (Ohio Department of Education, 2006).

I found the class to be very informative and well organized. It focused on very teacher-friendly and usable activities and strategies for reading across the curriculum. I came away from the sessions with a wealth of ideas that I could use the very next day in my classroom.

For my project, I selected three reading strategies from *Tools for Teaching Content Literacy* by Janet Allen (2004). *Tools for Teaching Content Literacy* is a flipchart

highlighting effective instructional reading strategies from various authors in content reading and writing. I would highly recommend it to anyone.

The first strategy I tried was called REAP, an acronym for the following stages of reading: Read, Encode, Annotate, and Ponder. Students are asked to read on their own, encode the text by putting the gist of what was read in their own words, annotate the text by writing down the main ideas and the author's message, and ponder what they read by thinking and talking with others in order to make personal connections and connect this reading to other reading they have done (Eanet & Manzo, 1976). Use of this strategy will support increased comprehension. By revisiting the text for each of the stages, students internalize the content of the reading as they think about ways to represent the main idea and message in the author's and their own words. When students move to the ponder stage of this activity, they must connect with the text at a higher level through analysis and synthesis of the reading (Allen, 2004).

The second strategy, QAR, developed by Raphael and Peterson (1982) helps students develop awareness of the multiple sources of information in their reading. After reading a selection, students are assigned to small groups to develop three different types of questions from the text. The questions types are Right There Questions, Think and Search Questions, and On Your Own Questions. The three types teach students how to anticipate questions, how to find answers to questions, and how to use questions to review their reading (Raphael & Pearson, 1982).

The last strategy, called Cornell Note-Taking, is a "systematic process for taking notes during reading or viewing, analyzing the notes to form questions the notes would answer, and using the notes and questions to summarize the important ideas presented" (Allen, 2004). The strategy is very effective for helping students understand and remember more of what they read or view. It supports readers in making connections, developing questions, monitoring their understanding, and analyzing what they have learned. Students use a graphic organizer to read a content-based text and separate it into three sections: notes taken during reading, questions that could be asked from the notes, and a summary of the main idea in two to three sentences.

Newspapers in Education

Newspapers are part of the life of nearly nine out of ten Americans and touch two out of three on a typical day. 53% of the public says they do not get enough news from the



TV and want the added details on the big stories a newspaper can provide (Bogart, 1984).

Newspapers are used widely for instructional purposes in thousands of schools each year. A growing body of research provides evidence of the value of this educational tool (Rhoades & Rhoades, 1985). Several studies show improved reading competencies for elementary and secondary students who use the newspaper in class. Students are better able to distinguish facts from opinions and major details from minor details in newspaper stories. Newspaper use improves student’s attitudes toward reading. Those exposed to newspapers in class became greater users of news media. And frequent, year-round use of the daily newspaper can significantly increase student interest in current events (Rhoades & Rhoades, 1985).

For these reasons, I decided the use of newspapers would be an integral part of my science attitudes teacher research. Newspapers (along with SIRI reading strategies) would help me promote content literacy in my science classroom. As do many newspapers across the country, the *Columbus Dispatch* promotes a “Newspapers in Education” (Columbus Dispatch, 2006) program, which allows teachers to receive up to 60 copies of the paper each week during the school year for a very reasonable fee (\$8.00 for the entire school year). I decided to take advantage of this offer.

Although my original intent was to use current science articles from different branches of science, the actual articles used turned out a little differently.

We were studying space science in class at the time I collected my data, so I thought it would also be important to find articles related to our content whenever possible. As it turned out, I was able to find space related stories for all six weeks of “Science in the News.” Five of the six came from the science section of the Columbus Dispatch, and one article was from Science World magazine (see table 1 below).

Table 1: “Science in the News” Schedule

Week	Article Title	Source	SIRI strategy
1 – 1/19/16	Coming Into Focus	Columbus Dispatch Science section, 1/17/06	REAP
2 – 1/25/06	If This Makes You Feel Small	Columbus Dispatch Science Section, 10/25/05	QAR
3 – 2/1/06	Nasa Looks to Moon and Beyond	Columbus Dispatch Science Section, 10/18/05	Cornell Note-Taking
4 – 2/8/06	Meet Your New Neighbor	Science World Magazine, 11/28/05	REAP
5 – 2/15/06	On a Clear Night	Columbus Dispatch Science Section, 2/7/06	QAR
6 – 2/23/06	Unmasking the Man on the Moon	Columbus Dispatch Science Section, 2/21/06	Cornell Note-Taking

Findings and Discussion

By comparing the pre and post science attitudes surveys and combining that with actual statements made by the students in my focus group, there appeared to be modest improvements in student attitudes.

After reading and discussing the articles, many students felt it was easier to understand science concepts. Perhaps they were becoming more familiar with science terminology. They were also seeing what scientists do on a regular basis, which may have helped demystify science in general.

When asked to respond to the statement “science is irrelevant to my life,” Naomi from class stated, *“We use science in our lives every single day!”* Chris added, *“Technology is science. Anything electronic, anything period is science or related to science in some way.”* Although a few students understood the impact science had on their lives prior to the unit, more of them began to realize the relevance of science to their normal routines.

In responding to the prompt “Science should be part of my education,” Connor said, *“If you didn’t know about science, you wouldn’t know about what goes on in life.”* I think some students began to realize the importance of understanding and keeping up with fast paced scientific and technological change.

Technological advances were a common theme. Connor stated *“with new technology we’re coming out with, it makes life easier than like, 10 years ago,”* and *“10 years in the future, we’ll have stuff that’s even better.”* Mariam added, *“We’ll have more cures for disease.”*

Based on our readings and discussions, many students enhanced their understanding of the possibilities and opportunities that science can bring. Interestingly, Chris observed that science can *“extend your life in some ways, but shorten it in others, like by the use of new, more dangerous weapons or increases in pollution.”* He saw the big picture; with scientific advancements come the potential for risk or problems.

These “Science in the News” activities may have also had a slight effect on some students’ desire to read about science and technology. A comparison of the pre and post surveys revealed a 32% increase in independent reading of science and technology news articles. In addition, 43% of my students no longer showed a strong preference for TV over reading as a source of science and technology information (whereas 74% had reported this preference at the beginning of the unit). I felt that I had encouraged some students to pay more attention to science articles.

Regarding the SIRI reading strategies used, the QAR Questioning method was the least preferred by far (58% “didn’t like it at all”). Chris explained, *“Some of the subjects were hard to write questions to.”* Naomi just thought, *“It was hard to think of questions”*. In my experience, any time you ask an eighth grader to “think,” they’re going to complain

and express negative attitudes about the activity. Many of them felt that having to write questions was too challenging.

REAP was the preferred strategy by a slight margin (5%) over Cornell Note-Taking. Connor stated that REAP “*made sure that when you read it, you understood what was happening.*” I would suggest there were two reasons REAP was preferred. First, it didn’t require questions, and second, it had a smaller area that the students had to “fill in.”

Reflections

From a scientific standpoint, I am hesitant to draw firm conclusions based on limited data. However, I think that, taken as a whole, my project points to an improvement in science attitudes in this class over the time period that the data were collected. I also hope that I had some success in promoting content literacy, sharing with students reading strategies that may help them with reading success in the future.

Completing a “Science in the News” activity each week was a little too frequent. In the future, I plan to use this activity once per month. I’ll still use the same SIRI reading strategies but will also introduce other SIRI strategies in an attempt to find the most effective ones. I will also try to pick science articles that represent a broad sampling of science disciplines in an attempt to appeal to other interests and spark the imagination of more students.

It has become obvious to me that teacher research is a very effective tool for gathering useful, relevant information that can be used to increase teaching effectiveness. Done informally, it can provide the teacher with feedback on new activities or teaching ideas and allow teachers to improve their practice. Thanks to this project and SIRI, “Science in the News” will become a regular part of my science classroom.

References

- Allen, J. (2004). *Tools for teaching content literacy*. Portland, MA: Stenhouse.
- Bogart, L. (1984). The public's use and perception of newspapers. *The Public Opinion Quarterly*. 48(4), 709-719.
- Columbus Dispatch (n.d.). Newspaper in Education [home page]. Available at <http://nieonline.com/columbus/>.
- Directorate-general for Press and Communication, Public Opinion Sector (2001). Europeans, science and technology. Retrieved November 13, 2005 from www.eu.int/comm/research/press/2001/pr0612en-report.pdf
- Eanet, M., & Manzo, A. (1976). R.E.A.P- a strategy for improving reading/writing study skills. *Journal of Reading*. 19, 647-652.
- Gilroy, M. (2002). Waking up students: math/science attitudes and achievement. *Education Digest*. 68(4), 39.
- Jarvis, T. & Pell, A. (2002). Changes in primary boys' and girls' attitudes to school and science during a two-year science in-service programme. *Curriculum Journal*. 13(1), 43-69.
- National Science Board (2004). Science and engineering indicators 2004. Science and technology: Public attitudes and understanding highlights. Retrieved December 20, 2005 from <http://www.nsf.gov/statistics/seind04/c7/c7h.htm>
- National Science Foundation (2005, September). *2001 Survey of public attitudes and understanding of science and technology*. Retrieved December 29, 2005, from http://www.nsf.gov/statistics/showsrvy.cfm?srvy_CatID=6&srvy_Seri=17
- Ohio Department of Education (2006). Westerville 2004-2005 school year report card. Retrieved September 25, 2005 from <http://www.ode.state.oh.us/reportcardfiles/2004-2005/DIST/045047.pdf>
- British Association for the Advancement of Science, (n.d.). Public understanding, perceptions & attitudes in relation to science, technology and risk. Retrieved November 13, 2005 from http://www.the-ba.net/the-ba/News/_ConnectingScience.htm
- Raphael, T. & Pearson, P.D. (1982). *The effect of metacognitive awareness training on children's question answering behavior*. Technical report No. 238. Urbana, IL: Center for the Study of Reading.

Rhoades, L. & Rhoades, G. (1985). Using the daily newspaper to teach cognitive and affective skills. *Clearing House*. 59(4), 162-164.

Teens have high hopes for technology, poll shows. (2006, January 16). *The Columbus Dispatch*, p. C5.

Virginia Commonwealth University. VCU News. (October 4, 2001). Americans welcome scientific advancements with caution. Retrieved December 31, 2005 from <http://www.vcu.edu/uns/Releases/2001/oct/100401.htm>

Zeilik, M. (n.d.). Tools – Survey of attitudes toward astronomy (pre-test). *Field tested learning assessment guide*. Retrieved December 6, 2005 from <http://www.flaguide.org/tools/attitude/astpr.php>