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A study analyzing the perceptions of fifth-grade students toward science teaching methods

Andrew J. Brownfield
University of Dayton

A STUDY ANALYZING THE PERCEPTIONS OF FIFTH-GRADE STUDENTS TOWARD SCIENCE TEACHING METHODS

MASTER'S PROJECT

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by

Andrew J. Brownfield
The School of Education
UNIVERSITY OF DAYTON
Dayton, Ohio

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DEDICATIONS

I would like to dedicate this research project to all the people who were patient with me during my long hours and frustrations working on this master's project.

I would first like to dedicate this study to the students of my 1995/1996 fifth-grade class who did not realize the full magnitude of this project, but probably endured the most due to my lack of organization, lack of graded papers, and lack of patience during the entire year. Still with all, they were amazing and wonderful children to teach and to get to know this year!

Second, I would like to thank my family, friends, and colleagues for putting up with my countless excuses when they asked me to do favors for them. They have been very understanding and I thank them all for their love and prayers.

Third, I would like to thank my mom and dad (in memory) for all of their help, support, and love throughout my life here on earth. Thank you and I love you!

Finally, I would like to thank the only three persons who truly knew how difficult this project was for me; The Father, The Son, and The Holy Spirit!

CHAPTER I

INTRODUCTION

Purpose for the Study

Imagine for a moment that a parent stopped by their daughter's fifth-grade science class. The parent gently knocked on the door, and in a few moments a student opened the door. Upon the invitation of the child, the parent slowly walked into a classroom filled with students engaged in a hands-on science lesson. The desks were clustered together, and there was a considerable amount of talking. The teacher was located with one group of students fielding their questions.

The parent noticed that each child was working cooperatively with a small group of peers to sort and classify invertebrates into six major groups. As the parent approached his daughter's group, he noticed the educational tools the students had at their disposal. One student was assigned the task of reproducing and labeling a chart illustrated in the science textbook as a guide for this activity. A second student was holding up and examining one of twenty model invertebrates that came with a support set that was purchased with the textbooks. Two other students were busy leafing through their textbooks to help provide

data that would support the group's classification of this invertebrate. Meanwhile, the parent's daughter, taking additional notes for the group, wrote down the groups observations of the model and support information to be evaluated later.

As a result of the group's investigation, they labeled this model invertebrate as an arthropod, which the first student entered on the chart. Once the students have completed the chart and have analyzed the differences between the six main groups of invertebrates, the students wrote their groups conclusions to be handed in to their teacher.

The students in this classroom were engaged in a teaching strategy known as the inquiry teaching strategy. The inquiry strategy used by this teacher provided the students with the necessary materials and information needed to allow them to identify the problem, form a hypothesis, gather data, analyze that data, and form their own conclusions (Jacobson, Eggen, and Kauchak, 1993). The students in this classroom would later be evaluated by how well they gathered their information, by how well they classified that information on a cooperative group chart, and by how well they analyzed that information by developing written conclusions.

Had the parent's child been in another fifth-grade class down the hall, the parent may have walked in on an entirely different classroom situation. The students in

this science class down the hall was also learning how to correctly classify invertebrates by taking notes from their teacher's lecture and by having a teacher directed discussion over that information. Instead of working in small cooperative groups, these children were sitting in straight rows, respectfully listening, and writing down the information given to them by their teacher. Classifying invertebrates for them included volunteering information to their teacher who categorized the invertebrates on a chart reproduced from an overhead projector to a large screen on the front wall.

The students in this classroom were engaged in a teaching strategy known as the expository approach. The expository approach enabled this teacher to provide the main body of information to the students and to define the abstractions of the lesson being taught (Jacobson, Eggen & Kauchak, 1993). The students in this classroom would later be evaluated by taking a test that would assess what they knew about classifying invertebrates. Their only means of understanding these scientific concepts would come from what they have heard from their teacher and from what they have read from their textbooks.

In these examples the parent witnessed two entirely different teaching strategies which taught students how to classifying invertebrates. In the first example, the teacher used an inquiry teaching strategy which incorporated hands-on learning activities and cooperative group learning

to enhance the science curriculum guidelines. With the inquiry strategy, the teacher provided the students with a problem to solve, the task of generating a hypotheses, gathering information to support that hypotheses, and evaluating that information in order to reach a conclusion. The second example, also following the science curriculum guidelines, used the expository teaching strategy. With the expository strategy, the teacher stated the concept up front and then provided supporting examples to the note taking students via the lecture method (Jacobsen, Eggen, and Kauchak, 1993).

Educating science students has been debated, discussed, analyzed, and reevaluated by professionals for several years. Many conclusions that have been developed over the years, based on the needs of educating science students, comes from the evaluations and observations of teachers, administrators, and psychologists. This study focused primarily on the students' perceptions of some current science teaching strategies. The main areas that were considered with regards to the education of science students included: student perceptions toward teaching strategies, teacher attitudes toward science education, types of teaching strategies, hands-on learning methods, and future trends in science education.

The writer has taught fifth-grade science for two years and has experimented with both expository and inquiry teaching strategies. The writer also noticed that some of

his colleagues taught science using the expository approach exclusively, while others taught science using the inquiry approach exclusively. This left the writer wondering what approach would best cultivate the student's interests in learning science.

Problem Statement

The purpose of this study was to analyze the perceptions of fifth-grade students who have been exposed to one of three different science teaching strategies -- expository, inquiry, or a combination of these two strategies.

Assumptions

It was assumed that the Likert-type questionnaire was a valid instrument to measure the students' perceptions. It was also assumed that each student honestly answered each statement of the questionnaire.

Limitations

The writer recognized that there were many limitations to this study. One limitation included the sampling size and the fact that all of the students sampled came from the same economic status. The sampling size in this study

included seventy-one fifth-grade students from two elementary schools located in the same lower middle-class neighborhood. Findings would have been more accurate if the sample size was greater and included a sample of students from many social and economical backgrounds in school systems around the country.

A second limitation included the probability that some of the students may have been exposed to more than one of the strategies described in this project. Students who have experienced as many as two and perhaps all three of the teaching strategies discussed in this research project may rely on past experiences that best satisfied their desire to learn.

Definition of Terms

Expository is a strategy of teaching in which the teacher is the main provider of information (Jacobson, Eggen & Kauchak, 1993).

Inquiry is a strategy of teaching where the teacher provides the students with a problem to solve. The student's generate a hypothesis, gather data to support the hypothesis, and evaluate that information in order to reach a conclusion (Jacobsen, Eggen & Kauchak, 1993).

Hands-on experience is an activity in which students are able to experience learning while using their hands.

Cooperative learning is a strategy of teaching where

students work together to achieve a common goal (Jacobsen, Eggen & Kauchak, 1993).

Departmentalized is a setting where each teacher teaches one specific content area.

Self-contained is a setting where each teacher teaches all the content areas.

Lower middle-class is the approximate economic status that describes people who live above lower-class status and below middle-class status.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

This chapter is divided into five sections. They include: factors which influence elementary student perceptions toward science, factors which influence elementary teacher's attitudes toward science education, types of science teaching strategies, why hands-on learning methods should be used for teaching elementary science, and future trends in elementary science education.

Factors Which Influence Elementary Student Perceptions Toward Science Education

One factor which influences elementary student perceptions toward science may be the result of past experiences with science education (Butts, Hofman, and Anderson, 1993). Many students find scientific concepts difficult to grasp the first time they are exposed to them. Other students may have developed misconceptions about science during their first exposure to science. If a student finds learning science a difficult task, one understands the student's need to experience science in a positive learning atmosphere.

A second factor which influences elementary student

perceptions toward science is the age level of the student. Young children tend to show a positive attitude about science education. Yager (1983) states, "The younger the students, the more positive their attitude about their own performance and capabilities." Referring to an earlier study, the National Assessment of Educational Progress (NAEP): Third Assessment of Science of 1977 and again in 1982, Yager (1983) argues that these studies show that elementary students show favor toward science and toward their science teachers. If the students favor science education and their science teachers at an early age, one understands that students like science education and the elementary science teacher during the time a student is in elementary school.

A third factor which influences elementary student perceptions toward science may be influenced by the teacher's attitude toward science (Abell and Roth, 1992). When the teacher exhibits positive attitudes about teaching science, the students usually feel positive about learning science. Subsequently, when the teacher displays negative feelings about teaching science, the students usually feel negative about learning science. If the students favor science because it is taught by a teacher who exhibits positive attitudes about science, one understands why student's acquire a positive attitude toward science.

In this sections the author discussed the factors which influenced elementary student perceptions toward science

education. In the next section the factors which influence elementary teacher's attitudes toward science education are presented.

Factors Which Influence Elementary Teacher's Attitudes Toward Science Education

Manning, Esler, and Baird (1982) believe that one factor which influences elementary teacher's attitudes toward science education is their lack of confidence in teaching science. This lack of confidence may be the result of poor planning, a lack of enthusiasm toward teaching science, or a teaching strategy that the students may not respond to positively (Abell and Roth, 1992).

A second factor which influences elementary teacher's attitudes toward science education, according to NAEP 1977, is their lack of academic training in science education (Yager, 1983). Elementary educators studying to become teachers usually focus on one main are of concentration: language arts, mathematics, social studies, or science. Those educators who have focused on a content area other than science often lack the proper training skills required to teach science education. This lack of college training may leave many elementary educators inadequately prepared to teach elementary science.

In this section the author discussed the factors which influence elementary teacher's attitudes toward science

education. In the next section, three types of science teaching strategies are presented.

Three Types of Science Teaching Strategies

One approach to teaching science is the use of the expository approach. The expository approach, often referred to as the traditional approach, is one of the most common teaching methods utilized by current elementary science teachers (Barrow and Sawanakunanont, 1994). The expository approach is a strategy in which the teacher is the main provider of information. Jacobsen, Eggen, and Kauchak (1993) state, "The abstraction is stated by the teacher before examples are given, and then the examples are provided to help illustrate the abstraction." The two greatest advantages to this strategy is that it allows the teacher to save time by working through material quickly, and it allows the teacher to maintain a greater amount of classroom control. Perhaps the greatest disadvantage of the expository approach is the way the teacher provides the students with the examples of the abstraction via the lecture method. The lecture method utilized by the expository teacher may cause the students to loose their interest and their motivation toward the subject matter.

A second approach to teaching science is the use of the inquiry approach. The inquiry approach changes the traditional teacher's role from presenter to facilitator

(Rossman, 1993). The inquiry strategy promotes student involvement and develops their thinking skills. In contrast to the expository approach, the inquiry approach provides the students with a problem to solve. This creates learning activities which develops thinking skills that emphasis identifying problems, forming hypothesis, gathering data, analyzing data, and forming conclusions. Perhaps the greatest problem with this approach is the amount of time it takes due to the many possible student responses (Jacobsen, Eggen, and Kauchak, 1993).

A third strategy of teaching science is the use of the combination approach. The combination approach combines elements of the expository approach with elements of the inquiry approach. This approach allows the teacher to choose the approach that best fits the lesson objectives and the amount of time the teacher wishes to spend on a given assignment.

In this section the author discussed three types of teaching strategies. In the next section the author explains why hands-on learning methods should be used for teaching elementary science.

Why Hands-on Learning Methods Should be Used for Teaching Elementary Science

One reason why hands-on learning methods should be used for teaching elementary science is that it helps students

learn scientific concepts correctly the first time. Butts, Hofman, and Anderson (1994) state that elementary student concepts of science are retained longer when students experience hands-on activities. In an earlier study, Butts, Hofman, and Anderson (1993) state that students who learn science through hands-on experiences, coupled with classroom discussion, retain what they learn longer.

Another reason why hands-on learning methods should be used for teaching elementary science is that it helps change past misconceptions about science. Elementary students often retain misconceptions of past experiences rather than learn the concepts correctly when taught to them a second time. Stephans, Beiswenger, and Dyche (1986) suggest three recommendations to help curb science misconceptions: select a textbook that is interesting to the learning process, develop laboratory experiments to allow students to encounter hands-on experiences to reeducate themselves, and start science education at an early age in elementary school and attack the misconceptions head-on within the science classroom.

A third reason why hands-on learning methods should be used for teaching elementary science is that it encourages student enthusiasm while enhancing student's creative and individual thinking skills (Rossman, 1993). The enthusiasm and interest level shown by students engaged in hands-on learning helps motivate the student and develops personal ownership in their own learning.

In this section the author discussed why hands-on learning methods should be used for teaching elementary science. In the next section future trends in elementary science education are presented.

Future Trends in Elementary Science Education

One future trend in elementary science education involves the use of more current technology to enhance science curriculums. These current teaching aids include the use of videotapes, CD roms, and computer software (Fallon, 1993). The information that can be obtained by using the CD rom and the information that can be accessed from the computer are ever increasing. These current teaching aids are becoming more popular to homeowners, and are increasingly used by students in the privacy of their homes.

A second future trend in elementary science education includes other everyday materials such as newspapers, magazines, food nutrition labels, and weather reports (Orlich, 1989). The elementary science teacher's opportunity to incorporate these materials into their science curriculum not only allows students to relate science to their everyday life, but it also allows the teacher and the students to use these materials as connections to other academic areas of study.

A third trend in elementary science education includes

proficiency testing. Educators and administrators will focus on curriculum guidelines that center on scientific concepts that will develop student thinking skills. The proficiency tests will help educators narrow their focus on what scientific concepts are important and will encourage educators to incorporate strategies of teaching that will enhance the optimum learning and student involvement such as with the inquiry teaching approach and with hands-on learning methods (Abell and Roth, 1992).

The focal point of this research project is to develop an understanding of fifth-grade student perceptions toward science education. The research gathered in this study will help support latter findings which will better inform fifth-grade science educators the needs, interests, and attitudes of fifth-grade students toward science education.

CHAPTER III

PROCEDURE

Subjects

Students. There were seventy-one fifth-grade students, thirty-three boys and forty-eight girls, surveyed for this study. Sixty-eight of the students were Caucasian American, two boys were African American, and one boy was Vietnamese American. All the students were between the ages of ten and twelve. To achieve this sampling size, the writer focused on two neighboring elementary schools with a total student population of eight hundred students.

Teachers. There were three classroom teachers cooperating with this survey. Two of the teachers, one a male and the other a female, were both in their second year of teaching. The third teacher was a male in his fifteenth year of teaching. All three teachers were teaching a classroom of students in a self-contained learning environment. All three teachers instructed the students in reading, English, spelling, math, social studies, and science, except for the female teacher who does not teach social studies.

Each of the three teachers had his or her own teaching

strategy when teaching science. The three approaches to teaching science included: inquiry, expository, and a combination of these two strategies. One of the fifth-grade teachers taught science using the inquiry strategy. This strategy provided the students with information and then allowed the students to discover the scientific concepts on their own. One of the other fifth-grade teachers depended on the expository teaching strategy when teaching science. The expository teacher initiated the lessons by first stating the scientific concept. The expository teacher then provided the students with information that supported that scientific concept. Still another fifth-grade teacher depended on a combination of both strategies when teaching science. The teacher who used this combination strategy incorporated elements of both the inquiry strategy and the expository strategies to facilitate the scientific information to the students.

Setting

Schools. The two neighboring elementary schools cooperating in this study were located on the same site and shared a common playground area. Both schools contained students from the kindergarten level through the fifth-grade level. A total of twenty-eight classroom teachers (seventeen at one school and eleven at the other) were employed by the school district to teach in these two

schools. There was a combined total of approximately 135 students per grade level and a combined school student population of approximately 800. Three fifth-grade classrooms out of the five fifth-grade classrooms in these two schools cooperated in this study.

Community. The community where the study took place was located in a lower middle-class suburban neighborhood of approximately forty thousand residents. The residents generally held blue-collar occupations combined with a smaller number of industrial and professional occupations. The resident's ethnic make-up was approximately ninety percent Caucasion American, nine percent African American, and one percent Asian American. The two elementary schools were two of seven elementary schools in this southwestern Ohio community.

Data Collection

Construction of the Data Collecting Instrument.

A Likert-type questionnaire was constructed. The questionnaire consisted of two initial questions that asked the students to state the name of their teacher and to circle whether they were a boy or a girl. The remainder of the questionnaire consisted of twenty-two statements. Seven of the statements focused on the inquiry teaching strategy, seven of the statements focused on the expository teaching

strategy, and eight of the statements were general opinion statements about science and could have been a response to either teaching strategy. The writer developed the questionnaire based on the content of the research provided in the previous chapter.

The instrument was reviewed by the three fifth-grade teachers who were administering the questionnaire. The questionnaire was also tested on one other fifth-grade class located in the same school district to test the questionnaires' content.

The questionnaire provided students with the opportunity to respond to several statements that would test the student's perceptions of the teaching strategy of each classroom teacher. The students responded to each statement by circling the appropriate number that corresponded to their opinion regarding their science situation. The possible student responses to the Likert-type questionnaire were: strongly agree, agree, undecided, disagree, and strongly disagree.

Administration of the Data Collection Instrument.

The questionnaires were sent to the three fifth-grade classroom teachers. The questionnaires were then administered to the students by their teacher who provided an explanation of the possible choices (i.e., strongly agree, agree, etc.). The students were also asked not to sign the questionnaires. The questionnaires were

administered and returned by March 18, 1996. The return rate was 100 percent.

CHAPTER IV

RESULTS

Presentation of the Results

Refer to table 1. Table one shows the responses to the questions of the respondents who were exposed to the inquiry teaching strategy. The results are expressed as mean scores. The first column displays the overall mean scores for all the children surveyed for each statement of the questionnaire. The second column shows the mean scores of the boys only. The third column shows the mean scores of the girls only.

Refer to table 2. Table two shows the responses to the questions of the respondents who were exposed to the expository teaching strategy. The results are expressed as mean scores. The first column exhibits the overall mean scores for all the children surveyed for each statement of the questionnaire. The second column shows the mean scores of the boys only. The third column shows the mean scores of the girls only.

Refer to table 3. Table three shows the responses to the questions of the respondents who were exposed to the combination teaching strategy. The results are expressed as mean scores. The first column illustrates the overall mean

scores for all the children surveyed for each statement of the questionnaire. The second column shows the mean scores of the boys only. The third column shows the mean scores of the girls only.

TABLE I

QUESTIONNAIRE RESULTS OF FIFTH-GRADE STUDENTS' PERCEPTIONS TOWARD THE INQUIRY TEACHING STRATEGY EXPRESSED AS MEAN SCORES*

STATEMENTS	TOTAL NUMBER OF STUDENTS =	ALL 21	BOYS 9	GIRLS 12
1.	I like science class.	4.1	3.8	4.3
2.	My science class is interesting.	4.3	4.3	4.3
3.	My teacher likes teaching science.	5.0	4.9	5.0
4.	I think learning science is important.	4.5	4.2	4.8
5.	I work with my classmates on science activities in class.	4.6	4.5	4.7
6.	My teacher likes when students participate during science class.	4.9	4.8	4.9
7.	I like reading my science textbook.	3.0	2.7	3.2
8.	My teacher explains the science information well.	4.8	4.8	4.8
9.	We do a lot of hands-on activities in science class.	4.5	4.3	4.7
10.	My teacher values researching skills in science class.	4.5	4.4	4.5
11.	My science textbook is interesting.	2.8	2.8	2.8
12.	My teacher makes learning science fun.	4.5	4.4	4.6
13.	I like doing science research projects.	4.1	4.1	4.0
14.	I like to write down information about what we are learning during science class.	3.1	3.1	3.0
15.	The tests in science class are always about what we learned.	4.6	4.1	4.9

16. My science class is challenging.	3.7	3.6	3.8
17. I have a chance to say things in science class.	4.5	4.0	4.8
18. My teacher knows a lot about science.	5.0	4.9	5.0
19. I like doing hands-on science experiments.	4.2	3.8	4.6
20. I like doing science work from the science textbook.	2.8	2.7	2.8
21. I like it when my teacher talks about the science chapter we are studying.	3.4	3.2	3.6
22. I like working with other students in science class.	4.3	3.7	4.8

*Mean scores range between five and one, with five being the highest score.

TABLE II

QUESTIONNAIRE RESULTS OF FIFTH-GRADE STUDENTS' PERCEPTIONS TOWARD THE EXPOSITORY TEACHING STRATEGY EXPRESSED AS MEAN SCORES*

STATEMENTS	TOTAL NUMBER OF STUDENTS =	ALL 24	BOYS 14	GIRLS 10
1.	I like science class.	3.5	3.6	3.1
2.	My science class is interesting.	4.1	4.3	3.8
3.	My teacher likes teaching science.	4.3	4.3	4.2
4.	I think learning science is important.	4.2	4.3	4.1
5.	I work with my classmates on science activities in class.	3.6	3.6	3.4
6.	My teacher likes when students participate during science class.	4.8	4.9	4.5
7.	I like reading my science textbook.	3.0	3.4	2.4
8.	My teacher explains the science information well.	4.1	4.1	4.1
9.	We do a lot of hands-on activities in science class.	3.5	3.7	3.3
10.	My teacher values researching skills in science class.	4.2	4.2	4.2
11.	My science textbook is interesting.	3.2	3.7	2.5
12.	My teacher makes learning science fun.	2.9	3.1	2.6
13.	I like doing science research projects.	3.3	3.7	2.8
14.	I like to write down information about what we are learning during science class.	3.3	3.0	3.6
15.	The tests in science class are always about what we learned.	4.4	4.6	4.2

16. My science class in challenging.	4.0	3.9	4.2
17. I have a chance to say things in science class.	4.3	4.4	4.1
18. My teacher knows a lot about science.	4.5	4.5	4.4
19. I like doing hands-on science experiments.	3.6	4.0	3.0
20. I like doing science work from the science textbook.	2.9	3.4	2.2
21. I like it when my teacher talks about the science chapter we are studying.	3.8	3.6	4.0
22. I like working with other students in science class.	4.0	3.9	4.1

*Mean scores range between five and one, with five being the highest score.

TABLE III

QUESTIONNAIRE RESULTS OF FIFTH-GRADE STUDENTS' PERCEPTIONS TOWARD THE COMBINATION TEACHING STRATEGY EXPRESSED AS MEAN SCORES*

STATEMENTS	TOTAL NUMBER OF STUDENTS =	ALL 26	BOYS 10	GIRLS 16
1.	I like science class.	3.7	3.3	3.9
2.	My science class is interesting.	3.8	3.7	3.9
3.	My teacher likes teaching science.	4.2	4.5	4.1
4.	I think learning science is important.	4.4	4.4	4.4
5.	I work with my classmates on science activities in class.	4.1	3.9	4.3
6.	My teacher likes when students participate during science class.	4.9	4.8	4.9
7.	I like reading my science textbook.	2.9	2.6	3.1
8.	My teacher explains the science information well.	4.5	4.7	4.4
9.	We do a lot of hands-on activities in science class.	3.7	3.8	3.6
10.	My teacher values researching skills in science class.	4.2	4.2	4.2
11.	My science textbook is interesting.	3.0	3.1	2.9
12.	My teacher makes learning science fun.	4.5	4.1	4.7
13.	I like doing science research projects.	4.1	4.1	4.1
14.	I like to write down information about what we are learning during science class.	2.6	3.0	2.3
15.	The tests in science class are always about what we learned.	4.6	4.5	4.7

16. My science class is challenging.	3.9	4.1	3.8
17. I have a chance to say things in science class.	4.3	4.2	4.4
18. My teacher knows a lot about science.	4.5	4.4	4.6
19. I like doing hands-on science experiments.	4.6	4.7	4.6
20. I like doing science work from the science textbook.	2.6	2.6	2.6
21. I like it when my teacher talks about the science chapter we are studying.	4.1	4.0	4.2
22. I like working with other students in science class.	4.3	4.3	4.3

*Mean scores range between five and one, with five being the highest score.

Discussion of the Results

In this section each statement from the three separate questionnaires were analyzed and compared by the writer.

1. I like science class.

Generally, all the students from the three groups responded favorably toward their science class. Yager (1983) confirms this pattern of behavior establishing that earlier studies NAEP (1977 and 1982) displayed that elementary students showed favor toward science at the elementary level. The highest overall mean score was the inquiry group with 4.1. The lowest group was the expository class with a 3.5 mean score. The girl's and the boy's attitudes showed no major difference between mean scores with regards to this statement.

2. My science class is interesting.

The students in all the groups responded favorably to this question. The writer has experienced that students were generally interested in science class and Yager's (1983) research supports these findings. The highest mean score was the inquiry class with a 4.3. However, the lowest mean score was a 3.8 from the combination strategy class. Again, both the boy's and the girl's attitudes displayed no major difference between mean scores, except with the inquiry class where the mean scores of both the boys and the girls was 4.3.

3. My teacher likes teaching science.

The inquiry strategy had a mean score of 5.0. The other two classes showed favorable marks with the expository strategy showing a 4.3 mean score and the combination strategy showing a 4.2 mean score. The gender attitudes were about the same with regards to the mean scores except the inquiry strategy, where both boys and girls had a 5.0 mean score. The writer has experienced that most teachers usually enjoy teaching regardless of the subject.

4. I think learning science is important.

The total mean scores for this statement ranked very high with scores between 4.2 and 4.5. Generally, through the writer's experience, most students do understand the value of learning science. Although the inquiry approach had the highest mean score, it was only a few tenths higher than the mean scores of the other two approaches. The gender mean scores were about the same.

5. I work with my classmates on science activities in class.

Here the differences between the three approaches were greater. The inquiry strategy recorded a 4.6 mean score, the combination strategy recorded a 4.1 mean score, and the expository strategy recorded a 3.6 mean score. This provided positive feedback that the students in the inquiry classroom were often engaged in cooperative learning

activities. On the other hand, this study would also prove that the expository classroom used cooperative learning activities to a lesser degree. The gender mean scores were about the same.

6. My teacher likes when students participate during science class.

Here the mean scores for the three approaches were very high. Regardless of the teaching strategy, the educators in all three classrooms must have encouraged student participation. From the writer's experience, students seem to learn science concepts more thoroughly when they hear their peers define the concepts through classroom participation. The overall mean scores between the three approaches were 4.8 and 4.9. The lowest recorded mean score was 4.5 from the girls column of the expository classroom.

7. I like reading my science textbook.

All of the students surveyed scored in the undecided response category. Both the inquiry and the expository approaches' overall mean scores were 3.0. The combination approaches' overall mean score was a 2.9. The writer thinks, from experience, that many students view the textbook as uninteresting and that many of the students have picked up this negative feeling about their science textbooks long before they entered the fifth-grade. The gender mean scores displayed no difference.

8. My teacher explains the science information well.

The inquiry class had the highest mean score of 4.8, the combination strategy had a mean score of 4.5, and the expository class had the lowest mean score of 4.1. It was interesting to observe that the inquiry and combination strategies scored higher than the expository strategy. Both of the first two strategies tend to use hands-on learning methods regularly while the expository strategy tends to use the lecture approach regularly. Butts, Hofman, and Anderson (1994) believe that scientific concepts are retained longer when these concepts are taught to the students using hands-on methods. The gender mean scores were generally the same as the overall mean scores.

9. We do a lot of hands-on science activities in science class.

The inquiry classroom showed the highest mean score of 4.5, indicating that they use a lot of hands-on activities. The combination classroom and the expository classroom scores were 3.7 and 3.4, respectably. The combination and expository scores ranged between the undecided and agree columns of the questionnaire and, therefore, would suggest a lack of hands-on activities in the expository classroom with some use of hands-on activities in the combination classroom. Rossman (1993) believes hands-on learning methods should be used for teaching elementary science because it encourages student enthusiasm while enhancing

student's creative and individual thinking skills. The gender mean scores were generally the same for this statement.

10. My teacher values researching skills in science class.

All three teaching strategies scored about the same, and the mean ranges were from 4.2 to 4.5. These high mean scores showed that all the classroom teachers favor researching skills. The inquiry class had the highest overall mean score, though the three approaches scored generally the same. A possible explanation why the three approaches scored about the same may be the fact that teaching researching skills was presently a course of study requirement in that school district. There was less than a .5 mean score difference between the boys and girls regardless of their classroom strategy.

11. My science textbook is interesting.

All the strategies ranged between a 2.8 and 3.2 mean score. This means that these scores fell into the undecided column of the questionnaire. The writer knows that the students in all three of the classrooms surveyed used a science textbook as part of their daily science education. However, the writer has witnessed that many of the students usually show a lack of interest when the teacher assigns work to be accomplished using the textbook. As stated in question number seven, this trend in negative behavior

toward the use of the science textbook, as well as any textbook, may have been a negative perception from the students first exposure to any textbook. The gender mean scores were generally the same.

12. My teacher makes learning science fun.

Both the inquiry strategy and the combination strategy mean scores were high at 4.5. The expository strategy's mean score was only 2.9, which shows that the students were undecided about their teacher making learning science fun. This would support Rossman's (1993) opinion that hands-on methods encouraged student enthusiasm toward science.

The highest mean difference between any gender group was between the girls of the combination classroom scoring a 4.7 mean and the girls from the expository classroom scoring a 2.6 mean. The writer felt that the difference between the combination strategy and the expository strategy may have more to do with the classroom teacher than with the teaching approach. However, the writer could not account for the difference between the girls mean scores of these two approaches.

13. I like doing science research projects.

Unlike question ten which asked the students to respond to whether the teachers valued researching skills or not, this statement asked whether or not the student liked doing research projects. Both the inquiry and the combination

strategies ranked this statement at a 4.1 mean score which was considerably higher than the expository strategy mean score of 3.3. The inquiry and combination strategies encourage researching skills and may have instilled a positive viewpoint from the students in these classrooms. The writer has experienced this method of exposing students to positive learning environments that in turn develop positive student involvement. The gender mean scores were generally the same.

14. I like to write down information about what we are learning during science class.

The overall mean scores ranged between 2.6 and 3.3. The expository approach exhibited the highest mean score of 3.3. The writer, therefore, concluded that the students in the expository classroom write down much of the information they received from teacher lectures and, therefore, were more familiar with this statement and responded slightly higher. However, all the teaching strategies responded in the undecided column of the survey which would suggest an uncertain student response about taking notes during science class. The inquiry classroom had a mean score of a 3.1 and the combination classroom had a mean score of 2.6. The gender attitudes were about the same.

15. The tests in science class are always about what we learned.

The overall mean scores were high and generally the same, ranging from 4.4 to 4.6. The expository approach ranked the lowest, but it was not a major difference. This would suggest that regardless of the teaching strategy, each teacher was testing the students on what they were taught from the course objectives outlined by the classroom teachers. The gender mean scores were about the same.

16. My science class is challenging.

The expository classroom had a mean score of 4.0, the combination classroom had a mean score of 3.9, and the inquiry classroom had a mean score of 3.7. The three scores are not too much different, and the writer has concluded that regardless of the teaching strategy, the students surveyed generally believed that science was challenging. The writer has experienced that most students do find scientific concepts difficult to understand, especially the first time the students see them. The gender mean scores were generally the same.

17. I have a chance to say things in science class.

The inquiry classroom ranked this statement the highest with a 4.5 mean score. The other two classrooms ranked this statement at a 4.3 mean score which was not significantly different. Again there is no clear difference in teaching strategy that would suggest one strategy over the other with regards to student participation. The girls overall mean

scores were a couple of tenths higher in this category and may suggest that they were slightly more interested in class participation than the boys.

18. My teacher knows a lot about science.

The inquiry strategy ranked the highest on this statement with a 5.0 mean score. The other two strategies also ranked high with 4.5 mean scores. All three strategies showed favorable mean scores. The writer has experienced the tendency on the part of the fifth-grade students that their teacher naturally knows more about science then the student could know at their current age level. The gender scores were almost even.

19. I like doing hands-on science experiments.

This statement did not state whether the students experienced hands-on science experiments or not, just whether the students liked doing hands-on science experiments. The combination group scored the highest with a 4.6 mean score and the lowest overall mean score was the expository approach with a 3.6. The difference was much lower, and the writer concluded that the students who were exposed to the expository approach may not have enough experience with hands-on experiments to develop an opinion about liking hands-on science experiments. The boy's and girl's mean scores were generally the same.

20. I like doing science work from the science textbook.

The mean scores for all the strategies ranged in the undecided category of the questionnaire. Like the other questions about the use of the science textbook (question number seven and number eleven) the students from all three test groups showed no positive or negative opinions about the science textbook. The gender mean scores were about the same.

21. I like it when my teacher talks about the science chapter we are studying.

Perhaps the only positive response about the science textbook may not have anything to do with the chapter as it does with the educator who was delivering the information. The combination classroom ranked the highest with an overall 4.1 mean score, the expository classroom ranked second with a 3.8 mean score, and the inquiry classroom ranked last with a 3.4 mean score. The results reflected what could have been expected because the inquiry approach probably used the textbook the least. The girls overall mean scores were much higher than the boys which may suggest that the girls understand specific scientific concepts better when the teacher explains the chapter they are studying.

22. I like working with other students in science class.

This question was designed to look at whether or not the students liked working cooperatively in their

classrooms. The inquiry classroom and the combination classroom both scored a 4.3 overall mean score. The expository classroom ranked close behind with a 4.0 overall mean score. The writer concluded from the results that the students do like to work with their peers during science class. The writer has experienced this positive response toward cooperative learning and has noticed how instantly the students respond to the notion of working cooperatively with their peers. The girl's mean scores were a little higher overall on this statement. The writer has experienced a higher degree of interest from the girls toward cooperative learning than from the boys. The boys generally seem more independent than the girls.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Science education has become an increasing concern among administrators and educators. Resent studies have provided evidence that a growing number of school systems around the country have been adding science to their proficiency testing. With the advent of the science portion of the proficiency tests, the school systems have also explored and expanded their science curriculum guidelines.

The purpose of this study was to analyze the perceptions of fifth-grade students who have been exposed to one of three different science teaching strategies -- expository, inquiry, or a combination of these two strategies.

This study took place at two neighboring elementary schools in a lower-middle class suburban neighborhood. The population of the two schools totaled approximately 800 students.

The questionnaire was completed by seventy-one fifth-grade students, thirty-three boys, and twenty-eight girls. All the students surveyed were between the ages of ten and twelve.

A Likert-type questionnaire was constructed and contained twenty-two statements. The statements were designed to develop an understanding of fifth-grade student perceptions of science teaching strategies. The possible answers of each statement included strongly agree, agree, undecided, disagree, and strongly disagree. A mean score was calculated by assigning each response with a number value between five and one. The mean scores were then applied to three separate areas; all students being surveyed, all boys being surveyed, and all girls being surveyed.

The results of the questionnaire showed that most of the fifth-grade students surveyed enjoyed science class and found science interesting. Regardless of which teaching strategy they learned science from, most of the students valued the importance of learning science. Although not all of the teaching strategies in this study use hands-on instruction and cooperative learning groups to foster science education in their classrooms, most of the students surveyed responded favorably toward both of these methods of teaching science.

Conclusions

This study showed that the fifth-grade students surveyed generally enjoy science class and science-based activities. Their overall attitudes toward their teacher and the feelings about the teacher's attitude toward science

were above average. In contrast, the students showed an undecided attitude toward the use of the science textbook, science note-taking, and science homework.

The students from the inquiry teaching strategy classroom generally displayed high mean scores with an overall favorable attitude toward science. The combination strategy was a close second, occasionally displaying the highest mean scores. The expository strategy's mean scores were usually the lowest with regards to most of the survey statements and responded least favorably to science class overall.

There was no clear difference between the boys and girls on most of the survey questions. The boys showed higher scores on the statement relating to their like in doing research projects. The girls showed higher scores on three statements. The areas of science education where the girls attitudes were higher than the boys included classroom discussions, teacher explanations, and cooperative learning.

Recommendations

The results of this study clearly show that students are interested in science. This study showed that students enjoy learning science from a positive and interactive educator who develops lessons that focus on student involvement during the learning process. With this in mind, the following statements are recommendations for what

university educational programs, school districts, elementary principals, and fifth-grade classroom teachers can do to improve student interests and learning attitudes toward science:

1) University training programs for teachers' education should increase their emphasis on science education to insure positive teacher attitudes toward science education at the elementary level,

2) School districts and elementary principals should allocate more classroom time to science education at the elementary level to support positive teacher involvement,

3) School districts and elementary principals should develop more time, money, and space for science laboratories to enhance and encourage teacher and student hands-on opportunities,

4) School districts and elementary principals should develop new curriculum guidelines that will focus on a relationship between an instructive textbook coupled with hands-on instruction and supportive laboratory kits that can be renewed on a yearly basis,

5) Fifth-grade educators should update their training experiences through science in-service programs, and

6) Fifth-grade educators should evaluate their teaching strategies that will change to meet school district curriculum guidelines and provide productive student involvement and learning.

APPENDIX A

FIFTH-GRADE STUDENT SCIENCE SURVEY

Directions:

I. Write the name of your teacher _____.
II. Circle whether you are a: boy or girl.

III. Please carefully read the following statements about your science class and circle the number that best describes your feelings.

5 = Strongly Agree
4 = Agree
3 = Undecided
2 = Disagree
1 = Strongly Disagree

1.	I like science class.	5	4	3	2	1
2.	My science class is interesting.	5	4	3	2	1
3.	My teacher likes teaching science.	5	4	3	2	1
4.	I think learning science is important.	5	4	3	2	1
5.	I work with my classmates on science activities.	5	4	3	2	1
6.	My teacher likes when students participate during science class.	5	4	3	2	1
7.	I like reading my science textbook.	5	4	3	2	1
8.	My teacher explains the science information well.	5	4	3	2	1
9.	We do a lot of hands-on activities in science class.	5	4	3	2	1

10. My teacher values researching skills in science class.	5	4	3	2	1
11. My science textbook is interesting.	5	4	3	2	1
12. My teacher makes learning science fun.	5	4	3	2	1
13. I like doing science research projects.	5	4	3	2	1
14. I like to write down information about what we are learning during science class.	5	4	3	2	1
15. The tests in science class are always about what we learned.	5	4	3	2	1
16. My science class is challenging.	5	4	3	2	1
17. I have a chance to say things in science class.	5	4	3	2	1
18. My teacher knows a lot about science.	5	4	3	2	1
19. I like doing hands-on science experiments.	5	4	3	2	1
20. I like doing science work from the science textbook.	5	4	3	2	1
21. I like it when my teacher talks about the science chapter we are studying.	5	4	3	2	1
22. I like working with other students in science class.	5	4	3	2	1

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