TEACHERS PERCEPTIONS OF SCIENCE CONTENT KNOWLEDGE RETENTION OF AMONG EIGHTH GRADE STUDENTS

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This Master’s Project has been approved
By the Department of Teacher Education

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X This document has been submitted and successfully cleared a plagiarism check.
Supporting documentation has been provided to the Department Chair.
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CHAPTER 1

INTRODUCTION

Background

A primary goal of education is to promote long-term knowledge storage and retrieval, not just memories that fade after a given lecture or conference. Therefore, we pose the question: how can we best transfer knowledge into long-term memory (Raman, 2010). In education the process of retaining knowledge is essential for students to become successful in learning science. Science concepts tend to build on one another throughout the grade levels and long-term understanding and retention help students retain prior and construct new knowledge about science concepts.

Learning science from, a constructivist point of view, occurs when students construct their own ideas about how the world works (Skamp, 2004). Younger students need to experience phenomena in order to discuss their interpretations. It further helps when students can test and challenge their own and others’ ideas through practical tasks. Primary and middle school students need to be effectively engaged before they are ready to learn (Skamp, 2007). If a student is not effectively engaged in a science lesson, he or she will lose interest in actually learning or retaining the science concept. Science involves asking questions, hands-on experiments, discussions, inquiry and real world connections. Unfortunately, most students do not have a correct perception of science (Skamp & Logan, 2005). In their eyes, science is associated with memorizing facts and completing lab sheets. Despite the excitement that science can bring into a student’s life, a majority of middle school students do not have a passion for science. Too many
students enter the classroom believing that science is boring and irrelevant to their world (Skamp & Logan, 2005).

Most studies indicate primary students’ attitudes toward and interest in science decline as they progress into the secondary years (Logan & Skamp, 2007). Research has shown that young children at age 10 have positive attitudes towards science, but this interest next declines sharply and by age 14, their attitude and interest in the study of science has been largely formed (Logan & Skamp, 2005). According to Osborne (2003), an individual’s attitude towards science is made up of several components, including: perception of the teacher, anxiety towards the subject, the value of science, self-esteem at science, motivation towards the science, enjoyment of the subject, attitudes of peers and friends towards science, attitudes of parents towards science, the nature of the classroom environment, achievement in science and fear of failure in science.

Statement of problem

A student’s interest and attitude toward science provides linkages to their retention of a concept and the academic achievement gap, but there are several other factors to be investigated in the retention of science concepts among middle school students. Factors that were investigated in this research study included: teacher effectiveness, methods and importance of science instruction, socioeconomic status of school district and students, students’ motivation towards learning science, developmental levels of young adolescents, eighth grade students learning styles and abilities, standards taught, resources available for science instruction and the standards that were taught to and retained by the eighth grade students.
Research question

The perceptions of prior and current teachers of science at Pinewood Middle School in Southeast Ohio were investigated to answer the following research question:

- What factors contributed to the retention or lack of science concepts among eighth grade students?

Purpose of study

The purpose of this study was to assess the perspectives of teachers of science on science content knowledge retention among eighth grade students based on the Ohio Academic Content Standards for Science. (see http://education.ohio.gov/Topics/Academic-Content-Standards/Science) Prior research suggests that different approaches to science instruction lead to different levels of knowledge retention. The purpose of this study was to assess teacher perspectives on various factors that affect science knowledge retention.

Limitations

This Master’s Research Project focused on teacher perspectives on factors that contribute to the retention or lack thereof of science content knowledge among eighth grade students at Pinewood Middle School. Three teachers who once taught at middle school level were interviewed based on their perceptions of the retention of science content among eighth grade students. Two teachers, one who had moved out of the district and one who had retired, were not available to be interviewed. In addition, this study focused only on one period of eighth grade students from among the entire eighth grade cohort.
Organization of body

This chapter provided the background, statement of problem, research question and limitations of the research study. Chapter Two is a review of literature. Chapter Three describes the methodology used in this Master’s Research Project. Chapter Four will present the findings of the research project. Finally, Chapter Five will present a summary, conclusion and recommendations for future research.
CHAPTER 2
REVIEW OF THE LITERATURE

Introduction

There has been a significant amount of research related to the retention of science curriculum. This gap in science academic achievement and retention of knowledge has been linked to several issues. Although the gap in retention of science content could be the result of many causes such as lack of parental involvement, cultural attitude towards, education, and the educational resources available at home of a child, the school and its teachers can have a significant impact on a student’s education (Morgan, 2012). Other factors that can affect the retention of content include student motivation, administrative support and the educational resources available to science teachers. All of these factors contribute to the retention of science content knowledge or lack thereof in middle school students. These factors will be investigated to possibly constitute the cause or links to this academic achievement gap and retention of science curriculum in middle school students.

Teacher Effectiveness

Accountability is the driving force behind the focus of the educational system in the United States today (Swanson, 2012). State departments of education and districts seek to link the causes and problems of academic achievement to the performance and competency of the teachers in our nation’s schools. The fundamentals of teaching competence can be categorized as encompassing content knowledge (expertise in the subject being taught, also known as “subject-matter knowledge”) and pedagogical knowledge (expertise in teaching strategies and tactics, typically taught in teacher
education courses) (Torff & Sessions, 2009). The available test-score research suggests that teacher’s content knowledge and pedagogical knowledge both appear to be positively associated with student outcomes, but which has greater effect remains in dispute (Torff & Sessions, 2009). In today’s society teachers are required to be highly qualified in the subject area that they are licensed to teach. A core component of the definition of high-quality teachers in No Child Left Behind Act, the promise to close the historic gap in educational achievement between children of more affluent U.S. families and our underclass, is that teachers must have subject-matter competency in the subjects they teach. To be deemed highly qualified in science, teachers must prove competency in an individual science discipline, such as chemistry, biology, or physics, or demonstrate competency broadly across the field of science (Marx, 2006). Although these competencies contribute to the effectiveness of a teacher, there are many other links to student achievement such as standardized testing.

The No Child Left Behind Act drives the current educational system. It requires that educators measure students’ yearly progress; encourage high academic standards, and implement greater accountability throughout the nation’s school system. Of special interest to science educators is the requirement that schools must annually assess students’ science knowledge and skills in elementary, middle school and high school (Jackson, 2011). The challenge in receiving adequate achievement in students is the retention of content taught throughout the academic school year. The method of instruction used to teach science content aligns with the effectiveness of science teachers. There are several methods of science instruction, but ultimately the two most common are traditional teaching versus inquiry-based instruction.
Methods of science instruction

Educators face a dilemma each and every day. Teachers are challenged to prepare students for standardized assessments while still trying to add creativity to the curriculum. Frequently, students express concern merely with what will appear on the upcoming assessment. Teachers are often criticized for “teaching to the test” and therefore enabling students. State assessments can steer even the most skilled teachers down the wrong path as they deliver instruction (Longo, 2010). As teachers are preparing students for the state test, in hindsight, they need to keep in mind that the learning objectives of science standards entail for the students to remember the content not just for the test, but for life-long learning.

For well over a decade there has been a clear push toward instructional practices in science that facilitate critical, deep thinking by students (Marshall, 2011). Unfortunately not all teachers follow this method of instruction and still practice traditional teaching practices. Past research has shown that traditional instruction which includes teachers lecturing and teaching to the test fail to engage the students who have limited interest in academic learning and who also often happen to be part of the student population that determines whether a school meets its Adequate Yearly Progress objectives (Mehmet, 2011). In traditional teaching, the teacher decides which topics to include, in what sequence, and in what ways. The teacher is the authority and students are the passive recipients (Yager, 2008). Although this type of teaching may improve test scores in the short term, they do little to improve student learning and content knowledge retention (Blanchard, 2010). Traditional teaching practices focus on declarative knowledge and do not represent equity among students (Mehmet 2012). The type of
instruction that is suggested to ensure equity and meaning towards individual students needs and differences is inquiry-based science instruction (Mehmet 2012).

Inquiry-based science instruction is promoted as an effective way to help students learn science content, comprehend the nature of scientific inquiry, and understand how to engage in the inquiry process (Blanchard, 2010). Research has shown that students who have historically been low achievers in science can succeed in inquiry-based learning (Blanchard, 2010). A hallmark of inquiry instruction is an emphasis on constructing a deep understanding of science content beyond simple recall of scientific facts (Marx, 2006). Students more likely retain science content for a longer period of time with inquiry-based instruction. In scientific inquiry students engage in a thoughtful and coordinated attempt to search out, describe and explain and predict a natural phenomenon. Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation (Longo, 2010). This type of instruction helps students construct their own meaning and definition of a science concept which helps in long-term retention of the scientific phenomena.

The prevalence of traditional teaching including lecturing, memorizing facts, and “drill and practice” is apparent in our school systems. The question is does this type of instruction help students retain knowledge after the mandated state test? The reasonable answer supported by research is that this type of instruction does not help students retain information except for a short period of time following the test. Inquiry is the answer in leading the way to longer retention of content knowledge in students. Inquiry enhances creativity by providing an ongoing combination of observations, wonderment, and life-
long learning (Longo, 2010). Unfortunately, some believe such as reading and mathematics, deserve more time in a school day.

Importance of science instruction

The reason for the devaluing of science can be traced back to No Child Left Behind legislation. The pressure of NCLB accountability, in which all students in grades 3-8 are assessed in language arts and mathematics annually, has led principals and teachers to direct time and resources to language arts and mathematics, and, due to limited hours in the school year, to diminishing time for science (Marx, 2006). States have been given the flexibility to decide whether to include students’ achievement scores in their calculation of their AYP objectives or not. This flexibility can potentially encourage some school districts and states to provide limited support and resources for improving the quality of science instruction (Mehmet, 2012). Given the wide scope of many states’ science standards, and limited time allotted to meet these standards, such policies may discourage science teachers from differentiating instruction to meet the learning needs of all students (Mehmet, 2012). These policies for standardized testing contribute to the academic achievement gap in science, and unless overcome by administrators and teachers this will continue to be a problem in our nation’s educational system.

Because many states do not include students’ science scores in their calculations of AYP, increasing students’ achievement in science may not be a priority for the school administrators (Mehmet, 2012). Administrators’ support of and judgment on the importance of science curriculum contribute to effectiveness of science instruction. Principals are suitable candidates to consult on issues of importance of science
curriculum and teacher quality (Torff & Sessions, 2006). Principals’ jobs are to evaluate teachers’ effectiveness in instruction deliverance of curriculum in the classrooms, and therefore when a principal devalues the science curriculum his or her negative perception can potentially become a trend school wide. A negative perception of science instruction may result from the socioeconomic status of the school community.

Socioeconomic status

Poverty is a concept that often has been linked to failure in American schools (Gassama, 2012). When a family is embedded in poverty, the child’s education becomes the lowest on their scale of preference. For the family without resources, survival takes the front seat. It can be wrong, however, for anyone to embrace the belief that poor parents from poor families overlook their children’s education (Gassama, 2012). The parents of these children do not have the choice to prioritize their children’s education as, survival is of primary importance. Poverty is considered a major risk factor in academic failure. Known factors that are related to poverty and likely to contribute to a child’s academic failure include: unemployment, homelessness, mobility, exposure to inadequate educational experiences, substance abuse, inadequate child care, lead poisoning, television, and birth weight (Gassama, 2012). All of these factors contribute to a student’s education and how efficient or insufficient it may be. A child’s background of poverty contributes to his or her success in school, but so does the school.

School climate

School climate has been reported to have a direct relationship with students’ academic performance and teachers’ productivity (Blessing 2011). School climate may be defined as a collective measure of school’s characteristics, such as relationships
between parents, teachers and administrators, as well as the physical facilities on ground. It can be seen as the overall interaction resulting from human relationships with each other and with the physical plant in the school environment (Blessing, 2011). Thus school climate is a fundamental contributing factor to the educational opportunities and success of students.

Morgan (2012) argues that the gap in achievement is not about the students who are failing, but rather a system that fails to provide the educational opportunities for low income students. Many inequalities between poor schools serving low-income students and those in wealthier areas, point out that in some advantaged districts, schools spend over twice as much per pupil than those in poorest districts. In some inner city schools children not only have teachers with inadequate training, but also have to deal with overcrowded classrooms, run-down buildings and dilapidated textbooks (Morgan, 2012). Poverty stricken schools that are not receiving nearly enough funding from the government reap negative consequences such as poor student academic achievement, shortage of qualified teachers and educational resources. Unfortunately, students who face limited resources and have teachers with limited qualifications are being forced to compete with those that have sufficient resources and well-qualified teachers (Mehmet, 2012). As students continue to perform poorly in academics it is hard to inspire motivation.

**Student motivation**

Lack of student motivation is a shared concern of teachers across all content areas, at all educational levels. Unmotivated students exhibit behaviors of being unengaged, distracted, and unwilling to put forth. Motivation has been shown to foster a
strong sense of self-efficacy, which may lead to personal expectations of successful learning (Laing, 2011). Research has found that the level of personal mastery goals, classroom engagement, and motivation stay more or less stable throughout the years of early adolescence (Hooghe, 2008). Research has also suggested that the motivation of adolescents in democratic schools is not a primary result of home influence but is rather related to school’s culture (Weiss, 2012). Middle school students need to be engaged and interested in the science curriculum to exhibit motivation and attentiveness towards learning. The developmental levels of middle school students need to be addressed while implementing science instruction.

Young adolescent development

Findings show that students desire caring teachers, want active classrooms, and that technology use impacts their attitudes towards learning. Implications are that middle-school learning can increase relevance by teachers who exhibit caring for students as individuals; structuring opportunities for students to interact with the teacher and each other around real-world problems; and incorporating technology (Steinberg, 2012). Addressing factors that contribute to the development of young adolescents can potentially help students retain content information and be more engaged in their learning. In a study about students’ opinions about their life in middle school, students shared that they wanted their learning to be active; they preferred hands-on activities, discussions and debates, and role-playing situations. Furthermore, they stated that the best classes were often the challenging ones that involved them in real world activities and problem solving (Steinberg, 2012. Do science teachers consider all these qualities of young adolescents while planning for instruction?
Conclusion

There are many factors that contribute to the retention of science content knowledge in middle school students. However, many of these factors can be targeted and positively addressed by teachers and administrators to help increase science content knowledge in young adolescents. Providing students with active, engaging, challenging and cooperative learning is one of the many ways to help students retain science content. In order for students to retain content more effectively, teaching strategies must change within schools. Many schools are implementing lessons that will help students retain information for the mandated state test, but in the long term students will not retain the science information. Research has shown that there are many effective strategies that can be implemented to increase science content knowledge retention in students through inquiry-based learning. The socioeconomic status of young children also plays a role in retention of content knowledge, but the school culture is even more a resource in whether a child is destined to thrive in an academic setting.

All these factors contribute to whether or not middle school students retain science content over an extended period of time. The purpose of this study is to determine the perceptions of science teacher’s views of retention of science content knowledge among eighth grade students at Pinewood Middle School.
CHAPTER 3

METHODS

Students’ motivations for learning, development, achievement and ongoing education are tied to their individual differences and perceptions, family values and expectations, community and social values, school culture and teaching practice. School-related motivation influences student’s decisions and actions present and future, as motivation and experiences in school impact choice of college, careers and lifelong learning (Harde, 2012).

Yet a gap remains between what rural students are doing, learning and achieving, and what their teachers believe they can achieve with adequate educational motivation (Harde & Sullivan, 2009). Their lack of motivation leads to disengagement and dropout from school and educational pursuits, an issue, more prevalent in rural schools than non-rural schools (Harde, 2012).

Research and design

In order to measure the factors that can potentially cause a gap in eighth grade student the retention of science content knowledge, several components need to be investigated such as learning styles and abilities, teachers’ methods of instruction, availability of resources, community socioeconomic status, administrative support, student developmental levels, time allotted for science instruction and the importance assigned to the science curriculum in a daily schedule. The findings of this study will help provide information about and teaching strategies for retention of science content knowledge among middle school students. This section explains how teacher interviews
and an assessment were used to address eight teachers’ perceptions the lack of retention of science content knowledge among the eighth grade students.

Setting and school community

All research and interviews was conducted in rural Appalachia at Pinewood Middle School in various classrooms. The middle school housed grades 5-8th and comprised 272 students. There were 17 teachers at the school. The teacher-student in each classroom was 16:1. There was one principal and several other staff including a librarian, custodians, technology service, lunchroom attendees, cooks and two secretaries. The school was located near the center the community and shared a building with the elementary students. There only was one of each elementary, middle and high school in the district. The town in which Pinewood Middle School is located in was old compared to the surrounding areas, and only had a few blocks with a few restaurants and convenient stores. The students attending the school lived in the area, but several of the teachers commuted to work every day.

According to the census, the population of the rural town was approximately 1,800. According to Ohio Department of Education’s School Report Card (http://ilrc.ode.state.oh.us/), Pinewood Middle School was designated as under “Continuous Improvement” and has failed to meet Adequately Yearly Progress. The student population was 95% economically disadvantaged, 91% Caucasian and 23% included students with disabilities. The school did not meet the required attendance rate according to the School Report Card.

Academic achievement may be raised by improving attendance of those students who would normally have a high rate of absenteeism. Students who regularly attend
school are less likely to fail high-stakes tests (Daugherty, 2008). The school continues the trend of scoring poorly on academic state tests and the Ohio Department of Education report cards. The school district has never passed an Ohio Academic Achievement Science Test, and rarely scored close to or higher than fifty percent. The school community is working towards improving its low performance scores, especially in the realm of science curriculum.

Participants

The participants in this study included eighth grade students and science teachers from Pinewood Middle School. The students were chosen to participate in the study because the researcher student taught in an all year clinical program only in the specific eighth grade science classroom. Only those eighth grade students participated in the study who had continuously attended Pinewood Middle School since grade four. The student in the participating classroom included ten females and eight males, ranging in age from 12 to 14. Two students who moved to the district later than fourth grade were not included in the study. While these 16 students represented 89% of their class, they represented 22% of the total eighth grade cohort of 72 students.

The teachers who participated had taught science to the eighth grade student participants in prior years or during the current academic school year. Relationships are at the heart of educational encounters (Giles, 2012). The teachers offered their personal perspectives on to the factors that contribute to the lack of science content knowledge retention. The students were surveyed to acknowledge the science teachers that they had in the past, and then the participants were contacted in interest to participate in the research study.
The science teacher participants included the current eighth grade science teacher and the students’ previous sixth and seventh grade science teachers. The sixth grade teacher currently taught at the high school, but agreed to participate in an interview. At the time of this study, the seventh grade science teacher now taught fourth grade at the elementary school, but agreed to participate as well. The current eighth grade science teacher worked with the researcher during the entire year and offered her insights as well. The eighth grade students’ fourth grade teacher had moved from the district and could not be contacted. The fifth grade teacher had retired from the teaching profession and district several years after teaching science to the eighth grade students, and also could not be contacted.

Data collection

The principal of Pinewood Middle School was contacted prior to the research study to give permission for the study, and she verified that the research study could be done on school grounds and whether any information should be shared to benefit the district’s science curriculum. Principals, teachers, and students are key players in the implementation process of education (Alani, 2010). The principal was aware that the student’s parents would sign a consent form (see Appendix A) before the research study, and that whether or not students were willing to participate there would be no academic repercussions. The principal was aware that the Science Academic Content Standard Assessment would be taking place during a normal school day.

The procedure included the assent script for minors participating in the study (see Appendix B) which was read at the beginning of the class period. To measure the eighth grade students’ science content knowledge I administered the Science Academic Content
Standard Assessment (see Appendix C). The assessment was given during a regular school day. The students independently answered all twenty-seven questions of the assessment. They were reassured that the assessment would not affect their academic record, and to answer each question to the best of their ability. They completed the assessment during their regular fifty minutes science lesson and informed that their score would not be reported.

The Science Academic Content Standard Assessment was based on the fourth through eighth grade Ohio Academic Science Content Standards (see http://education.ohio.gov/Topics/Academic-Content-Standards/Science). The assessment included Earth and Space Sciences, Physical Sciences and Life Sciences. These three content topics build off one another, and help with understanding each specific science content statement. Science education reform documents call for the elimination of the so-called layer cake approach to the science disciplines- chemistry, physics, geology, biology- in favor of a more integrated, conceptual teaching approach (Ramsey-Gassert, 1997).

The assessment included science content standards that the eighth grade students should have learned during their current or prior academic school years. The assessment included twenty seven questions varying from multiple choices, to short answer, true or false and matching. The questions were knowledge and inferential based. Because images are powerful means of communicating scientific results (Watson, 2008), four of the questions contained a picture or graphic to which the students were to refer. The students also had an option of drawing their answer on the short answer questions to display their knowledge of the science content standard. When done, the students turned
their assessment in a designated place. I did not look at any of the assessments until all were finished and dismissed.

Data analysis

The next step in the research project entailed a quantitative analysis of the scores on the Science Content Standards Assessment. The aggregate scores were reported to the science teachers during the teacher interview. It is worth noting that evaluation projects often have specific objectives that guide data collection and analysis. Some common objectives are to identify what is working well in a program and what needs improving (Thomas, 2006). I documented the students’ strengths and weaknesses in the science content areas on the assessment to share with the science teachers in the interview portion of the research project. Assessment should be an opportunity for teachers and students to reflect on the learning that has taken place (Neal, 2004).

The science teachers at Pinewood Middle School were contacted to set up an interview time with the researcher. The consent form was discussed orally and in documentation with the science teachers, and the concept of confidentiality was stressed. Because frequent and powerful reminders about the necessity of confidentiality are necessary throughout the research process (Wagner, 2011), the teachers were informed that the interviews’ content would not be shared with anyone, including administration, and therefore not have any impact on employment status.

The science teacher interview guided the Teacher Interview Questionnaire. (See Appendix C.) According to Varner (2012), action research is a concept that is often heard in the field of education. It is not a new concept but rather one that has been gaining attention for over twenty years. Action research is defined as:
“any systemic inquiry conducted by teachers, administrators, counselors, or others with a vested interest in the teaching and learning process for the purpose of gathering data about how their particular schools operate, how they teach, and how well their students learn. The information is gathered with goal of gaining insight, developing reflective practice, effecting positive changes in the school environment and on educational practices in general, and improving student outcomes.”

Action research allows schools to develop an understanding of the needs of students and to make plans for change. The information gleaned from the teacher interviews serves and develop an understanding and make plans for future changes for the future in science curriculum of Pinewood Middle School.

The Teacher Interview Questionnaire included several components addressing factors that contributed to the science teachers’ perception towards the eighth grade students’ retention of science content knowledge. The science teacher interview questionnaire addressed the following information: 1. Methods of science instruction, 2. Perception of the importance of science instruction, 3. Amount of time allotted for science instruction, 4. Required level of science content, 4. Performance in other content areas, 5. Instructional materials, 6. Administrative support, 7. Student motivation, and 8. Retention.

The last section of the science teacher interview questionnaire addressed a Science Technology Concept Program that is designed help students retain science knowledge. The teachers were interviewed about this program and asked whether they believed it would be an effective instructional tool for future use in the classroom. The
teachers were also asked to complete a Likert Scale Survey addressing the teacher’s perception towards the importance of science curriculum. A Likert scale is a psychometric scale commonly involved in research based on survey questionnaires. The respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements while responding to a particular Likert questionnaire item. The range of Likert scale captures the intensity of their feelings for a given item (Barua, 2013).

Each teacher interview was recorded and then transcribed by the researcher. The data collected was analyzed using a comparison and contrast method to develop categories and themes. Bray (2007) argues that making sense of teaching and learning relationships is a central task of educational inquiry. This social dimension brings a complexity that makes it impossible fully to control or measure with precision the interrelatedness of particular factors. The findings of the perceptions of the particular factors contributing to the retention of science content knowledge among eighth grade students are presented in Chapter Four.
CHAPTER 4

FINDINGS

Research on factors contributing to the retention of science knowledge was presented in Chapter two. Research has found that factors involving students’ learning ability, style, motivation, interest in science and teachers’ science instruction should be considered for long-term retention of science content among eighth grade students. Studies also suggest that the developmental level of adolescents, socioeconomic status of the school and student as well as school culture contribute to the retention of science knowledge among eighth grade students. These factors were investigated in interviews with the science teachers at Pinewood Middle School. The science teachers interviewed included: Ms. Hershey, the sixth grade teacher; Mr. Curtis, the seventh grade teacher; and Ms. Waverly, the eighth grade teacher. These teachers’ perspectives on the retention of science content among the eighth graders will be presented in this chapter.

The chapter presents the findings with regard to student ability to meet the Science Academic Content Standard Assessment, information about the eighth grade students and science teachers, methods of science instruction, time allotted, importance of science, factors that contribute to the retention of science content, opinions on the Science Technology Concept Program and results of the survey on perspectives on importance on science instruction.

Science Academic Content Standard Assessment

The eighth grade students took a Science Academic Content Standard Assessment based on the Ohio Academic Science Content Standards for grades four through eight. The assessment was scored by calculating which percentage of students
answered a question correctly out of a total of twenty-seven questions. The results of each question are presented in the table below.

Table 1. Results: Science Academic Content Assessment

<table>
<thead>
<tr>
<th>Questions</th>
<th>Percent Correct</th>
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<tbody>
<tr>
<td>1. What type of process is erosion? (Multiple choice)</td>
<td>100</td>
</tr>
<tr>
<td>2. What type of process is deposition? (Multiple choice)</td>
<td>100</td>
</tr>
<tr>
<td>3. Identification of topographic map picture</td>
<td>87.5</td>
</tr>
<tr>
<td>4. I am a scientist observing a creek habitat. I notice that there is a high population of beavers and a low population of fish. What is happening in this habitat? (Must use the terms predator, prey, population, survival and habitat) (Short answer)</td>
<td>100</td>
</tr>
<tr>
<td>5. Inference of fossil picture</td>
<td>100</td>
</tr>
<tr>
<td>6. Mrs. Jamison has a piece of banana bread for lunch, but her little daughter crumbles it all into pieces. Does Mrs. Jamison’s banana bread have the total amount of matter after her daughter crumbled it? Explain. (Short answer)</td>
<td>93</td>
</tr>
<tr>
<td>7. What are two ways to change a substance from one state of matter to another? (Short answer)</td>
<td>81</td>
</tr>
<tr>
<td>8. Jane leaves a cup of water in the hot car for a whole afternoon. What would happen to volume of the water? (Multiple choice)</td>
<td>81</td>
</tr>
<tr>
<td>9. Match the vocabulary words with the definitions about organisms.</td>
<td>100</td>
</tr>
<tr>
<td>10. Energy in this food chain is not transferred from one organism to another. (True or false)</td>
<td>100</td>
</tr>
<tr>
<td>11. Jimmy touches with his hand a hot metal spoon in a pot of noodles. What type of heat transfer is happening? (Multiple choice)</td>
<td>100</td>
</tr>
<tr>
<td>12. Photosynthesis picture identification</td>
<td>93</td>
</tr>
<tr>
<td>13. The physical and chemical properties in a substance remain unchanged in a chemical change. (True or false)</td>
<td>100</td>
</tr>
<tr>
<td>15. What source can electric energy be produced from? (Multiple choice)</td>
<td>81</td>
</tr>
</tbody>
</table>
16. Jake rolls a ball across a smooth table and measures the distance. The ball travels 8 cm. He then rolls the ball over carpet and it travels 4 cm. He used the same amount of force both times rolling the ball across the different areas. What caused the ball the ball to travel slower on the carpet? Use the word friction and force in your explanation. (Short answer)  
17. A hypothesis is ______. (Multiple choice)  
18. A three beam balance is most appropriately used to measure the mass of which of the following? (Multiple choice)  
19. The measure of the pull of Earth’s gravity on an object is called? (Multiple choice)  
20. When heat is added to most solids, they expand. Why is this the case? (Multiple choice)  
21. What cell organelle contains the cell’s stored food? (Multiple choice)  
22. Which of the following is not a necessary characteristic of living things? (Multiple choice)  
23. Which of the following organisms uses spores to reproduce? (Multiple choice)  
24. A fish cleans the teeth of other fish by eating away plaque. This is an example of __________ between fish. (Multiple choice)  
25. Which of the following rocks are created from magma? (Multiple choice)  
26. Which of the following animals are most likely to live in a tropical rain forest? (Multiple choice)  
27. The theory of continental drift is supported by which of the following? (Multiple choice)  

The results of the assessment show that the students’ strengths are landforms, specific types of organisms, ecosystems, basic science vocabulary and heat transfer. The weaknesses of the students include questions related to earth and space science, details about plants and relationships among organisms, different types of energy, relationship between heat and volume of a substance, photosynthesis, cells and continental drift. The students had more weaknesses in science content than strengths, and answered eleven questions with 100% accuracy and sixteen without. The percentages were reported to the teachers to document strengths and weaknesses.
Teacher background

The science teachers taught in different districts before employment at Pinewood Middle School with the exception of the Ms. Hershey, sixth grade teacher. Ms. Hershey taught sixth grade at Pinewood Middle School for four consecutive years but at the time of this study taught English and History at the high school.

Mr. Curtis taught science at a middle school in Central Ohio for four years before coming to Pinewood Middle School. He taught seventh and eighth grade science at Pinewood Middle School, but now taught fourth grade at Pinewood Elementary.

Ms. Waverly taught middle school science in Hawaii before her employment at Pinewood Middle School. This was her first year teaching science at Pinewood Middle School.

The backgrounds of the science teachers were similar in the fact that the focus subject that was taught by all was science. The differences included the location and number of years taught at Pinewood Middle School.

Student performance

The teachers’ reactions to the Science Academic Content Standard Assessment were very similar. They were not surprised by the gaps in scientific concept knowledge and caused complications for each.

Ms. Hershey had a problem with the students retaining information from lessons they would later need to know for the unit test. She believed that the learning styles of the children varied greatly. Therefore she used different instructional strategies to help the students retain science concepts. However, they still had problems retaining information. She believed that the eighth grade students were motivated and interested in
science but that their grades suffered when it came to assessment. Ms. Hershey quoted, “The year I had the [current] eighth grade students was definitely a challenging year. The students lacked background knowledge of science concepts. This particular group of students was always eager to learn, but no doubt a challenge.”

The challenges that Mr. Curtis encountered during his year of teaching the current eighth grade students were similar. The students had difficulty remembering concepts that were taught despite engaging and differentiated lessons. He claimed he was very frustrated at times teaching this group of students, and had tried to find a cause to the problem. He believed that the allotted time he had for science instruction was a cause. In addition, these students came from low socioeconomic status homes lacking parental involvement. He argued that, “The connection between home and school is very important in any child’s education especially if the parents want the students to be successful.” He believed the eighth grade students were motivated and interested science but rarely retained the information longer than a span of a week or less.

Ms. Waverly emphasized that re-teaching was a common thing she had to do. She believed that the students were capable of retaining science information. She stated that she changed her instruction continuously until the students were successful. When asked to define “re-teaching”, she stated, “I would have to teach the whole concept over again, but differentiate the method of instruction and assess if the students understood it throughout and at the end of the lesson.” She also agreed that teaching this particular group of eighth grade students was a challenge.

All three each found it challenging to teach these eighth grade students at Pinewood Middle School. In fact, they agreed that these students had a hard time
connecting personal experiences, background knowledge and the science standard. An additional theme throughout the interviews included their conviction that these were nonetheless interested in and motivated to learn science. The teachers also argued they used differentiated inquiry-based instruction.

**Instructional methods**

Research suggests that inquiry is effective method of teaching science. Inquiry-based instruction supports long term retention of a science concept. The science teachers at Pinewood Middle School supported the concept of inquiry-based learning.

Ms. Hershey explained that her methods of instruction in science she used with the current eighth grade students always included hands-on materials, experiments and lessons. One negative connotation she held, however, towards hands-on learning was she continuously ended up paying for resources from her own income. The resources available for science instruction were very limited so she had to “make do” with the little that was available. She had a science textbook to accompany her curriculum and suggested that reading about a science concept helps students to better understand and retain information. When asked how the science curriculum could be strengthened she replied that she needed more resources and instructional time.

Mr. Curtis agreed when asked the same question about strengthening the science curriculum. His method of science instruction was not merely inquiry-based. He strongly emphasized that he differentiates his instruction with videos, games, projects, real-life scenarios, engaging discussion and the textbook, when necessary. The time he was allotted for this type of science instruction was limited, especially when it came to labs that easily take more than the 30-40 minutes. He claimed to although he had taught all
required seventh grade standards is was a challenge to help the students make connections to science concepts they should learned at prior grade levels.

Ms. Hershey was a strong advocate of inquiry-based learning. She explained that students need to develop their own understandings of a concept by being posed with a question or a vocabulary word, and then through hands-on experiences be led to grasp the scientific phenomenon. She believed that her students were not used to thinking on their own and building their own concepts. This was a challenge throughout the academic school year. She indicated that she starts each day with a learning goal that will hopefully met and understood by her students. She indicated she uses formative assessment to drive her instruction, and that when her students do not display adequate knowledge of the science concept she will address it in a different manner. She has incorporated models, writing, graphs, experiments, technology and other differentiated methods to help students retain the required academic content standards.

She spent the beginning of the year gauging the students’ scientific knowledge and determined there were significant gaps in their understanding and content knowledge. She had a hard time teaching them new content because she had to go back and re-teach science concepts as far back as kindergarten. She stated, however, that she was able to teach all required science standards for eighth grade with the exception of those for energy and chemistry.

The challenges that she faced included being able to connect prior science knowledge to her lessons. Her students were challenged to complete a lab on their own or create a scientific model or graph. Resource availability also posed a problem as well
as the amount of time allotted to science. She explained she only used the textbook as a reference or to help students study for the unit test.

When asked about strengthening the science instruction at Pinewood Middle School, Ms. Waverly stressed the lack of available resources to teach science. She believed that the school lacked basic materials in science such as Bunsen burners, chemicals and other things that are required for the students to understand and grasp a concept. She believed that science teachers do need to be held accountable for the standards they are supposed to teach and be monitored for using effective instructional methods.

All three science teachers thought that they needed more instructional time as well as more resources. They also agreed that eighth grade students learn best through hands-on experiences and inquiry-based learning and to only use the textbook as a reference. A significant difference, however, was that Ms. Waverly used formative assessment as an instructional tool whereas Ms. Hershey and Mr. Curtis did not.

The time available for the science teachers at Pinewood Middle ranged from 30 to 40 minutes each school day whereas language arts and math that were allotted 90 minutes of instructional time. All three also believed the school administration did not allocate a sufficient amount of time for teaching science and that science would be better served under a block schedule, as this would allow for more time to effectively engage students in learning science.

Although science was meant to be taught on a daily basis at Pinewood Middle School, the administrators did not mandate this until the current academic year. Ms. Waverly explained that the principal checked lesson plans and learning goals on a bi-
weekly basis but did not make any changes in the schedule to allow more time for science instruction.

Science And Technology Concept Program

The Science And Technology Concepts Program-Secondary (STC) is a 16-unit, inquiry-centered middle school science curriculum developed by the Smithsonian Science Education Center (SSEC), an organization of the Smithsonian Institution. Each STC-Secondary unit provides opportunities for students to experience scientific phenomena firsthand. A comprehensive, research-based curriculum, STC-Secondary is aligned with the National Science Education Standards (NSES) of the National Research Council (NRC) (see http://www.carolinacurriculum.com/STC)

Ms. Hershey and Mr. Curtis expressed their dislike of the STC-Secondary. They argued the modules fail to supply sufficient non-renewable resources which are expensive to replace. Although they were familiar with the concept of science modules, not being previously acquainted, led them to be disinclined to use the program in their own classroom.

In contrast, Ms. Waverly had previously used the STC-Secondary program at her school in Hawaii and argued that it strengthened the curriculum. She believed that it helped teachers save time planning lessons and included excellent resources to motivate students. Although she was aware of its relatively high cost, she indicated that the company sometimes offers free trials for short periods of time. She also noted that she was interested in proposing the idea of the STC-Secondary program to the Pinewood Middle School administration as an avenue for strengthening the school’s science curriculum through hands-on, inquiry-based science instruction.
Importance of science

The teacher-survey included twelve Likert-scale questions ranging from 1 [strongly disagree] to 5 [strongly agree]. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I believe science should be taught daily.</td>
<td>5</td>
</tr>
<tr>
<td>2. Science should be taught through reading.</td>
<td>5</td>
</tr>
<tr>
<td>3. Science instruction should be inquiry-based.</td>
<td>5</td>
</tr>
<tr>
<td>4. I enjoy teaching science.</td>
<td>5</td>
</tr>
<tr>
<td>5. Students rarely retain science information.</td>
<td>3</td>
</tr>
<tr>
<td>6. I make it a priority to teach all science content standards.</td>
<td>5</td>
</tr>
<tr>
<td>7. Teaching science is hard.</td>
<td>4</td>
</tr>
<tr>
<td>8. Most of my students enjoy science.</td>
<td>4</td>
</tr>
<tr>
<td>9. I find it hard to teach science on a daily basis.</td>
<td>2</td>
</tr>
<tr>
<td>10. Teaching math is more important than science.</td>
<td>2</td>
</tr>
<tr>
<td>11. Teaching social studies is more important than science.</td>
<td>2</td>
</tr>
</tbody>
</table>

The results of the Likert-scale survey indicate that the three teachers enjoy teaching science using inquiry-based instruction and reading. The results suggest they believed that science is not less important than any other content area and should be taught on a daily basis.

Summary

The three science teachers at Pinewood Middle School who participated in this study were very passionate about their school, students, and the science curriculum. They sincerely desired to make a difference. They agreed that lack of instructional time, resources, and parental involvement as well as lack of prior knowledge were important factors in the retention of science content knowledge retention among the eighth grade students at their school.
CHAPTER 5
SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This research study included three teachers and sixteen eighth grade students from Pinewood Middle School. The eighth grade students completed a Science Academic Content Standard Assessment that was a significant part of the interview with the three science teachers. The researcher conducted interviews with the three science teachers addressing factors that contributed to the retention or absence of science content knowledge of grades four through eight. The interview questionnaire was designed to address the science teachers’ perceptions toward the retention of science content among the eighth graders and factors that contributed to this problem.

The specific scientific objectives of this research are to assess the perceptions of teachers of science content knowledge retention among eighth grade students based on the Ohio Academic Science Content. Prior research on this topic suggests different approaches to science instruction lead to different levels of knowledge retention. The purpose of this study is to assess teacher perceptions on various factors that affect science knowledge retention. The literature review documents that there are several contributing factors that affect science knowledge retention. Several factors may have a great contribution to the retention of science knowledge retention than others such as socioeconomic status, school culture, resources, teacher’s methods of instruction and student’s motivation to learn science content.
The findings of the research show that the eighth grade students show a lack of knowledge regarding science content standards. The weaknesses of the student’s scores on several questions in the assessment show that certain science concepts such as heat and volume, scientific tools, animal relationships, rock cycle and formation, environmental science and earth space sciences indicate that the science content was not retained throughout grades four to seven.

The interviews with the teachers address that all of the teachers agreed that the eighth grade students had a significant gap in science content knowledge. The teachers believed that the factors that contributed to the lack of science content knowledge retention include resources, science instructional time, parental involvement, socioeconomic status of the district, administrative support and science importance district wide. These factors were the main themes of the interview with all of the science teachers at Pinewood Middle School. Most of the teachers shared similar perspectives on what were the causes of the lack of retention of science content among the eighth grade students. The causes of the lack of science content retention included all of the factors listed above.

Conclusion

The research study indicated that the science teachers at Pinewood Middle School believed that the students retention of science content knowledge was based on several factors, but each teacher offered the best science instruction he or she could to help address the lack of science content retention. Each science teacher believed that hands-on and inquiry based learning would help address the problem of the eighth grade students not retaining science information. The teacher’s took account the student’s
interest and motivation toward learning science. The science teachers at Pinewood Middle School always put their student’s needs and interest first by creating a positive and engaging learning environment. According to Neal (2004), students who are actively engaged in their learning have an opportunity to express their thoughts, opinions, and ideas in such a way that the material is made more interesting to them. This provides a more meaningful learning experience than a classroom using a lecture mode of instruction. The methods of instruction that the science teachers used in the research study did not seem to be the contributing factor to the lack of science content knowledge.

The science teachers in grade four and five were not able to be interviewed, and could have addressed several issues that could contribute to the major lack of science content knowledge retention among the eighth grade students. Parental involvement and socioeconomic status of the eighth grade students could also be a contributing factor, but this was not investigated during the study. Administrative support at Pinewood Middle School seems to only be apparent during the recent academic school year addressed by the eighth grade science teacher. The administrators of Pinewood Middle School were not interviewed during the study, but also could be a link to the lack of retention of science content among the eighth grade students. The key to success in science content knowledge retention would be for the whole school community of Pinewood Middle School working towards strengthening science curriculum at each grade level and working with one another to deliver the best methods of science instruction for the middle school students.
Recommendations

In order to evaluate the factors that contribute to the lack of science content knowledge among the eighth grade students more research would be need to be done and investigated. Several members of the school community such as administrators or the other science teachers that would not participate in the research study would need to be interviewed or more eighth grade students from the specific cohort would need to be assessed. The science content standards the eighth grade students were taught in grades four through seven would need to be evaluated and assessed. Data collection and analysis would need to be done to address the specific standards and each grade level that the lack of content retention occurred. This would be helpful to address the problem of middle school students not retaining science content at Pinewood Middle School. Science content knowledge is something that must be built upon throughout each grade level and gaps in science content knowledge can cause this problem that was seen at Pinewood Middle School.
Title of Research: Teacher Perceptions of Science Content Knowledge Retention of among Eighth Grade Students

Researcher: Alyssa Lohrman

You are being asked permission for your child to participate in research. For you to be able to decide whether you want your child to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your child’s personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your child’s participation in this study. You should receive a copy of this document to take with you.

**Explanation of Study**

This study is being done to find out information about science content retention among eighth grade students.

If you agree to allow your child participates, your child will be asked to participate in a science content knowledge assessment.

Your child should not participate in this study if he or she has not attended Trimble Local Schools, grade four to present.

Your child’s participation in the assessment will last approximately 50 minutes and be part of the regular school day.

**Risks and Discomforts**

No risks or discomforts are anticipated.

**Benefits**

This study is important because it will offer insights into factors that help students retain science content knowledge.
Confidentiality and Records
Your child’s study information will be kept confidential by…

* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU;

Contact Information
If you have any questions regarding this study, please contact Alyssa Lohrman (513)309-9478 al105107@ohio.edu or Dr. Frans Doppen doppen@ohio.edu

If you have any questions regarding your child’s rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740)593-0664.

By signing below, you are agreeing that:
- you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
- you have been informed of potential risks to your child and they have been explained to your satisfaction.
- you understand Ohio University has no funds set aside for any injuries your child might receive as a result of participating in this study
- you are 18 years of age or older
- your child’s participation in this research is completely voluntary
- your child may leave the study at any time. If your child decides to stop participating in the study, there will be no penalty to your child and he/she will not lose any benefits to which he/she is otherwise entitled.

Parent Signature____________________ Date______

Printed Name________________________

Child’s Name________________________
APPENDIX B

ASSENT SCRIPT FOR MINOR PARTICIPANTS IN STUDY

I am currently working with your science teacher on issues related to the teaching and learning of science. Your teacher has agreed to help me with a research project on this topic by providing me with an opportunity assess your class.

I am interested in finding out what you science content knowledge you retained from grades four to eighth. I will be giving you an assessment that has several questions on it regarding science information that you have learned in prior grades.

There is no risk to you at all. Your teacher will not receive the data until after you finish his/her course; the data will in no way affect your grades. You do not have to participate in this assessment. You may leave your assessment blank. If you do participate, you are free to withdraw your consent to participate and to discontinue participation in the study at any time. All assessments will be turned into a box and I will not know who turned in the blank assessment, because no one taking the assessment will put their name on the document.

Do you understand the purpose and procedures for the study, and if so, do you wish to participate in this study?
Answer all questions.

1. **What type of process is erosion?**
   a. constructive  
   b. destructive  
   c. weather  
   d. landforms  

2. **What type of process is deposition?**
   a. constructive  
   b. destructive  
   c. weather  
   d. landforms  

3. **What type of map is this a picture of?**

4. **I am a scientist observing a creek habitat. I notice that there is a high population of beavers and a low population of fish. What is happening in this habitat? (Must Use the terms predator, prey, population, survival and habitat)**
5. What can you infer about this organism in this fossil? 

a. The organism lived in a body of water.
b. The organism was living before made into a fossil.
c. All of the above

6. Mrs. Jamison has a piece of banana bread for lunch, but her little daughter crumbles it all into pieces. Does Mrs. Jamison’s banana bread have the total amount of matter after her daughter crumbled it? Explain.

7. What are two ways to change a substance from one state of matter to another?

1. ________________________________

2. ________________________________
8. Jane leaves a cup of water in the hot car for a whole afternoon. What would happen to volume of the water?
   a. The volume would stay the same.
   b. The volume would increase.
   c. The volume would decrease.

9. Match the vocabulary words with the definitions

   a. _____ herbivore  F. organisms that break down decay
   b. _____ carnivore   G. organisms that only eat meat
   c. _____ omnivore   H. organisms that only eat plants
   d. _____ decomposer I. organisms that produce their own food
   e. _____ producer   J. organisms that eat both plants and meat

10. True of False? __________

    Energy in this food chain is not transferred from one organism to another.

11. Jimmy touches with his hand a hot metal spoon in a pot of noodles. What type of heat transfer is happening?

    a. Conduction
    b. Convection
    c. Radiation
    d. There is no heat transfer at all.
12. What process is happening in this picture above?

   a. Respiration
   b. Condensation
   c. Photosynthesis
   d. Oxygen cycle

13. True or False? ____________

   The physical and chemical properties in a substance remain unchanged in a chemical change.

14. What source can electric energy be produced from?

   a. Sun
   b. Wind
   c. Coal
15. Describe how day and night are caused by Earth’s rotation. You may draw a diagram to help with your explanation.

16. Jake rolls a ball across a smooth table and measures the distance. The ball travels 8 cm. He then rolls the ball over carpet and it travels 4 cm. He used the same amount of force both times rolling the ball across the different areas. What caused the ball to travel slower on the carpet? Use the word friction and force in your explanation.

17. A hypothesis is ______.
   a. a simplification of or substitute for what is being studied.
   b. The raw data collection from an experiment
   c. An unproven theory or educated guess to explain a phenomenon.
   d. The independent variable in an experiment

18. A three beam balance is most appropriately used to measure the mass of which of the following?
   a. Seven paper clips
   b. Three oranges
   c. Two hundred cells
   d. One student’s elbow

19. The measure of the pull of Earth’s gravity on an object is called
   a. Mass number
   b. Atomic number
   c. Mass
   d. Weight

20. When heat is added to most solids, they expand. Why is this the case?
   a. The molecules get bigger.
   b. The faster molecular motion leads to greater distance between the molecules
   c. The molecules develop greater repelling electric forces.
   d. The molecules form a more rigid structure.
21. What cell organelle contains the cell’s stored food?
   a. Vacuoles
   b. Golgi Apparatus
   c. Ribosomes
   d. Lysosomes

22. Which of the following is not a necessary characteristic of living things?
   a. movement
   b. reduction of local entropy
   c. ability to cause local energy from changes
   d. reproduction

23. Which of the following organisms uses spores to reproduce?
   a. fish
   b. flowering plants
   c. conifers
   d. ferns

24. A fish cleans the teeth of other fish by eating away plaque. This is an example of _______ between fish.
   a. parasitism
   b. symbiosis
   c. competition
   d. predation

25. Which of the following rocks are created from magma?
   a. fossils
   b. sedimentary
   c. metamorphic
   d. igneous

26. Which of the following animals are most likely to live in a tropical rain forest?
   a. Reindeer
   b. Monkeys
   c. Puffins
   d. Bears

27. The theory of continental drift is supported by which of the following?
   e. The way the shapes of South America and Europe fit together
   f. The way the shapes of Europe and Asia fit together.
   g. The way the shapes of South America and Africa fit together
   h. The way the shapes of North America and Antarctica fit together
Teacher Interview Questionnaire

Background about science teacher

1. How long have you been a teacher at Trimble Local Schools?

2. What grade do you currently teach?

3. What grades have you previously taught, if different, in Trimble School District?

Information about current eighth grade students

4. What is your assessment of the results of the Science Content Standard Assessment?

5. What can you tell me about the current eighth grade students with regard to …?
   a. their learning styles
   b. abilities and needs
   c. attitudes toward science
   d. involvement in the classroom
   e. grades
   f. retention of science content?

6. What challenges have you encountered in teaching science to this year’s eighth graders?

7. What gaps in science content knowledge, if any, did/have you observed in this year’s eighth graders?

Methods of Science Instruction & Required Science Content Standards

8. What methods of instruction did/do you use in your daily classroom for science instruction?

9. What methods do you believe are most effective in teaching science curriculum?

10. Did/do you have a science textbook?
11. What content standards were you required to cover when/now that you had/have the current eighth graders? Were/are you able to cover all of the content standards?

12. What do you believe will help strengthen science curriculum and instruction at Trimble Middle School?

Amount of time allotted

13. Do you believe we/Trimble dedicate[s] sufficient time to teaching science? Why or why not?

14. How often on a weekly basis must science curriculum must be taught at each grade level?

Importance of Science Curriculum

15. How important has teaching science been at your school throughout the last four years?

16. Does your administration support teaching science?

17. When you taught [As you teach] the current eighth grades was/is science content required on the Ohio Academic Achievement test?

Retention of Science Content

18. Do you believe students retain science content from previous years, or lose it instantaneously after the unit test? Please explain.

19. What methods do you think can be used to help students better retain science content?

20. How do you believe children best retain science content?

21. What is the most effective way for students to retain science content?
22. What have you done in your science classroom to address a possible lack of science content?

23. If you agree there is such a lack, what do you believe is the cause of the eighth grade students lacking science content knowledge?

24. What do you believe can be done to help students retain science content knowledge they are expected to have gained in prior years?

25. How motivated were/are the current eighth grade students to learn science?

26. What methods did you use to motivate the students to learn science?

27. Are there any other factors that you think affect student learning and retention of science content knowledge?

Science Technology Concept Program

1. Have you ever heard of the Science Technology Concept Program in helping improve science instruction and retention of science information for students? (If no, show the teacher the Science Technology Concept Program website to show the information)

2. What do you believe would be benefits to science instruction using this program?

3. How do you think the Science Technology Concept Program would help students retain state required science content knowledge?

4. Would this help in your lesson planning and instruction of science curriculum? Please explain.

5. Would you be interested in using this program in your classroom?
Perception towards the importance of Science Curriculum

<table>
<thead>
<tr>
<th>Perception</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe science should be taught daily.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Science should be taught through reading.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Science instruction should be inquiry-based.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I enjoy teaching science.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Students rarely retain science information.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I make it a priority to teach all science content standards.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Teaching science is hard.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Most of my students enjoy science.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I find it hard to teach science on a daily basis.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Teaching language arts is more important than science.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Teaching math is more important than science.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Teaching social studies is more important than science.</td>
<td>1 2 3 4 5</td>
</tr>
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</table>
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Steinberg, M. (2012). Listening to their voices: Middle schoolers' perspective on life in middle school. *Qualitative Report, 17*(68), 1-14.


