

Using Classroom Management Strategies in an Inquiry Classroom

by

Angelica Matias

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by

Angelica Matias

Approved By:

Thomas R. Allen

7/28/11

Advisor

David J. Ingolf

Date

08.16.11

Director, Graduate Programs

Date

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Chapter I: Introduction

One challenge that many teachers face when implementing inquiry learning in their classrooms is management. Inquiry learning is by nature student-centered. Students' questions and interests are an important component to the inquiry-based model of instruction. Teachers can see this component as a challenge because of the distractions and problems that can occur during increased freedom associated with independent student problem solving.

Problem Statement

Research supports the benefits of student-centered instruction. Students are more likely to develop deeper understandings of concepts when they can construct their own knowledge. Because of certain factors such as time constraints, teachers can find it difficult to allow students the freedom to explore concepts and search for answers to questions generated by the students. Teachers can often feel compelled to provide students with the answers to unplanned questions that arise during a lesson or investigation to move the lesson or investigation along. This pressure to cover curriculum with such a limited time frame combined with teachers' need to feel in control of the classroom can lead to teachers avoiding the full or correct implementation of inquiry-based instruction.

Significance of the Problem

When teachers avoid implementing or implement in an incomplete way inquiry-based instruction in the classroom, students are at a disadvantage. They are missing out on the chance to experience science as a process. In a classroom that lacks quality inquiry-based instruction students will come to see science as content

that has little to no meaning for them as opposed to a process of which they are an active part. It is the students' active role in an inquiry classroom that is the key to students developing problem solving skills that can be applied, not only to science, but to other academic areas as well.

Purpose

Current research strongly advocates for the use of a more student-centered model of instruction which goes along with the inquiry-based learning model. Because teachers face certain management challenges when attempting to implement this style of instruction in their classroom, I thought it would be useful to explore the different management strategies that could help teachers to allow students the freedom necessary to complete inquiry-based activities. The goal is to lessen teacher frustration by directly relating management strategies to inquiry lessons. The strategies would be targeted at the specific challenges that teachers face when attempting to "teach" lessons that are more student-centered.

Rationale

Time is an extremely valuable and limited resource to teachers. I teach third grade in the Rochester City School District and know firsthand how much of a challenge it can be to cover the required curriculum in the time allotted each day. Teachers receive pacing charts for every subject to give them a general idea of how long they should be spending on one topic/unit before moving on to the next. I have found it very difficult to stay at all close to the pacing guides for science and social studies in particular. The administration requires that ninety minutes be allotted to reading, sixty to writing, and sixty to math. After accounting for the thirty minutes

for lunch and special, that leaves about twenty five to thirty minutes for science or social studies. All of the third grade teachers in my building alternate teaching science and social studies. We will cover one chapter of science and then cover one chapter of social studies and so on. Cover would be the perfect word to describe what I feel like I'm doing sometimes. I feel like I have been in a race against time to cover the material that has been deemed necessary by the district.

Teachers and researchers sometimes suggest integrating science into ELA instruction as a way to deal with time constraints. I feel that the benefits of this approach can be overrated and that there can also be some negative consequences as well. I have observed teachers who use the "science" time in their schedules to reinforce reading comprehension skills. Students are introduced to new vocabulary at the beginning of each new lesson. They then read the lesson in their science books and answer the review questions found at the end of the lesson. Each science lesson is relatively the same with the occasional Venn Diagram, chart, or fill in the blank activity thrown in to add variety. At the end of the chapter a text book assessment (paper and pencil test) is copied and distributed to students. Students then show how much of the content they have "learned" by answering multiple choice, matching, fill in the blank, and a few open-ended questions. Both the manner of instruction and assessment are more closely related to reading comprehension objectives than science. The assessments assess whether or not students comprehended the text that they've read. The fact that the text was science-related is of little or no consequence.

While this approach can help create opportunities to expose students to science content, it does, little if anything to address the lack of inquiry experience

students receive. This approach, more often than not, uses science content to help increase reading and writing achievement and can water down the science curriculum. I feel that if teachers had more student-centered management strategies readily available to them, they would be less cautious about devoting time to inquiry-based instruction because they would feel more in control of the time spent.

Summary

Researchers tend to agree that both teachers and students miss out when inquiry-based instruction is done improperly or left out all together. So, what exactly are the benefits of a student-centered; inquiry approach? If it has so many benefits, why do some teachers not teach more student-centered and inquiry-based science units? How do we get teachers to buy into this approach in an age of high-stakes testing when science is not being tested to the same extent as math and language arts?

The goal of the research is to address the management issues that will arise during inquiry-based instruction. One important challenge that will be addressed is the issue of using time efficiently and effectively. The use of time is also related to other issues of management such as participation and engagement of students as well as finding reliable ways to assess students' understanding of the processes involved in inquiry.

The students in my class often show an extreme level of frustration when faced with the prospect of problem solving. They prefer strong direction from teacher and clearly laid out expectations. Freedom to explore and generate ideas and questions is not seen as freedom at all but as a source of frustration. It is important

for teachers to find ways to help guide students through that frustration while leaving most of the control in the hands of the students.

The research surrounding the topics of inquiry and classroom management address three main issues. The issues are: the importance of inquiry-based learning, classroom management challenges, and possible solutions to those challenges.

Definition of Terms

Science Inquiry- the process of asking and answering science related questions

Inquiry-based learning/instruction- instruction that is student-centered and driven by students' questions and plans to answer those questions

Chapter II: Literature Review

Why Inquiry-Based Learning is Important

Researchers have come to some common conclusions about the importance of quality science instruction. They also have very similar beliefs as to the best practice for delivering science instruction. Akinoglu (2008) comments on the complexity and importance of science instruction. He says that science plays a prominent role in the changing world we live in. Akinoglu believes that project activities are a key educational activity because they allow students to learn by doing and promote inquiry-based active learning. Akinoglu conducted a study in which ninety teachers from twenty-four primary schools in Istanbul participated. He identified areas in which the most obvious benefits were gained by students. The top three areas identified were: to learn and understand the subject matters in science and technology class, to develop their skills of creative thinking, and to develop their cooperative learning skills. It is important to notice that the benefits of inquiry-based learning go beyond academic gains measured by content knowledge gained and include benefits such as problem solving skills, scientific writing and reasoning skills, questioning skills, and critical thinking skills (Tessier, 2010)

Lawson (2000) acknowledges the, "... need to teach science in a 'hands-on,' 'minds on' investigative way that engages students in active inquiry" (Lawson, 2000, p.641). Keys and Kennedy (1999) have pointed out that there has in fact been a shift in thinking about inquiry that is now more based on active engagement than thought processes. They say that inquiry involves more than how scientists think; it is also about what they do. The core concepts of a constructivist perspective are strongly

related to the core concepts of inquiry-based learning. Scott, Mortimer, Leach, & Asoko (1994) comment, “The core commitment of a constructivist position, that knowledge is not transmitted directly from one knower to another, but is actively built up by the learner, is shared by a wide range of different research traditions relating to science education” (Scott et al., 1994, p.5). Cobern, Schuster, Adams, Applegate, Skjold, Undreiu, Loving, and Gobert (2010) also acknowledge that many educators see inquiry-based instruction as more beneficial than a direct instruction approach. They say that educators see a strong correlation between the benefits and similarities to the constructivist theory of learning; a student-centered approach. The goal of the research conducted by Cobern et al is to gather convincing evidence of the benefits of inquiry instruction over direct instruction. They were not able to gather the credible evidence that they were after to prove such a difference existed. More research is necessary to compare the benefits of inquiry instruction and direct instruction of science.

Buczynski and Hansen (2010) point out that every science reform movement has included a focus on the importance of inquiry. They say, “Fusing content and inquiry together in teaching methodology offers the opportunity to increase students’ experience with authentic activities of scientists while also building on a content knowledge base” (p. 600). Gilbert (2009) also cites previous research and earlier reform movements to support an inquiry-based approach to scientific investigation. He specifically cites the work of Barba (1998), Llewellyn (2002), Stewart and Kluwin (2001); saying that the constructivist approach which allows students to observe and

construct new knowledge based on those observations and make connections to prior knowledge, is supportive of the inquiry-based approach.

Challenges to Implementation of Inquiry-Based Teaching Methods

Inquiry can be viewed in different ways. There are many broad definitions available to those willing to look for them. These general definitions, do not address the challenges of teaching inquiry. They contribute little, if any help as teachers try to implement inquiry strategies in the classroom (Keys and Kennedy, 1999, 315). Teachers can feel uncomfortable implementing something with so much uncertainty attached to it.

Krajcik et al. (1999) comment on the studies that have been done on the benefits of inquiry learning. Similar to Keys and Kennedy, Krajcik et al. (1999) believes that a more applicable and realistic view of inquiry learning needs to be shared with teachers in order for it be of value in the classroom. They agree that a vague and inapplicable definition of what inquiry-based learning is as it is related to science leaves teachers with little direction when it comes to implementation. Teachers need to have their role clearly defined in an inquiry classroom in order to successfully implement science instruction through an inquiry approach.

Scott et al. (1994) discuss the problematic relationships between scientific knowledge, the learning of science, and pedagogy. They say that it is important for science educators to teach students how to think about science, ask questions, and investigate scientific ideas. They go on to define the teacher's role as providing the physical experiences and encouraging reflection. Scott et al. (1994) note that teaching science this way creates a challenge for teachers who themselves have to

learn this new process. Teachers should act as guides for students, giving them the tools necessary to be successful in an inquiry classroom.

Research has been conducted to connect the perspectives and attitudes of teachers and teacher candidates to actual classroom practice. In other words, how the beliefs of the teacher affect what students learn. Hume and Coll (2010) attribute a high correlation between the teachers' intended curricula and what students experienced to the fact that teachers made a deliberate effort to teach science in a particular way. They say that teachers were influenced less by national policy and more by the interpretations of the policy by school science departments. Identifying the source of influence on teachers helps to give some perspective on what motivates teachers to teach science a certain way.

Yet another researcher who examines the attitudes of educators towards science is Seung-Yoeun. Seung-Yoeun (2010) looks at the attitudes of early childhood educators and the influence that their attitudes have on their instruction. Seung-Yoeun's study explores how teachers' attitudes towards science change after the use of the process of reflective thinking with reflective journals and portfolios as a critical component of the process. The participants in the study are four teachers. The data collected was based on reflective journal entries, videotaped teaching episodes, and discussions of the teaching experiences. Through the study conducted, Seung-Yoeun concludes that teachers' attitude is an essential component that influences the success of science instruction. Another result of the study was that teachers developed a better understanding of the process of understanding science rather than memorizing and owning scientific knowledge.

Apostolou and Koulaidis (2010) focus their study on the epistemological views of secondary science teachers. They also make the connection between teachers' views and the instruction that students receive. They claim that, "Scientific or philosophical positions, which in general are not unique, can hide behind a series of decisions, positions and attitudes that seem self-evident" (p. 163). Their hope is that their study will help make teachers aware of their epistemological views and ultimately use that information to improve their instruction.

The purpose of the study conducted by Gilbert (2009) was to investigate how teacher candidates were able to connect their philosophy of science with their science practice. Most of the candidates included inquiry-based and constructivist approaches as desirable in their philosophy statements which they wrote at the beginning of the study. They then used their philosophy statements to identify gaps between their philosophy and the lessons they created. They redesigned their lesson plans and taught the revised lessons in their field placement. Their ideas about inquiry-based instruction changed when they entered their field placements. The teacher candidates were far more concerned with maintaining control and began to see taking a constructivist and inquiry-based approach as creating chaos. They saw their field placements as being too restrictive for the approaches that they had expressed in their philosophy statements. Teachers abandon their ideas of constructivism and inquiry-based teaching, not because they no longer believe that it is the best approach, but because they feel limited by factors such as time, standards, test pressure, etc.

Researchers have made connections between inquiry-based approaches and classroom management issues. Harris and Rooks (2010) claim that, “enacting inquiry-based instruction requires a different kind of approach to classroom management that takes into account the close-knit relationship between management and instruction” (p.227). They see the need to address these management issues as “pervasive”. Harris and Rooks (2010) agree with other researchers who say that teachers find it challenging to manage an inquiry classroom. They therefore believe that it is of great importance to examine the necessary changes that teachers will have to make to their classrooms to promote science learning through inquiry. They focus on the “practical problems” such as managing students, materials, tasks, science ideas, and the social aspects of inquiry classrooms.

Lawson (2000) also recognizes that certain classroom management problems can arise when attempting to teach inquiry lessons. Lawson (2000) describes these problems and offers possible solutions. Some of the key problems identified are; student participation, getting students started, lack of background knowledge, and students not wanting to think for themselves. Keys and Kennedy (1999) have identified similar problems such as equipment and safety as well as other management issues.

The participants in a study conducted by Akinoglu (2008) identified two main deficiencies in making science projects. The first was time constraints and the second was their lack of training on creating science projects. Buczynski and Hansen (2010) also identify time constraints as a challenge to implementing inquiry-based instruction. Teachers felt pressure from a district pacing guide that did not reflect

consideration for inquiry pedagogy and because of this, investigations were cut from science instruction.

Fang, Lamme, Pringle, Patrick, Sanders, Zmach, Charbonnet, and Henkel (2008) conducted a study that examined the benefits of integrating reading into middle school science. One of the biggest concerns of the participant teachers was the issue of time. They already felt pressure to cover science content and felt that it would be difficult to commit to the thirty to forty minute blocks that researchers asked for the integrated instruction. Because of limited time, teachers can find it challenging to allow students the freedom to explore concepts and search for answers to questions that are student-generated. Teachers will often give the answer to a spontaneously generated question to move a lesson along instead of letting students explore.

Working in a group is an important and proven effective part of inquiry-based lessons. “Cooperative learning can help develop appropriate social skills, increase retention of knowledge, improve self-esteem, foster motivation, and enhance the overall learning experience” (Parr, 2007, p.21). However, cooperative learning can be seen by some teachers as a challenge because of the behavior problems that can occur during group work. Cooperative learning poses a challenge to teachers who are unsure of how to implement certain aspects while maintaining control in their classroom. Harris and Rooks (2010) also believe that teaching students how to collaborate effectively with classmates is an important part of the teacher’s role in the management of an inquiry classroom.

The increased freedom that is associated with independent student problem-solving can lead to an increase in certain undesirable behaviors. In their article titled “In Putting the Cart Before the Horse” Geiken, Van Meeteren, and Kato (2009) cite research that supports the benefits of inquiry-based curriculum and recognize the time and effort of teachers in attempting to plan inquiry-based investigations. Some of these undesirable behaviors can include: arguing, being off task, using materials inappropriately, etc. They say that it is important to consider that socio-moral atmosphere of the classroom as a necessary foundation for classroom management. The classroom management strategies suggested by other authors and researchers are more specific to dealing with issues that occur during planned problem-solving or inquiry-based investigations. Geiken, Van Meeteren, and Kato suggest more of an overall approach to managing a classroom that fosters students’ ability to problem-solve in any classroom situation.

Another challenge that teachers face when attempting to implement inquiry-based teaching methods is the “pedagogy of poverty”, identified by Thadani, Cook, Griffis, Wise, and Blakey. The “pedagogy of poverty” refers to a phenomenon of low-income and minority students in the U.S. that are disproportionately subjected to didactic, teacher-controlled instruction. Part of the explanation for this phenomenon is that teachers, students, and others hold lower expectations in these settings. Teachers are therefore less likely to take on the challenges of an inquiry-based learning approach. Teachers in this setting tend to rely on methods that place students in a passive role where they read for information and complete worksheets.

Lack of resources was identified by the participants in the Buczynski and Hansen study as a challenge to implementing an inquiry-based model of instruction. Both money and technology were difficult to come by for the teachers in this study. Most teachers purchased their supplies with their own money which limited what they could do. They also had limited forms of technology available to them. Teachers commented on computers that were not always in working order and an absence of microscopes and balances. The management of instructional materials is another component that affects inquiry learning. Harris and Rooks (2010) comment that teachers will often use materials in a way that reflects how they were taught in school. These methods rarely reveal an authentic inquiry approach. The use of materials to create a hands-on science experience is only part of inquiry learning. This adoption of the superficial features can be observed when a teacher uses materials to teach a science lesson in which students conduct a “recipe” style experiment from a science book. Instead of engaging in genuine inquiry, students follow predetermined steps to recreate an experiment or situation and then to make predictions and record observations. In an inquiry-based science lesson, students would have more freedom to decide which questions to explore as well as more freedom to choose, from the materials provided, those that would be most beneficial in their exploration. This freedom and opportunity for choice account for a significant shift in the classroom management structure for an inquiry classroom.

The teachers in the Buczynski and Hansen study, received professional development that taught them how to plan and implement an inquiry lesson, but once in the classroom they struggled to deal with the behavioral issues that arose. One of

the sixth grade teachers was not able to transfer the knowledge she gained from the professional development to her classroom because she did not account for the lack of skills her students had with material distribution, listening, and group work.

Suggested Strategies

Elementary teachers are spending less and less time on social studies and science instruction. What is even more disconcerting is the reason why. High-stakes testing and increased accountability brought on by The No Child Left Behind Act are forcing teachers to focus more of their instructional time on math and language arts (Thomas and Jones, 2006). One possible solution to this problem of limited time for science instruction is to integrate reading into science. In the study conducted by Fang et al, integration was seen as an opportunity to extend the amount of time that students spent on learning science because it was now part of the ninety-minute reading block in addition to the original thirty minute science block. Fang et al concluded that this integration was indeed beneficial in that it broadened students' knowledge of science. They also believed that it improved their inquiry learning. The researchers found, through the analysis of their data that the students who participated in the integrated model showed significantly greater achievement.

Concerning the problem of time management and how questioning affects it; Bond (2007) suggests writing out some questions when planning the lesson. Planning questions to ask, ahead of time can help assure that the questions will be open-ended and meaningful. Bond also advises that questions be well thought out, meaningful, appropriate. Another management technique used to help minimize behavior problems when questioning is to clearly set expectations before beginning the

questioning period. Bond states that when expectations for discussions are established students will be more successful at completing class tasks and will also develop communication skills that are applicable outside of the classroom. Teaching students how to ask questions is an important part of establishing a foundation for rich discussions. (Bond, 2007, 45).

Parr also shares many of these views on maximizing the benefits of group interactions. One way to make group interactions effective is to set and discuss expectations as soon as groups are established (2007). Assigning roles for each member of the group is one way of keeping all members of the group active and participating. He suggests giving each member of the group a handout which describes each role in detail, have students write their name next to their role, and place the handouts in the front of their science notebooks. He also suggests that the teacher models the task for each group role, which helps students to understand and perform the assigned task. Parr has created a group strategy that she uses with her seventh grade life-science classes called CAR. CAR stands for Collaborate, Agree, and Record. The purpose of CAR is to make sure that students are actively engaged and developing problem-solving skills. Car helps to set clear expectations for students and establish an environment where students can exchange ideas with classmates in a productive way.

Wilder and Heering conducted research to examine the effects of an unknown dependent group contingency on on-task behavior during math instruction in two general education classrooms. In other words, how would rewards that can be earned as a group affect the behavior of students in that group? The teachers in the

classrooms identified items/activities that they thought would be appropriate to use as rewards for students' on-task behavior. Students were given access to the identified reward items/activities if they were identified as being on-task for at least 75% of the observed intervals. The results of the study suggested that group contingencies can be used to increase on-task behavior among third and fourth graders (Wilder and Heering, 2006).

The study conducted by Wilder and Heering explores and makes several good points about dependent group contingencies but is limited by its definition of on-task behavior.

“On-task behavior was defined as students being in their seats (defined as student's buttock touching the seat and all four legs of the chair making contact with the floor) and making eye contact with the teacher, paper, books, or other work-related materials” (Wilder and Heering, 2006, p. 462).

This definition makes me think if it is enough to accept or look for on-task behavior from students. A student or group who can be identified as on-task by this definition can be completely lost during a lesson. It seems to ignore the question of whether or not students are engaged in learning. It also does not account for the fact that students can be engaged in learning and very much on-task without fitting those previously determined guidelines. The definition that Wilder and Heering (2006) use would have to be modified when considering what on-task behavior would look like during an inquiry-based investigation.

The suggestions that Geiken et. al offer are different than some of the others I have found. The classroom management strategies suggested by other authors and researchers are more specific to dealing with issues that occur during planned

problem-solving or inquiry-based investigations; whereas, Geiken et. al suggest more of an overall approach to managing a classroom that fosters students' ability to problem-solve in any classroom situation. They claim that a more teacher-centered environment helps to create a dependency on the teacher that is detrimental to students' problem-solving and decision-making (2009). In order to create a more autonomous classroom setting, they suggest that the teacher consider the children's point of view and involve the children in decision-making. They believe that this can be accomplished by letting students be more involved in the rule-making and conflict resolution processes. Geiken et.al's point can best be summarized by the following quote:

“Establishing socio-moral classroom atmosphere is a process that takes time, commitment, and consistency on the teacher's part. In other words, fostering an autonomous atmosphere is something that needs to be worked on throughout the day, becoming part of the fabric of the children's school experience. The teacher's beliefs in the children's ability to problem-solve leads to interactions that foster children's autonomy. Once children develop autonomy and feel confident in asking questions and sharing ideas, they will do so in all aspects of classroom life. As a result, inquiry will be a natural part of all they do” (2009, 263).

The two strategies/management techniques included in the research that I decided to explore further are: developing group work guidelines and encouraging students to think for themselves (via various activities, types of questioning, and assessments). I am interested in seeing how these strategies/techniques can be applied and modified for an elementary classroom. I have found little research that directly explores the management issues in an elementary, inquiry-based setting. Keys and Kennedy (1999) do come the closest to exploring those issues. Yet they do not offer much data on how successfully those issues were addressed. I hope to be able to offer that kind of data through my action research.

Chapter III: Applications and Evaluations

Design of the Study

The action research was conducted in a third grade classroom in the Rochester City School District. The goal of the research was to address the management issues that teachers encounter during inquiry-based instruction. The purpose of addressing these issues is to maximize learning of both content and skills associated with inquiry learning.

Participants

The participants in this research were 23 third grade students in a public school in the Rochester City School District. There were eleven females and twelve males within the class. Of the 23 students, 18 were African-American, three were Caucasian, and two were Asian-American. The classroom was classified as general education with one classroom teacher. There were two students who had Individualized Education Plans and received services in both language arts and math from a resource teacher. They also received speech services. The school was one of 57 in the Rochester City School District with an enrollment of approximately 750 students in grades K-6.

I was the classroom teacher of the students participating in the study. I have five years teaching experience and all five years have been in the same building and at the third grade level. The training that I have received in teaching inquiry-based science includes one course in undergraduate and one course taken in graduate school at SUNY Brockport.

Procedures for the Study

The study took place over the course of two weeks. The two challenges that were the focus of the study were the management of teacher and student materials and the behavioral issues related to both the cooperative learning aspect and the more student-centered (versus teacher-directed) nature of inquiry-based learning.

The non-inquiry lesson followed the format that had been typical for the school year. I introduced the new lesson and activated students' prior knowledge by asking questions about the topic of the lesson. I then introduced new vocabulary and students recorded the new vocabulary into their science notebooks. Students then read the lesson and answered the lesson review questions. A class discussion of the review questions followed. I led the class discussion; calling on volunteers to respond to each question and moved the discussion along as necessary to accommodate time limits. Students took a quiz to assess their understanding of the material the next day.

The inquiry lesson was more student-centered. Students shared their prior knowledge about plants and I recorded that information on a three column chart labeled with the headings: What we Know, What We Want to Know, and What We've Learned. They then asked questions that they would like to have answered about plants. Those questions were also recorded on the KWL chart. At this stage of the lesson students were presented with certain materials and asked to take a close look at the questions that were generated by the class and choose a question that they would like to explore further. This question selection then drove the next part of the lesson. Students were then divided into groups and were asked to choose from the

available materials to further explore their question. They then used those materials to plan and conduct their investigation.

Instruments for the Study

I collected a baseline measure of data by completing a checklist of observable student behaviors (Appendix A) such as on-task discussions and appropriate use of materials during a non-inquiry based science lesson. The non-inquiry lesson followed the same delivery of instruction that my students had become familiar with during this school year. I also completed a similar checklist (Appendix B) during an inquiry-based science lesson. The checklists were used to highlight and compare the differences between specific student behaviors during the two lessons. Students responded to reflection questions immediately following each lesson (Appendices C and D). The reflection questions focused on students' comfort/confidence level with the work they completed during each lesson as well as their level of engagement and/or frustration during both types of lessons. Students also took a quiz (Appendix E) to determine the extent to which learning objectives were met.

Chapter IV: Results

Classroom Management Strategies

The purpose of this research was to address the management issues that teachers face when implementing inquiry-based lessons in their classrooms. Specific challenges such as time management, management of materials, and student participation/engagement were identified through other research as some of the main areas of concern and frustration for teachers.

This research, conducted over the course of two weeks, was designed to identify if the above mentioned classroom management challenges were more prevalent in an inquiry-based lesson as opposed to a non-inquiry lesson. The next step in the research was to develop and use classroom management strategies to address those issues and to measure the efficacy of those strategies. Data was collected through the use of observation checklists, student reflection questions, and a post-assessment quiz.

Observation Checklists

An observation checklist was used to collect data during each of the science lessons. The checklists (see Appendices A and B) differed slightly from each other. The differences reflect the differences in the format of each lesson. For example, the checklist for the inquiry lesson included aspects such as whether or not students were sitting knee to knee/ eye to eye with their group during their investigation. This was not included on the non-inquiry checklist because there was no group investigation. The purpose of these checklists was to compare student engagement as well as whether or not objectives were met within the time limit.

Non-Inquiry Observation Checklist

The first component of the non-inquiry-based observation checklist (see Appendix A) examined whether or not students were on task. During the beginning of the lesson, students were asked to sit in rows on a rug in front of the teacher while the topic of the lesson and new vocabulary was introduced. On task behavior was defined as students showing “Active Listening” posture (sitting with hands folded in lap, eyes on speaker, and mouth closed). During this part of the lesson, I observed six students who were off-task and needed redirection on at least two separate occasions while on the rug.

During the time that students were at their seats working independently on reading the lesson and answering the lesson review questions, I observed seven students who were off task. The off task behavior that was observed was talking during the independent work period. Five of the seven students needed at least two reminders to get back on task.

The second component of the observation checklist examined whether or not the objectives were met within the time limit. The lesson was planned for 40 minutes. The two measurements used to determine whether the objectives had been met in that time were whether or not students had completed answering the lesson review questions and the quiz results. All students were able to answer the four lesson review questions during the time allotted for the independent work period. However, during the whole group discussion that followed, it became apparent that at least four students misunderstood at least two of the questions. These

misunderstandings resulted in taking more time than was originally planned for the whole class discussion.

Inquiry-Based Lesson Checklist

The inquiry-based lesson took place over the course of seven days during which students worked in groups to complete an investigation about plants. I filled out an observation checklist (see Appendix B) on the first day of the inquiry lesson to identify the management issues that would need to be addressed. Based on the data from that checklist, I developed and implemented strategies to address those issues and then completed the same checklist a second time on the seventh day. I then compared the information on the two checklists to see if the classroom management strategies addressed the problems that were identified by the first checklist.

The first component of the inquiry-based lesson checklist was similar to the non-inquiry checklist in that both examined the issue of whether or not students were on task during the lesson. The specific areas examined as part of the on-task component were different. On the inquiry-based lesson checklist these areas examined whether the discussion was on topic and whether students were sitting knee to knee/ eye to eye. I walked around the classroom to observe on task behaviors and visited each of the four groups four times. As I walked around the room during the group work part of the investigation, I observed that three out of the four groups' discussions were off topic at least two of the times that I checked in with their group. Two groups needed several reminders of the group procedures. All four groups were sitting knee to knee/ eye to eye during the investigation.

The second component examined whether all students participated in the investigation. During the four times that I checked in with each group, I observed that three of the four groups did not have all members participating in the investigation. There was one group in which one student was complaining that another student was not writing fast enough. This caused the group to be off task for several minutes.

The third component of the inquiry-based checklist examined whether the objectives of the lesson were met within the time limit. Due to the nature of the inquiry lesson, the time allotted for the lesson was longer than the non-inquiry lesson. The inquiry lesson took place over seven days. Each day students worked for approximately 40 minutes on their investigation. On the observation checklist I commented on whether or not students had completed their task for each of the seven days. I observed every group each day and recorded that two of the four groups were able to complete their task for each of the seven days.

After collecting data from the first checklist, I implemented specific guidelines for students to follow during their group work time. First, students were given role cards which described the expectations of each member in the group during the work time. The roles included: recorder, material manager, and encourager. These roles were explained and modeled by the teacher. A few students were then selected to model for their classmates. These roles were developed to increase student participation and on task behavior.

On the seventh day of the inquiry-based lesson I walked around the classroom to observe on task behaviors and visited each of the four groups four times. As I

walked around the room during the group work part of the investigation, I observed that two out of the four groups' discussions were on topic at least three of the times that I checked in with their group. Two groups needed at least one reminder of the group procedures. All four groups were sitting knee to knee/ eye to eye during the investigation. During the four times that I checked in with each group, I also observed that three of the four groups did have all members participating in the investigation and performing their roles. Three of the four groups were able to complete their task each day of the investigation. The fourth group completed their task on four of the seven days.

Comparing Teacher Observations

Students' on task behavior appeared to be much higher during the inquiry-based lesson on the seventh day of the lesson. Students needed more redirection during both the non-inquiry lesson and the inquiry-lesson that occurred prior to the classroom management strategies than during the final inquiry lesson. The off task behavior that students were engaged in most during the non-inquiry lesson was talking (off topic). Student participation was also higher during the final inquiry-based lesson. There was more allotted time for student discussion and discussion was observed to be on topic more often than not.

Student Reflection Questions

The purpose of the Student Reflection Questions (see Appendices C and D) were to provide another measurement, from the perspective of the students themselves, of the level of participation and engagement of the students during each lesson. The reflection questions for the non-inquiry lesson were given to students on

the same day of the lesson, after the whole group discussion of the lesson review questions. The reflection questions for the inquiry-based lesson were given to students at the end of the lesson on the first day of the investigation and at the end of the seventh day of the investigation.

Student Reflection Questions for the Non-Inquiry Lesson

The two questions that focused most on students' participation and engagement were questions four and five. Twelve of the sixteen students who responded to the question, "were you on task during the lesson?" said that they were on task during the lesson. Two of the sixteen students said that they were off task part of the time and two students said that they were off task for most of the lesson. Those four students who commented that they were off task at least part of the time said that they could "stay on task", stop talking during the lesson", and "listen better" to improve during the next lesson.

Student Reflection Questions for Inquiry-Based Lesson (1)

There were four questions that examined student engagement and participation during the inquiry-based lesson. Students were asked if they felt like they had contributed to their group's work and twelve out of sixteen students commented that they felt like they had contributed to their group's work. Students were also asked if they were on task during the investigation. Eleven students said that they were on task during the investigation. Two of the students commented that they were off task for part of the investigation. Students were also asked to circle (from a list of three things) what their team did well while completing their task. Two teams circled all three of the items listed. Those items were: everyone

participated and did their job, we completed our task, and we used the materials appropriately. The final question that the students responded to was, “what are two things that your team can do better next time you work together?” Two of the groups agreed that they could have agreed more and argued less. Another group said that they could have done a better job of sitting knee to knee/eye to eye during the work time. The fourth group said that they could have “talked less”.

Student Reflection Questions for Inquiry-Based Lesson (2)

All sixteen students commented that they felt like they had contributed to their group’s work. Fourteen students said that they were on task during the investigation. One student commented that they were off task for part of the investigation. Students were also asked to circle (from a list of three things) what their team did well while completing their task. All four teams circled all three of the items listed. Overall, students’ responses reflected a feeling of being more on task and engaged during the last inquiry-based lesson.

Post-Assessment Quiz

The post-assessment quiz (see Appendix E) for the non-inquiry lesson was administered the day after students completed the lesson. Thirteen of the sixteen students who took the quiz were able to answer the first three questions correctly. The fourth question was an inferential question; “How can too much rain affect a habitat?” To answer that question correctly, students had to apply what they had learned from the lesson and draw conclusions. Only six out of the sixteen students answered the fourth question correctly.

A post-assessment quiz was not given after the inquiry-based lesson. Students used questions from their KWL chart to determine the direction of their investigations which made it less beneficial to create one quiz for all groups. Instead, data to determine students' learning was collected by looking at the first item of the student reflection question for the inquiry lesson which said, "Write two things you learned from this investigation." All four groups listed at least one significant fact that was learned from their investigation. For example, one group stated that they learned that while all plants need water to survive, "different plants need different amounts of water". They also wrote, "Maybe that's why you don't see some plants in certain places because they need habitats with different things to survive".

Chapter V: Conclusions and Recommendations

Conclusions

This research presents evidence that suggests that implementing classroom management strategies to address problems that arise in an inquiry classroom can be successful. The strategies used lessened the frequency of off-task behavior and increased student participation. Students also showed more understanding of science concepts that were discussed with their peers as opposed to the science concepts that were learned solely by reading about them independently in a science text book. Students also showed less frustration when they were able to have discussions with their peers. The opportunities to ask, explore, and answer their own questions helped students to feel more engaged and responsible for their learning. During the inquiry lesson that followed the interventions, I noticed that it was less necessary for me to deal with behavior issues such as students being off-task. I observed students having meaningful discussions and showing genuine interest in the topics that they were exploring during the inquiry lesson. Students asked more content related questions as opposed to questions about procedures. I felt as though my role had changed from managing behaviors during work time to facilitating meaningful discussions.

Though inquiry-based teaching methods present challenges, the benefits appear to outweigh those challenges and when examined carefully, it is possible to successfully implement classroom management strategies to lessen and even eliminate some of the problems that may arise.

Explanation of Findings

The purpose of this study was to identify classroom management issues that occur during an inquiry-based lesson and to develop effective strategies to address those problems. The two main issues identified and addressed were student participation and on task behavior. After all data was collected, there was a clear correlation between the increase in students' participation and on task behavior and the interventions that were implemented after the first inquiry lesson. This is supported by both the teacher observation checklists and the student reflection questions. The observations recorded on the checklists indicated that more groups were on task more times during the last inquiry-based lesson than during the first. More students also commented that they were on task and contributing to their group during the final lesson (after the role cards were introduced).

Limitations of the Study

One limitation of this study is that the fact that both the researcher and the teacher were the same person. I have a strong belief in the benefits of cooperative, student-centered learning and inquiry-based instruction. The purpose of the study was to examine the effect that interventions such as role cards might have on problems such as off-task behavior during an inquiry lesson. Because the methods for ascertaining the effectiveness of those strategies were subjective, it was possible for bias to affect the data.

Another limitation of this action research centers on the students and me. My students and I have limited prior experience with inquiry-based learning. This was the first time they were exposed to those types of activities which could have

impacted the results as well as my first time trying this new teaching strategy. Their seemingly higher level of engagement during the inquiry-based lesson could be attributed more to the fact that they were experiencing something new and different and not necessarily to the fact that certain interventions were in place.

Recommendations

It has already been established, by researchers such as Lawson, Buczynski, and Hansen, that inquiry-based learning is beneficial to students. There has also been research published over the past several years that attempts to examine the challenges to the implementation of inquiry-based teaching methods. Researchers such as, Lawson; Harris and Rooks; and Buczynski and Hansen, have identified classroom management as a significant obstacle to the implementation of inquiry-based teaching. What is lacking from all of this research is evidence that the suggested solutions to these classroom management problems do in fact have an impact on students in an elementary classroom.

It is my belief that this research did in fact show that there are ways to effectively address the management issues that frustrate teachers during inquiry lessons. Both the teacher and the students observed a difference in the lesson that occurred prior to the classroom management interventions and the lesson that occurred after the interventions took place. Implementing the classroom management techniques that were used in this research might help teachers commit to teaching more inquiry-based lessons which should in turn increase student achievement.

Past research has examined the impact of teachers' attitudes and beliefs on students' achievement in science. Hume and Coll are two researchers who have

observed this correlation. Seung-Yoeun also conducted research on the attitudes of educators and concluded that attitude is an essential component that influences the success of science instruction. If teachers' attitudes about science education have an impact on the effectiveness of their instruction methods, then the implications of research that explores ways to effectively address challenges to use a method such as inquiry is significant and should be expanded upon.

Future research can be initiated to explore the benefits of classroom management techniques across different grade levels and with different populations of students. Different grade levels and populations present their own set of specific challenges and therefore might require further research criteria that supports the use of effective classroom management techniques. It could also be beneficial to research the benefits of these management strategies over a longer period of time like an entire school year or to follow a cohort of students for several years. Researching the benefits of these and other interventions over a longer period of time might reveal ways to improve upon them and make them even more effective. Now that research has been completed to examine the benefits and the challenges of inquiry-based learning, it is important for educators to find realistic and effective ways to implement this research-supported practice.

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Appendices

Appendix A

Non-Inquiry Observation Checklist

Observation Checklist (Non-Inquiry-Based Lesson)

___ Students were on task:

- Students are using “Active Listening” posture (Sitting with hands folded on desk or in lap, eyes on speaker, and mouth closed)
- Post Assessment (Quiz) will be used as a measurement of whether or not students were on task

Comments:

___ Objectives were met within time limit.

- ___ Students completed their investigation worksheet.
- Post Assessment (Quiz) will also be used to determine if objectives of the lesson were met.

Comments:

Appendix B

Inquiry-Based Observation Checklist

Observation Checklist (Inquiry-Based Lesson)

___ Students were on task:

- ___ discussion is on topic
- ___ sitting knee to knee/ eye to eye with group during investigation
- Post Assessment (Quiz) will also be used as a measurement of whether or not students were on task

Comments:

___ All students participated in investigation:

- ___ Students are performing their roles (as defined on their role cards).
- Investigation Reflection Questions will also be used to determine if all students participated in the investigation.
- Post Assessment (Quiz) will also be used to determine participation.

Comments:

___ Objectives were met within time limit.

- ___ Group completed their investigation worksheet.
- Post Assessment (Quiz) will also be used to determine if objectives of the lesson were met.

Comments:

Appendix C

Non-Inquiry Lesson Student Reflection Questions

Student Reflection Questions (Non-Inquiry-Based)

1. Write two things you learned from this lesson.

2. Do you have any questions about the lesson? If so, what are they?

3. How could you find the answers to your questions? Where could you look?
What could you do?

4. Were you on task during the lesson?

5. What could you do better next time?

Appendix D

Inquiry-Based Lesson Student Reflection Questions

Student Reflection Questions (Inquiry-Based Lesson)

1. Write two things you learned from this investigation.

2. Do you have any questions about the investigation? If so, what are they?

3. How could you find the answers to your questions? Where could you look? What could you do?

4. Do you feel like you contributed to your group's work?

5. Were you on task during the investigation?

6. What could you do better next time?

7. Circle the things that your team did well while completing this task.

- Everyone participated and did their job.
- We completed our task.
- We used the materials appropriately.

8. What are two things that your team can do better the next time you work together?

Appendix E

Post-Assessment Quiz

Post Assessment

1. How do plants and animals depend on their habitat?

2. What can happen to organisms when a habitat changes?

3. How do changes in amounts of water affect habitats?

4. How can too much rain affect a habitat?
