THE EFFECT OF SELF-EFFICACY ON MOTIVATION AND ACHIEVEMENT AMONG FIFTH GRADE SCIENCE STUDENTS

A Master's Research Project Presented to

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by

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Chapter One

Introduction

Understanding what motivates a student to strive for excellence versus mediocrity remains a puzzling issue in education today. Most educators will agree there are numerous factors affecting any given student's level of motivation. In addition, many researchers will agree that motivation is a main driving force that leads to accomplishment when faced with obstacles of varying degrees. The idea of motivation leading toward achievement is present in the case of many famous persons, such as, Mozart, Darwin, and Tiger Woods (Aronson 2002). Those individuals did not reach such high levels of achievement based purely on raw talent; they worked hard over time due to high levels of motivation. Knowing that learners need to be motivated is a general consensus among educators, but understanding where motivation comes from and knowing how to stimulate student motivation are problems we face.

Problem Statement

Among the factors that affect motivation is the concept of self efficacy. Self efficacy refers to an individual's beliefs about their ability to execute a particular performance (Maddux 1995). Depending on how a student feels they are able to perform, the level of motivation they have may vary drastically. In other words, whether a student believes intelligence is fixed or malleable plays a role in how they view learning (Aronson 2002). I intend to identify what motivates students and how their level of motivation impacts achievement level. Due to the

large number of variables affecting student motivation, I plan to address a specific aspect of motivation. In addition, I will narrow my research to a specific grade level and subject area.

Research Question

How does self-efficacy effect motivation and achievement among fifth grade science students? I theorize that students who feel they are capable of accomplishing a task are often more motivated and can ultimately achieve more. This theory stems from my own personal experiences and from the observations of others. For instance, when faced with a task, I am often more motivated to complete it if I feel that I am fully capable of doing such an activity. However, when faced with something I have no prior knowledge of; I may feel less driven to tackle the task at hand. Furthermore, while observing students and fellow classmates throughout my education, I have witnessed instances similar to those mentioned above. Ultimately, the ideal situation is for a learner to have feelings strong feelings of self-efficacy when learning new topics. I believe that characteristic is important for optimal student achievement.

Significance of the Study

Upon completing this research I hope to have a clearer understanding of what leads students to their feeling about self-efficacy and what implications that has in the classroom. Understanding how students feel about their capabilities could potentially aid in developing alternate forms of instruction and assessment. In other words, knowing the factors that increase the levels of students' self-efficacy will hypothetically raise motivation and

achievement. A practical outcome from this research would be lessons or even curriculum centered on achieving positive student self-efficacy. If, through my research, I can determine where feelings of self-efficacy stem from and thus relate to student productivity, I can apply those findings to struggling students with a lack of motivation.

Limitations

The research I conducted was not completed in a perfect setting with only a single unknown variable. Unfortunately, there were certain variables I could not control, which placed limitations on my research methods. As a fifth grade teacher, my research was limited to a single grade level, as opposed to being expanded throughout an entire grade band. In addition, due to the lack of time available to me in the classroom with the students, I was unable to present the research in a manner best suited for an optimal outcome. In other words, the lessons presented as part of the research method were rushed at times, potentially causing shifts in the overall data. Lastly, the timing of the actual research and the nature of the topic did not complement each other. The research was conducted toward the end of the school year, when student motivation may possibly be at its lowest. All of these factors will be taken into consideration when making conclusions in chapter five.

Methodology

The methods used to research this topic are comprised of literature reviews of past research in similar areas of interest, and personal research conducted in my fifth grade science classroom. The literature used in the research was mainly obtained through electronic

databases of scholarly reviewed articles. The two main databases used were ERIC and PSCYINFO. Searches were limited by several factors: grade level, scholarly reviewed, and a publish date of 2000 or later. Many different keywords were used in the searching process. For example, self efficacy, motivation, achievement, students, mathematics, and science were searched in both of the aforementioned databases and the keyword containing articles were combined. The research conducted in the classroom was done using typical, everyday teaching techniques while observing the outcomes. The information gathered from the classroom was collected using a coded numbering system to keep participants anonymous.

Organization of Body

The remainder of this paper is broken down into seven more content-specific chapters. Chapter two is made up the literature reviews of several other studies or research articles related to the topic of self-efficacy and/or student motivation. This chapter will offer background information on the topic being researched. Chapter three outlines the methods used to conduct the actual research in the fifth grade science classroom. The data collected through the research methods is showcased in chapter four of the paper. Chapter five is comprised of a conclusion section, in addition to the potential implications for the teaching practice. Lastly, the appropriate references and appendices are listed at the end of the paper.

Chapter Two

Literature Review

Prior to conducting my own research in the classroom, I reviewed several articles and studies related to self-efficacy and student motivation. I am including those reviews in this section to provide more background information on the topic and to offer an alternative perspective on the different work already conducted in this area of interest. In addition, these articles and studies will serve as a basis for comparing the data I collect in my own research. The title of each article will serve as the heading for the following seven sections in this chapter.

Understanding Student Motivation

In this article, author, Timothy Seifert (2004), analyzes student motivation based on several contemporary theories; including self-efficacy theory, attribution theory and self-worth theory. Seifert (2004) defines self-efficacy as "a construct synonymous with confidence and refers to a person's judgment about his/her capability to perform a task at a specified level of performance" (p. 137). According to this theory students who consider themselves capable are likely to driven to achieve, while students who find themselves as incapable are likely to avoid difficult or challenging tasks.

Attribution theory is loosely defined as the reason students give for how they have performed. In other words, when students experience a particular outcome, they will attribute that outcome to a variety of different factors. The different factors that students choose to

attribute their successes or failures to, is what shapes the students level of motivation. For example, “students who attribute failure to internal, uncontrollable stable factors are more likely to feel shame and humiliation and will show little effort or cognitive engagement” (Seifert, 2004, p. 140). On the contrary, students who attribute failure to controllable factors are more likely to work towards a method for improvement.

Self-worth theory is based on the idea that every person has some level of self-worth. “Self-worth refers to the judgment one makes about one’s sense of worth and dignity as a person” (Seifert, 2004, p. 140). According to the theory, based on the level of effort and the resulting outcome, students will shape their feelings of self-worth. For example, if a student puts forth high levels of effort, but does not achieve the desired outcome, they may lack self-worth as a result.

Seifert further dissects motivation theories and offers a pattern of behavior that is known as learned helplessness. He refers to the theory as being “characterized by an unwillingness on the part of the student to engage in tasks because he or she believes that effort is futile and failure is imminent” (Seifert, 2004, p. 146). Students in this situation feel that they have little or no control over their academic outcome. Seifert’s reference to this theory is very relevant in my research, because I often see student’s exhibiting varying degrees of behavior symptomatic of this theory. Seifert’s article is a good transition into the following case study of a middle school student.

Learned Helplessness: A Case Study of a Middle School Student

The author in this study, Mary Walling, also a part-time physical education teacher, conducted a study that centered on a 13-year-old female that was thought to have been exhibiting signs of learned helplessness. The main method of this study was to administer an Intellectual Achievement Responsibility Questionnaire (IAR) to establish the different factors the student attributes her outcomes to. Walling (1995) analyzed the data from the IAR in conjunction with three factors relating to the student: (1) her family relationships and circumstances, (2) her relationships with teachers, and (3) her relationships with peers (p. 457). Ultimately, the author determined that the student was indeed suffering from learned helplessness behaviors. When questioned about particular events, ranging from poor test scores to being picked on by other classmates; the student articulated her answers in a manner of little hope. She expressed feelings that exemplified her sense of helplessness and feelings of little control over her overall outcome. Walling (1995) concluded that it is important to educators to structure a learning environment that is conducive to the needs of all students. The learning environment should offer ample learning and social opportunities for all students. Learned helplessness is only slightly uncovered in this study, and the author even mentions a need for further research on the topic. The following study offers a more specific look into the analysis or learned helplessness.

Learned Helplessness: The Effect of Failure on Test-Taking

Authors, Michael Firmin et al. (2004), examine how the order of questions play a role in test taking in regards to learned helplessness behavior. Two different groups of students were given test questions in opposite order. In general, one group was given difficult questions first, followed by easier questions, where as the second group was given just the opposite. The group that was given difficult questions first performed poorer when faced with failure from the beginning of the test. However, the group of students given easy questions first, performed better when faced with difficult questions at the end of the test. Ultimately, the authors address the importance of ordering test questions to give students the optimal chance at performing to their full potential. This study addresses learned helplessness on a smaller, more specific scale, but is still very important to the overall concept of student motivation and success.

Factors Supporting School Engagement and Achievement among Adolescents

The authors, Cynthia Hudley et al. (2002), address student academic success, intrinsic motivation, and student perceptions in terms of their relationship to engagement in school. Furthermore, the study was conducted over a diverse group of students, resulting in a comparison between Anglo and Latino groups of students. The exploration of intrinsic motivation is interesting, due to its positive affects when highly present. Intrinsic motivation is "the innate tendency to learn for the sake of personal satisfaction in increasing one's own

capacities" (Hudley et al., 2002, p. 2). According to the authors, learning that is intrinsically motivated results in higher levels of achievement and better memory for students from elementary school through college.

The study was completed by administering a 53-item questionnaire to the participants that addressed perceived educational aspirations, perceived career aspirations, perceived support from teachers, perceived equal treatment of ethnic groups, self-appraisals of academic efficacy, and self-perceptions of intrinsic motivation (Hudley et al., 2002, pp. 7-8). According to the results, students with positive self-perceptions of intrinsic motivation earned higher grade point averages.

Ultimately, Hudley et al. (2002) discover that students' self-efficacy is the most influential factor among the factors studied in determining a student's engagement level. This study is applicable to my research, because it examines several different areas that may affect student motivation and achievement.

Extrinsic Motivators and Incentives: Challenge and Controversy

The author, Michael Ingram (2000), discusses the controversial issue of using tangible rewards as motivators for students. The main argument against the use of extrinsic motivators is the tendency for them to decrease an individual's intrinsic motivation. The author offers contradicting information on the use of extrinsic motivation. Some researchers claim it has little effect on intrinsic motivation, while other say it undermines a student's intrinsic motivation, resulting in motivation only when they know a tangible reward is a possibility. One

interesting approach to motivation that the Ingram offers is the use of indirect/subliminal motivators. For example, a teacher may present a reading passage to the students in large print that utilizes more pages. The purpose of this technique is for the students to turn the page more often, resulting in a feeling of accomplishment.

Overall, this article offers little resolve to the issue of using extrinsic motivators. The author basically restates the viewpoints of several other sources. The article serves as a stepping stone into the particular subject area, as opposed to an answer to the problem. The article does reference many typical classroom situations, which will serve as a reference later in the conclusion chapter of this paper.

The Dynamics of Motivation and Effort for Classroom Assessments in Middle School Science and Social Studies

The authors, Susan Brookhart et al. (2006), discuss several motivation theories related to classroom achievement, and then apply them specifically to science and social studies classes in a study conducted on eighth grade students. The data concerning the social studies content is not of interest to me, but the generalities of the results are still applicable to my research. The authors address the following topics: classroom assessment environment, motivation, self-efficacy, goal orientations, and invested student effort. The authors compared the classrooms of four different teachers from different parts of the country and found student self-efficacy to be the major factor in determining student motivation (Brookhart et al., 2006). These results were similar to the results from Hudley et al. (2002) study. The authors break down the data by

different content areas and different teachers. The science data is more applicable for my research and the results for each teacher were dependent on the teacher's individual classroom environment. Further research would be required to determine the best classroom assessment environment for optimal student motivation and effort.

Science Achievement and Self-efficacy among Middle School Age Children as Related to Student Development

The authors, William Carter et al. (2001), examine the effectiveness of a particular science program that implements hands-on activities and inquiry-based learning. The goal of the program is to allow students to discover new ideas and concepts on their own, hopefully attributing the learned material to their own efforts. A novel test was administered prior to the hands-on program and afterwards as well. Nearly all students gained self-efficacy after engaging in the science program.

Ultimately, the authors made a positive connection between the use of hands-on science lessons, where students attribute their learning to their own effort, and the increase of self-efficacy. Also, the authors state that "self-efficacy is learned and is not a deep psychological construct" (Carter et al., 2001, p. 10). That claim suggests that educators are able to help increase feelings of self-efficacy when necessary using appropriate methods. The importance of hands-on activities and group work is emphasized as well, due to its sense of self-worth established when being utilized. This study is applicable to my research more

specifically than others due to its concentration on the science content and its relationship to self-efficacy, hands-on learning and inquiry-based learning.

Summary

The reoccurring theme in the majority of the aforementioned articles and studies is the relationship between self-efficacy and student achievement. Most of the authors agree that positive feelings of self-efficacy result in higher achievement and an overall sense of self-worth. The connection between self-efficacy and achievement is not necessarily disputed; however, the source of self-efficacy is still unclear. Why do students possess certain feeling pertaining to self-efficacy? What causes students to feel the way they do about academic achievement and learning in general? These are questions that have not yet been answers, but I hope to address them more clearly through my research process. In addition, methods for obtaining optimal levels of motivation are still unclear. The experts on the topic still have conflicting opinions. In the next several chapters I hope to iron out those details and provide clearer solutions to the problem at hand.

Chapter Three

Setting

Research was conducted at an elementary school, kindergarten through sixth grade, in southeastern Ohio. The school is very economically and culturally diverse, with over twenty different countries represented within the student body. Specifically, the research methods were restricted to a single fifth grade classroom. Two different groups of students, coming from different home rooms, filtered through the classroom on a daily basis for science class. During the research process, both groups underwent the same set of methods and the data was then combined upon completion of the study. Combining the two groups of students resulted in a total of forty-one participants. The students were very diverse in nature; coming from different backgrounds and having varying ability levels.

Delimitations

The main limit I placed during the research process was the use of certain data. While conducting the research, I included every student that was present. I did not want to exclude certain students because I felt that it may skew the results is some manner. I wanted all students to feel included to maintain an even playing field. When organizing all of the data after implementing all of my research, I discarded student data that was not complete. If a student missed one of the days in which research was conducted, I chose not to include their information in the overall analysis.

Due to the format of my research implementation, students that were pulled out of the classroom for intervention needs were not able to be included in the research process. Therefore, participants in this study did not include students with special needs that required pull-out instruction.

Methods

Research was conducted in my classroom during my teaching fellowship position in fifth grade science. The research was implemented into everyday classroom procedures and academic content in order to collect data in the most realistic classroom environment. I included every present student in the research process, but only chose to analyze the data for the students that were present for the entire five-day process. Several students missed days of school for various reasons, and were not able to complete some of the questionnaires. While those students' contributions to their completed questionnaires may have been relevant, I realized I would not be considering their contributions in the overall analysis due to lack of data comparisons throughout the research process.

The research lasted for approximately five school days. During day one of the research, students completed questionnaire A, which assessed the students' basic feelings about learning and determined their academic likes and dislikes. The purpose of questionnaire A was to establish a baseline or profile for each student that could later be referenced when comparing data from later sections of the research. I typically asked students questions relating to their thought processes and feelings about other educational topics throughout any given school day, which made the use of questionnaires an acceptable method for collecting student data. In a

typical week of class, I would often ask students their opinions and feelings related to the learning process. Therefore, the students didn't find answering questions about their thoughts to be an abnormal request, which should have led to honest and thoughtful responses. Following the initial questionnaire, I chose to implement two different types of teaching styles that were mentioned on questionnaire A.

Specifically; I chose to use a lecture format and a discovery-based learning format due to their polar opposites. Day two through day four were used to instruct the students using those two teaching methods. Discovery-based learning was used first to help the students determine what muscles they use when doing everyday activities. Students had some minimal prior knowledge of the different major muscles and more extensive knowledge of the major bones of the body. The ultimate goal of the activity was for students to make the connections between certain muscles groups and their relationship to specific bones in the body. After the discovery-based activity, I taught a second related topic using a lecture format. I lectured, with the aid of a PowerPoint presentation, about the different types of muscles (skeletal, cardiac and smooth) in the human body. The objective of the lecture was for students to understand the different types of muscles and to be able to identify their different roles in the body. Both lessons were concluded within three days; after which a follow-up questionnaire was administered. Students completed questionnaire B, which dealt with student feelings about the different instructional methods of the past three days. Students gave feedback about the different teaching methods through the direction of the questions.

On the last day of the research, the students completed a brief assessment (quiz) to check for understanding of the topics learned in the previous three days. The assessment was

comprised of several different forms of questions in a varying question order. The types of questions used were multiple choice format, short answer, critical thinking and questions referring to different diagrams. The questions were not completely grouped together by type, but rather divided up throughout the quiz. In other words, multiple choice, short answer, critical thinking and diagram-based questions were scattered throughout the quiz in no apparent order or grouping. Prior to allowing the students to begin working on the assessment, I went over the different sections and read the different sets of directions to ensure the students were aware of the different types of questions and their locations. After completing the assessment, students completed questionnaire C, a brief follow-up to the quiz format. Students responded with their feelings about the different forms of questions and the order in which they picked questions to answer.

Throughout the research process, the questionnaires served as the formal, concrete method of data collection. However, during the implementation of the different instructional methods I made informal observations to further supplement the other collected data.

Chapter Four

Results

After completely collecting the data for all three questionnaires and administering the final assessment, each participant's contributions were analyzed. The data associated with students whom did not complete all sections of the research process was thrown out and not tabulated into the final results. Therefore, the number of student-participants contributing to the research totaled thirty-three: 18 males and 15 females.

The results for my research can be broken down into several categories based on the different types of questionnaires, the final assessment and a summary of the data including observations made throughout the research process. Each of the following sections contains results for the different steps of the research process according to the specific heading.

Questionnaire A

Students completed questions related to their feelings toward the learning process and the school environment in general. Initially students gave information about their favorite and least favorite subjects in school. Forty-six percent of the participants (15 students) considered science as one of their favorite subjects, while 39% (13 students) considered science as one of their least favorite subjects. Fifteen percent, or 5 students, did not think of science as one of their favorite or least favorite academic subjects. Next, based on four choices; discovery learning, reading from a textbook, a lecture or hands-on learning; students chose the methods they felt were their best and worst. According to the data, students felt their best methods

were hands-on learning and discovery-based learning, with 52% and 39% of the participants choosing those methods, respectively (Figure 1). Students believed their worst learning methods were reading from a textbook and listening to a lecture; 43% and 39% choosing those methods, respectively (Figure 2).

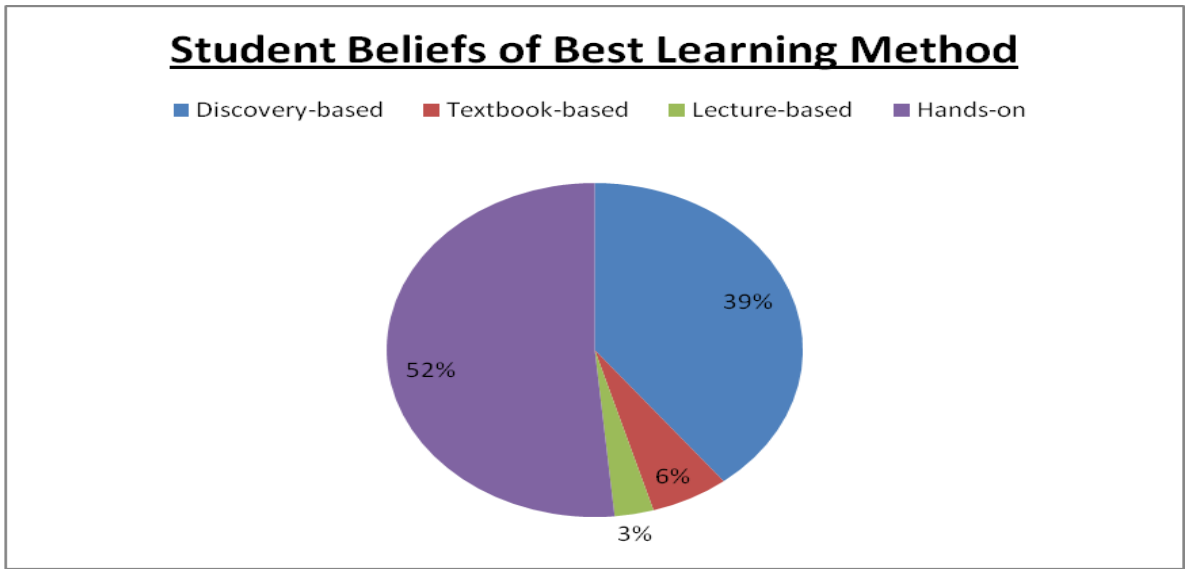

Figure 1

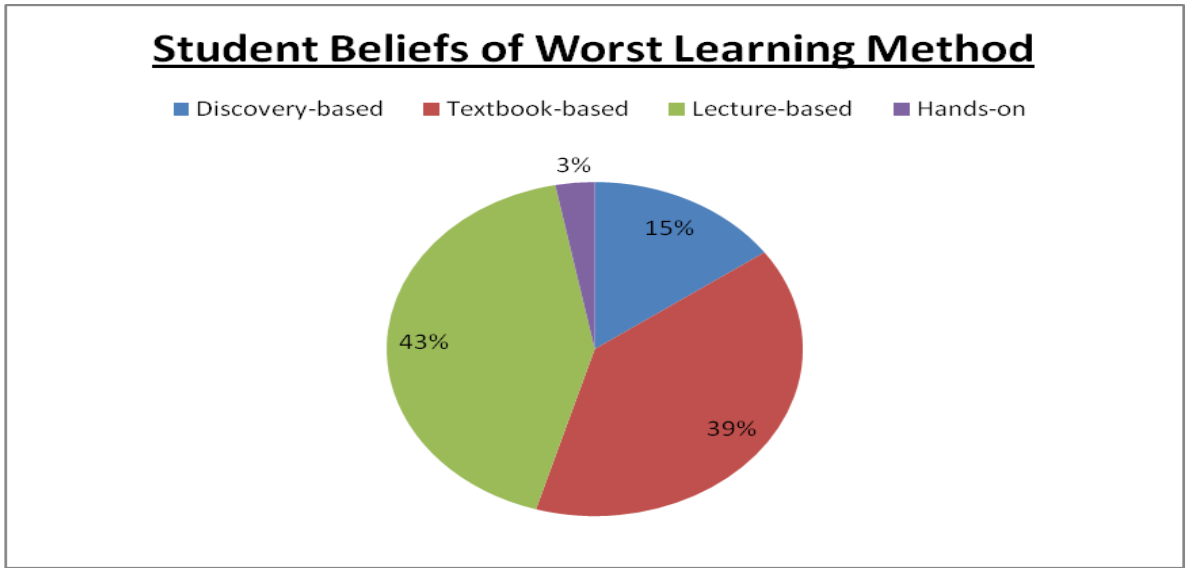

Figure 2

Combining the previous two sets of data, the way students feel about their learning styles can be examined based on their academic subject preferences. According to the following graphs, figure 3 and figure 4, of the students who name science as one of their favortie subjects, 53% consider hands-on learning their best method of learning and 46% consider reading from the textbook as their worst method. However, of the students who name science as one of their least favorite subjects, discovery-based and hands-on learning are both considered the best methods for learning, both with 46% of the participants chosing them. In the same groups of participants, sixty-one percent of the students chose lecture-based learning as their worst method.

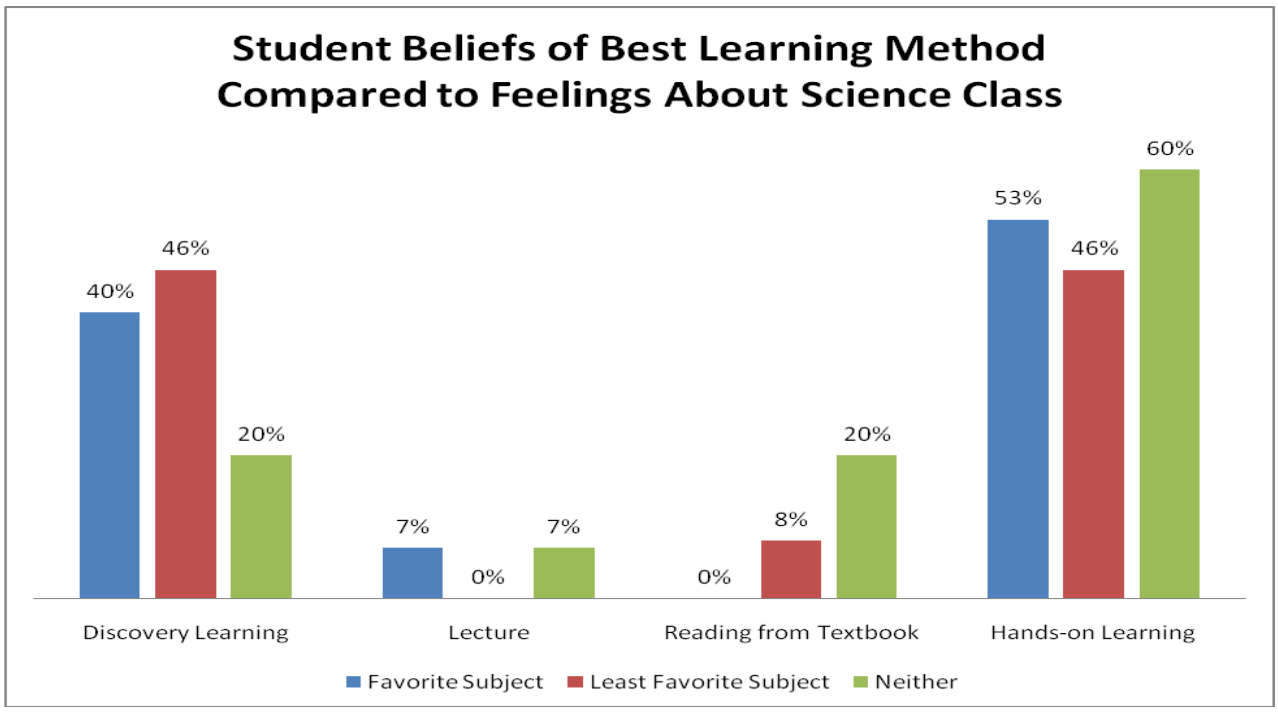

Figure 3

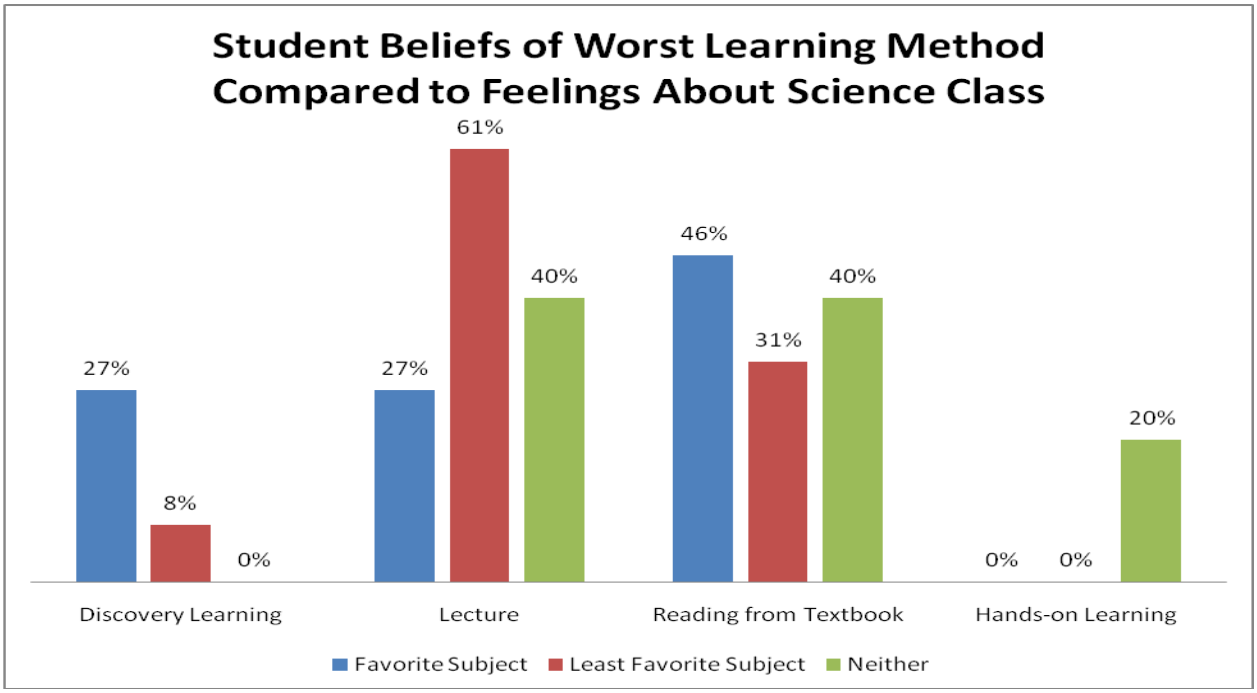

Figure 4

Students also completed a section describing their reasons for motivation in science class. Because students have different feelings toward science in general, their reasons for motivation may vary and stem from different sources or beliefs. Therefore, student motivation will be broken down into the top two reasons and it will then be compared to the students' feelings towards science. According to the data, the number one reason for student motivation in science class is the idea of earning a good grade. Sixty-one percents of the students chose "earning a good grade" as their number one motivator, while 24% chose "pleasing your parents" (Figure 5). The number two reason for student motivation in science class is the idea of "pleasing your parents" for the students. Forty-six percents of the students chose "pleasing your parents" as the number two motivator, while 24% of the students chose "earning a good grade" (Figure 6). By combining the top two reasons for student motivation into a single set of

data, it provided information on the overall motivator for students in science. After grouping the data, 42% of the students chose "earning a good grade" and 35% of the students chose "pleasing your parents" (Figure 7). Also, looking at figure 7, the smallest motivator was "pleasing the teacher", while 12% of the participant group chose "working hard for yourself" as one of their top two motivators. In other words, eight of the 33 participants chose "working hard for yourself" as either their number one or number two motivator in science.

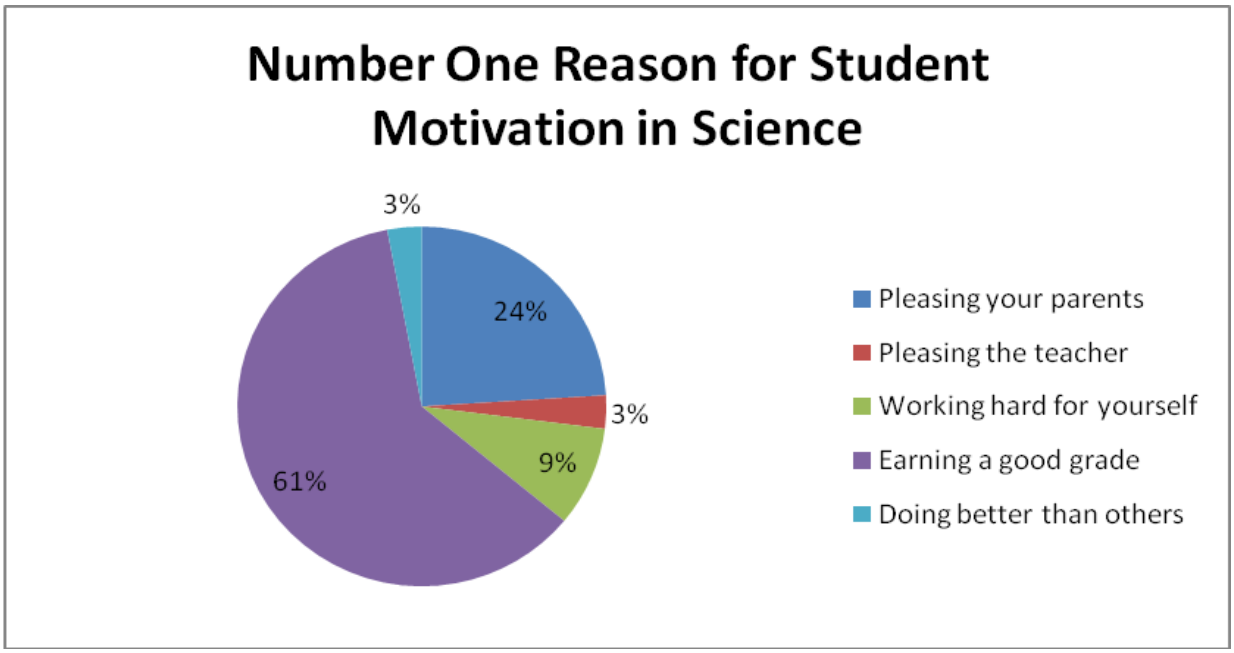

Figure 5

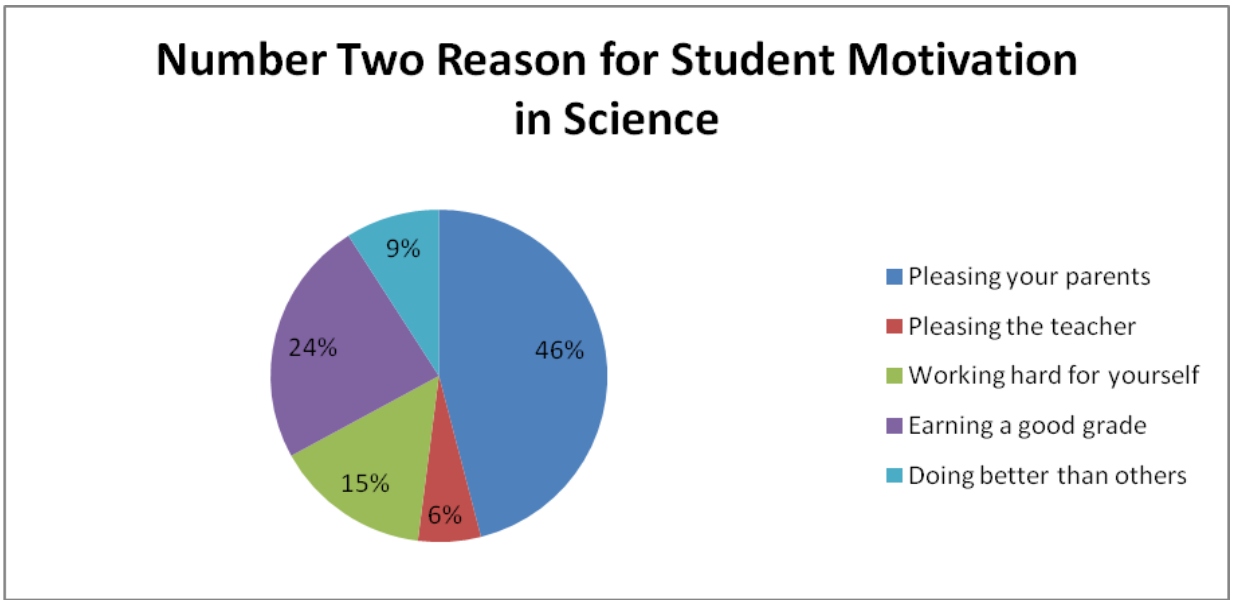

Figure 6

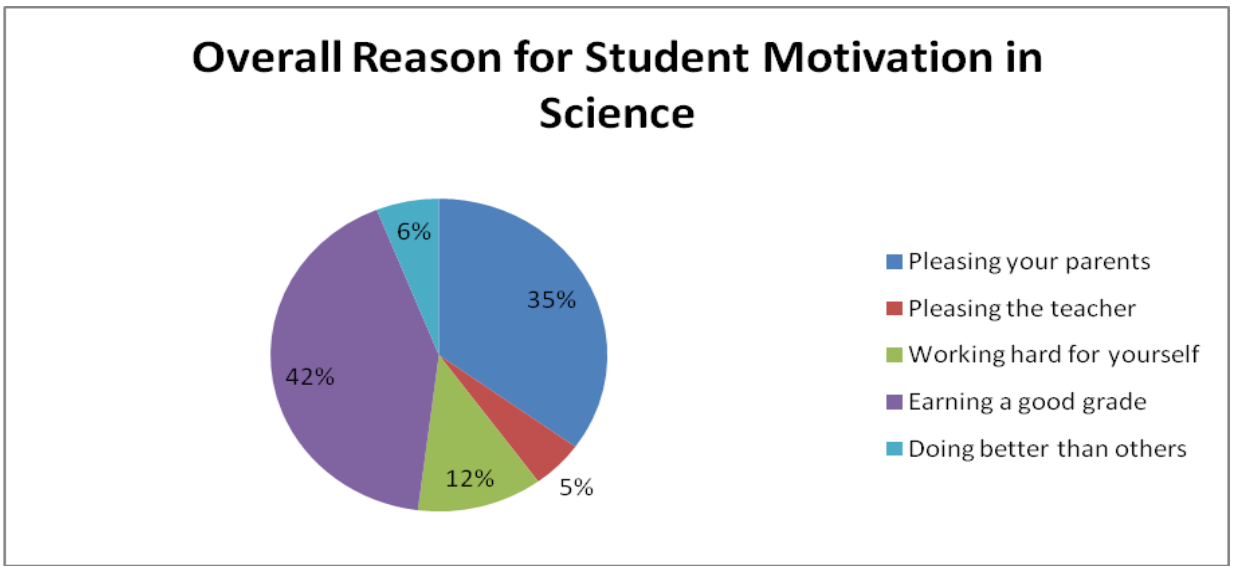

Figure 7

Comparing student reasons for motivation in science to their feelings about the topic of science is important. By combining the data related to the participants' favorite subjects with the data in figure 7, I can relate student interest level to reasons for motivation. For students

that consider science as one of their favorite subjects, 43% and 37% attribute “earning a good grade” and “pleasing your parents”, respectively, as their top two overall reasons for motivation (Figure 8). Of the students that consider science as one of their least favorite subjects, 38% and 35% describe “earning a good grade” and “pleasing your parents”, respectively, as their top two reasons for motivation in science class. Finally, of the students that consider science as neither a favorite nor least favorite subject, 50% and 30% characterize “earning a good grade” and “pleasing your parents”, respectively, as their top two overall reasons for motivation. The results are similar across the board for participants, regardless of feelings toward the subject of science.

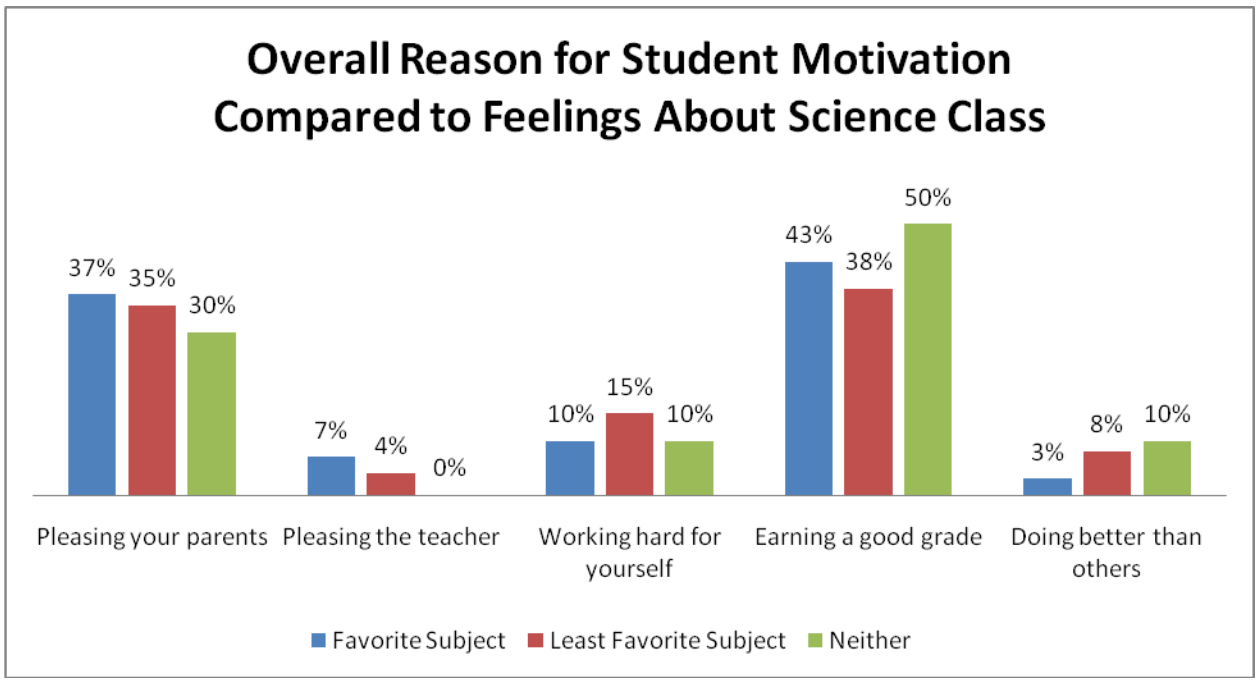

Figure 8

The final bit of data from the initial questionnaire is related to what students prefer to do when faced with a difficult question in science class. Students were asked to choose between (1) having the teacher tell them the answer and (2) figuring out the answer on their own; when faced with a difficult question in science. Answers to this question (Number 3: Questionnaire A) varied greatly, because students were also asked to explain why they felt the way they did. Overall, though, 55% of the students chose to have the teacher give them the answer. Reasons for such a response included students expressing their laziness, preferring the quickness to the solution, the ease of the solution and the lack of work involved. On the contrary, 33% of the students said they would prefer to figure out the question on their own. Reasons for this response included students enjoying the challenge, attributing it to the learning process and having the opportunity to express their knowledge and ability. Twelve percent of the participant group (four students) still remains: these students were unable to make a decision one way or the other. One of the students claimed that the situation depended on how well they understood the topic. Two other students considered both options to be an acceptable choice.

According to student 16, "both because I would be anxious to know but I would be frustrated to think".

According to student 10, "both, sometimes I like assistance, but I don't like it when I don't know why the answers the answer".

The fourth student in the mixed feeling group put a slight twist on their response. The student didn't want to do it by themselves, but they didn't just want the answer: they wanted help.

Student 12 stated, "Have him (the teacher) <u>Help me</u> because if he told me the answer I wouldn't learn anything".

Questionnaire B

After teaching two different, yet related, science topics utilizing somewhat opposite teaching methods (direct instruction and discovery-based learning), students completed a second questionnaire. The goal of the questionnaire was to determine the students' beliefs and feelings about the two different teaching strategies. Upon completing this questionnaire, students were instructed to answer either question one or three, but not both, due to their close similarities. Question 1/3 asked students to provide insight into their feelings about which teaching method was more satisfying to them or they enjoyed most. According to the responses, 55% of the students enjoyed the discovery-based teaching method more, when compared to 39% of the students preferring the lecture-based method (Figure 9). However, two students did not correctly respond to the question, so their opinions could not be tabulated either for or against either of the teaching methods. Some of the reasoning for the pro-discovery methods included the following responses:

Student 13: "With group members because its hands on and you have more brains to come up with ideas."

Student 1: "I like working in group better because I had to think and explore not just listen and write."

Student 6: "Discovered the info because it is more fun then jotting down a bunch of notes."

On the contrary, several students had various reasons for their enjoyment of the lecture process. The following are several student examples:

Student 21: "I enjoyed the lecture more because it is harder to find the answer on my own than when the teacher just tells me."

Student 18: "Teacher because it's easier because he knows more and can just tell us."

Student 19: "Lecture because the teacher knows the information and if you discover it you don't know if its correct."

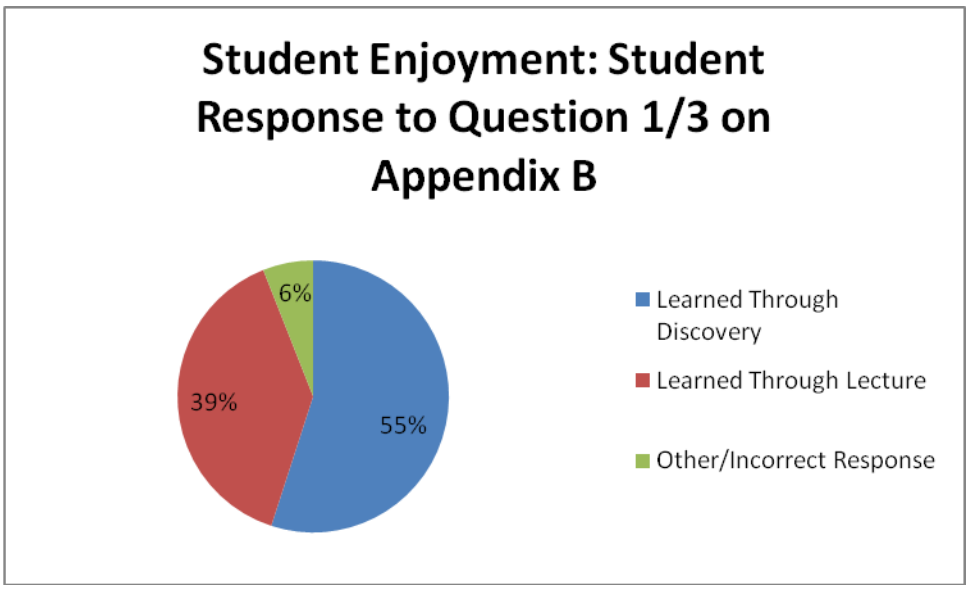

Figure 9

Based on the responses to question two, the majority of the students, 64%, believed they would be able to teach the topic they learned through a lecture format more effectively to other students, as opposed to the material learned through discovery-based learning (Figure 10).

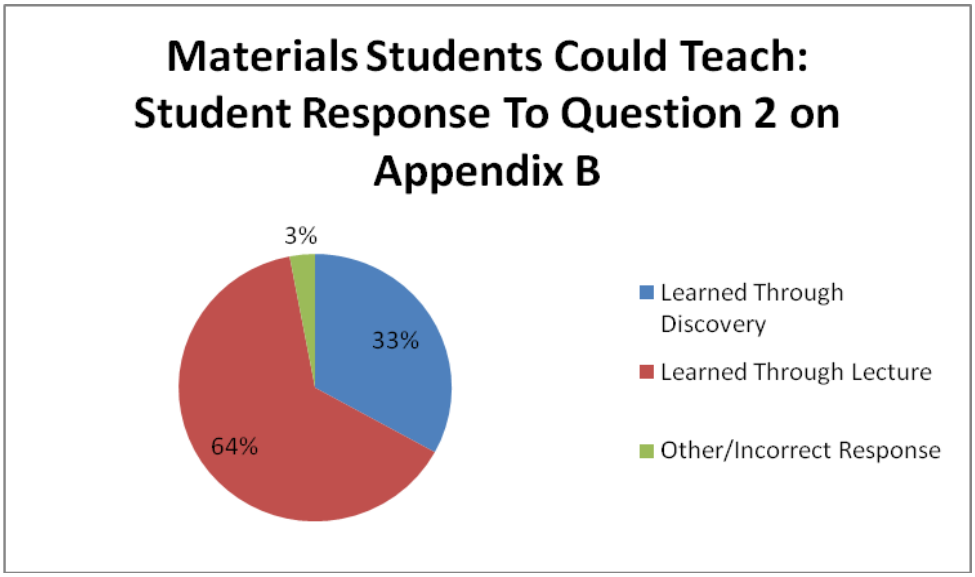

Figure 10

According to student responses from question 6, 52% of the students were more motivated during the discovery-based lessons; compared to 39% of the students being more motivated by the lecture-based lesson (Figure 11). Again, several students answered the questions incorrectly, which affected the data collection process. Students provided explanations for their feelings of motivation for the two different methods. The following excerpts are examples of student responses that are pro-lecture:

Student 15: "Lecturing because I think its easier to work and I learn better when people are instructing."

Student 5D: "When the teacher lectured, because he would just give us the answers."

Student 13: "When the teacher lectured because it explains more and you learned more about topic"

As part of the majority response, the following examples are samples of student responses that are pro-discovery in nature.

Student 21: "When I learn on my own I'm more motivated, because I get more into the topic."

Student 5W: "When I was on my own because I know that I wouldn't be given a direct answer."

Student 19: "On my own. It was like 'Ou, I didn't know that! Cool!'."

Student 6: "When we did the experiments on our own because we got to actually move around instead of sitting in a chair taking notes."

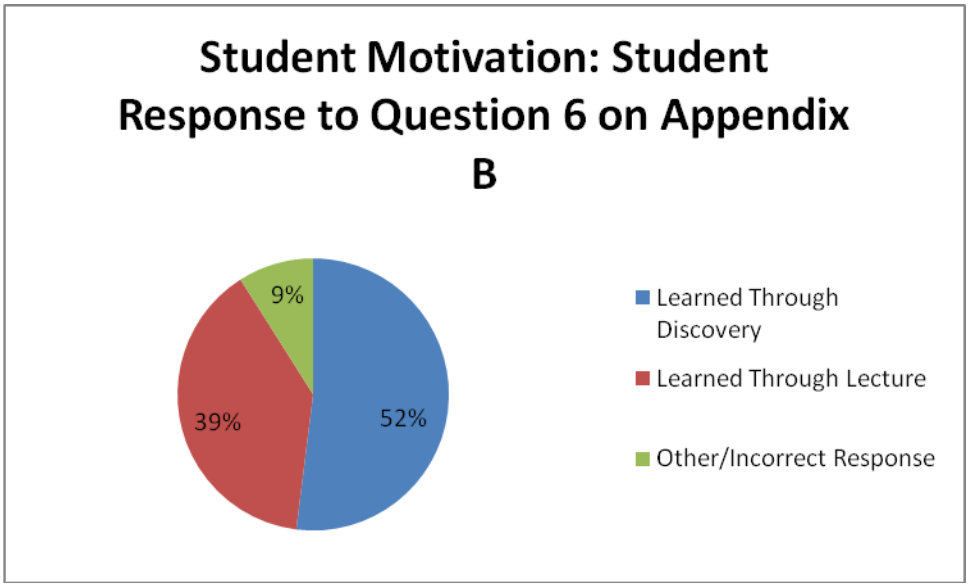

Figure 11

Assessment

The assessment consisted of a 14-question quiz with four different types of questions addressing the two different topics taught using the different teaching methods. In all, the quiz had six multiple choice questions, three short answer questions, two critical thinking questions and three diagram-related questions. The different types of questions were represented evenly between the two different topics being assessed, except for the diagram-related questions. There were two diagram-related questions assessing the discovery-based content, while there was only one question addressing the lecture-based content. The following charts, figure 12 and figure 13, express the student scores for the different types of questions for the two different teaching methods.

Discovery Based:	**# of questions**	**% correct**
M/C	3	34%
S/A	1	58%
C/T	1	12%
Diagram	2	46%
	Total Avg.	38%

Figure 12

Direct Instruction:	**# of questions**	**% correct**
M/C	3	60%
S/A	2	73%
C/T	1	67%
Diagram	1	79%
	Total Avg.	70%

Figure 13

According to the data, the teaching method that resulted in an overall higher student achievement was the lecture-based method. Thirty-eight percent of the questions related to content learned through the discovery-based method were answered correctly (Figure 12), while 70% of the questions related to the lecture-based content were answered correctly (Figure 13). Among the questions related to discovery-based learning, the short answer questions had the highest level of correct responses with 58% correct. On the other hand, the lowest achievement within the discovery-based questions was present in the critical thinking questions. Analyzing the lecture-based data, the questions related to diagrams received the best scores among students with 79% correct. In the pool of lecture-based questions, the poorest performance was related to the multiple choice questions, with 67% of the questions being correctly answered.

Removing a variable from the above set of data, we can look specifically at the performance related solely to question type (multiple choice, short answer, etc.). Looking at figure 14, it is evident that short answer (S/A) and diagram based questions obtained the highest level of correct responses, with 66% and 63% correct, respectively. The critical thinking (C/T) questions received the fewest amount of correct answers, with only 40% correct.

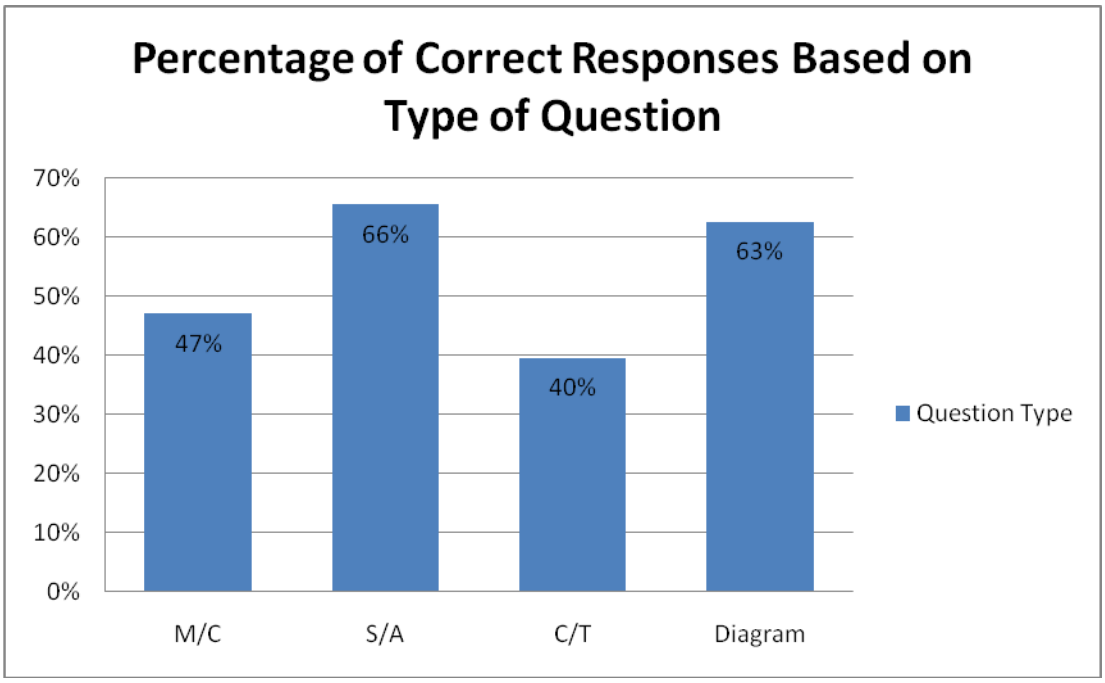

Figure 14

Questionnaire C

The final questionnaire served as a follow-up to the entire research process and addressed student feelings about question type, difficult questions and the order in which questions were answered. Student ordered the different types of questions on the quiz in ordered of increasing difficulty from one to four. Figure 15 represents the student responses toward the level of difficulty of the four different question types used in the assessment.

Student Response to Question Difficulty: Easiest to Hardest (1-4)				
	#1	**#2**	**#3**	**#4**
Multiple Choice	88%	9%	0%	3%
Short Answer	0%	36%	52%	12%
Critical Thinking	0%	9%	18%	73%
Drawing Diagrams	12%	46%	30%	12%

Figure 15

According to the table, the majority of students consider multiple choice items to be the easiest type of question to answer, while the majority of students thought critical thinking was the most difficult. The data can be expressed in a slightly different manner, by breaking figure 15 into sections based on the four different ranking numbers.

The following four figures express the different student responses for each ranking number in terms of percentages. Figure 16 shows that 88% of the students felt multiple choice was the easiest, but 12% though diagram-based questions were the easiest. Figure 17 expectedly represents diagram-based questions as the second easiest, with 46% of the students giving it a number two ranking. The third easiest, or second to last most difficult, question is the short answer type, with 52% of the students ranking it number three (Figure 18). Finally, according to the students, the most difficult types of questions are critical thinking questions. Seventy-three percent of the students ranked that type of question as number four in their ordering (Figure 19).

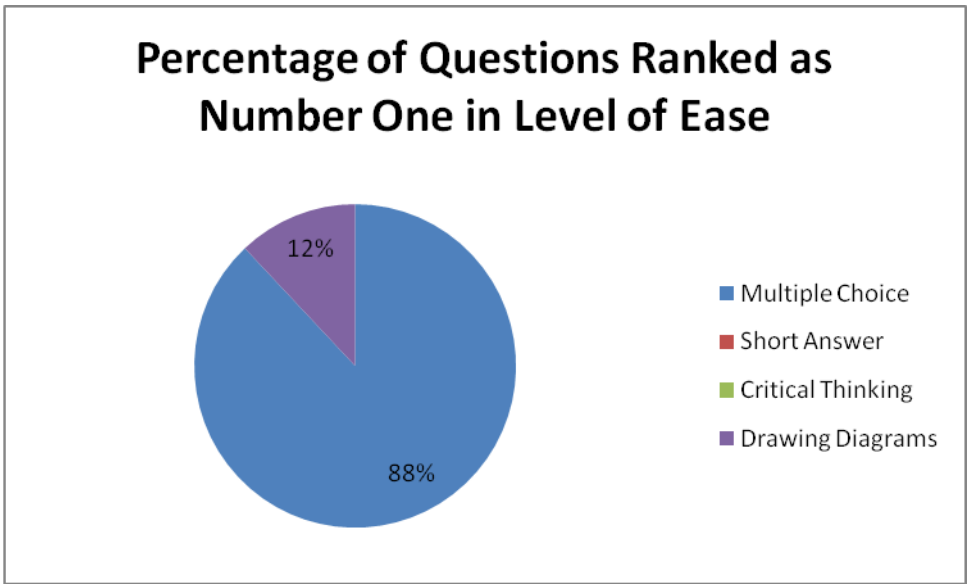

Figure 16

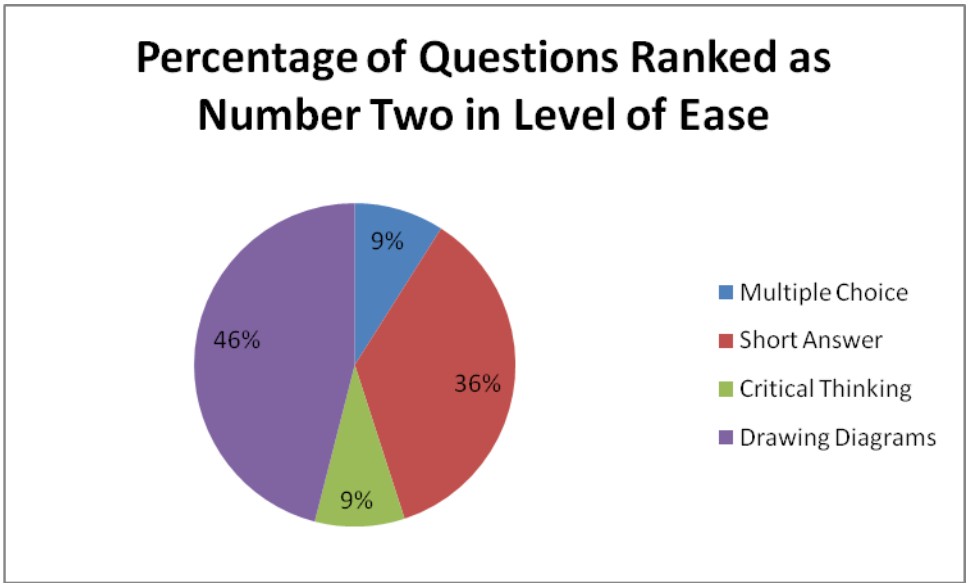

Figure 17

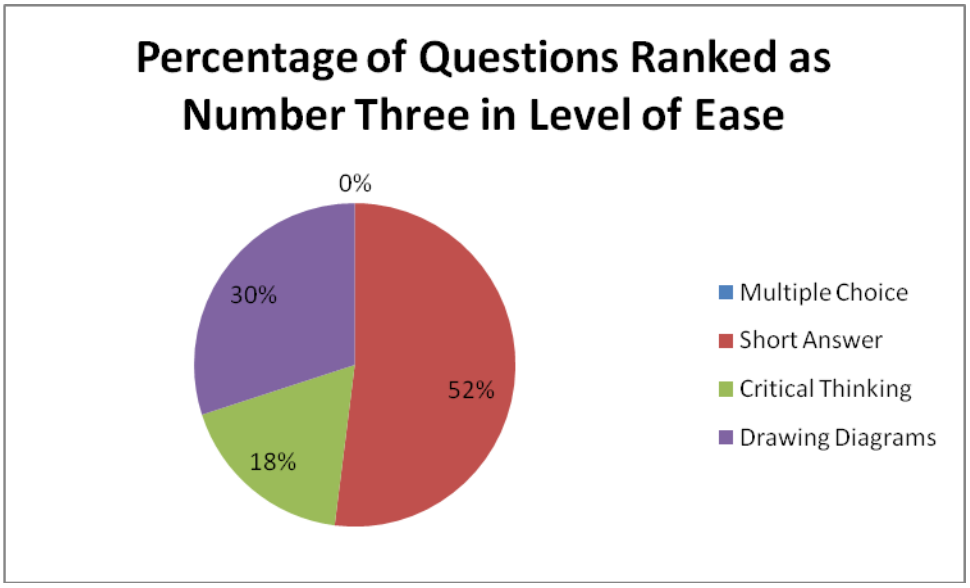

Figure 18

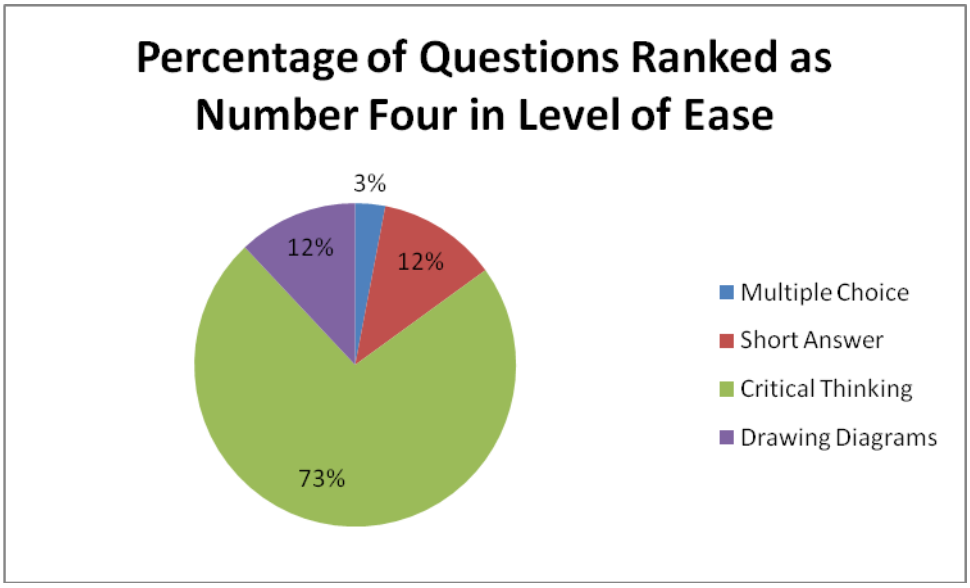

Figure 19

Students also gave feedback on the feelings they encountered when faced with a difficult question, and on the different methods they used when choosing what types of questions to answer first. When dealing with questions that students think they do not know how to answer, they exhibit a wide range of different emotions. After reading through student response, some of the feelings expressed were nervousness, disappointment, pressure, annoyance, hopelessness, frustration, and many students said they would often panic under those circumstances. There were several common actions students claimed to have taken when faced with difficult questions. Many students resorted to guessing, skipping the question and coming back later, or asking for help. Below are several examples of student responses that represent common student beliefs when asked: How did you feel when you came upon a question that you felt you could not answer and what did you do?

Student 1: "I kind of panicked because thought I would get the question wrong and get a bad grade so I skipped the question and thought about it harder."

Student 8: "Annoyed, look for other questions that might have the answer in them."

Student 14: "I started asking myself why I didn't study more. I eliminated the options until I got to the last one."

Student 10: "I feel hopeless like I going to fail and I just sit there for 5 minutes and think hard and if I still don't know I just guess."

Students also gave feedback on what methods they chose to answer the questions on the assessment. In other words, did the students answer the questions in the order they appeared or did they use an alternative method chose questions to answer? According to the data, the majority of students answered questions in an order different from how they appeared. Sixty-four percent of the students used an alternative method to pick questions to address. Of those students, the largest portion of students, 38%, chose to address the easy questions first and then the more difficult ones. On the contrary, 14% of those students opted to answer the more difficult questions first and then tackle the easy questions last. The following student response examples express the reasoning for some of the choices students made while picking questions to address.

Student 10: "I go through and answer all the questions I know, and are easiest to explain, and then I go back and do all the questions I skipped. I answer my questions that way because I might remember after I review all the other ones that I know."

Student 5: "I chose another method so that I could get the hard questions done first."

Student 14: "I didn't go in order. I went from easy to hard so then I could focus all of my energy on the harder ones."

Student 2: "I just answered them in order because I would forget to answer the other ones."

Student 12: "I flipped around the test and did the question that were easy and then went back to the hard ones so I didn't waste time."

Summary

Throughout the research process I was able to make many informal observations. While implementing the different teaching methods, the students' behavior and level of engagement varied. During the discovery-based lesson, student engagement was very high and the level of participation was great. However, during the lecture-based lesson, student would occasionally become detached and off task. Also, during the lecture, which was PowerPoint-based, the students' main concern was ensuring that they copied every bit of text down in their notebooks. There were not very many questions throughout this process. During the discovery-based lesson students were constantly asking questions and wanting guidance. Unfortunately, the level of actual student engagement was difficult to assess, because I was constantly being utilized as a facilitator in different groups at varying times in the activity. Looking at the actual data, may shed some light on this preponderance. Comparing the initial student responses related to their best and worst learning methods to the actual achievement levels during the assessment offers an interesting perspective.

I only looked at the students that listed discovery-based learning or lectures as their best learning method. There were 13 students that listed discovery-based and only one student that listed lectures. Of the 13 students that chose discovery-based learning, only two students answered more than 70% of the discovery-based questions correctly on the assessment. One student scored a 100% on the discovery-based section. The student that chose lecture-based as the best learning method scored a 71% on those questions.

As in the case with the best learning methods, I only looked at student who chose discovery-based learning or lectures when analyzing the perceived worst learning methods. There were five students that believed discovery-based learning was their worst method and fourteen students that fell under the lecture-based category. One student scored above a 70% in the group of five students believing discovery-based was their worst method. In the group of fourteen students that felt lecture-based was their worst learning method, nine students scored about a 70%. Overall, the average score on the questions that students felt were based on their best learning method was 42%, while the average score on the questions that students felt were based on their worst learning method was 56%.

Chapter Five

Conclusions

Initially, based on the data, my original theory does not appear to be supported. The overall data collected throughout this research process, specifically the assessment section, is actually quite surprising and unexpected. However, I believe there are several underlying factors that contributed to the data in the assessment portion of the research. I will try to expose those factors throughout this discussion in order to make sense of the otherwise skewed data.

Originally, I theorized that student performance would be at its peak when the student was highly motivated and they had positive feeling of self-efficacy related to the task at hand. However, looking at the data from questionnaire A and comparing it to the achievement levels on the assessment, it is clear that the opposite trend was actually present. The students that were answering questions based on what they thought was their worst method of learning actually performed better than student answering question on what they thought were their strengths. In addition, the overall order of difficulty that students attributed to the different question types was not correlated across their actual performance. Student performed the best on short answer questions when they had originally considered them to be the second most difficult type of question to answer. Because there were fewer short answer questions, it makes the numbers that much more compelling. Similarly, students thought multiple choice questions were the easiest, but they performed second poorest on those questions. Mainly,

the expected results were quite often the opposite of the actual results when played out in the classroom setting.

I attribute two main factors to the unexpected outcome of the assessment scores: motivation was not present and the lessons were not conducted in an ideal manner. I believe those two factors were greatly affected by the research being implemented at the end of the school year. According to the data, the students' main motivators were good grades and pleasing their parents. However, at the end of the school year, students are aware of the reduction in grades and often begin to shut down. Students may realize that the few grades taken at the end of the year do not make a large difference in their overall all grade. It is also a possibility that the parents are not putting as much pressure on the students as the school year winds down, thus, removing the second main motivational factor.

In addition, the large majority of students, a combined 91%, felt that learning through hands-on and discovery-based lessons was their best learning method. Assuming that is true, it takes time to properly engage students in a discovery-based or hands-on lesson. Time was lacking at the end of the year, which led to a hurried lesson. Hurrying the lesson quite possibly lessened the effectiveness of the teaching method and ultimately skewed the results.

Due to the above factors quite possibly altering the data, I cannot make very concrete conclusions about the effects of self-efficacy on achievement and motivation. However, the literature still supports my original theory, which leads me to believe that this research may be better conducted during the beginning or middle of a school year. The results from an investigation such as that would be very interesting. Research shows that hands-on activity engages students to increase levels of self-efficacy (Carter 2001). In addition, students with

high levels of self-efficacy tend to have higher grade point averages (Hudley 2002). Nevertheless, I don't believe the data collected in this research is without some other interesting conclusions.

I found that the majority of students are motivated based on some external factor. Very few students possess forms of intrinsic motivation, which is potentially disastrous. This phenomenon could harmful to student success if the external motivators are taken away. External motivators tend to lessen intrinsic motivation. Therefore, taking away external motivators could leave students with nearly no motivation (Ingram 2000). Comparing reasons for motivation with the students' interest level in science also led to a useful conclusion. Based on the level of interest in science, the students' overall reason for motivation did not change. Therefore, it is likely that reasons for motivation can be generalized across all of the academic contents, with some minor exceptions.

Other conclusions based on student motivation in science class can be made based on the data from questionnaire B. Student enjoyment is directly related to motivation. The majority of students enjoyed doing a hands-on lesson, as opposed to learning from a lecture. Nearly the same percentage of students was also most motivated when learning through a hands-on method, rather than through a lecture. Those findings support the current research the same topic.

Lastly, the information dealing with the order of test questions is of interest. According to research, many students become frustrated when faced with difficult questions prior to the easier questions and ultimately perform at a lower level (Firmin 2004). Supporting that same line of thought, the majority of students in this study preferred to answer the easier questions

first, as opposed to the more difficult questions. That leads me to believe the importance of ordering questions in order increasing difficulty on assessments to aid with student success.

Overall, I do not feel this research served as a very conclusive study of self-efficacy and its effects on motivation and achievement. However, several useful conclusions were made about motivation and self-efficacy in general, but not necessarily in relation to one another. Future research would be necessary to more completely dissect the issue at hand. Creating an environment that lessens the limitations would be a vital aspect to any future investigations. It would be important to allow ample time for each teaching method to unfold naturally. It would also be interesting to assess the students knowledge after a certain period of time had elapsed. That would allow a researcher to determine which teaching methods helps students internalize information and retain it for a longer period of time; a valuable piece of information. Nonetheless, there are definitely still questions that have gone unanswered and more research that needs to be done in order to uncover this topic.

Implications for Practice

I believe educators should be aware of what motivates students and use that information to create an environment to promote those motivations and/or aid in the creation of new, more positive motivators. Based on the data collected, it is also important to base lesson types and themes around what students enjoy, because it will result in higher levels of motivation as well. Acknowledging how students approach different questions on an assessment is very applicable to educators too. The majority of students do answer easier

questions first, so ordering questions accordingly may be a good idea. However, ordering questions from easiest to hardest still leaves out the minority group of test takers. Therefore, educators need to inform students of the importance of answering questions in the order they are most comfortable with, not necessarily in the order the questions appear. Lastly, educators should address students with levels of low self-efficacy to ensure optimal achievement and student well-being. Acknowledging the conclusions made in this research should help educators increase levels of self-efficacy.

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Appendix A

Questionnaire A

Directions: Answer the following questions honestly and to the best of your ability.

Like and Dislikes:

1. What are your two favorite academic subjects in school? _____ and _____.

2. What are your two least favorite academic subjects in school? _____ and _____.

3. What is your favorite part of a normal school day?

4. What is your least favorite part of a normal school day?

5. What do you enjoy doing with your free time outside of school?

6. What method do you feel you learn the best with in science class?

_____ Discovery learning (teaching yourself individually or working as a group to teach each other a new topic)

_____ Reading from the textbook

_____ Lecture

_____ Hands-On Learning

7. What method do you feel you learn the worse with in science class?

_____ Discovery learning (teaching yourself individually or working as a group to teach each other a new topic)

_____ Reading from the textbook

_____ Lecture

_____ Hands-On Learning

How do you feel when…?:

1. How do you feel when you are having trouble understanding a topic in science?

2. What do you do when you are having trouble with a topic in science?

3. When faced with a difficult question in science class, would you like to have the teacher tell you the answer or would you like to figure it out on your own? Why?

4. What motivates you most to work hard in science class? Choose the top two reasons from the list below. Number them 1 and 2, with number 1 being the major reason for your hard work and number 2 being the second most important reason.

_____ You want to please the teacher.

_____ You want to please your parents.

_____ You want to work hard for yourself.

_____ You want to earn a good grade.

_____ You want to do better than other students.

Appendix B

Questionnaire B

Directions: Answer the following questions honestly and to the best of your ability.

1. Were you more satisfied with learning science when the teacher told you the information during a lecture or when you discovered the information on your own? Why?

2. Which topic do you feel you could teach better to another student? The topic you learned on your own or the topic you learned in the lecture? Why?

3. Did you enjoy learning science more when the teacher lectured or when you explored a topic on your own (or with group members)? Why?

4. When working with your group members, how did you feel when your group struggled to understand the topic?

5. What did you do when your group struggled with a topic?

6. Were you more motivated to learn science when you were trying to discover the knowledge on your own or when the teacher was lecturing? Why?

Appendix C

Questionnaire C

Directions: Answer the following questions honestly and to the best of your ability.

1. Order the following types of questions in order of easiest to most difficult to answer. Number them 1-4, from easiest to most difficult.

_____ Multiple Choice

_____ Short Answer

_____ Critical Thinking

_____ Drawing Diagrams/Pictures

2. How did you feel when you came upon a question that you felt you could not answer? What did you do?

3. Did you answer the questions in the order they appeared, or did you choose another method to decide what questions to answer first? Why?