INQUIRY-BASED SCIENCE PROGRAM EVALUATION

Bethel Middle School

by

Christopher M. Longo

Western Connecticut State University

Table of Contents

Comment [KB1]: Well done!

INQUIRY-BASED SCIENCE PROGRAM EVALUATION

The type of program proposed to be implemented as part of a program evaluation is middle school science inquiry-learning program. Inquiry in science includes many constructivist ways in which students generate explanations based on evidence. This program is a school-based program to be implemented with the hope of motivating middle school students in the sciences.

Statement of the Purpose

This evaluation will address the necessity for an inquiry-based science program at the middle school level. ~~It is important for today's educators to utilize an inquiry-based program in the middle school science classroom to increase student motivational levels and interest.~~ This science program is completed supported by the Bethel Public School district. The inquiry initiative is also found in both the National and Connecticut Science Frameworks.

Traditional science programs have forced students to follow a scripted procedure in science investigations. With inquiry learning, students can explore areas in science by asking questions, forming hypotheses and discovering knowledge with limited assistance. "Asking theoretical questions, making observations, developing hypotheses, engaging in experimentation, collecting and analyzing data, drawing conclusions, making inferences, and formulating new questions are some of the exciting processes that are practiced through inquiry-based science" (Hammerman, 2006, xxii).

This evaluation serves to address the importance of motivation and its role in an inquiry learning model. To motivate students, they should be encouraged to think like scientists and real-world connections should be made. According to the National Science Education Standards, "inquiry is defined as the diverse ways that scientists study the natural world and as the activities

Comment [KB2]: Are you seeking to find out if motivation is important or have you made that decision? Not clear.

used by students to formulate an understanding of the work that scientists do" (National Research Council, 1996). Real-world connections create a more powerful instructional tool in the use of inquiry learning in the classroom.

Rationale: The Need and the Significance of the Evaluation

The purpose of this study is to determine the impact of student motivation on a middle school inquiry learning program. After a recent site visit by the New England League of Middle Schools (NELMS), a suggestion was made to incorporate increased opportunities for student-centered learning ~~in order~~ to increase motivation. The need for this inquiry program stems from this suggestion, as well as the requirement to prepare high school students in science.

Motivation is critical for middle school students. An effective inquiry learning program can be an effective tool to stimulate curiosity in science and serve as a precursor for motivation. By providing an environment where students create and solve real world problems, motivation can flourish. Increasing student motivation is increasingly important at the middle school level. By incorporating motivation, and ultimately measuring motivational subscales using a valid and reliable instrument, an effective inquiry program can be developed. This program can serve as a true, constructivist learning model that positively contributes to student motivation.

Definition of Terms

The following terms are relevant to this program evaluation:

1. **Inquiry learning –** "the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work" (National Research Council, 1996, p. 23).
2. **Discovery learning –** "All forms of obtaining knowledge for oneself by the use of one's own mind" (Bruner, 1961, p. 22).

3. **Motivation** – "an inner stimulus that leads to mimic the learned behavior." (Bandura, 1977, p. 43).
4. **Mental focus scale of the CM3 –** The person scoring high in mental focus is diligent, focused, systematic, task-orientated, organized and clear-headed (Giancarlo, 2010, p. 7).
5. **Learning orientation scale of the CM3** – The person scoring high in learning orientation is motivated by a desire to increase their knowledge and skill base (Giancarlo, 2010, p. 7).
6. **Creative problem solving scale of the CM3 -** Persons scoring high in creative problem solving have a tendency to approach problem solving with innovative or original ideas and solutions (Giancarlo, 2010, p. 8).
7. **Cognitive integrity scale of the CM3 -** The person scoring high in cognitive integrity are motivated to use their thinking skills in an open-minded and truth-seeking fashion (Giancarlo, 2010, p. 9).
8. **Scholarly rigor scale of the CM3 –** A disposition to work hard to interpret and achieve a deeper understanding of complex and abstract material (Giancarlo, 2010, p. 10).

Comment [KB3]: Are these definitions quoted directly from the source. You included the page #'s but did not use quotation marks.

Research/Evaluation Questions

By using a systematic approach, this evaluation will address the following research question:

1. Is there a significant difference in motivation of middle school science students participating in an inquiry-based program as compared to students who participate in a traditional science program?

Comment [KB4]: This question relates to just one aspect of your science inquiry program evaluation. You need to include the questions that are related to the evaluation of the entire program as you described in your purpose and rationale. This question is just reflective of the motivation aspect.

Review of Related Literature

Inquiry-based science instruction has direct links to student motivation. Inquiry is rooted in a constructivist approach, where students become self-directed learners. Bandura (1977)

explains the manner in which individuals learn new behaviors through a process that involves observation, interaction, and modeling. When undertaking inquiry activities, students use skills such as making observations, inferences, and creating questions. In a guided inquiry approach, the teacher models in a way that provides structure for students as they begin to explore.

National and state departments of education include inquiry as a component of the science curriculum. The National Research Council (1996) encourages the use of inquiry: "Students will engage in selected aspects of inquiry as they learn the scientific way of knowing the natural world" (p. 23). The Connecticut State Department of Education (CSDE) lists scientific inquiry as part of the curriculum frameworks. The CSDE (2004) cites scientific inquiry as:

> … ~~A~~a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation. (p. 19)

Chang & Mao (1999) investigated the impact of inquiry-group instruction and traditional teaching methods on student learning in earth science and student attitudes towards the subject. The findings of this research demonstrate that inquiry instruction can lead to improved student achievement and attitudes toward earth science. Chang & Mao ~~(1999)~~ also conclude that "the inquiry-group approach encourages students to work collaboratively in groups and therefore helps students to actively construct their own meaningful learning" (p. 344).

Brickman, Gormally, Armstrong & Hallar (2009) examined the differences between traditional science settings compared to those lab settings that were inquiry-based. The findings suggest that students who received inquiry instruction showed gains in literacy and problem solving skills compared to those who were in traditional science classes. Significant

improvement in student confidence based on an inquiry-based approach also was ~~also~~ reported from this research.

Studies have also shown that motivation has a positive effect on science achievement. Singh, Granville & Dika (2002) investigated the effects of motivation, interest, and academic engagement on science and math achievement. This study began with nearly 25,000 middle school students. The researchers drew 25% of these students as a random sample, which left 3,227 students who participated in this study. It was found that motivation had positive effects on science achievement. The strongest effect was found on academic time spent on homework.

Comment [KB5]: This is not 25% of 25,000.

Research on different inquiry models also contributes to the benefits behind an inquiry learning program. Alshraideh (2009) used the Suchmans' inquiry model to observe differences in critical thinking of university students. This model uses a step by step method of training students to develop their thinking skills by investigating and explaining specific situations by asking questions. The researcher reported statistical significance in using this type of inquiry learning program as opposed to a traditional science program.

Methodology

Participants and Subjects

A sample of convenience will be drawn from a population of 715 middle school students from a suburban middle school in the Northeast. The sample will be taken from intact groups in the sixth, seventh and eighth grades. Students chosen for this study will be those who are currently enrolled in a science course at the middle school level. The sample will include approximately 53% male and 47% female. A total of five teacher participants will be assigned an instructional strategy to implement over a 20-week study.

Although the school district is predominantly white (81%), there has been an increased racial, ethnic and economic diversity over the past five years according to the Strategic School Profile for the district. The community is comprised of approximately 18,000 people. The median income for this community is $74,000.

Instrumentation

The evaluative tool that will be used is the *California Measure of Mental Motivation* (CM3). This instrument provides a measurement of critical thinking and motivation. "The CM3 was developed to capture measures of the personal attitudes that collectively orient a person toward learning and reflective thinking" (Giancarlo, 2010, p. 2).

The purpose of administering the CM3 is to evaluate the motivational levels before and after an inquiry treatment is administered. This survey attempts to measure dispositions toward critical thinking and mental motivation. "The CM3 can be used to gather valid and reliable evidence about the performance of groups of people, which data may be of use in program evaluation" (Giancarlo, 2010, p. 6).

The CM3 is described by the author as a 4-point Likert scale. The author of the instrument uses five scales in this assessment: Mental Focus, Learning Orientation, Creative Problem Solving, Cognitive Integrity and Scholarly Rigor. Descriptions of these scales can be found in the definition of terms, as well as in Appendix G in further detail.

Validity and reliability of the CM3. The CM3 has an established reliability and validity. Three separate studies support the reliability and validity of the CM3. Two of the studies were conducted in Northern California using both male and female high school students from diverse backgrounds. The third study was performed in the Midwest and involved predominantly Caucasian females.

Item prompts for the CM3 were developed after reviewing literature as well as adapting selected items from the authors of the California Critical Thinking Disposition Inventory (CCTDI). Four factors were retained from Study 1. In the next study, items were retained or added to increase validity and reliability, which lead to the naming of the subscales: Learning orientation, creative problem solving, mental focus and cognitive integrity.

Internal consistency of scores obtained by the CM3 was evaluated using Cronbach's alpha coefficient. The reliability estimate for learning orientation was .79 - .83. Creative problem solving produced an alpha coefficient ranging from .70 - .77. Mental focus ranged from .79 - .83 and cognitive integrity ranged from .53 - .63.

The researchers have established external validity. All four scales of the CM3 resulted in statistically significant positive correlations ($p < .01$). Predictive validity was examined by correlating CM3 scores with standardized test scores and grade point average. The two strongest relationships were found between scores on the Creative Problem Solving scale and performance on the Math subtest of the SAT9 ($r = .33$, $p < .001$). Another strong relationship was found between scores on the Cognitive Integrity scale and performance on the Reading subtest of the SAT9 ($r = .43$, $p < .001$). Lastly, GPA was significantly related to the Mental Focus scale.

Procedures

This program evaluation follows a social science research model (Posavac & Carey, 2003). "The way to determine a program's degree of success was to form two random groups, providing one with a service and using the other as a control group. After the program was completed, the members of both groups were observed or they described themselves on appropriate dependent variables" (Posavac & Carey, 2003, p. 25).

Comment [KB6]: This is a good support for the type of program evaluation you propose to conduct as oppsed to a more comprehensive approach.

Interview procedures. All stakeholders associated with this program evaluation will be interviewed. These participants include the following: superintendent, associate superintendent, principal, teachers, parents, and students. Conversations will take place that include timing of the program, monetary needs, staff accommodations, and any other essential needs.

Acquiring consent from stakeholders. The next stage in a program evaluation is to obtain consent from all of the necessary stakeholders. Written permission will be obtained from the superintendent of schools and associate superintendent of schools (s~~S~~ee Appendix C). Once approved, consent will be obtained from the principal of the middle school (s~~S~~ee Appendix D). Next, other stakeholders will be notified. Teachers participating in the study will be notified (see Appendix F), followed by parents (see Appendix B) and students (see Appendix E). Written consent to participate will be received from students and their parents before instrumentation is administered.

Training of teachers. Three 6-hour professional development sessions will be conducted for the teachers involved in the treatment group (inquiry-learning program) before the program is implemented. A pretest will be administered at the beginning of the study. Statistical analysis will be conducted to make sure the groups are similar before treatment is administered. If not, ~~then~~ corrections will be made or covariates will be chosen.

Testing procedures. The CM3 will be administered as a pretest to both the treatment and control groups at the start of the study.

Directions for administering this instrument are very specific and complete. The user manual provides directions for administering all versions of this assessment. ~~The version used for middle school children is the CM3 Level II. Participants are to use only a #2 pencil. Identification numbers are to be written on the answer sheet and the corresponding bubbles are to~~

~~be filled in below. Mistakes are to be completely erased. The test manual states that the following directions should be given to the students:~~

~~This is an opinion survey. Please indicate the extent to which you agree or disagree with each of the 72 statements. You will be able to agree strongly, agree, disagree or disagree strongly with each statement. There are no right or wrong answers; just indicate how you really feel. It should take you about 20 minutes for you to respond to all items. (Giancarlo, 2010, p. 23).~~

~~Test takers are not to write on the survey booklets. Talking or distracting behavior is not tolerated. The person administering the survey should ask for any questions before starting the assessment. Also, it is important that the room is properly lit and suitably comfortable. When these preliminaries have been completed, students are instructed to begin the CM3.~~

The assessments will be sent to a scoring group (Cap Score Scoring) and the results will be sent back electronically when complete. After 20 weeks of implementation of the inquiry program, both the treatment and control groups will be given a posttest. The interpretation of these data will provide specific information on which components should be part of an inquiry program for middle school science students. Once all data are received back from the scoring services, the appropriate statistical analyses will be run.

Research Design and Data Analysis

A quasi-experimental pretest/posttest design will be implemented over a 20-week period. A multivariate analysis of variance (MANOVA) will be implemented to determine if there is a difference in student motivation between inquiry-based instruction and traditional instruction. Mean differences between groups will be analyzed for all dependent variables. There are five scales associated with motivation. Therefore, five dependent variables will be studied in the

Formatted: Indent: Left: 0", First line: 0.5"

Comment [KB7]: You do not include this type of information in a proposal. You might include this in a final report of a research study.

Comment [KB8]: In a program evaluation we look for multiple data sources or multiple ways to analyze the program. You have focused on the actual assessment that you plan to administer.

MANOVA. Wilk's Lambda of the independent variable will be analyzed and if $p < .05$, then there will be differences on the variate across groups. Next, the test between subjects table will be analyzed in order to determine where the differences are. Partial eta squared will explain the percentage of the variance.

Limitations

Several threats to internal validity can affect this study. Mortality is always a limitation to any study, as it is very hard to control those participants that are lost along the way. Also, differences could be present to groups before treatment. If this is so, a covariate and MANCOVA analysis would need to be used in order to address this potential threat. Because middle school students are extremely competitive, there is a potential threat of the John Henry effect, also known as compensatory rivalry by the control group. When the control group perceives that they are in competition with the treatment groups, they perform beyond their usual level. Even though the CM3 instrument is a valid and reliable assessment, testing can represent a possible threat to internal validity because some students can improve by learning strategies of test-taking.

Comment [KB9]: This is not a scholarly phrase.

External validity can present limitations to the study. If the study is not described in explicit detail, then ecological validity will be a threat and the study will not be replicable in other studies. It is important that the researcher carefully obtains ongoing correspondence during the study with the stakeholders in terms of how the treatment is being implemented and what is happening in each of the classrooms.

Another example of a threat in external validity is the Hawthorne effect. "The Hawthorne effect refers to any situation in which the experimental conditions are such that the mere fact that

individuals are aware of participating in an experiment, are aware of the hypothesis, or receiving special attention improves their performance" (Gall, Gall & Borg, 2007, p. 390).

Statement of Confidentiality

Students who agree to participate will complete and submit all information to a designated data collector and will not be directly submitted to the researcher. Privacy will be protected. Student names will be numerically coded. Failure to complete the project will not affect each student's grades. All subjects' identity will be maintained in a secure location. This maintains confidentiality.

References

Alshraideh, M. (2009). The effect of Suchmans' inquiry model on developing critical thinking skills among university students. *International Journal of Applied Educational Studies*, *4*(1), 58-69.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice Hall.

Brickman, P., Gormally, C., Armstrong, N., & Hallar, B. (2009). Effects of inquiry-based learning on students' science literacy skills and confidence. *International Journal for the Scholarship of Teaching and Learning*, *3*(2), 1-22.

Bruner, J.S. (1961). The act of discovery. *Harvard Educational Review*, *31*, 21-32.

Connecticut State Department of Education. (2004). *Science Curriculum Framework*. Retrieved on March 29, 2010, from http://www.sde.ct.gov/sde/lib/sde/word_docs/curriculum/science/framework/sciencecoreframework2005v2.doc

Chang, C., & Mao, S. (1999). Comparison of Taiwan science students' outcomes with inquiry-group versus traditional instruction. *Journal of Educational Research*, *92*(6), 340–346.

Driscoll, M. P. (2005). *Psychology of learning and instruction* (3rd ed.). Boston: Allyn & Bacon.

Gall, M. D., Gall, J. P., & Borg, W. R. (2006). *Educational research: An introduction* (8th edition). New York: Longman.

Giancarlo, C. A. (2010). *The California Measure of Mental Motivation: User manual*. Millbrae, CA: California Academic Press.

Formatted: Font: Not Italic

Formatted: Font: Not Italic

Giancarlo, C. A., Blohm, S. W., & Urdan, T. (2004). Assessing secondary students' disposition toward critical thinking: Development of the California Measure of Mental Motivation. *Educational and Psychological Measurement, 64*(2), 347-364.

Hammerman, E. (2006). *Eight essentials of inquiry-based science*. Thousand Oaks, CA: Corwin Press.

National Research Council. (2000). *Inquiry and the national science education standards*. Washington, DC: National Academy Press.

National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.

Posavac, E. J., & Carey, R. G. (2003). *Program evaluation: Methods and case studies.* Englewood Cliffs, NJ: Prentice Hall.

Singh, K., Granville, M., & Dika S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research, 95*(6), 323-332.

Windschitl, M. (2003). Inquiry projects in science teacher education: What can investigative experiences reveal about teacher thinking and eventual classroom practice? *Science Education, 87*(1), 112-143.

Formatted: Font: Not Italic

Formatted: Font: Not Italic

Formatted: Font: Not Italic

Appendices

Appendix A: Completed IRB form

Proposal # _____

WESTERN CONNECTICUT STATE UNIVERSITY

Human Subjects Research Review Form (Hum-1)

Information

Principal Investigator(s): Christopher M. Longo
If the PI is a student, Faculty Supervisor: Karen Burke, CSJ, Ed. D.
Project Title: An Investigation of Middle School Science Motivation

Department: Education and Educational Psychology
Address (Where the reviewed application should be sent): 64 Ridgedale Road, Bethel, CT 06801
E-mail: longoc@sbcglobal.net
Phone number: (203) 910-1992
Is this grant funded? YES **NO** ✓ If yes, Grant agency: _____
Is this a new research project? **YES** ✓ NO

If so, are you applying for?

_____ Exempt Review
__X__ Expedited Review
_____ Full Review

Is this research a Continuation of previously reviewed research? YES **NO** ✓

Is this research a Modification of previously reviewed research? YES **NO** ✓
Principal Investigator's Name Christopher M. Longo
Principal Investigator's Signature _____ Date _____
Faculty Supervisor's Karen Burke, CSJ, Ed. D. (Ed and Ed Psych Dept.) Date _____
Name and Department

Faculty Supervisor's Signature _____ Date _____
(if PI is a student)
Department Chair's signature _____ Date _____

Committee Action:

__ Approved through exempt review

__ Approved by full committee review

__ Approved through expedited review

__ Not approved; clarification/modification required

IRB Chair's Signature _____ Date _____

1. Title:

An Investigation of Middle School Science Motivation

2. Abstract:

This study will allow for an assessment of middle school student motivation as part of a program evaluation. By measuring motivation in middle school science, informed decisions can be made to enhance an inquiry-learning program. Inquiry-based science instruction assists students in the process of discovering knowledge for themselves instead of simply being asked to recall information.

Student motivation levels will be measured using the *California Measure of Mental Motivation* (CM3). Through the administration of the CM3, student motivation will be measured according to the subscales of mental focus/self-regulation, learning orientation, creative problem solving, cognitive integrity and scholarly rigor. By using data from each of these categories, an inquiry learning program can be developed that supports student motivation and leads to high level critical thinking.

3. Rationale:

Motivation is critical for middle school students. An effective inquiry learning program can be an effective tool to stimulate curiosity in science and serve as a precursor for motivation. By providing an environment where students create and solve real world problems, motivation can flourish. Increasing student motivation is increasingly important at the middle school level. By incorporating motivation, and ultimately measuring motivational subscales using a valid and reliable instrument, an effective inquiry program can be developed. This program can serve as a true, constructivist learning model that positively contributes to student motivation.

4. Protocol:

Research Questions:

1. What effect does middle school science motivation have on the inquiry learning process?

The *California Measure of Mental Motivation* (CM3) will be administered to subjects. The various subscales of the instrument will serve as multiple dependent variables. These data will be used for the purposes of further enhancing an inquiry learning program. Future studies will use a multivariate analysis of variance (MANOVA) to determine if there is a difference in student motivation between inquiry-based instruction and traditional instruction.

5. Human Subjects:

A target population of five eighth grade students from a suburban school district in the Northeast will be piloted for this brief study. These students will be administered the CM3 and these data will be used for the purposes of further developing an inquiry learning program. Written consent to participate will be received from students and their parents before instrumentation is administered.

6. Risks and Benefits:

The study will not provide an environment of physical, psychological, or social injury.

7. Protection on Human Subjects:

Students who agree to participate will complete and submit all information to a designated data collector and will not be directly submitted to the researcher. Privacy will be protected. Student names will be numerically coded. Failure to complete the project will not affect each student's grades. All subjects' identity will be maintained in a secure location. This maintains confidentiality.

8. Reporting:

The results of this research will not be reported or distributed. The data will be used for the development of an inquiry learning program that supports the subscales of student motivation, as measured by the CM3, which in turn, lead to increased levels of student critical thinking and motivation.

B. Answer the following (if you answer yes to either question, the protocol requires full review):

- Does your project involve **risk of physical injury** to subjects?
  ____ Yes **_X_ No**

(If yes, describe the nature of the risk, the justification for undertaking the risk, and the procedures used to obtain the subject's informed consent to take the risk.)

- Does your project involve **risk of psychological or social injury** to human subjects?
  ____ Yes **_X_ No**

Appendix B: Letter and Consent Form (Parent/Guardian)

WESTERN CONNECTICUT STATE UNIVERSITY
Student Consent Form to Participate in a Research Study

Dear Parent or Guardian,

I am currently enrolled in the doctoral program for Instructional Leadership at Western Connecticut State University. This program requires that I design and implement a dissertation research study. In preparation for next year's study, I have to pilot an assessment instrument based on student motivation this spring.

The *California Measure of Mental Motivation* (CM3) will be administered to your child to measure his/her motivation. This assessment will provide valuable information about your child's motivation in science. Results will not be reported to the district or impact your child's science grade. Student names will be coded and remain confidential.

This research study has been reviewed and approved by Western Connecticut State University's Institutional Review Board. It is hoped that the results of this study will help teachers develop an effective inquiry learning program that stimulates student motivation.

Participation in this study is completely voluntary. You are free to withdraw your child from the study at any time. All information is completely confidential.

If you have any questions, please contact me via email at longoc@bethel.k12.ct.us or phone at (203) 794-8670.

If you agree to have your child participate in this pilot study, please sign the attached statement and return it to your child's science teacher_____ by
_____. (name of classroom teacher)
(date)

Sincerely,
Christopher Longo

I, _____, the parent/legal guardian of the student minor
(printed name of parent or guardian)

below, acknowledge that the researcher has explained to me the purpose this research study, identified any risks involved, and offered to answer any questions I may have about the nature of my child's participation. I voluntarily consent to my child's participation. I understand all information gathered during this project will be completely confidential.

Student/Minors's Name: _____

Signature of Parent or Guardian: _____

Appendix C: Letter and Consent Form (Superintendent and Associate Superintendent)

Department of Education and Educational Psychology
181 White Street
Danbury, CT 06810

March, 2010

Dear Dr. Chesley:

As you know, I have been a science teacher in Bethel for 10 years and am now a doctoral student at Western Connecticut State University. I am seeking district permission to carry out a pilot study at the middle school level in the Bethel Public Schools in preparation for next year's research study for my dissertation. This study has been approved by the WCSU chapter of IRB. This study will allow for an assessment of middle school student motivation as part of a program evaluation. By measuring motivation in middle school science, informed decisions can be made to enhance an inquiry-learning program that will be implemented next school year at Bethel Middle School.

Students who agree to participate will complete and submit all information to a designated data collector and will not be directly submitted to the researcher. Privacy will be protected. Student names will be numerically coded. Failure to complete the project will not affect each student's grades. All subjects' identity will be maintained in a secure location. This maintains confidentiality.

If you have any questions, please feel free to contact me.
Sincerely,

Christopher M. Longo
longoc@sbcglobal.net

I agree that the study described above can be conducted in Bethel Public Schools.

_____
Please Print Name

_____ _____
Signature Date

Department of Education and Educational Psychology
181 White Street
Danbury, CT 06810

March, 2010

Dear Dr. Jordan:

As you know, I have been a science teacher in Bethel for 10 years and am now a doctoral student at Western Connecticut State University. I am seeking district permission to carry out a pilot study at the middle school level in the Bethel Public Schools in preparation for next year's research study for my dissertation. This study has been approved by the WCSU chapter of IRB. This study will allow for an assessment of middle school student motivation as part of a program evaluation. By measuring motivation in middle school science, informed decisions can be made to enhance an inquiry-learning program that will be implemented next school year at Bethel Middle School.

Students who agree to participate will complete and submit all information to a designated data collector and will not be directly submitted to the researcher. Privacy will be protected. Student names will be numerically coded. Failure to complete the project will not affect each student's grades. All subjects' identity will be maintained in a secure location. This maintains confidentiality.

If you have any questions, please feel free to contact me.
Sincerely,

Christopher M. Longo
longoc@sbcglobal.net

I agree that the study described above can be conducted in Bethel Public Schools.

_____
Please Print Name

_____ _____
Signature Date

Appendix D: Letter and Consent Form (Principal)

Department of Education and Educational Psychology
181 White Street
Danbury, CT 06810

March, 2010

Dear Dr. Smith:

As you know, I have been a science teacher in Bethel for 10 years and am now a doctoral student at Western Connecticut State University. I am seeking permission to carry out a pilot study at the middle school in preparation for next year's research study for my dissertation. This study has been approved by the WCSU chapter of IRB.

This study will allow for an assessment of middle school student motivation as part of a program evaluation. By measuring motivation in middle school science, informed decisions can be made to enhance an inquiry-learning program that will be implemented next school year at Bethel Middle School.

Students who agree to participate will complete and submit all information to a designated data collector and will not be directly submitted to the researcher. Privacy will be protected. Student names will be numerically coded. Failure to complete the project will not affect each student's grades. All subjects' identity will be maintained in a secure location. This maintains confidentiality.

If you have any questions, please feel free to contact me.

Sincerely,

Christopher M. Longo
longoc@sbcglobal.net

I agree that the study described above can be conducted in Bethel Public Schools.

_____
Please Print Name

_____ _____
Signature Date

Appendix E: Letter and Consent Form (Student)

WESTERN CONNECTICUT STATE UNIVERSITY
Student Information Form to Participate in a Research Study

Dear Student,

I go to school at Western Connecticut State University. I am doing an exciting research study. I would like you to be a part of my study. I will send a permission slip home with you. But first, I would like you to know about my study.

The study is on motivation. I will need to use a test in my study. You will take the *California Measure of Mental Motivation* (CM3) in order to measure your motivation. This assessment will provide valuable information about motivation in science.

I will not use your name in the study. I will use numbers instead of names. The test we use will have nothing to do with report card grades. All of the information will be kept private.
You will be a volunteer for this study. If you have questions, please ask me.

If you would like to be in my study, please print and sign your name below:

_____
Print student name

X_____
Student signature

Thank you,
Mr. Longo

Appendix F: Letter and Consent Form (Teacher)

WESTERN CONNECTICUT STATE UNIVERSITY
Teacher Consent Form to Participate in a Research Study

Dear Teacher,

I am currently enrolled in the doctoral program for Instructional Leadership at Western Connecticut State University. This program requires that I design and implement a research study. This study will occur next school year. In preparation for this study, I am conducting a pilot study this spring.

The purpose of this pilot study is to identify the effectiveness of using The *California Measure of Mental Motivation* (CM3) to measure student motivation. This assessment will provide valuable information about student motivation in science. Results will not be reported to the district or impact your child's science grade. Student names will be coded and remain confidential.

This research study has been reviewed and approved by Western Connecticut State University's Institutional Review Board. It is hoped that the results of this study will assist in the further development of an inquiry learning program in science. In addition, this study will provide insight on whether or not this type of instrument will be an effective measure to use in next year's doctoral study.

Participation in this study is completely voluntary. You are free to withdraw from the study at any time. If you have any questions, please contact me via email at longoc@sbcglobal.net or by phone at (203) 794-8670.

If you agree to participate in this research study, please sign this form and return it to me.
Sincerely,
Christopher M. Longo

Participant Signature _____ Date: _____

Appendix G: Subscale Descriptions of the *California Measure of Mental Motivation*

Go to: http://www.insightassessment.com/Scales%20CM3.html

Assignment Two: Proposal 40%			
Criteria	**Possible Score (40)**	**Actual Score 36/40**	**Revisions**
Statement of purpose for this evaluation proposal 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= Information is present, but is not presented in a clear manner. 3= All information is present, the flow of writing could be improved. 4= All information is present, the writing flows well and information relates to all the components.	4	3	
A **rationale** describing the reason for completing an evaluation in the chosen area. 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= Information is present, but is not presented in a clear manner. 3= All information is present, the flow of writing could be improved. 4= All information is present, the writing flows well and information relates to all the components.	4	4	
A **research question** or questions. 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= All information is present, the writing flows well and information relates to all the components.	2	1	
Definition of terms. 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= All information is present, the writing flows well and information relates to all the components.	2	2	
Review of Literature to support the evaluation. 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= Information is present, but is not presented in a clear manner.	4	4	

3= All information is present, the flow of writing could be improved. 4= All information is present, the writing flows well and information relates to all the components.			
Description of your **methodology** including the evaluation design, setting and subjects, instrumentation, and form of analysis. (4 points for each of the 4 components) 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= Information is present, but is not presented in a clear manner. 3= All information is present, the flow of writing could be improved. 4= All information is present, the writing flows well and information relates to all the components.	16	14 (see notes regarding evaluation design and analysis)	
Limitations to the study. 0= The component is not evident. 1= Basic information is present, but some information is left out or is not related to the topic. 2= All information is present, the writing flows well and information relates to all the components.	2	2	
Completed **IRB** form 0= The component is not included. 1= Basic information is present, but some information is left out or is not related to the topic. 2= All information is present, the writing flows well and information relates to all the components.	2	2	
Grammar/Syntax/APA 1=The errors are so distracting that it is difficult to focus on the content. 2=Many errors are present, but the content is understandable. 3=Some errors are present. 4=There are so few errors, making the document easy to read and understand.	4	4	