

INVESTIGATOR STUDY PLAN - REQUIRED

1. TITLE

The Effects Of The *Claim, Evidence, Reasoning* Format Of Argument Writing On Urban Middle School Science Students' Performance

2. EXTERNAL IRB REVIEW HISTORY*

N/A

3. PRIOR APPROVALS:

N/A

4. BACKGROUND*

The ability to read and write effectively is critical for success in an increasingly global society, and recent science education reforms and standards have emphasized *arguing from evidence* as a critical learning goal (NGSS Lead States, 2013; MA DESE, 2016). As evidenced by poor scores on open response questions on classroom and state tests, students in Lowell are not acquiring the skills necessary to use science content information appropriately in order to *argue from evidence* in their science classes. There are several factors that could contribute to this issue, including a lack of direct writing instruction in science, a lack of open-response writing practice, and inconsistent practices in regard to teaching *arguing from evidence* in science class. Science teachers often feel they are not responsible for teaching reading and writing, but may not be aware of the higher-level disciplinary literacy skills used within their field of study that are beyond the scope of the English Language Arts class. Research has shown that modeling a writing skill and providing multiple opportunities for practice greatly improves student learning. It is expected that student academic success in science can be increased by focusing on direct writing instruction related to teaching the CER (*claim, evidence, reasoning*) format for *arguing from evidence*. This organizational problem study aims to fill a “gap in practice” at the middle school level.

5. OBJECTIVES*

The student researcher conducting this organizational problem improvement study is the Science Department Chair at Lowell High School; she has observed a decline in students' scores on the open response questions on both the eighth grade Science MCAS and the tenth grade Biology MCAS. She and the teachers attribute part of the struggle to achieve success to the lack of instruction of science-specific writing skills. Therefore, the purpose of this study is to determine the effects of implementing a *claim, evidence, reasoning* (CER) format of argument writing in

INVESTIGATOR STUDY PLAN - REQUIRED

middle school science to equip students with the necessary writing skills for the high school level. The research is guided by the following questions:

- *To what extent does participation in claim, evidence, reasoning writing tasks affect students' writing skills on answering constructed response argument prompts?*
- *Is there a relationship between students' writing scores and their content knowledge scores?*
- *To what extent does participation in claim, evidence, reasoning writing tasks affect students' attitudes towards writing in science?*

6. STUDY OUTCOMES*

This study will help middle school science teachers determine whether explicit instruction in a CER argument-writing format will affect students' science writing skills and their content knowledge. Argumentation is a core practice of science and has recently been advanced as an essential skill in such seminal works as *A Framework of K-12 Science Education*, the Common Core State Standards (CCSS) for Science & Technical Subjects, and the Next Generation Science Standards (NGSS). Building on a previously conducted, IRB-approved doctoral study conducted at Lowell High School that indicated a need for writing instruction across the content areas, this study will analyze quantitative and qualitative data to determine the relationships that might exist between explicit science writing instruction, students' science writing skills, and students' science content knowledge at the middle school level.

7. INCLUSION AND EXCLUSION CRITERIA*

Four science teachers, two at the Stoklosa and two at the Wang, will participate in researcher-provided CER Professional Development. The teachers will collect data from 1-2 of their classes. Teacher participation in the study will be strictly voluntary.

The teachers who volunteer will purposefully select which of their classes to include in the study for a total of approximately 100-150 students. From that larger quantitative sample, the participating teachers will choose one or two students from each class for a smaller qualitative sample for student interviews. Student participation in the study will be strictly voluntary.

8. VULNERABLE POPULATIONS*

- **Students:** The researcher does not teach any of the students and has no influence over the students' grades. Students are the intended target of the writing instruction and therefore need to be included. Student participation in the study will be strictly voluntary, and they will be informed that the project is designed to improve instructional practices in science courses.

INVESTIGATOR STUDY PLAN - REQUIRED

- **Employees:** The researcher does not supervise any of the science teachers at the middle schools, and teachers will be assured that participation or non-participation in the study will have no effect on their evaluation. This study will inform larger, long-term projects at some of the schools in Lowell, from which all teachers may benefit.
- **Subjects who are not yet adults (infants, children, teenagers):**
 - Permission will be obtained from one parent or guardian through a parent/guardian consent form that explains the research project (see Appendix D)
 - Student assent will be obtained on the same form as parent/guardian consent
 - Participation for both parents/guardians and students is completely voluntary; anyone may stop participating at any point without repercussion

9. SETTING

The site of the research study will be in Science classrooms at the Stoklosa Middle School and the Wang Middle School. Potential participants will be recruited from among the Science teachers in the building, and from their students in their fall 2019 Science classes. Data collection will occur in the school, and data analysis will occur in a secure location outside the school. The student survey will be conducted on school computers or laptops, or on the students' personal smart phones. Student interviews will be conducted in an empty classroom or a private office at the respective school.

10. RESOURCES AVAILABLE

- Principal Investigator is a doctoral candidate; responsible for outreach, receiving and documenting consent, gathering data, conducting interviews, and analyzing data. Researcher has been trained in procedures for human subject research.
- Faculty Advisor is serving as the dissertation committee chair; responsible for oversight of conduct of research and secondary data validation. Faculty advisor has been trained in procedures for human subject research.
- Research timeline – data collection completed prior to December 2019, data analysis completed by February 2020.

11. STUDY TIMELINES*

- Teachers and students will be involved in the research during the fall semester of the 2019-2020 school year.
- It is expected that one-two weeks will be needed to enroll all participants
- Four to eight students will participate in two semi-structured interviews, each lasting for approximately 30 minutes.
- Primary analysis will occur on a continual basis as data is collected, and should be completed by December 2019.

12. NUMBER OF SUBJECTS*

INVESTIGATOR STUDY PLAN - REQUIRED

Three to four teachers will be recruited, and approximately 100-150 students will be involved in the study.

13. PROCEDURES INVOLVED*

Sequence	Action
July-August	Finalize consent forms Obtain school committee and principal permission Submit IRB review
September	Recruit teachers to participate in study (Appendix C) Create data collection instruments
Early October	Administer pre-survey (Appendix A) Administer pre-test for Unit 1 Conduct initial interviews with representative sample (Appendix B) Conduct intervention Collect artifacts for Unit 1
Mid October	Administer post-test for Unit 1 Administer pre-test for Unit 2 Conduct intervention Collect artifacts for Unit 2
Late October	Administer post-test for Unit 2 Administer pre-test for Unit 3
Early November	Conduct intervention Collect Artifacts for Unit 3
Mid November	Administer post-test for Unit 3
Late November	Administer post-survey (Appendix A) Conduct final interviews with representative sample (Appendix B) Begin data analysis
December	Continue data analysis
January-February	Finalize data analysis Report on study findings
March-April	Finalize study Prepare dissertation defense Prepare to disseminate results

14. RECRUITMENT METHODS*

Science teachers at two of the middle schools in Lowell will be recruited through email after the building principal has been notified and has given the researcher access to the eighth grade science teachers. Each of the participants will nominate one or two of their classes for the study. Since class sizes vary, the researcher expects to include approximately 100-150 students. Teachers will then provide students with the consent/assent form (Appendix D).

INVESTIGATOR STUDY PLAN - REQUIRED

15. CONSENT PROCESS*

The researcher will be obtaining informed consent from the teachers through an email and will ask for a response within one week of receiving the email. Student and parent/guardian consent will be obtained through a consent/assent form sent home at the beginning of the study, and the form will ask for a response within one week of receiving the form. All participants will be informed that they may drop out of the study at any time.

16. PROCESS TO DOCUMENT CONSENT IN WRITING

Please see Numbers 8 and 15 above.

17. WITHDRAWAL OF SUBJECTS WITHOUT THEIR CONSENT*

N/A

18. SHARING OF RESEARCH RESULTS WITH SUBJECTS*

The results of the research will be shared with all middle and high school science teachers at the end of the study, and will be used to guide further instructional practice improvements in the schools. The results will also be shared with the Superintendent through an executive summary when the dissertation is completed.

19. RISKS TO SUBJECTS*

There is minimal risk to teachers and students in this study. Teachers may feel obligated to participate, but will be assured throughout the process that participation or non-participation in the study will have no effect on their evaluation. I will periodically check in with the teachers to mitigate risks; all activities are considered part of a normal school day. Students may feel some social discomfort during the interviews, but the researcher will take precautions to make the students feel at ease. All interview questions are related to schoolwork.

20. POTENTIAL DIRECT BENEFITS TO SUBJECTS*

N/A

21. DATA AND SPECIMEN ANALYSIS AND MANAGEMENT*

N/A

22. PROVISIONS TO MONITOR THE DATA TO ENSURE THE SAFETY OF SUBJECTS*

There is minimal risk to participants in this research. Most of the data collected is typical of a normal school day and students' experience in a classroom. Three sets of pre-test, formative assessment, and post-test data will be collected from participating students. The researcher will continuously analyze the data as it is collected. Survey questions will be related to students'

INVESTIGATOR STUDY PLAN - REQUIRED

opinions about writing in science and general demographic information; these pose little to no risk to the students.

23. DATA AND SPECIMEN BANKING*

N/A

24. CONFIDENTIALITY

The participating teachers will collect hard copies of students' pre-tests, formative assessments, and post-tests. These will be copied before being given to the researcher; the teachers will keep the originals. The researcher will de-identify and code the data. The data will be stored in a locked cabinet away from classrooms for the duration of the study. After three years, all data and the code key will be shredded.

25. PROVISIONS TO PROTECT THE PRIVACY INTERESTS OF SUBJECTS

Demographic information will be collected from students on the student survey, but will not include their name. The interviews will be conducted in an empty classroom or a private office. Students will be told that they do not have to answer any question that makes them feel uncomfortable or that they do not want to answer.

26. COMPENSATION FOR RESEARCH-RELATED INJURY

N/A

27. ECONOMIC BURDEN TO SUBJECTS

N/A

28. COMMUNITY-BASED PARTICIPATORY RESEARCH*

N/A

29. MULTI-SITE RESEARCH*

N/A

30. RESEARCH CONDUCTED IN A FOREIGN COUNTRY

N/A

31. DRUGS OR DEVICES

N/A

INVESTIGATOR STUDY PLAN - REQUIRED

Appendix A: Survey Questions

Science Writing

1. Writing helps me understand science ideas and/or concepts.
2. My teacher has me write about science ideas and/or concepts.
3. My teacher provides constructive feedback on my science writing.
4. My teacher includes open response and/or short-answer type questions on tests and quizzes.
5. It is difficult for me to write about science ideas and/or concepts.
6. My teacher does not include open response and/or short-answer type questions on tests and quizzes.
7. I enjoy writing in science class.
8. My teacher does not provide feedback to improve my ability to write about science ideas and/or concepts.
9. I can clearly explain in writing my thinking about science ideas and/or concepts.
10. I do not answer open response and/or short-answer type questions on tests and quizzes.

This will be a six-point Likert Scale survey created through Google Documents. The answer choices will include: strongly disagree, disagree, slightly disagree, slightly agree, agree, strongly agree.

INVESTIGATOR STUDY PLAN - REQUIRED

Appendix B: Interview Questions

Interview Guide

Please think of all the writing activities you have done in science class since coming to this school when answering the following questions.

1. Since starting middle school, have you done any new types of science writing that you did not do in elementary school? If so, what are they?
2. What kinds of science writing do you most like to do? Can you think of a specific example?
3. Why do you enjoy these types of writing? What made the example you cited enjoyable?
4. Please tell me about the kinds of science writing do you least like to do? Can you think of a specific example?
5. What makes these types of writing not enjoyable? What made the example you cited not enjoyable?
6. Has there been an individual who has been particularly helpful to your development as a writer in science? [This can be a teacher, parent, friend, classmate, website, etc. and does not have to be from just middle school.]
7. Do you think writing about science topics helps you to understand them? Why or why not?

INVESTIGATOR STUDY PLAN - REQUIRED

Appendix C: Email to Teachers

Dear Science Teacher,

As part of my Doctoral Dissertation, I would like to conduct a research study titled: *The Effects Of The Claim, Evidence, Reasoning Format Of Argument Writing On Urban Middle School Science Students' Performance*. You will be receiving researcher-provided Professional Development on the *claim, evidence, reasoning* (CER) format of argument writing.

There is no obligation to participate, and participation or non-participation will not be included in your evaluation in any manner. If you would like to participate, please respond to this email.

Thank you,

Stephanie Selvaggio

INVESTIGATOR STUDY PLAN - REQUIRED

Appendix D: Consent/Assent Form



Parental Letter of Consent with Assent included

IRB Protocol Number:

Title of Research Study: The Effects Of The *Claim, Evidence, Reasoning* Format Of Argument

Writing On Urban High School Biology Students' Performance

Summary Statement (include activities, risks and benefits): This study will help the science department determine whether explicit instruction in a *claim, evidence, reasoning* format of argument writing will affect students' science writing skills and science content knowledge. Your child will take pre-tests and post-tests on the regular science content material in Biology, and they will participate in formative assessments in between that will help the teacher determine student learning on subtopics of a particular unit. There are no potential risks associated with students' participation, and students' grades will not be affected whether they participate or not. The specific benefit from participation is that it may increase their science writing skills and may help them to better understand science content material.

Dear Parent/ Guardian and Student,

My name is Stephanie Selvaggio and I am the Science Department Chair at Lowell High School. I am conducting a research study on the *claim, evidence, reasoning* format of argument writing. The purpose of this research is to find out what happens when this writing format is explicitly taught to middle school students. Several students will be asked to participate in two researcher-conducted interviews at the beginning and the end of the project.

We are asking your permission for your child to participate in this research. Participation is completely voluntary, and if you agree, we will also ask your child for their assent to participate as well. The decision to participate or not, will not affect your child's grade in any manner. The research will involve the following activities with your child:

- a) Taking a survey on their thoughts about writing in science classes
- b) Taking a pre-test on the material that will be taught (this will NOT count as a grade)
- c) Participating in formative assessments that help the teacher gauge student understanding of subtopics in a unit (these may or may not count as a grade, and are a regular instructional practice at Lowell High School)
- d) Taking a post-test on material that has been taught in the unit (this will count as a grade, and are a regular instructional practice at Lowell High School)
- e) Participating in two researcher conducted interviews

The risk to your child from participation in this research is minimal. However, your child may feel uncomfortable participating or uncomfortable answering interview or survey questions. You or your child may opt out of this research at any time by sending an email to sselvaggio@lowell.k12.ma.us or speaking directly to the researcher at 978-970-4295

INVESTIGATOR STUDY PLAN - REQUIRED

If you have any questions or concerns regarding this study, please feel free to contact me. Thank you for your support!

Stephanie Selvaggio, Principal Investigator, Science Department Chair

Email: sselvaggio@lowell.k12.ma.us Phone: 978-970-4295

Parental Acknowledgment:

I understand the potential risks and benefits to my child that have been described in this document and by the researcher. By signing below, I agree to allow my child to participate in this study.

Parent/Guardian Name (printed): _____

Parent/Guardian Signature: _____

Name of my child (printed): _____

Date: _____

Student Assent or Agreement to Participate:

I understand that my teacher is participating in a research study about argument writing in science.

I know that my parents have agreed to let me participate in the research study but that I can choose to participate or not participate AT ANY TIME.

I understand that choosing to participate or not participate will not affect my grade in any way.

- YES, I want to participate
- NO, I do not want to participate

My Name (printed): _____

My Signature: _____

Date: _____ Class Period: _____