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Rhetoric and science: examining and identifying the rhetorical techniques used by students in a composition classroom

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RHETORIC AND SCIENCE:

EXAMINING AND IDENTIFYING THE RHETORICAL TECHNIQUES USED BY STUDENTS IN A COMPOSITION CLASSROOM

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Rhetoric and Science in Students' Education

Rhetoric and science, at first glance, seem like such different concepts. Rhetoric is often thought to be about people communicating ideas and making arguments. Science is often viewed as scientists asking questions and conducting experiments in labs. However, first looks can be deceiving. Despite the fact that science and rhetoric are normally studied separately (science in courses such as biology and social science and rhetoric in composition courses and oral communication courses) the two topics are intrinsically bound. Scientists use rhetoric to communicate ideas between scientists and between scientists and non-scientists. In this way, science cannot escape rhetoric.

People, scientists included, learn to make choices about how to deal with language in order to pose questions and explain their ideas to new audiences. Namely, they use rhetorical techniques, rhetorical appeals, and the rhetoric of their discipline in order to communicate ideas.

While people have debated over the definition of rhetoric for many centuries, it can at least be said that rhetoric, at its core, is a method of communication. Namely, rhetoric is the language of how people use language. Rhetorical language is mainly made up of three rhetorical appeals: ethos, pathos, and logos. Ethos is the credibility of an author and his and her arguments. Pathos refers to emotional appeals made by the author. Logos is the reason used by the author. These rhetorical appeals were created and described by philosopher Aristotle. Rhetorical techniques, on the other hand, refer to how a person uses these types of appeals in consideration of the audience, purpose, and context of whatever argument they are making or idea they are attempting to present.

Despite the relationship that exists between rhetoric and science, this connection

has not been or recognized in most educational models. What has not been, as of yet, fully realized is the idea that the rhetorical learning accomplished by students in a college composition classroom could be very helpful in their later work in the sciences.

It is the concept of transfer that allows for learning in one class to transcend classroom boundaries to be effective in other contexts. To one expert, "*transfer* can be considered as the learner's use of parts of a mental map, derived in relation to one focal event, meaningfully in another focal event" (Gilbert 830). This expert mentioned that "Transfer can only be attained when a student sees a new context as being analogous—alike in some ways—to the one in which thinking patterns have been initially learned." Rhetorical learning could be transferred between classes, then, if students are made to realize that rhetorical skills are used in scientific settings. For example, rhetorical learning accomplished in a composition classroom (one focal event) could be transferred to coursework and other efforts in the sciences because learning in one class can transfer to another class (a different focal event).

One example of rhetoric involved with the sciences is connected to the major focus in education today on supporting education in the sciences through STEM initiatives. STEM is an acronym that stands for science, technology, engineering and mathematics. The difficulty some experts have noted about the current STEM curriculum is the idea that "Traditional science training provides a solid foundation of facts and basic science technique, but rarely examines how to foster scientist's creative, cross-disciplinary problem identification and solving skills" (Madden et al. 541). Some of the topics that STEM education may not focus on enough include communication about science, scientific literacy, and how to speak and write in scientific contexts.

Communication, literacy, and speaking and writing are all practices that require those involved to communicate clearly and with conscious purpose. Learning more about the art of rhetoric can help to address learning these issues.

Some researchers have begun to realize the potential strength of emphasizing the importance of learning rhetoric to a science curriculum. A few of these researchers are involved in promoting what is called STEAM curriculum. STEAM is the acronym for science, technology, arts, engineering, and mathematics. STEAM is a curriculum that would add the arts as a major focus to STEM education. In "Rethinking STEM Education: An Interdisciplinary STEAM Curriculum" (2013), Madden et al. point out that "traditional science training provides a solid foundation of facts and basic science technique, but rarely examines how to foster scientist's creative, cross-disciplinary problem identification and solving skills" (541). Based in this reasoning, Madden et al. propose a kind of interdisciplinary STEAM curriculum that would emphasize the creative aspects of art in the sciences. Applying STEAM ideas to more schools would therefore allow for the benefits of rhetorical learning to be more emphasized in a curriculum.

One of the main ways a curriculum can focus on rhetoric is through teaching and writing in a composition classroom. Higher education scholar Dr. George Kuh talks about how writing for classes is an aspect of rhetorical expression, saying that it "ensures that everyone benefits from the extensive writing experience, and discipline-specific writing helps students realize the importance of writing well in their future professions" (Kuh 185). Through his focus on writing in classes, and writing for disciplines, Kuh emphasizes the social nature of learning to communicate not just broadly, but in ways specific to different kinds of knowledge. Due to the potential benefits, learning rhetorical

skills is part of the larger answer for how to help students learn literacies in their different disciplines, science in particular. Rhetoric, as a part of writing and communication, then, is foundational to any literacy, even scientific literacy, since it is often integral to the decisions made and the types of communication expressed in disciplines.

Therefore, experts in science, STEM proponents for example, should care about the learning accomplished in composition classes because of the way rhetorical thought could benefit students' performance in the sciences. If students learn rhetorical techniques more effectively during their first or second year in college, that means they may be able to contribute more to their disciplines, science especially, in the long run. This would especially be true if this learning were supplemented by discipline-specific rhetoric and writing education provided by the students' major classes.

Considering that science curricula could benefit integration with rhetorical education, it is important to gather more concrete examples of rhetoric at work in a composition classroom in order to understand in more detail exactly how the learning of rhetoric could influence student expressions in their disciplines and beyond. While rhetoric includes more than decisions made in the course of a single paper, assignments written for a class are a great place to view students' use and understanding of rhetoric. As a product of rhetoric, the writing process a student uses to complete assignments is complex and can speak volumes about the thought process and learning of a student.

Student use of rhetoric can provide insight into student learning since rhetoric is, in part, epistemological. Epistemology refers to the study of the way someone thinks about a topic. Rhetoric is epistemological, therefore, because rhetoric is, at its core, the way ideas are thought about and expressed. Therefore, identifying and analyzing student

usage of rhetorical techniques has the potential to allow a glimpse at the epistemological state of the student mind concerning their rhetorical learning. Insight drawn from knowing what students do and do not know concerning rhetoric could be extremely valuable to teachers in that it could pinpoint opportunities for greater learning. It could also be very valuable to STEM teachers, considering that science, math, and technology are need areas in both academia and the rest of the world. Finding ways to teach students to be more effective communicators, especially in mathematical, scientific, or technological contexts, then, is a topic that ought to receive attention because it provides the foundation for students' later achievements.

In light of the importance of examining the rhetorical learning accomplished by students in connection with the sciences, I have investigated the rhetorical appeals and techniques used by students in the University of Northern Iowa Spring 2014 College Writing and Research course focused on writing in the life sciences. Since this course is partly focused on the sciences, seeing the connections between rhetorical learning and scientific discourse will be an easier process due to the fact that students will be learning about rhetoric and expressing it in both scientific and non-scientific assignments. My goal in this study is to answer the following two research questions: what kinds of rhetorical techniques and practices do students in a composition class use? and what do these rhetorical techniques and practices say about these students' epistemological understanding of rhetoric? My answers to these questions will not be definitive, but they may be indicative of the ways in which the rhetoric is an important aspect of composition for the sciences, due to its foundational place in the educational life of all students, including those going into the sciences.

Examining Students' Rhetoric is Important

As I have argued, to show how the composition classroom fosters student rhetorical learning, one must begin by identifying the rhetorical situations and techniques of a sample population of composition students. The study examined the rhetorical techniques and appeals one class of students used in their written and spoken work. The students' uses of these rhetorical techniques helped to describe the epistemological understanding of rhetoric that these students displayed. This understanding could identify gaps in the students' knowledge of rhetoric, which could be problematic for their students' future work in their chosen disciplines.

The importance of my research is threefold. One, my examination could become the base of future efforts to investigate the relationship between rhetoric and science in college composition courses and beyond. Two, my examination could help educators better cater to the learning needs of students. Professors and teachers could use my research to help them decide how to teach students in composition classrooms that may be in similar situations or have similar difficulties as the students in my study. Three, my research could also give proponents of STEM efforts another focus on how to improve science education, namely by incorporating rhetorical ideas, which could improve the expressions of students in scientific, and other, disciplines.

Considering these three main reasons for the importance of my research, the main audience for this thesis includes professors, teachers, rhetoric scholars, administrators, and STEM proponents. These audience members, as well as students themselves, could, for example, utilize a greater knowledge of students' rhetorical writing techniques to

make students more aware of their own writing practices. This would allow students greater opportunity for metacognition and self-learning, both of which are so vital to student development of communication skills, both in and out of science.

As a teaching assistant in Dr. David Grant's Spring semester 2014 College Writing and Research course with a focus on writing in the life sciences, I had an excellent position from which to identify the rhetorical expressions of students. In my role, I have especially been able to identify what rhetorical techniques they use, study firsthand how second-semester freshmen and other students express rhetorical knowledge, and identify the epistemological understanding of rhetoric they indicated by their attempts to communicate in English and science genres.

The Development of Rhetoric and Science

Rhetoric's history stretches back to Socrates, Plato, and Aristotle. These men, as well as many others throughout the centuries, argued about the place of rhetoric. Rhetoric was born in the Greek city-state of Athens, which was also the birthplace of democracy during the fourth century BCE. This is no coincidence. With the rise of democracy came the need for people, such as each of the hundreds of members of the Athenian government, to convince others to vote in a certain way. This process of convincing is what led to the birth of rhetoric as a way to argue more effectively.

Plato, one of the most influential voices in the early discussions of rhetoric, discusses the two main definitions of rhetoric at length in his works, *Gorgias* and *Phaedrus*. While quite hostile to rhetoric in *Gorgias*, Pluto has Socrates strike a more moderate tone in *Phaedrus*. Rhetoric is often defined by comparison to logic. Logic, in

Plato's works, is often referred to as "dialectic" (Plato). The character of Socrates sees rhetoric as lesser than the philosophical, scientific "dialectic." He defines rhetoric as "an art of influencing the soul though words, not merely in the law courses and all other public meeting places, but in private gatherings also"

Socrates, at the end of his narrative in Phaedrus, is putting down rhetoric by putting down those who would be "composing a document for a political maneuver" (Pluto 72). Despite this belief, Socrates relaxes his stance by looking at the other side of the rhetorical coin. This other side can include "the man who thinks that the written word on any subject necessarily contains much that is playful" (Pluto 73). Socrates then goes on to admit that rhetoric is "true instruction" (Pluto 73). Plato and Socrates devalued rhetoric, but in *Phaedrus*, this one moment does show that the ancients valued the ability of rhetoric to notice the playful thoughts in a text.

The other ancient philosopher that is incredibly important to the development of rhetoric is Aristotle. Aristotle defined many aspects of rhetoric. For example,

> Aristotle said that we persuade others by three means: (1) by the appeal to their reason (logos); (2) by the appeal to their emotions (pathos); (3) by the appeal of our personality or character (ethos). We may use one of these means exclusively or predominantly or we may use all three. Which of these means we use will be partly determined by the nature of the thesis we are arguing, partly by current circumstances, partly (perhaps mainly) by the kind of audience we are addressing (Corbett 37).

In addition to defining rhetorical appeals and how they can be used in terms of audience, purpose, and context, Aristotle spoke about the artistic proofs of rhetoric in comparison

to the non-artistic proofs of science. One can understand how rhetoric is artistic by understanding how "everyone develops some instincts for adapting means to fit the subject, occasion, and audience, but by experience and education some people so refine these instincts that their success in dealing with others can be attributed to an art rather than to a mere knack" (Corbett 37). This art is rhetoric. Many ideas presented through rhetoric are concerned with audience, purpose and context, and these are considered artistic considerations. Non-artistic proofs concern ideas that do not include the art of rhetoric and are often used in science. Aristotelian artistic and non-artistic proofs, then, help to define the differences between rhetoric and science.

Therefore, the ancient definition of rhetoric was one that focused most on rhetoric's dual nature, both as a tool for teaching and learning and as a tool to spin stories. Clearly, the fields of rhetorical study, and the study of the connections between science and rhetoric, have roots in this history of rhetoric.

Modern Rhetoric

The modern understanding of rhetoric is far more complex than the ancient dichotomy, though it can, in popular parlance, often fall into the same dichotomy defined by Plato. However, the modern understanding of rhetoric does still incorporate Aristotle's view of rhetoric as comprised of ethos, pathos and logos. This modern understanding of rhetoric was born through the discussions of Sister Miriam Joseph and her contemporaries in the middle of the twentieth century. For rhetoric scholar Sister Miriam Joseph, rhetoric is the master art of the trivium. In comparison to other artistic endeavors (like painting or pottery), there is no physical object of rhetoric. Rather, rhetoric is an intransitive practice that can help students by socializing them into the discourse

communities they would like to join (Joesph). Joseph explains this concept through the metaphor of a rose. Rhetoric is not the rose itself, but rather the opening of the rose (Joesph). This understanding of rhetoric as intransitive differs from the transitive forms of learning, which have an object. For example, one paints a painting. The process of painting is one that involves artistic techniques, often referred to as poiesis. In contrast, less imaginative kinds of learning, such as crafting a table, belong to the mechanical arts, the techniques of which are often referred to as techné. Once understood as the process rather than the product, rhetoric has the ability to help students communicate in and with their chosen field of study.

Rather than focusing on the processes of rhetoric, much modern rhetorical scholarship has focused on the epistemic nature of rhetoric. Namely, what this means is that much of the scholarship of the past couple decades has looked at how rhetoric is bound up with what a person knows and how they express that knowledge.

Scholar Richard Cherwitz, concerning the epistemic nature of rhetoric, argues that "all three disciplines [science, logic, and rhetoric] may be treated as independent 'ways of knowing.' In each, knowledge is dependent upon certainty, the basis for which is a perceived impossibility of error. Whereas the dialectician is *logically* certain and the scientist is *empirically* certain, the rhetor is *intersubjectively* certain" (455). This quote emphasizes that science and rhetoric both are “ways of knowing.” And the intersubjectiveness of rhetors shows that the rhetor must be able to use rhetoric in many different contexts, such as in science. People, including students, choose how they will use rhetoric as well as language. Therefore, since rhetoric is epistemic and rhetoric is

based in language, one could examine the choices a person makes in writing language to identify the epistemological state of their mind.

In his book, *The Rhetoric of Science*, scholar Alan Gross uses rhetorical analysis to examine science in an effort to determine whether "science may be progressively revealed not as the privileged route to certain knowledge but as another intellectual enterprise" (Gross 3). Gross also defends rhetoric as a tool of examination, claiming that it was the previous expressions of thinkers like Plato that kept rhetoric in such low esteem as a form of communication and intellectual inquiry. Gross examines and debunks many of the beliefs about science, such as the esteem that gives scientific "communications a built-in ethos of especial intensity" (21), the passivity of scientific language, and the esteemed process of peer review. He specifically looks at *The Origin of Species* by Charles Darwin and the "A Structure for Deoxyribose Nucleic Acid" article by James Watson and Francis Crick. Through his arguments, Gross comes to the conclusion that "scientific truth is...the natural result of the persuasive process that is science, a persistent effort to renew consensus despite a constant influx of potentially disruptive utterances" (204). In this light, science is connected to rhetoric because science is created through a constant rhetorical discussion.

As an intellectual enterprise, science, therefore, can be useful for developing student rhetorical writing and communication skills, since science is connected to rhetoric. While I agree with Gross's debunking of science as something more than intellectual inquiry, I wonder about the status of students in the conversations of scientific communities. Students need to be able to understand what science says as well as understand how the science community works. In order to do this, they must be able to

identify the kinds of claims made by scientists and be able to analyze those claims. Understanding the concepts of rhetoric would go a long way to understanding the what and how of science. In consideration of this relationship between student's understanding of rhetoric and science, students could learn to be part of the conversation by learning rhetorical modes of communication.

Rhetoric and Science

Other rhetoricians in the field of rhetoric of science have pointed out that rhetorical studies should focus more on rhetoric's place in science. In "Idea of Rhetoric in the Rhetoric of Science," Gross and Laura Gurak discuss the work of Dilip Gaonkar, another influential voice in the discussion on the place and purpose of rhetoric in science. Gaonkar published an article entitled "Idea of Rhetoric in the Rhetoric of Science" wherein he "avers that neither of these traditions supports a rhetoric of science" (Gross and Gurak 242). Gross and Gurak explain how this belief has brought forth both criticism of his stance and serious consideration of rhetorical studies. However, they believe that rhetorical studies should focus on more areas of science, including the style, visuals, technology, and digital media of science. This renewed focus of rhetoric on science could also include a focus on how rhetoric is used not only to examine and critique, but also in the creation process of scientific works.

Another scholar, Chad Wickman, in his "Rhetoric, Technê, and the Art of Scientific Inquiry," presents his "framework for exploring rhetoric in the process of scientific inquiry" (Wickman 21). Through this framework, Wickman presents scientific practices as a process. He explains how "the Aristotelian concept of technê, and the four causes in particular, can be used to conceptualize scientific practice as a productive

technical art and thereby locate rhetoric in the actual production of artifacts" (Wickman 23). Through these words, Wickman points out that science is a technical art that is produced through rhetoric. Rhetoric, therefore, must be a part of scientific discourse. Having students realize the relationship between rhetoric and science should be an important aspect of the undergraduate curriculum because then science would become more accessible and less imposing to students. This understanding could become a base upon which professors, teachers, and future employers could build the knowledge and methods of science. So, in a way, rhetoric can be a mode to impart scientific literacy as opposed to simply scientific "fact." This approach could be very useful to students since it is both informative and empowering.

Nancie Atwell also writes about an informative process, namely the process of writing, specifically student writing, as a dynamic process. In her book, *In the Middle: New Understandings About Writing, Reading, and Learning*, she describes writing as iterative rather than hierarchical or sequential (Atwell). This basically means that Atwell believes writing is a process that is repetitive in its methods rather than being something that starts with the most important point and works down. In this light, writing is a dynamic process that requires repeated input and effort from students. This, of course, connects back to Kuh's point that discipline-specific writing helps students to appreciate writing more. If students are actively and dynamically engaged in their writing, especially discipline-specific writing, they will be more likely to remember and appreciate what they learn.

Peter Elbow, a proponent of composition in the classroom, like Atwell, says that writing is a process. In fact, Elbow also echoes Atwell when he mentions how the writing

process is complex and how no one has found a "hierarchical" way to teach it that works every single time (135). However, in his book, *Writing Without Teachers*, he makes the point that a classroom without a teacher is one that allows room for communication, and thus, writing. Rather than worrying about living up to the standards set by a teacher, a group of students can write without expectations. Later, Elbow makes the point that in a "normal teaching situation, if the teacher has reactions to the student's words, he usually doesn't tell them accurately and honestly to the student...the trouble is that his reaction is mostly hidden and his theory isn't true" (134). This view is certainly polemic, but the points he makes about writing are less so. For instance, Elbow mentions in his book that that there are two conditions to making writing easier: "the first condition is to know how people are reacting to your words...[and] another condition that makes it easy to produce language: *not worrying* how the audience experiences your words" (Elbow 124-125). Like Kuh, Elbow argues that a greater focus on writing, rather than the teacher, will improve learning.

Elbow is focusing on the social dynamics of writing and what induces better and more prolific writing. Elbow's focus on writing rather than teaching is indicative of the idea that learning, much like what scholars Atwell and Lave and Wagner argue, should be an active process. Students who are trying to learn scientific literacy, for example, could write scientific forms of communication (such as a lab report) rather than only listening to the teacher. This could be a more active, and thus effective, mode for students to learn scientific literacy.

The learning that students accomplish in their classrooms, Lave and Wenger point out, is situated within the context of their classrooms. Lave and Wenger argue that

learning is best done in a situated context. Situated learning refers to learning within a real-world, social context (Lave and Wenger 29). This certainly connects to students' learning to write not just effectively overall, but effectively in their discipline. Lave and Wenger explain that "learners inevitably participate in communities of practitioners and that the mastery of knowledge and skill requires newcomers to move toward full participation in the sociocultural practices of a community" (Lave and Wenger 29). By working with issues in an active rather than a passive way, students must deal with the challenges and breakthroughs inherent in any difficult, yet rewarding exercise. In writing exercises, students will most likely experience the halts and starts of the writing process. In looking at the rhetorical techniques used and the rhetorical appeals expressed by students, therefore, one could identify the epistemological understandings held by students.

Despite the depth and the breadth of information covered by these discussions of rhetoric and rhetoric and science, one aspect that has not yet been focused on in these discussions of rhetoric and science is the idea of what students bring to the table when they are beginning to learn the processes associated with rhetorical writing and expressing themselves well. Especially when it comes to first learning how to write for a specific discipline, like science, it is very important to gain knowledge of how to express oneself in that discipline in order to make an understandable and worthwhile contribution to that discipline, or even to make use of that discipline's knowledge.

Questions Asked During the Study

My goal, as I mentioned earlier, is to answer my two main research questions: what rhetorical techniques and practices do students in a composition class use to express

themselves? and what do the rhetorical techniques and practices they use say about their epistemological understanding of rhetoric? By knowing the answers to these two questions, I can say something about how students enact rhetorical processes in their efforts to learn science. I can also say how this knowledge is valuable to STEM. But, for any of this to be possible, I had to ask the following list of seven detailed questions:

1. What are the initial assumptions about science discourse and literacy expressed by second semester students at the University of Northern Iowa?
2. How do students struggle and work with concepts and challenges in a composition classroom focused on the life sciences?
3. What rhetorical techniques and epistemological understandings of rhetoric do University of Northern Iowa students use at the beginning of the course?
4. How do these techniques and frameworks appear in their written work?
5. How do these techniques and frameworks appear in their spoken interactions in class and in study sessions?
6. Do these techniques and assumptions match up with those expressed in the science community?
7. Are there any gaps in their understanding?

Once I gained the answers to the above questions, I was then be able to answer what rhetorical techniques and appeals students utilize in their efforts to learn more about scientific discourse and literacy.

How I Accomplished This Study

To answer these questions, I used qualitative procedures to gather, analyze, and triangulate data. My research was qualitative, and as such I followed Norman Denzin and Yvonna Lincoln's guidelines from their *The Sage Handbook of Qualitative Research*. Since students' expressions of rhetorical methods appear both in writing and speech, I wanted my research methods to match. Therefore, I conducted an ethnographic inquiry with a primary focus on textual and oral analysis. Using these different foci helped me ensure the validity of my results because I was able to explain ideas and results through what Clifford Geertz refers to as "thick description" (215) by looking at their written products as well as the context of that its creation. For the textual focus, I examined two assignments that the students in the class completed, including the rhetorical analysis and the lab report, to examine and identify the students' written forms of rhetorical technique and the epistemological understandings of rhetoric implied within. For the oral analysis, I conducted interviews and took field notes during each class period on the teaching style as well as the questions, concerns and words of the students involved in my project.

I was able to conduct and complete this study in large part due to my presence in the classroom. I was chosen by Dr. Deanne Gute, the University of Northern Iowa's Writing Center Coordinator, to be a teaching assistant in the class, which provided me a great opportunity to study the rhetorical expressions of students in a partly science-focused classroom. As a teaching assistant, I took notes for Dr. Gute as well as for my own project. I took notes on flow, which is a concept that refers to how people, students included, face challenges. If challenge and skill are reasonably balanced, students can concentrate, apply feedback, and immerse themselves in the activity to meet specific

goals. While these notes on flow were not part of my project in the end, they were part of field notes and of my presence in the classroom. As a teaching assistant, I had no grading responsibilities, so students did not need to worry about my project affecting their grade. Being a teaching assistant meant that I helped students with their work, which may or may not have increased their knowledge of rhetorical techniques and appeals. In the end, my presence allowed me to finish this study.

To be clear, this study was guided by UNI's IRB procedures. At the beginning of the study, I used a recruitment form of my own creation (see Appendix A) to ask for student participation in my project. I then formally asked for their consent through the consent form I created for the project (see Appendix B). This form included a brief explanation of the project, yes or no questions that allowed them to agree to a varying amount participation in the study, contact information, and a place to sign to be involved in my research. This form helped me to gain sixteen out of a possible nineteen full approvals (answered all yes) to being part of my research out of a possible nineteen. Overall, these sixteen students involved were mostly freshman, some sophomores, and one senior. Eleven males and five females were involved in my study.

To further comply with IRB procedures, Dr. Grant provided me with clean copies of the students' written work so that I could conduct my own observations and make conclusions about their content. Dr. Grant directed students to hand in their papers, specifically the rhetorical analysis and the lab reports, to him. Dr. Grant also told students to turn in an extra copy of their rhetorical analyses. He proceeded to give me one copy of each paper. When Dr. Grant gave me the second copy of the papers, I destroyed and did not use the ones from students who declined to participate. This ensured that Dr. Grant

did not know for sure whose papers I examined. Dr. Grant and I meant to follow the same procedure when collecting the lab reports, but neither of us told the students what to do in time. So, I personally emailed the students and some of them responded by sending in their lab reports to me. This allowed them choice as to whether or not to participate and also prevented Dr. Grant from knowing which students participated and which did not. I only collected and analyzed three lab reports. There were so few lab reports because the reports were accomplished in groups, and I could not analyze some lab reports because their groups included a student that had declined to be part of my study. The three students that did not participate were in three separate groups, so that eliminated three of the possible seven lab reports I could have analyzed.

Dr. Grant graded the rhetorical analyses and the lab reports, which were eventually returned to the students. I did not see the students' graded papers or anything given back to the students. Once I had the papers, I analyzed their usage of rhetorical appeals and separated them into effective and ineffective rhetorical appeals. I made this judgment based on whether or not the students' use of a rhetorical appeal improved the clarity and meaning of their argument or not. An effective appeal was one that worked seamlessly within the context it was used in by adding complexity, depth, and/or clarity to the student's paper. An ineffective appeal often created confusion or worked against what the student was trying to say by undermining their argument. I also coded them for types of rhetorical techniques used and then compiled these codes into themes. The types of rhetorical techniques I coded for in the lab report included References to and Uses of Second Person Language, Examples, Passive Voice, Active Voice, Critical Thinking, Show of Emotion, Concise Wording, Theory, Question, Justification of Reasoning, and

Data. The types of rhetorical techniques I coded for in the rhetorical analysis included Audience, Purpose, Consideration of Context, Color, Questions, Visual Description, Use of Second Person, Popular Culture Reference, Use of Statistics, References to Ethos, Pathos, or Logos, Thesis, Reference to Personal Experience, Repetition of Ideas, Confusing Statement, Transition Statement, Justification for Reasoning, Attention, Men/Women, Sex, and Generalizations. I discussed these themes, rather than the actual content of the papers, with Dr. Grant. This analysis of the appeals and of the codes and themes was the first part of my triangulation technique to try and identify the rhetorical techniques and epistemological frameworks expressed by students.

Triangulation is a technique used in qualitative research. Specifically, "triangulation is a method used by qualitative researchers to check and establish validity in their studies by analyzing a research question from multiple perspectives" (Guion et al. 1). In my study, I chose to use data triangulation, which means that I used "different sources of information in order to increase the validity of a study" (Guion et al.1). I chose to use three data sets for my triangulation: the codes and themes I compiled through my rhetorical analysis of the rhetorical analyses and lab reports, the results I gained through my observations in the classroom as mentioned in the field notes I kept during each class period I was present during the duration of the study, and the results from the interviews I conducted with willing students that were a part of my study.

The second leg of my triangulation technique, then, was the field notes I took in the classroom. I wrote my notes in the field note form (see Appendix C) during every class I attended. To the best of my ability, I avoided writing ideas down about students that declined to be a part of my study. My field notes allowed me to write down ideas

about several topics. In one respect, I was looking for qualities expressed by students that were representative of the concept of flow, as per Dr. Gute's request. As I mentioned earlier, the concept of flow refers to how people in general, students included, deal with challenges. In the context of the classroom, I often noted flow techniques and experiences during writing-based or discussion-based times of the class. I took these notes on an observation form, which can be seen in Appendix C. This form includes the nine dimensions integral to flow experience. The notes I took over the nine dimensions of flow were not necessary in answering my research question, so they do not appear in my analysis.

During the process of keeping my field notes, I also looked for rhetorical techniques and ideas expressed during the class. Some of the notes I took also concerned the notes and ideas Dr. Grant mentioned in class or that were discussed between Dr. Grant and the students, such as the requirements for an assignment or rhetorical definitions and techniques. These notes helped me to see some of the rhetorical ideas being presented in class, whether that was through Dr. Grant or the students themselves. Knowing the context of the learning of the students was helpful for understanding their rhetorical expressions and other concerns expressed in their papers and in their interviews.

The third and most insightful aspect of my triangulation technique was the interview. I interviewed seven students, so almost half of the students in my study and approximately 40% of the students in the entire course. I had not planned on interviewing them all, so this went according to plan. Three of my interviewees were male and four were female. I wanted a representative sample of the participants of my

study and I believe I accomplished that. I recruited my interviewees through an email request; see Appendix E for my interview request email script. I considered those who responded as those that were wiling to be interviewed and those that did not respond to my email as those that did not want to be interviewed. I did not pursue the other nine students to be interviewed because I wished them to have some authority and ability to say yes or no to my project. My interviews, then, were only conducted with willing students. Since I was able to interview and get results from seven people, this aspect of my project was successful.

Appendix D includes all of the questions I asked these students. I had originally planned to also complete a survey, but based on the volume of data, the amount of time I had to complete this study, and the convenience to the students, I decided to ask the questions I would have asked in the survey along with the questions I had originally planned to ask in the interview. Since I asked the survey questions in the interview, I chose to eliminate the survey from my study. The interview questions, as outlined in Appendix D, helped me to triangulate the results of my coding and thereby triangulate for validity in my study. In using these tools, I used methodological triangulation to become more certain of the patterns and codified themes that I identified in their papers.

These interviews were conducted in places that were convenient for the student, such as in the first floor of the Redecker Center, a student social space beneath a student dining center. I interviewed two students over the phone, four in person, and one through the application FaceTime. I made sure to make students aware that where we chose to do the interview would be up to them, considering that their privacy was of the utmost importance. For some, it was easiest to do the interview in a slightly more public area,

which was acceptable with them because I asked more experiential questions and not highly personal questions. Some interviews were more private, considering that they were done over the phone or through the application FaceTime. In whatever situation, I made sure that the student was at ease with the context before beginning the interview. No matter how I interviewed them, I asked them slight variants (depending on the flow of the questions and answers) of the same questions, which you can find in Appendix D. For each interview, I took notes on my computer and often was able to capture the exact wording students used to answer the questions. I did not use any voice capture technology.

The interview script, namely the list of questions I asked the students, was developed with answering my questions in mind. The questions in the interviews were limited to learning more about the students' history with writing, knowledge, writing processes, self-awareness of their use of rhetorical techniques, and experiences writing in college and specifically writing, mostly papers, in Dr. Grant's class. Overall, I asked for experiential data, not personal facts, during the interviews. For example, I asked the students "What methods have you used to write papers for this class?" Rather than asking their opinion of what they learned in the class, which would have been a personal question, I asked them what methods they used, which refers to their experience of writing in the class. The data gathered through the interview helped me to recognize any uniquely recursive habits in the student's writing and to triangulate the students' responses with my coding.

With this data gathered from students' talk and written expressions, I did complete an analysis of the students' oral and written discourse. Examining their oral

discourse included analyzing the ideas within my field notes and within their answers to my interview questions. Likewise, examining their written discourse included analyzing their rhetorical analyses and lab reports. Through analysis of these written works, I found codes concerning their rhetorical modes of expression and extrapolated themes from these codes. These themes helped me identify what sorts of rhetorical appeals were most prominent in this particular set of mostly freshmen and sophomore students.

Since I gathered these ideas, I was able to triangulate the epistemological understanding of rhetoric of students. My results were supremely useful in answering the questions I posed in the previous section. In the following pages, I will explain these results and conclusions in more detail.

The Results of My Study

My efforts to triangulate my coding of the rhetorical analyses and the lab reports with my field notes and the interview responses created many results. The main areas of these results include the rhetorical appeals of the rhetorical analyses, the rhetorical appeals of the lab report, the codes and themes generated by my analysis of the rhetorical analyses, the codes and themes generated by my analysis of the lab reports, the results of my field notes, the results of my interviews with students, and the results of the triangulation.

Rhetorical Appeals of the Rhetorical Analyses

I read through each of the sixteen rhetorical analyses, and through that process I identified the rhetorical appeals that each student used in their paper. I did this to identify if students were using rhetoric in their work and, if so, what kind of rhetoric they used.

Through my reading, I identified the students' appeals to ethos, pathos, and logos. As I analyzed the pieces, I realized that some of the appeals were effective and some were not. Effective appeals were the ones that either effectively moved forward the argument in the rhetorical analysis or got the point across in the lab reports. Ineffective appeals caused confusion, did not further the arguments, or were detrimental to the focus of the arguments the students were making.

Table 1, as seen below, represents the total number of effective rhetorical appeals I found in the sixteen rhetorical analyses. As a result of this analysis, I discovered that students appeal to logos the most out of the three types of rhetorical appeals. One such

Rhetorical Analyses			
Effective Rhetorical Appeals	**Ethos**	**Pathos**	**Logos**
Number of Occurrences	**102**	**107**	**146**

Table 1: Effective Rhetorical Appeal Occurrences In Rhetorical Analyses

logical point included, "If a person thinks about Reebok when working out, then they are more likely to buy products from them for their workout." This if then statement had clear reasoning, so it was an effective logos appeal.

In my analysis of the student's rhetorical analyses, I also realized that appeals to ethos and pathos were about equal in number. Ethos appeals were often one and the same with the pathos and logos appeals. For example, one student mentioned that "Therefore, it is no coincidence they chose to use a billboard to advertise because adults will be driving when they come across the ad." This particular student was writing a paper about an ad that warned drivers against texting while driving. This sentence shows that the student thought about the context of the ad in relation to the content of the ad and, through this

sentence, is presenting the logic of the situation to the reader. This logical point improved the student's credibility, otherwise known as ethos, through its clear reasoning.

In their rhetorical analyses, the students were especially adept at appealing to pathos in an effective manner most of the time. For example, a student explained how "It implies that women cannot be happy or care-free unless their body meets the mark of social standards for women." This sentence refers to emotions such as happy and care-free and looks at those ideas in the context of society. This adds complexity and depth to the student's argument, making it an effective pathos appeal.

Typically, I found that the most effective rhetorical analyses were the ones with balanced expressions between ethos, pathos, and logos appeals. For example, one student's paper included both "I have noticed they see a lot of green and orange to make the advertisement pop out and grab people's attention" and "Newport is a company that I have noticed that is not straight forward with their advertising at all because the actions that the people are doing in the pictures have nothing to do with the actual product." The first quote refers to a pathos appeal that focused in on the company's efforts to make their product stand out and catch the attention of their audience. The second quote is both a logos and an ethos quote since it includes an idea that the student noticed as well as the reasoning to back it up. This idea, because of the clarity of its reasoning, adds credibility.

In my analysis, I also came across rhetorical appeals that were not effective. These appeals were ineffective because they did not add to the argument of the rhetorical analysis in question. As can be seen in Table 2, there were far fewer ineffective uses of rhetorical appeals than there were effective uses of rhetorical appeals. Of the ineffective rhetorical appeals, ethos and logos were the most prevalent, normally occurring together.

When logos was faulty, ethos tended to be faulty. An example of this dual ineffectiveness occurred when a student said, “This advertisement was also being shown during the 2012 summer Olympics.” While this phrase makes sense as a stand-alone sentence, it was ineffective both logically and credibility-wise because it came up in the narrative without any preamble. It was an important enough fact to have been mentioned in the introduction, but was not, so I found it both jarring and disheartening as a reader. This made me question the logic of their argument, which also made me question their credibility and trustworthiness as a writer.

Since logos was appealed to most throughout the papers, it only makes sense that there would be more errors and problems with the logos appeals. For example, one student mentioned that “Yes it is important to eat healthy, but having a healthy diet does not directly impact ones performance in athletics.” Besides missing a possessive apostrophe in “ones,” this student made an over-generalization. How could the sustenance one eats not effect one’s athletic performance directly? Athletes are often on specific diets to achieve certain physiques or certain characteristics.

As for ineffective pathos appeals, one student talked about how “In fact, rhetorical things can produced a special feeling so people may easily attracted by this rhetoric” In addition to grammatical incorrectness, this quote mentions that “rhetorical things can produced a spell feeling,” but never explains WHY the person is attracted, just that they are. This is an ineffective pathos appeal, then, because it references an emotion but does not explain why that emotion is created.

The similar number of ineffective ethos appeals to logos appeals makes sense since the expression of logic is so connected to the idea of the character, or ethos, of an

author. An example of an ineffective ethos appeal occurred in the rhetorical analyses when a student wrote “When I came across the commercial for the Under Armour future super bowl ad I had some questions and something’s to say.” Besides displaying a wrong use of an apostrophe, the generality of the phrase “some questions and something’s” does not explain what the author is trying to say, potentially instilling confusion and perhaps a lack of confidence in the writer in a reader, thereby making it an ineffective ethos appeal.

Rhetorical Analyses			
Ineffective Rhetorical Appeals	**Ethos**	**Pathos**	**Logos**
Number of Occurrences	**25**	**2**	**36**

Table 2: Ineffective Rhetorical Appeal Occurrences In Rhetorical Analyses

In the course of my analysis, I also went through three of the lab reports created for the College Writing and Research course. In analyzing these lab reports, I wanted to see what kind of rhetorical appeals were in them as well to see if and, if so, how, students were using rhetorical ideas in their science-genre work. Through my read through of the lab reports, I found that the rhetorical appeals of ethos, pathos, and logos were here as well. Table 3 details the number of effective rhetorical appeals I identified in the lab reports.

The number of pathos appeals was very low in this sample. One of the few ineffective pathos appeals that occurred said “They were selected through their personal relationships with the experimenters.” This is a pathos appeal because it shows that the experimenters chose people to be a part of their study based not on unbiased, unemotional, and arbitrary terms, but rather on more biased and potentially emotional terms. The five occurrences of pathos appeals were interesting because, normally, science

does not use or depend on pathos appeals, rather putting greater emphasis on logos and ethos appeals. The rare occurrence of pathos made sense in these students' lab reports because many were still developing their skills at writing in a science genre. The greater number of ethos and logos appeals attests to their efforts to communicate in the sciences.

Lab Reports			
Effective Rhetorical Appeals	**Ethos**	**Pathos**	**Logos**
Number of Occurrences	**36**	**5**	**52**

Table 3: Effective Rhetorical Appeal Occurrences In Lab Reports

In the lab reports, appeals to logos were the most prevalent, clocking in at approximately fifty-two separate instances. One example of this occurred when one group of students used scientific language, saying, "the number of recitations for each participant was gathered into a table." The passive voice detaches the action from the actors, which is a scientific way to arrange language.

Along with the high level of logos appeals came a similar, but lesser, level of ethos appeals. For example, one lab report included a long prose description of the procedures, and they used words like first, next, then, and finally to lead their reader through the steps of the experiment. The methodical way the authors wrote this section was clear to me as a reader, so I counted it as an effective ethos appeal since my appraisal of their credibility rose as a result.

Once again, I can attribute the similar levels of ethos and logos appeals to the connected relationship between most logos and ethos appeals. For instance, in one lab report, the students spoke about how "The purpose of this experiment was to create a cloud in a bottle in order to see how the elements of water, smoke, and pressure can work

together to cause the creation of clouds." In this example, the writers are stating the purpose of the experiment as well as the reasoning behind the purpose; stating the purpose is credible and expressing the reasoning is quite logical.

Overall, there were also a few ineffective rhetorical appeals, as can be seen in Table 4. Like with the effective ethos and logos, ineffective ethos and logos appeals tended to occur together. For example, one lab report had ineffective appeals to both ethos and logos because it lacked a cohesive hypothesis. Given the low number of pathos appeals in general, it made sense that there would also be no ineffective expressions of this appeal. Ethos and logos were about the same, coming in at 5 or 6, respectively.

Lab Reports			
Ineffective Rhetorical Appeals	**Ethos**	**Pathos**	**Logos**
Number of Occurrences	**5**	**0**	**6**

Table 4: Ineffective Rhetorical Appeal Occurrences In Lab Reports

The most effective and persuasive rhetorical analyses were the ones with balanced appeals to ethos, pathos, and logos. The most effective and persuasive lab reports were ones that the ones that mainly used ethos and logos.

Besides the results I received concerning the rhetorical appeals of the rhetorical analyses and lab reports, I also read through their rhetorical analyses papers and lab reports and identified codes that represented different rhetorical decisions students made as they wrote their pieces. Below I discuss the codes and themes for the rhetorical analysis as well as the codes and themes for the lab reports resulting from my analysis.

Codes and Themes for the Lab Reports

After reading through the three lab reports submitted by willing students, I was

able to identify eleven codes. This included the following codes: References to and Uses of Second Person Language, Examples, Passive Voice, Active Voice, Critical Thinking, Show of Emotion, Concise Wording, Theory, Question, Justification of Reasoning, and Data. See Table 5 for a detailed summary of the codes I gathered with one example of said code within the student work.

Code	Example of Code
Second Person Language Usage	"Water vapor is a type of invisible, gaseous component found in our atmosphere."
Examples	"Water, for example is more dense than air."
Passive Voice	"A mark was then put ½ inches to the right of the column."
Active Voice	"The participants in the study varied by how many repetitions it took them until memorization."
Critical Thinking	"It was an observational exercise that required us to use critical thinking to analyze the results, and that is exactly what we did."
Show of Emotion	"we were not surprised when we saw our anticipated results."
Concise Wording	"The index of refraction for air is roughly one."
Theory	"We saw exactly what we theorized would happen."
Question	"But is that belief true or misleading?"
Justification of Reasoning	"When materials are more dense than others, the more plentiful particles act as obstacles for the light waves to travel in, so light is technically diffracted in air."
Data	"Angle of Incidence: 30º degrees Angle of Refraction: 30º degrees Angle of Incidence: 30º degrees Angle of Refraction: 22º degrees"

Table 5: Compilation of Codes and Examples of Codes in Lab Reports

I have organized these codes into three main themes: Sentence Structure, Major Ideas, and Purposes.

My first theme, Sentence Structure, includes the Passive Voice, Active Voice, Concise Wording, and References to and Uses of Second Person Language. All of these codes refer to the choices the students made in how their sentences were structured. The appearance of passive voice far more than active voice was an example of how students were creating the language of the science genre at the sentence level. The appearance of concise wording, at times, also points to this conclusion. However, the occurrences of the second person are a bit problematic at times, since they could become even less personal by using third person replacement words. Overall, the sentence structure of the lab reports is representative of students learning, and somewhat succeeding, to create scientific language.

My other theme, Major Ideas, includes the Theory, Question, Data, and Examples. These refer to how some of the most important content in the lab reports was presented. The use of theories and data are both very scientific actions. Examples are more illustrative, which is an important skill to have, since it allows students, as well as other writers of science, to translate an idea more effectively to their readers. The use of questions falls into the same category as the use of examples, though I would say that the questions used and asked in the lab reports were one of the least scientific aspects of the lab reports. But, in any case, since most of the questions asked improved the flow and clarity of the lab report, I believe that bodes well for the growing scientific literacy of the students in Dr. Grant's class.

My final theme, Purposes, includes the Justification of Reasoning, Show of Emotion, and Critical Thinking. These refer to the purposes I have identified behind certain sentences in students' work. The statements that justified previous reasoning or

showed critical thinking about the topic were all quite professional and scientific in tone and purpose. However, the least scientific of these codes was the Show of Emotion. Since sentences of this sort happened so rarely, I would say that it showed that while students were learning scientific literacy, they were also bringing their prior experiences, say with the rhetorical analysis, to the table, and that that may have affected the way they wrote their lab reports.

Codes and Themes for the Rhetorical Analyses

Through analyzing the first set of papers, I identified codes and extrapolated themes. The codes I identified included Audience, Purpose, Consideration of Context, Color, Questions, Visual Description, Use of Second Person, Popular Culture Reference, Use of Statistics, References to Ethos, Pathos, or Logos, Thesis, Reference to Personal Experience, Repetition of Ideas, Confusing Statement, Transition Statement, Justification for Reasoning, Attention, Men/Women, Sex, and Generalizations. These codes, as well as examples of these codes, can be found in Table 6.

Code	Example of Code
Audience	"Burger King wants to advertise to everyone."
Purpose	"The purpose of the advertisement is to attract individuals to buy their product to help them lose weight and gain fitness."
Consideration of Context	"The world's runways have been presenting increasingly thinner women, who are parading in clothes that could easily be found in the children's section."
Color	"While symbolizing blood, the model's deep red hair unconsciously makes women think about their period."
Question	"What better way to attract children than with other children who are the same age?"
Visual Description	"The model within this advertisement looks young and beautiful dressed in fashionable clothing and accessories. With shiny perfectly shaped hair in a hip style, she looks chic and sophisticated even while sitting in a box."

Use of Second Person	"'The future is ours' is a pretty bold statement that ensures that we are the future of sports."
Popular Culture References	"the people in the commercial were all good-looking to societies (sic) standards"
Use of Statistics	"In 2011, which was two years ago, there were 1.3 million car accidents involving cellphones, which makes up 25% of car wrecks that year."
Reference to Ethos, Pathos, or Logos	"With this commercial, the company is using a lot of good things to boost their ethos."
Thesis	"Using many different aspects including their model, font choices, colors, and demonstrations, Always convinces women to purchase and stay loyal to their product."
Reference to Personal Experience	"I know this from personal experiences because before every football game, basketball game, or even track meet I would go to Subway and get a sandwich."
Repetition of Ideas	"After seeing so many advertisements over my lifetime I have noticed that they are becoming less and less straightforward and more and more complex."
Confusing Statement	"So in Dove beauty campaign, the tense and rhythmic music can grab the attention and warn the people who may suffer from the bad effects so they can avoid that problem."
Transition Statement	"The presence of ethos is incorporated into the advertisement also."
Justification of Reasoning	"Bright colors, such as purple, pink, lime green, and while, bounce off the pages and lure the viewers to the attracting spread. Along with the capturing colors, bold text stands out and attracts the eyes to see what it entail."
Attention	"The words on the picture 'Newport Pleasure' is an attention grabber by stating that Newport brings pleasure to the people who buy them."
Men/Women	"With that phrase the company of Corona manages to display an appeal to sex, pleasure, and the overall male population."
Sex	"Sexual desire is very commonly used today in the media, no mater how subtle the desire might seem."
Generalization	"Every ad can be traced back to the need to increase sales.

Table 6: Compilation of Codes and Examples of Codes in Rhetorical Analyses

The first theme I compiled based on the connections between codes is called

Explicit Rhetorical Arguments. This theme includes Audience, Purpose, Consideration of Context, and References to Ethos, Pathos, or Logos. All of these codes referred to moments wherein the author was clearly referring to a rhetorical technique as part of their audience. This type of argument was clearer but not always more effective than subtle argument. This theme in the students work showed them to be clearly mindful of rhetorical technique because they referred to them blatantly by name. For example, in one paper, a student said that "there are three main situations that come into play in the rhetorical analyses of this Burger Kind ad found in a ESPN sports magazine. These three situations include: Purpose, Audience, and Context." Another student mentioned that "The presence of ethos is incorporated into the advertisement also," later going on to reference "the official seal" placed on the ad. Students, in these situations, were making a clear effort to engage rhetorically.

The second main theme I noticed was Subtle Rhetorical Techniques, which includes the Popular Culture Reference, Reference to Personal Experience, Repetition of Ideas, Use of Statistics, Questions, Visual Description, Use of Second Person, and Generalization codes. These rhetorical techniques were not explicitly stated to be rhetorical. These rhetorical techniques may easily have been created unconsciously, and, considering the answers from the interviews, may normally be unconscious techniques in this class's students' writings.

The third theme I noticed was Structural Rhetorical Choices, which is comprised of the codes for Thesis, Justification for Reasoning, Confusing Statements, and Transition Statement. The themes in this category represent the fact that the students in Dr. Grant's class do not perfectly execute writing styles all of the time. Confusing Statements in the

final versions of the documents indicate either a lack of understanding for how to create statements that made sense or a lack of time, effort, awareness, or ability to fix the statements. The students' justifications for reasoning, theses, and transition statements sometimes were very good and sometimes were nonexistent. I think the varying quality of how students chose to structure their piece, whether or not they were aware of their choices as rhetorical, shows that the students in Dr. Grant's class are at different capability levels when it comes to the writing process.

The final theme that I noticed in my analysis is the Rhetoric of Content, which includes the codes for Attention, Men/Women, Sex, and Color. All of these were choices made by the students to include or focus on certain content. I think the ability to choose to focus on certain topics says something about the epistemological understanding of rhetoric that these students have. The moments I labeled as falling under all four of these codes often referred to emotional ideas, thereby placing them in the pathos category. This result may show that pathos is one of the types of appeals that students can understand and use.

Interview Results

The second of the three legs of my triangulation of epistemic ideas in students in Dr. Grant's composition course included the interview results I found.

As for the results, I learned that most students' writing processes either involved some planning and outlining or just a matter of writing a draft quickly. One student mentioned that "Some projects I give it more thought than others." In answer to another question about their writing methods in this particular class, students mentioned that they wrote an outline or drafted or kept "context in mind."

I also learned that all of the students I interviewed had some sort of high school writing class. One was happy with her experience, saying that her "teacher gave us the basics of the papers, not every step." When I asked her further about her preference for direction versus not directions, she mentioned that she liked working independently. But this positive experience was not the norm. Most of the students related stories about learning the basics of writing papers. Two students even mentioned having bad experiences in high school, one because he learned to "blabber" about a topic and the other because her school only focused on writing the five-paragraph essay, so writing anything else was difficult.

In response to question three, I learned that the major problem these students were having with college papers was a matter of not being sure of their efforts. The majority of the students I talked to expressed concerns about not knowing enough about what an assignment or a professor required for an assignment to be a success. The other main concern was having answers about ideas. Students had trouble because they could not use Wikipedia or had difficulty concluding their ideas.

I also learned that students dealt with the problem I just expressed in different ways. Three students send their work to another person; either they sent it to a friend or a family member for revision. Others just "grin and bear it through it" or "go for it...[since] thing have always worked out."

The interviews took an interesting turn when I asked students about which rhetorical approach they thought they use in their writing. Most had to pause and think before answering, but nearly half of my interviewees said something like "I'm not sure about that" or "I don't know." Those who did not say those things were still a bit unsure,

but said that they tried to grab attention or another person pointed out that he thinks "about mostly the context."

This unsettling answer did not deter me from finishing the interviews. From another question, I learned that the majority of the interviewees had written a paper for some kind of science class before, such as biology or psychology. Therefore, most of the interviewees had prior experience in the sciences before taking this course.

When asked where they learned the most about writing, students had a variety of answers. Several students said a composition course in high school. Two students spoke about the practicality of writing in order to learn to write. Another student mentioned that she believed her writing skills were being polished in the course. That student expressed the concern that "I think it is a little idealistic to have students walk with their own legs but some students can't. if they can't now, they will have problems."

When my questions again focused on rhetorical appeals, I asked them which appeal they thought they used the most. It was an unclear question at best, so I got mixed reactions to it. Two people answered that they did not know. Two others pointed to trying to make their work logical. I associate this desire with appealing to logos. One of these two indicated a preference for logos and ethos over pathos when he mentioned that "Logos or maybe a mixture between logos and ethos because I don't want to say anything stupid. Pathos can be really abstract. Logos and ethos are to the point and have to make sense. You can't talk about something you aren't sure about." Only one student mentioned concerns about context, and only one student mentioned trying to cover all of the aspects, such as context, audience, and purpose.

Students also showed confusion with the next question, which asked them about where rhetoric is used the most in this course. One student mentioned that "I'm so confused as to what rhetoric means" and that "its one of those things in my mind that I can't get to click." This seemed to be an implicit concern of other students as well, since several said that they did not know. One of the most common answers otherwise pointed to the teaching done by Dr. Grant. A student mentioned, for instance, that "Every assignment – Dr. G is sure to say it is rhetoric here too."

One of the most interesting answers I received through this interview process was the idea that most students were often not aware of the rhetorical techniques that they use in their writing. Almost every student, when asked about whether they had this awareness, answered in the negative. Only one student mentioned becoming aware of this after the initial stages of the writing process, saying that she "think[s] over how rhetoric worked in it and how I could make it more balanced." When asked, she told me that, for her, balanced meant "A good mixture of the three appeals," which actually lined up with my observations of the ethos, pathos, and logos usage in students.

This overall lack of awareness persisted as I asked students what aspects of writing rhetorically they thought they used the most and the least. The vast majority could only say that "I have no idea" or "I couldn't tell you" or just laugh at the idea of knowing that about themselves. The question became laughable because they did not know so deeply that it became more funny than serious. One student elaborated on this lack of knowledge, mentioning that "we didn't talk about it much in high school or before this class. I've heard the term rhetorical before but I'd never really put it together with

how it kind of factored into writing." A few students did mention that they thought they used ethos the least, which was quite interesting.

When I asked later if they needed clarification on anything, some students responded in the negative, which was fascinating to me given their typical lack of conscious knowledge about rhetoric. But other students did mention that they felt like the rhetoric part of their education could have been expanded. One student suggested to "go over the rhetoric (ethos, logos, pathos) again and specifically show what part of writing those will be in." One student also mentioned that "It is important to emphasize that it is 50% professor and 50% student to build this knowledge."

When I asked about students' ideas concerning science when they first came into Dr. Grant's course, I got mixed reactions. One said that "I don't like Science at all" and a few others referenced their interest since they would be going into scientific fields. A student mentioned that "my concept of science was the same we got in class. Science is not just biology. I see this discussion happening." Another student made the point that a class that "ties into other topics," like how this class covers both science and English ideas, "will show that they will use this class in their lifetime."

The question that I received the most feedback on was one of the more personal of the questions I asked. My question was twofold. I asked what the students had learned in the class about rhetoric in the sciences; I also asked them how this new knowledge could help them in their chosen career path. One mentioned "Now I know how to set up my science papers" Another, reflecting on the course, said that "That's the main thing I got: write more and more consciously, less mechanically. Especially in my major field, we need to be clear. In [the] science field we have to be very direct." Another student

mentioned that "I'm sure it will help me a great deal because I want to be a writer so I'm sure that getting every angle of writing will help me in my career." A different student mentioned that "I am going to major in bio and I think it is really going to be helpful" Another appreciated that Dr. Grant's way of teaching allowed the students the freedom to write the way they wanted. Another student liked his challenges. The answers to this question show that students did learn from the class, and as the first two quotes show, some even learned scientific writing methods, which is a step towards greater scientific literacy. For those not going into the sciences, it seems that they also benefitted from this class, as evidenced by the student who wanted to be a writer. Indeed, greater knowledge about how to write in any context has the potential to help students broaden the way they consider problems and solutions, perhaps allowing them to grow as critical thinkers.

Overall, the main result of my interview research has been that the majority of the students in the classroom do not understand rhetoric as well as they could after taking Dr. Grant's composition course. The students rarely consciously think of rhetoric and rhetorical appeals during their writing process. The relationship between their epistemological understanding of rhetoric and their conscious awareness of that knowledge is an interesting one. Namely, their relationship is one that may not be necessary for rhetorical output in the papers. They have already written lab reports and rhetorical analyses that often use rhetorical appeals and techniques even with their unsure feeling about their knowledge or their confessed lack of awareness. These results may indicate that conscious knowledge may not be necessary to engage in patterns of rhetorical choices.

However, I would say that the few students who expressed confidence about certain aspects of rhetorical expression actually had effective uses of those rhetorical appeals and techniques in their lab reports and rhetorical analyses. One student in particular had interesting results. When asked which aspect of writing rhetorically she thought she used the most, she replied, "Most of them." When she was asked what aspects of her speaking and writing she thought were rhetorical, she answered, "things I do naturally, I don't think about them much." And when asked about which aspect of writing rhetorically she thought she used the least, she answered, "I struggle with science writing because I am an emotional, opinionated [writer]." This combination of opinions was unique to this student, but it is remarkable considering that it is representative of many of my results.

Field Notes Results

Since I received permission from the IRB to conduct my study, I have taken notes in sixteen sessions of Dr. Grant's composition class. From analyzing these field notes, I have noticed several key ideas. Dr. Grant's methods often illustrated rhetorical concepts and methods to the students, students were more engaged when Dr. Grant crafted his speech around popular culture, and rhetoric was spoken about at length during class. I also noticed that everything a student does to make their argument is rhetorical. This was my biggest insight.

Dr. Grant has many methods of teaching that he used throughout his class. One of the most noticeable, however, was his use of questions. Much like Socrates with his Socratic method of questioning, Dr. Grant posed a question to elicit answers from the students. This often led to a discussion about the topic, or at least a short point made by

Dr. Grant. In some of the most successful iterations of this technique, Dr. Grant kept asking questions of the class until someone in the class came to a conclusion about the topic. For example, one day the class was talking about how the students were to present their lab reports in front of the class. Rather than giving them all of the answers outright, Dr. Grant began his lecture with a question and continued using questions to elicit answers from students. This kept the students more engaged during the class period.

The idea of student engagement is an important one, and it is a fact that I noticed more student engagement, namely speaking, commenting, and answering questions, as well as more looking at the professor and overall seeming more interested, when Dr. Grant spoke about popular culture. For example, on April 9, Dr. Grant and the students had a discussion about the Veisha riots and he was able to use the event to emphasize the importance of students beginning to develop their own critical habits, which connected to the research paper that the students were beginning to write. I noticed that students were engaged with this topic because it was so timely, but also because Dr. Grant was humorous. Humor received more attention from students.

Another main idea I noticed through my notes was the idea that rhetoric was discussed extensively throughout the class periods. Very few days went by that the students or Dr. Grant did not mention or speak about an aspect of rhetorical thought. For example, Dr. Grant had one day when students could prepare parts of their speeches in different stations in the classroom and out in the hall. Each station had a different focus, like how the technology would work or how to stand around the front of the room and move during the presentation. These stations had rhetorical foci because they allowed students to consider the situation in which they were going to present and how they

should act in order to get their ideas across effectively to the audience.

My biggest insight, however, was the idea that everything that the students do to make their argument is rhetorical, whether their actions are consciously rhetorical or not. This goes for their discussions in class as well as their discussions in their papers.

Triangulation Results

The triangulated results of my study, between the results of my analysis of the rhetorical analyses and lab reports, the interview results, and the field notes results, point to one main idea.

The first leg of this triangulation, my analysis of their rhetorical analyses and their lab reports, showed that the students were using rhetorical techniques in their written work. The second leg, the interviews, showed that while many students may know what rhetoric is because of this class, they are not aware of the rhetorical techniques they use in their writing. The third leg, field notes, showed that rhetorical techniques were talked about in class and practiced by the teacher and at least participated in by the students. Due to this triangulation of ideas, I have come to realize that there is a gap between what the students express and what they know when it comes to their own rhetorical technique and appeals, but that some of the ideas learned in class are making it into their work.

What the Results of My Study Mean

At the beginning of this study, I asked what rhetorical techniques and practices do students in a composition class use to express themselves? and what do the rhetorical techniques and practices they use say about their epistemological understanding of rhetoric? To answer these questions, I gathered and triangulated results to answer seven

sub-questions. The following discussion details how my results answer these questions as well as my general thoughts concerning the gap revealed through this study.

Throughout my research, I was not able to learn what the initial assumptions about science discourse and literacy the students in my study had. My interview questions, wherein I planned to gain students' perspective on this issue, ended up focusing on whether they had written a paper for a science class before (most of them had) rather than on what their initial assumptions were. What I did learn was that all but one of the students I interviewed came into the class with at least a little experience writing in scientific modes through papers written either in high school or college.

While I do not know what their initial assumptions were on this topic, I do know that many of them saw value in the learning about science and the rhetoric of science they did in this class. Some of the students were more interested than other students in the scientific aspects of the course. This was due to the fact that some of the students in my interviews were planning on entering scientific disciplines. On this topic, one of these students mentioned that "I think it is going to helpful because I am going to major in bio...You have to write papers in life so keeping those things in mind will help my writing." Another student reflected on the topic of rhetoric in her scientific discipline by saying "I could have good ideas, if I can't transmit the ideas, then I can't spread my ideas if I don't know how to communicate those ideas. This course is polishing. I need to learn to transmit my ideas to others. This is something I need to learn for my field." This student, in particular, saw the importance of rhetoric as a means to learn to communicate within a discipline.

In addition to learning that many students saw the value in learning about

scientific discourse and literacy, I also, after interviewing them and examining their papers, have a good idea about how students meet the challenges of this particular composition course. Many of the students I talked to normally do some planning ahead of time and then jump right in to the assignment. One student mentioned that "I always make outlines. I love making outlines for papers" and another student mentioned that "I draft out how the body of the paper first." Yet another student expressed that "my typical writing process is usually I write a really really rough draft to get my ideas out and then I will proofread and edit until I have a final draft." Besides writing process techniques, students also expressed that they overcame challenges by reading through the assignment page, just sitting down and doing it, sending it to someone else for revision, or even, as one student stated, that they wrote papers, in this class but also in college in general, without looking much at the rubric since, "in life there won't always be a rubric to go off of. I just go." All of these students expressed, in one way or another, methods that they used to meet the challenges of coursework in college and in this course specifically.

In their written work for this course, students also faced challenges, but proof that they worked to overcome these challenges is in the rhetorical techniques and appeals that appear in their work. Now, I was not able to figure out what rhetorical techniques and epistemological frameworks the students used at the beginning of the course. I actually, during the course of my project, narrowed the epistemological frameworks I was originally looking for down to epistemological understandings of rhetoric. But even then, I was not able to figure out what they used at the very beginning of the course. However, I was able to see how rhetorical appeals and techniques appeared in their rhetorical analyses and lab reports, which they created closer to the middle of the semester.

The rhetorical techniques and appeals that appeared in the students' lab reports and rhetorical analyses, such as structural elements like a thesis and transition statements or appeals such as logos and ethos, helped them to overcome the challenge of writing in both English and scientific genres. There were many appeals to logos in their lab reports, which indicates to me that their epistemological understanding of science is that science involves way more logic than emotional appeals, like pathos, for instance. Logos was also the most used rhetorical appeal in the rhetorical analyses, which may indicate a similarity in how the students approached and wrote for each assignment. I believe the greater use of logos is indicative of the students' epistemological favoring of reason over emotional or ethical appeals. While this may not be appropriate for college endeavors as a whole, this favoritism for logos appeals could indicate that, in a way, students understand logical approaches to arguments more than pathos or ethos appeals. This could be especially beneficial for potential learning in the sciences.

Unlike the plethora of logos appeals in the rhetorical analyses, there were far fewer pathos appeals (almost none) in the lab reports in comparison to the rhetorical analyses, which I think indicates a growing sense of scientific literacy in the students since they know, for the most part, to focus on ethos and logos appeals in a scientific genre and to include all three rhetorical appeal types in an English genre. Students used mostly logos and ethos appeals in their lab reports. One explanation for this came from one of the students who said he liked to use "logos or maybe a mixture between logos and ethos because I don't want to say anything stupid. Pathos can be really abstract. Logos and ethos are to the point and have to make sense. You can't talk about something you aren't sure about." This contrasts with the more balanced levels of logos, ethos, and

pathos appeals in the rhetorical analyses. One of the female students echoed the occurrence of these balanced levels by saying that she tried to achieve "a good mixture of the three appeals" in her work. A few students did mention that they thought they used ethos the least, which was quite interesting, since students did use ethos the least in the rhetorical analyses but not in the lab reports. What this means is that students seem to have a more clear understanding of logos and pathos appeals than they do of ethos appeals, which makes sense considering that ethos tends to be the most invisible of the three appeals. What I mean by that is that calls to credibility can, at times, be within a student's use of other appeals or techniques, such as using topic sentences. And by the sporadic use of topic sentences in the students' work, for example, I can see that, in this respect, the ethos appeal may be one of the more difficult ones for the students to learn. This indicates that future professors should consider emphasizing ethos in their teaching.

In comparison to the techniques and appeals student use or do not use in their work, I have noticed that they seem less confidant sometimes during class periods. For instance, in their papers, they sometimes used rhetorical questions to prompt a change in an argument or emphasize a point. However, while they were in the classroom, they tended to ask authentic questions rather than rhetorical ones. For example, when in the classroom, students asked for clarification about due dates, the particulars of an assignment, or for help in working through a tough point in their assignments. However, this was not always the case. I sometimes saw sparks of understanding and hard work in the students. This happened every now and then, such as when one student was doing a free write to learn more about what she wanted to talk about for one of her papers. The students would reach a moment of insight and learning. Of course, this was kind of rare,

but collaborative work, such as peer reviews or discussions among other classmates, was common. These interactions certainly refer back to Kuh's point that learning, and often writing, can be a social enterprise. So, while the appearance of rhetorical techniques and appeals may be rather minimal in the words of students in the classroom, it does not mean that students are not engaging in valuable learning experiences.

After considering how students use rhetorical techniques and appeals in class, in their lab reports, and in their rhetorical analyses, I have realized that some of the ways they use rhetorical techniques and appeals line up with how the scientific community writes and communicates. For example, the roughly equal use of ethos and logos appeals in the lab reports is similar to the way scientists write their own documents. I also think the parallel structure of their lab reports especially shows that students are trying to match up their work with what they believe to be what professional scientists would do. This shows how students are bringing their prior knowledge of science to how they write in the sciences. They do not come into the college classroom as blank slates. Rather, they use the knowledge they already have to connect to the larger conversation about science. This connects to the ideas Gross was talking about, in that science is connected to rhetoric because science is created through a constant rhetorical discussion. Of course, students' uses of these scientific methods of communication were partly the result of the genre they were requested to write in. However, the level of quality and the ability of the students to match the level of communication demanded by the genre they were writing in is not inherent in the genre. Through being conversant with the scientific communities they were discussing ideas about in the lab reports, these students displayed both effective and ineffective rhetorical appeals, basically meaning that the students are

beginning to understand how to use the rhetorical conventions of science disciplines. The similarities in the students' use of rhetorical techniques and appeals to the ways the scientific community writes and communicates are important, since they show that students are indeed beginning to learn the skills required of members of scientific disciplines in a college composition course.

After considering all that the students have done during the course of my study, I would say that there was certainly gaps in their understanding of rhetoric. They had difficulty using certain rhetorical techniques, such as topic sentences and theses. Also, their ineffective logos, pathos, and ethos appeals were indicative of gaps in their understanding of rhetoric. Each ineffective appeal or poor use of rhetorical technique is proof of an inability to understand or a lack of understanding of how to use a particular concept. This, in combination with the overall lack of conscious awareness of rhetorical usage (as indicated by interview responses), made me wonder, to what degree do students consciously use rhetorical concepts and terms to make interventions in their own work?

The biggest gap of the students' understanding of rhetoric is their lack of awareness of their use of rhetoric. Every student I interviewed expressed concerns or outright confusion about using rhetoric, saying words like "I've never really thought about it" as I spoke to them. One student mentioned that "I'm so confused as to what rhetoric means" and that "its one of those things in my mind that I can't get to click."

So what does it mean when students are using rhetorical techniques and appeals in their papers but lack 100% awareness of the rhetorical techniques and rhetorical appeals that they are making? I think the answer lies in their epistemological understanding of rhetoric. Because epistemology basically refers to the way someone understands and

thinks about a topic, a lack of knowledge or a lack of an ability to talk about their uses of rhetoric could inversely indicate a lack of any epistemological understanding of their uses of rhetoric. The instances that they consciously think about rhetoric are sporadic and while they identify with using certain rhetorical appeals, they still express uncertainty about their uses of rhetoric.

While I may not be able to give a recommendation as to how to improve each student's understanding of rhetoric, what I can say is that how it is being taught and learned right now has not helped them gain 100% awareness of their rhetorical techniques. Of course, as one of the students said, "It is important to emphasize that it is 50% professor and 50% student to build this knowledge." Both the professor and the students could work harder to help maintain greater retention of rhetorical technique and appeal knowledge in students.

However, it is worth considering whether, in the end, students even need to retain rhetorical terms. The students were adapting and, to an extent, conforming to writing in ways that match academic and genre expectations. While there were some variations and deviations away from expectations, for the most part, students were doing a good job of learning to express themselves in different disciplines. So, in light of this context, do students need to know the terms for rhetorical expression if they could express those ideas without knowing the terms? I would say yes they did, if they wanted to improve past where they were at the end of my study. By knowing the name of something, one gains understanding and eventually control over that object. This is the same with rhetorical terms. The better a student knows and understands rhetorical terms, the more

likely they will understand the concepts represented by the terms and perhaps learn how to use them in more and more effective ways in their writing and speaking.

But their lack of a firm awareness of their rhetoric is not the only factor of their epistemological understanding. The students seem to sense the importance of rhetoric, which could be helpful to their recognition and learning of the rhetoric of their chosen disciplines. What I am beginning to wonder is this, how much more powerful could they be if they had conscious awareness of more of their rhetorical choices? In order to figure this out, students would need to have the opportunity to develop their conscious awareness of their rhetorical choices in another learning opportunity, such as another composition class in the liberal arts core or one in their major.

Perhaps students could develop their individual awareness of their uses of rhetorical techniques and appeals if science more visibly supported composition courses. Due to the connections between science and rhetoric, science could benefit from students with better writing and thinking as well as deeper rhetorical understandings. The benefits may not stop there. Having students that were more aware of their own rhetorical approaches and techniques in their writing was a powerful thing. The more effective students are in their rhetorical expressions, then the better communicators they will be. How could disciplines not benefit from this arrangement? Science, especially, would not be immune to these benefits, since science, like rhetoric, is based off of the ability to ask questions and break down and build up ideas.

This entire study points toward the potential of students to learn how to use rhetorical techniques and appeals and thereby improve their later contributions to their chosen disciplines.

Limitations of the Study

One must remember that my study had its limitations. For example, this course was a unique class. Yes, it was one of many College Writing and Research course sections, but it was the only one with a focus on science. The course could not have as prominent of a focus on science as originally planned because there were not enough students signed up for the course. Despite this change in plans, this course was not a normal iteration of the College Writing and Research course. This was important to consider because students normally would not have gotten this focus on rhetoric in the sciences, and may never have gotten this same focus again. What this means is that if students did not learn rhetorical strategies at that exact time, then they may never learn it. Since this chance to teach students about the rhetoric of science in a composition classroom is such a small window of opportunity, and since it has such potential to improve the scientific expressions of students who have taken the course, science should be more focused on supporting ideas like STEAM to help more classes like this to exist.

Time also limited this study. With more time, I may have ben able to conduct more interviews. I could have also included a more detailed listing of the rhetorical techniques used by the students. Due to the time constraint, I had to focus on codes and themes that often included some of the rhetorical techniques most utilized by students.

The number of participants was also a limitation. I had sixteen participants, including eleven males and five females, which is a very small number to make any sort of definitive statement off of. Were I to have a greater pool of participants, I would have been able to make more definite statements. As it stands, my results and conclusions are

more indicative than they are definitive. This limitation meant that I was limited to analyzing sixteen rhetorical analyses and three lab reports. I believe I could have had a better idea of the range of rhetorical appeals and techniques utilized by students in a composition classroom were I to have analyzed more than sixteen rhetorical analyses and three lab reports. I also only interviewed seven of the sixteen participants, which may have skewed my results in an unforeseen way.

One of the difficulties I had with the interviews was with certain questions. Were I to complete this study again, I would change several questions to be more concrete and less ambiguous and expansive in scope. Were I to have made the questions more specific, I think the students would have answered with less hesitation and uncertainty. The vast majority of the questions I had no problem with, however.

Another limitation I had concerns the sheer amount of data I had. I had so much data that to do it complete justice would have taken me much longer. The results and discussion I have presented in this thesis are the most interesting and worthwhile points I discovered and thought about throughout my study.

Suggested Areas for Future Research

One aspect of my research that would be interesting to examine more in depth is the initial knowledge and assumptions of students as to what rhetoric and science are and how they are related. A future researcher could also take a look at how ideas about science and rhetoric differ from the beginning of the term to the end of the term. These ideas could be figured out through surveys, for example. More research into how science could support the learning, specifically the learning of rhetoric, of students in college

composition courses is needed. Further research will also be needed to figure out just how it would be better to teach and learn the subject of rhetoric and rhetoric in the sciences. Another area I would suggest for further research is in how ethos is taught in the classroom. A researcher could look into how it would be best to apply theoretical knowledge of ethos in the classroom.

What Can Be Learned From My Study

My goal in this study was to answer my two main research questions: what rhetorical techniques and practices do students in a composition class use to express themselves? and what do the rhetorical techniques and practices they use say about their epistemological understanding of rhetoric? By knowing the answers to these questions, I was able to figure out that, in this class, rhetoric and science both shared an emphasis on logos and ethos appeals. I was also able to say that the knowledge from this study is important to STEM and STEAM initiatives since knowledge gained in composition classrooms, if supported correctly, could help students in expressing themselves well in their disciplines, which would help the learning goals of STEM and STEAM initiatives.

Through the process of asking seven questions and triangulating the results of my field notes, interviews, and analyses of student rhetorical analyses and lab reports, I was able to figure out that students' epistemological understanding of rhetoric was lacking, but it was present. Overall, students used rhetorical techniques and appeals in writing of their papers (with some exceptions). However, each student was not completely aware of the rhetorical techniques and appeals they used in their papers. This shows that the students perceived that they were not wholly retaining their learning about rhetoric.

In this course, students wrote with rhetorical techniques, but they just were not

aware of them 100% of the time. A greater focus in school on developing these skills in that first year of college I think would be helpful in supporting the endeavors of both STEM and STEAM curriculums. Therefore, greater attention should be paid in the future to supporting the efforts of students and professors in college composition courses, especially those special few with emphases on science.

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Appendix A
Recruitment Script

Amanda: I am a senior honors student and as part of my honors thesis I want to research what you write and say as part of an effort to understand the rhetoric of science and how what you say and write shows what kind of rhetorical ideas you are using.

Amanda: As part of my research, I would like to ask you all to be part of my study. I want to emphasize that this study will hopefully increase understanding as to how students in a college composition course, such as yourselves, acquire a rhetorical mindset and what rhetorical techniques you use in your attempts to find information in the new discipline as well as what your use of rhetorical methods entails. Of course, you do not need to do this. It is not a required part of your grade and it will not affect your grade in the least. Dr. Grant will be unaware of your true identity in my notes, since I will be giving you all pseudo-names. I also will not discuss specific papers with him, but rather speak only of the codes and themes that are generated through my examination of your papers.

Amanda: As part of my research, I plan on looking at copies of your written work, perhaps occasionally recording your conversations, with your permission, of course, having you fill out one relatively quick survey, and potentially completing the occasional interview.

Amanda: If you would be willing to be part of this effort, please read, circle the appropriate answers, sign, and date the form that is going around now.

Amanda: Please be aware that Dr. Grant will never know who is really part of this study and that I have no grading responsibilities as your TA, so being or not being a part of this study will not influence your grade.

Appendix B
Informed Consent Document

Project Title: Rhetoric and Science: Examining and Identifying the Techniques Used by Students in a College Composition Course to Express Knowledge

Investigator: Amanda Arp

You are being requested to participate in a project conducted through the University of Northern Iowa Honors Program. The University requires that you give your consent to participate in this project by signing below.

The purpose of this project is to better understand how students in a college composition course, such as you, acquire a rhetorical mindset and what rhetorical techniques students use in their attempts to find information in the new discipline.

As a major aspect of this project, Amanda Arp will be analyzing the content of at least one of your papers as well as perhaps a sampling of audio-recorded small group activities and interviews and any notes she takes as part of the study in or out of class.

Besides a short survey and interview, there should be little cause for discomfort. The survey will take approximately ten minutes, the interview approximately ten minutes as well. If an interview were requested of you, the interview would take place in the library in a study room to protect privacy at a time of your convenience.

This project will allow you the chance to reflect upon your writing processes as well as give Amanda the chance to identify rhetorical practices used by you.

Participation in this research during your time in English 1005 will in no way, shape or form affect your grade, since pseudo-names will be used in place of your real names and only codes generated from my analysis, and not your individual papers, will be discussed with Dr. Grant. Papers and survey results will be locked in a container in Amanda's apartment.

You may at any point decide to withdraw from the project for any reason. If this becomes the case, your survey results, recordings, papers, or anything else, including you, will not be utilized in the final research project findings.

Potential Risks:

- This study will require some of your time

Potential Benefits:

- You could gain self-reflection, which could lead to learning
- The study could help to advance knowledge about composition students
- The study could deepen the knowledge teachers have about what rhetorical strategies students are using, thereby perhaps giving teachers a suggestion to improve teaching habits.

Circle Yes or No

Yes No I consent to being a part of Amanda Arp's research project.

Yes No I consent to Amanda Arp reading and analyzing my written work as a part of Amanda Arp's research project.

Yes No I consent to Amanda Arp listening to, taking notes on, and/or recording my spoken words as a part of Amanda Arp's research project.

Yes No I will endeavor to be honest in my responses to survey and interview questions.

Yes No I will also make Amanda and/ or Dr. Grant and/or the IRB aware of any issues that arise in relation to the research project.

Yes No I understand that recording and reading efforts shall be kept confidential, unless in the case of an emergency.

I am fully conscious of the nature and extent of my participation in this study and certify that I am 18 years of age or older. By signing this document, I am agreeing to participate in this project.

Participant Signature _____ Date _____

Participant Printed Name _____

Investigator Signature _____ Date_____

Investigator Printed Name _____

Contact Information:

If you have any questions or concerns about this study please contact me at 319-464-6502 or through my email at arpa@uni.edu. I will get back to you as soon as I can. If you have other questions or concerns, do contact Dr. Grant at (319) 273-3870 or through email at David.Grant@uni.edu. If you have questions about your rights as a participant in this study, please contact the office of the IRB Administrator, University of Northern Iowa, at 319-273-6148.

Appendix C
Field Notes

ENGLISH 1005, Section 12
Class Date:
Class Activity Summary:

FIELD NOTES

Flow Strategies Exhibited:
Challenge-Skill Balance

Action-Awareness Merging

Clear Goals

Unambiguous Feedback

Concentration on the Task at Hand

Sense of Control

Transformation of Time

Autotelic Experience (intrinsic sense of appreciation for the value of meeting the challenge)
Rhetorical Techniques Exhibited:

Other Techniques (Writing, ect.) Exhibited:

Questions:

Appendix D
Interview Questions

1. What is your typical writing process?

2. Can you describe how you were taught writing in high school?

3. What do you find most difficult about writing college papers in general?

4. If you find college level writing difficult or challenging, what methods do you use to overcome these difficulties or challenges?

5. What rhetorical approaches do you think you use in your writing?

6. Have you written a paper or other piece of writing for a science class or experience?

7. What methods have you used to write papers for this class?

8. Where did you learn the most about writing?

9. What do you do to begin writing an assignment?

10. When writing for this course, which rhetorical appeal do you think you use most?

11. While in this course, where do you think rhetoric is used the most?

12. Are you often aware of the rhetorical techniques you do or do not use in your writing?

13. Which aspect of writing rhetorically do you think you use the most?

14. Which aspect of writing rhetorically do you think you use the least?

15. What aspects of your speaking and writing do you think are rhetorical?

16. What have you learned about rhetoric in the sciences? How could this newfound knowledge aid you in your chosen career path?

17. When you first came into this class, what were some of your ideas about science?

18. Is there anything we've talked about in class that you still don't quite understand or need clarification for?

Appendix E
Interview Request Email Script

Interview for Amanda's Research Project- Response Requested

Hello [student name]! As part of my research project, I need to interview the students who agreed to be part of my project, like you, in order to learn more about your rhetorical techniques and views as part of this class. I would like to interview you, and do be aware you have choice in this, but I would highly appreciate it if you agreed to be interviewed. The interview will probably take about 10-15 minutes of your time. And I need to get them done very soon, so please get back to me within a day or two.

Would sometime this weekend work? I'd be available anytime except between 2-4 on Sunday. We could meet in person or through a phone call, whatever worked best for you.

Please let me know as soon as possible.

Thank you,
Amanda Arp

This Study by: Amanda Arp

Entitled: Rhetoric and Science: Examining and Identifying the Rhetorical Techniques Used by Students in a Composition Classroom

has been approved as meeting the thesis or project requirement for the Designation University Honors with Distinction or University Honors (select appropriate designation)

2 May 2014
Date

Dr. David Grant, Honors Thesis Advisor, Department of Languages and Literatures

5/9/14
Date

Dr. Jessica Moon, Director, University Honors Program