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Preparing Students to Think in the 21st Century: The Impact Of Asynchronous Online Discussions on Critical Thinking Skills in A High School English Class

Evan Way

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PREPARING STUDENTS TO THINK IN THE 21ST CENTURY: THE IMPACT OF
ASYNCHRONOUS ONLINE DISCUSSIONS ON CRITICAL THINKING SKILLS IN A
HIGH SCHOOL ENGLISH CLASS

by

Evan Way

Bachelor of Arts
Albion College, 2007

Master of Education
Cleveland State University, 2010

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Accepted by:

Hengtao Tang, Major Professor

Michael Grant, Committee Member

Lucas Vasconcelos, Committee Member

Anna Clifford, Committee Member

Tracey L. Weldon, Vice Provost and Dean of the Graduate School

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ABSTRACT

The purpose of this action research was to evaluate how the implementation of asynchronous online discussions into the classroom impacts the critical thinking skills of secondary language arts students. Although critical thinking has shown to be an important 21st century skill (Paul & Elder, 2002), many students are leaving high school lacking the thinking skills necessary to succeed in a modern society (Arum & Roksa, 2011; Conley, 2015). Standardized testing results within the population of this study indicated similar critical thinking deficits as the rest of the nation. This study focused on two central research questions: (1) To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of language arts students? (2) How do language arts students perceive the use of asynchronous online discussions to impact their critical thinking skills?

In this convergent parallel mixed methods study, students enrolled in my English 1 Honors course (n = 46) engaged in asynchronous discussion which was centered on a structured weekly debate. Debate groups received increasingly complex prompts each week and participated in required periods of reading, reflecting, writing, and responding. The Cornell Critical Thinking Test was used as a pre- and post-test to measure the impact of the intervention on student critical thinking skills. In addition, student discussion posts were analyzed at the beginning, middle, and end of the intervention with the Holistic Critical Thinking Scoring Rubric to examine how critical thinking skills evolved throughout the course of the study. Students completed a Likert style questionnaire, and

a subset of students participated in focus group interviews about their perceptions of how asynchronous discussion impacted their ability to critically think. Transcripts of the focus group interviews were coded looking for patterns and similar ideas in order to generate general themes about the data. Results from all four measures indicated that asynchronous discussions positively impacted student critical thinking skills. Likewise, students had positive perceptions of asynchronous discussions and its impact on their critical thinking ability. Implications on developing secondary school students' critical thinking are discussed.

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CHAPTER 1

INTRODUCTION

National Context

Due to advances in technology (e.g., smart phones), individuals are exposed to more information than ever before in history, making the ability to critically think and determine what to believe and what to ignore ever more important. In simple terms, critical thinking refers to the higher-order thinking skills that contribute to an individual's decision about what to do or what to believe (Ennis, 1993). Higher-order thinking includes the skills that fall higher on Bloom's Taxonomy and include actions such as applying, analyzing, creating, and evaluating (Song, 2019). An individual's ability to critically think can dramatically impact their life, and because of this, it is vital that educators develop these skills in students.

Although, the study of critical thinking can be documented as far back as Dewey (1910), it has seen a renewed emphasis in the field of education in the last 15 years (Ennis, 2018). Roth (2010) stated that developing critical thinking skills is now the primary goal of all levels of education. Bok (2005) also noted that in order to prepare students for the demands of a modern society, it is of utmost importance that instructors avoid allowing students to simply accumulate facts but teach them to critically think about the information they encounter.

In addition, the importance of critical thinking has gained significant attention from both political parties in the United States. In his 2014 State of the Union Address,

Barack Obama identified improving critical thinking as one of his major goals for education reform (Obama, 2014). Likewise, President George H.W. Bush included the development of critical thinking as one of his national education goals (Kubiak, 1991).

Despite the attention critical thinking has received in both the educational and political world, studies have shown that students are not leaving high school with the critical thinking skills necessary to excel at the collegiate level (Conley, 2015). In addition, a study of 2nd year college students from 29 different schools revealed that students showed little, if any growth in their ability to perform complex tasks such as critically think (Arum & Roksa, 2011).

In the high school classroom, critical thinking plays a major role in the way students write and analyze complex texts. This ability has become increasingly important as high-stakes standardized testing companies continue to implement questions and writing prompts that challenge a student's ability to critically think (ACT, 2019; Nickerson et al., 2014). Concern has grown over the fact that students in the United States are lagging behind other developed nations on standardized tests that require the use of complex thinking (e.g., Program from International Student Assessment [PISA], ACT, and SAT). Results from the 2015 administration of the PISA ranked the United States 31st worldwide in the composite score of Math, Science, and Reading (National Center for Education Statistics, 2017). Although many factors contribute to student performance on this test, it is clear that improving critical thinking could lead to a positive result on this assessment.

Researchers have shown that critical thinking can be cultivated (Mehta & Al-Mahrooqi, 2014; Z. Zhou, 2018); however, studies suggest that many teachers lack the

requisite pedagogical knowledge to develop these essential skills (Polat, 2015).

Likewise, most students are able to identify the importance of critical thinking but are unable to identify the skills that comprise this process (Forbes, 2018). Because critical thinking is such an important skill, it is vital that educators are prepared with the tools to cultivate this thinking in students.

A significant amount of research has been devoted towards developing strategies to improve critical thinking skills in students (Nold, 2017). Many studies point toward the effectiveness of discussion in cultivating this thinking (Gokhale & MaChina, 2018; Hall, 2015; Miri, David, & Uri, 2007). Although discussion takes place in most classrooms on a daily basis, many educators fail to utilize this process in a way that maximizes the development of critical thinking skills while also encouraging students to problem solve and make decisions (Gokhale & MaChina, 2018). Behar-Horenstein and Niu (2011) noted that educators often put too much effort into instructing students what to think rather than teaching them how to think. Garside (1996) identified several important features of discussions that encourage critical thinking, including higher-order questioning, paraphrasing, small-group problem solving, and active listening. In addition, Arend (2009) noted that providing students with pointed feedback on their discussion contribution was essential in developing thinking.

As technology becomes increasingly present in the modern classroom (Roberts, 2000), more opportunities have arisen for educators to implement peer-discussion through online platforms. Online discussion on threaded asynchronous discussion boards has been shown to yield improvements in critical thinking and overall student satisfaction with the class (Lo et al., 2011). Asynchronous discussion boards can also provide

opportunities for increased participation as well as the space to extend thinking with detailed contributions (Williams et al., 2015).

Local Context

This study took place at a large urban high school located in the Lowcountry of South Carolina. In 2018, 2302 students were enrolled, making it one of the largest high schools in the state (SC School Report Card, 2018). This school was composed of a highly diverse student body of 59% minority students with 34% of the total population coming from an economically disadvantaged home (SC School Report Card, 2018). This qualified it for Title I funding. In addition, the school's proximity to the Charleston Air Force base led to a high population of students coming in from other school districts with varying levels of achievement.

The school's vision was that all of its students will be prepared for college and career at the time of their graduation. However, important benchmarks showed that far too many students were underperforming in relation to their peers across the nation. Although the school had seen improvement in regards to graduation rate and college acceptance, on average students performed lower nationally on important measures such as the ACT, SAT, and Advanced Placement Testing (National Center for Education Statistics, 2011; The College Board, 2019). Students failed to perform on par with the nation on both the AP English Language and Composition and AP English Literature and Composition tests, scoring on average .50 and .54 levels below the national average respectively (The College Board, 2019). Furthermore, although students at this school consistently performed well on the English End of Course Exam comparatively to the rest

of the state, 41% of students still failed to achieve a 'C' on the test (SC School Report Card, 2018).

Pedagogical training from the National Math and Science Initiative was implemented in an effort to help students develop their writing and critical thinking skills. This intensive training provided educators with curriculum to help develop students' critical thinking skills in order to improve performance on high-stakes exams. However, much of this curriculum was only applicable on specific test questions and not focused on improving the overall critical thinking skills of students. Consequently, little growth was shown over the past five years on assessments that require higher-level thinking (The College Board, 2018).

In 2018, the district began requiring quarterly text-dependent analysis assessments that were standardized throughout the district but graded by individual teachers. Teachers made efforts to utilize this data among grade-level teams to collaboratively improve outcomes. However, little changed in student performance on standardized exams or in the way thinking was taught in the classroom.

Students in my English I Honors class struggled to analyze issues from multiple perspectives and generate responses that demonstrated more than just surface level understanding. They tended to ground their answers in their limited knowledge of the world. Although I saw high-level analysis generated through classroom discussion, due to the constraints of the classroom environment, not all voices could be heard and perspectives were limited to those who were comfortable speaking aloud. Collaboration could be made even more meaningful if all students had the freedom and space to voice their thinking.

Recently, the school adopted the Microsoft Teams platform as part of an initiative to increase technology usage in the classroom. Although this technology had been underutilized within the district, it provided educators with a variety of features to enhance student collaboration. In addition, the asynchronous discussion platform offered by Schoology allowed my students to collaborate more meaningfully without the restraint of time and place, which significant research has shown can enhance critical thinking skills in students (Arend, 2009; Ekahitanond, 2013; Nazleen & Rabu, 2013).

Problem Statement

Textual analysis essays and student performance on the South Carolina End of Course Exam indicated that students struggle to critically think.

Purpose Statement

The purpose of this action research was to evaluate the impact of asynchronous online discussions on the critical thinking skills of high school language arts students.

Research Questions

Two research questions guided this study:

1. To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of language arts students?
2. How do language arts students perceive the use of asynchronous online discussions to impact their critical thinking skills?

Researcher Subjectivities and Positionality

I made the decision to pursue a degree in educational technology because I have seen how technology has increasingly dominated the narrative of education since the beginning of my career. School leaders around the country are now including a

technology integration component in their evaluations of teachers. However, I have noticed that when teachers are evaluated on incorporating technology in their class, they are only evaluated on the fact that students are simply using some type of technological device (e.g., watching a video). By only focusing on the technology and ignoring the importance of instructional design, the true impact of technology integration is missed. This misunderstanding of educational technology has led to many teachers resisting its use in their classrooms. I would like to be part of the movement that demonstrates that educational technology is about far more than the devices that are used. Educational technology is about using the functionalities of the technology to create learning environments that expand students' thinking to places that would not be possible without technology. To me, this program is about learning how to create these learning environments and using what I learn to improve the educational system as whole.

The ideal educational technology professional is an individual who is adaptive, forward thinking, passionate, and determined. I believe that these characteristics describe an individual who is able to meet the demands of the industry while at the same time moving it forward. Although there may be many setbacks, the ideal professional is determined to succeed and improve the field while maintaining the willingness to adapt when necessary. I believe that these are all traits that I possess as an educational technology professional.

One trait that I possess that I feel is particularly well-suited for the field is my ability to maintain the trust and respect of my colleagues. As I move forward with my career, I think this will help me to install changes within my school that are system-wide rather than just in my own classroom. Despite being respected and trusted by my

colleagues, I often get wrapped up with what is taking place in my own classroom and focus only on the students enrolled in my own classroom. However, it will be important that I step out of my comfort zone and share my knowledge and experiences with my colleagues and other students as an educational leader.

Although I sometimes feel wrapped up in my own classroom, I have had experience leading departments and teams of teachers. This experience will help me as I push my school and my district to expand their vision of educational technology.

Although I have experience leading as a teacher, I have always said that the role of school administrator is a position I would never be interested in. I believe teachers have the greatest opportunity to have an immediate impact on their students; however, as I work towards changing the system as a whole, my lack of experience as an administrator may be seen as a challenge to fitting into the role of an “ideal” educational technology professional.

As I progress with my research, I am most interested in learning about how critical thinking skills can be developed in students. I believe critical thinking is the most vital skill that can be developed in students. I want to know more about different strategies for its cultivation, especially how technology can be used to enhance these skills. I believe that critical thinking is a cross-curricular skill; therefore, what I learn from this research can be applied to all subjects, not just my own.

As someone who has lived and taught in several states, I have had a diverse range of experiences that I can bring to my research. As a student in grade school, I grew up in a time when computers and internet were first being incorporated into the classroom. I have seen first-hand how this technology has impacted the way students learn and how

teachers teach. Furthermore, within my career I have seen the rise of smart phones and their impact of both good and harm within the classroom. This experience has given me a unique perspective and has given me the ability to view educational technology from multiple angles.

Although growing up as technology was first being incorporated into the classroom was an excellent opportunity, my students only know the world from the perspective of the smart phone era. With these devices, they have the ability to know the answer to virtually any question they can think of within seconds. They will never know what it is like to search through an encyclopedia hoping that there may be some sort of helpful information. However, as educators we cannot ignore the fact that this is how the world works now. My goal is to harness these developments in technology to take student thinking to a place that was not possible in previous generations.

Teaching high school English has been both a passion and a profession for nine years now. I am motivated to teach my students a love of reading and writing, but more than that, to help them develop the thinking skills necessary to succeed in a continuously advancing world. I am certified to teach gifted and talented students, but I have taught every level of high school English, including college preparatory and honors level classes. I am currently a 9th grade English team leader, and I have been a mentor for first-year teachers for three years. It is my goal to take what I find in my research and use it to help my colleagues to improve the efficiency and productivity of their own practices.

I come from a large family of educators; ten people in my immediate family are teachers, ranging from elementary to college. When I first became a teacher, I inherited my aunt's life work: her entire English curriculum that she had been working on for 40

years. I have received more guidance and support from family about teaching than any other place. The lesson that was always instilled in me was that students need to be taught to think for themselves and to support what they say. It has helped me to understand that the best teachers are those who focus on the process of acquiring knowledge rather than the end product. This guideline has shaped me as an educator and drives my development of curriculum and how I instruct my students.

In my district, there has been a big push to incorporate more technology into everyday classroom instruction. However, I am very biased against being required to use technological devices that do not increase collaboration, productivity, or efficiency. I believe the real benefit of educational technology comes from creating learning environments that challenge and develop thinking through interaction and collaboration with peers. Simply word processing a document rather than hand-writing it is not unleashing the learning potential of educational technology.

As an educator, I conducted my research based on a pragmatic approach because of the paradigm's goal of addressing a problem within the real world (Creswell & Creswell, 2018). Pragmatism places emphasis on achieving improvement rather than meeting some condition of truth (Morgan, 2007). Furthermore, pragmatism allows the researcher to select methods which best meet the needs of students rather than placing restrictions on the selection of methodologies (Mertens, 2009). In addition, the pragmatic goal of social justice (Feilzer, 2010) plays an important role in my research outlook. It was important to me that my study not only achieve a positive result in my students, but also worked towards closing the achievement gap between students coming from different racial and socioeconomic backgrounds.

As a researcher I assumed an insider positionality within my study (Herr & Anderson, 2005). I assessed the success of the intervention I designed within my own context. As an insider, I had access to the trust and acceptance of my students. This positionality also fits with pragmatism which states that the researcher must interact with participants in order to most fully address the research problem (Hall, 2013).

Although my insider position within my study had many benefits and aligned well with pragmatism, Herr and Anderson (2005) note that this positionality can lead to researchers viewing their study more positively than results actually indicate. Clearly, as an educator I want to see my students excel, and as a researcher I wanted my study to demonstrate positive results. It was important that I acknowledged potential bias and took steps to ensure data was faithfully gathered and analyzed. This helped minimize the impact of researcher bias within my study.

Definition of Terms

1. Asynchronous online discussion: “A text-based computer-mediated communication environment that allows individuals to interact with one another without the constraint of time and place” (Hew, Cheung, & Ng, 2010). This will consist of threaded discussions which are employed as a learning medium (Weltzer-Ward, 2014).
2. Critical thinking: Facione (1990) defines critical thinking as the “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based.”

CHAPTER 2

LITERATURE REVIEW

Method of Review

The purpose of this action research was to evaluate the impact of asynchronous online discussions on the critical thinking skills of high school language arts. This review of literature focuses on the two main research questions: (1) To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of language arts students? (2) How do language arts students perceive the use of asynchronous online discussions to impact their critical thinking skills?

In order to most thoroughly address these questions, a careful research process was employed to develop this literature review. This was guided by the four main variables of this study: (1) critical thinking, (2) social interaction, (3) discussion, and (4) asynchronous online discussion. A variety of sources were used to obtain thorough information about each variable. This review process began by using two electronic databases, *ERIC* and *Education Source*, to search for published research on the variables. Various combinations of the following keywords were used to guide this search: critical thinking, higher order thinking, advanced thinking, critical thinking skills, asynchronous discussion, discussion, threaded discussion, discussion boards, and social interaction.

After review of the results of these search terms, the following additional terms were added to increase the breadth of the research and incorporate theoretical foundations

into the study: constructivism, mobile learning, 21st century skills, constructivist learning, active learning, writing, project-learning, asynchronous discussion design, student behavior, social learning. In addition, the *Google Scholar* search engine was used to locate additional publications using the same keywords. A significant amount of additional research was found by mining the references of publications found through the *ERIC*, *Education Source*, and *Google Scholar* search. *Google Scholar* was particularly useful in locating specific articles that were found through the mining process. Once references were found, they were carefully evaluated using guidelines from Pырczak and Tcherni-Buzzeo (2019) to ensure the quality of the sources used within this literature review. Because of the timeliness of the topic, special consideration was given to articles published after 2015 to ensure the relevancy of the references.

This review of literature is divided into six separate sections. The first section will provide an overview of critical thinking and its importance in 21st century learning. Next, the theoretical foundations of constructivism will be connected to critical thinking and constructivist strategies to promote this skill will be discussed. Third, the importance of social interaction in constructivist learning and its use to develop critical thinking will be explored. The next section will review how writing has been used to promote social interaction and enhance critical thinking. Fourth, ASD will be defined and introduced as a method to combine social interaction and writing to improve critical thinking. Finally, strategies to enhance the impact of ASD on critical thinking will be reviewed, focusing on instructional design, instructor facilitation, and student behavior.

Critical Thinking

In a world of constantly accelerating complexity, individuals must develop the ability to think at a level that keeps pace with the advancement of modern society (Paul & Elder, 2002). This ability to critically think will play an increasingly important role in society; therefore, it is crucial to understand how it is defined and how it relates to the skills necessary to succeed in the 21st century. In this section, the theoretical foundations and the importance of critical thinking will be explored. It will begin by providing a research definition of critical thinking and then analyze how other researchers have contributed to our understanding of this concept. It will conclude by discussing the importance of cultivating critical thinking skills and its connection to 21st century skills.

This research used the definition put forth by Facione (1990), which states that critical thinking is “the purposeful, self-regulatory judgment which results in interpretation, evaluation and inference, as well as explanation of the evidential, conceptual, methodological, or criteriological, or contextual considerations upon which that judgement is based” (p. 3). This definition has been used in numerous other studies (e.g., Behar-Horenstein & Niu, 2011; Forbes, 2018) and is the guiding definition for the California Critical Thinking Skills Test (Knox, 2013).

Considerable research has been performed to add simplicity and clarity to the concept of critical thinking (e.g., Burbules & Berk, 1999; Chou, Wu, & Tsai, 2019; Giuliano & VonColln-Applying, 2017; Wang, 2017). Ennis (2018) simply defines critical thinking as “reasonable reflective thinking focused on deciding what to believe or do” (p. 181). It is important to note that critical thinking is not content specific and is more of a generalized list of abilities and thinking processes (Burbules & Berk, 1999). Paul and

Elder (2002) further describes this process by dividing thinking into two processes: first-order and second-order thinking. First-order thinking is comprised of spontaneous and simplistic thinking (e.g. true or false) while second-order thought requires reflection and analysis of experience (e.g. critical thinking). Coming from an educational perspective, critical thinking is often classified using Bloom's Taxonomy (Wang, 2017). Within this taxonomy, Krathwohl (2002) places critical thinking at the top levels of complexity which includes analysis, synthesis, and evaluation. According to Bloom, Engelhart, Furst, Hilland Krathwohl (1956), these higher levels of thinking involve problem-solving and require individuals to "adapt knowledge to the new situations" (p. 41) through careful critical thinking. These studies generate a clear picture of critical thinking and help to identify its manifestation, and when taken in the context of this study, critical thinking can be defined as the careful analysis, synthesis, and evaluation of a given stimuli that results in an individual's decision on how to approach the situation.

Looking at critical thinking and the processes which define it, it is clear why it has been identified as one of the essential 21st century skills necessary to succeed in society. 21st century skills are the necessary cognitive, interpersonal, and intrapersonal abilities that individuals must possess in order to succeed in modern society (Pellegrino & Hilton, 2012). Of all these skills, critical thinking has shown to be one of the biggest indicators of life success. One study performed on community college students found that critical thinking was a strong predictor of positive life events, even greater than IQ (Butler et al., 2017). Additionally, in a content analysis of 142,000 job advertisements, Rios, Ling, Pugh, Becker, and Bacall (2020) found critical thinking to be one of the most frequently sought-after job skills by employers. Clearly this ability to think is not only an important

determinant of one's future success, but also a vital skill necessary to meet the demands of a 21st century job market.

Although research shows that critical thinking is a vital skill to meet the demands of the modern job market, in order to encourage the adoption of critical thinking within classrooms, educators must see that learning outcomes can be improved through its cultivation. Paul and Elder (2012) argue that the thinking process is an essential part of learning and state that “when you think poorly while learning, you learn poorly, and when you think well while learning, you learn well” (p. 144). This idea may be simplistic in nature, but it demonstrates the point that developing essential thinking skills in students can improve learning outcomes in students. Nosich (2012) adds that critical thinking prompts students to become active learners and can result in more lasting and meaningful learning. This demonstrates that not only is critical thinking an important skill for 21st century success, but also an important aspect of meaningful learning. With that being said, identifying how learning theory is connected to critical thinking can help develop instructional strategies to most effectively encourage and develop this skill.

Constructivism and Critical Thinking

There is a close connection between critical thinking and constructivism (Ertmer & Newby, 2013). This section will look to demonstrate this connection and provide a theoretical foundation for the methods of this research. It begins by discussing the foundations of constructivist theory and its essential components, including the factors that influence learning. The connection between critical thinking and constructivism will then be explored. This section concludes by providing examples of constructivist learning strategies which have shown to be effective in cultivating critical thinking.

Constructivism

Constructivism is a learning approach with roots in the theories of Dewey (1910), Piaget (1972), Bruner (1974), and Vygotsky (1978). Under this approach, learning is the result of the interaction between experience and existing knowledge structures resulting in the formation of new constructs (Ertmer & Newby, 1993). As opposed to other theories such as Behaviorism, learning is an active process which requires interaction with the environment and reflection on experiences (Tam, 2000). In constructivist environments, learning is a social process where learning is shared between the student and the teacher, who acts as the facilitator (Olusegun, 2015). This knowledge can be developed through meaningful discussions that generate the necessary thinking to alter existing constructs. Cooperstein and Kocevar-Weidinger (2004) note that applying constructivist principles of active learning and social interaction into the classroom can making learning more meaningful, transferable, and increases the likelihood that knowledge will be retained and applied outside the classroom setting. Additionally, this approach encourages student engagement with class material, encourages diverse perspectives, and increases linkages between other subject areas (Howard & Brady, 2015). These benefits make constructivism an ideal approach to generate the learning outcomes necessary in a modern classroom.

Learning in Constructivism

In constructivism, the acquisition of knowledge occurs through an active process in which an individual creates meaning through the interaction with the environment, collaboration with peers, and problem solving (Jonassen, 1991). Within this constructivist learning environment, there are numerous factors which have shown to

influence learning. Lunenburg (2011) states the students should be encouraged to frequently interact with their environment rather than being passive recipients of information. Furthermore, learning should take place in an authentic setting which allows individuals to construct meaning through collaboration and problem solving (Mergel, 1998). It is important that the instructor allows students the opportunity to actively create knowledge by playing the role of the facilitator rather than strictly delivering information (Tam, 2000). Additionally, incorporating social interaction through collaboration and discussion has been shown to be an effective strategy to encourage students to alter their current knowledge structures (Jonassen et al., 1995). Creating learning environments that incorporate these factors can lead to improved learning outcomes and generate the high-level thought that is necessary to encourage critical thinking.

Constructivist Instructional Strategies

Numerous effective instructional strategies have been developed that are informed by constructivism. These strategies use the learning factors noted above to create environments conducive to constructivist learning. One of the most prevalent constructivist learning strategies is project-based learning, and significant research has been devoted to this design (e.g., Kokotsaki, Menzies, & Wiggins, 2016; Mahasneh & Alwan, 2018; Sumarni, 2015; Tamim & Grant, 2013). Jones (2017) describes an example of this strategy in which students are tasked with performing an investigation into a problem and collaboratively coming up with a solution through discussion and careful analysis of evidence. This learning strategy creates a learning environment that is

driven by students, focuses on problem-solving, and encourages peer interaction through discussion and critical reflection about experiences.

Constructivist Instructional Strategies to Enhance Critical Thinking

Many of the skills focused on in constructivism share a close relationship with critical thinking. A key commonality of these two concepts is the focus on elaboration rather than memorization (Ertmer & Newby, 2013). Elaborating on learning experiences forces students to make connections to previous experience by critically thinking about their relationship to existing constructs (Tam, 2000). This requires careful observation and analysis of the environment through critical thinking, reflection, and social interaction. Hurst, Wallace, and Nixon (2013) note that the use of discussion is a particularly effective tool for learning and in the cultivation of thinking. The close relationship between critical thinking and constructivism makes the constructivist approach ideal when designing instruction to cultivate critical thinking skills (Guiller et al., 2008).

Significant research has been performed in effort to identify learning tools within the constructivist approach which impact critical thinking (Cooperstein & Kocevar-Weidinger, 2004). Although, constructivism is a diverse approach and encompasses a wide variety of learning tools, writing and social interaction are two of the primary tools used which have shown to impact student critical thinking skills (Olusegun, 2015). One study on collaborative learning environments found that groups with higher levels of discourse outperformed those with less participation in academic literacy tests, indicating that critical thinking was positively impacted through participation in group learning (Zhao & Chan, 2014). Likewise, Jarvis and Baloyi (2020) found that writing activities

such as reflective journaling had a positive impact on student critical thinking performance. These studies suggest that incorporating both social interaction and writing into the instructional design of the classroom can have a positive impact on the cultivation of critical thinking skills. Both tools will be discussed in detail in the following sections.

Social Interaction as a Strategy to Cultivate Critical Thinking

Social interaction is an important component of constructivism and has shown to be an important strategy in the cultivation of critical thinking skills (Perrow, 2017). The following section will first define social interaction and analyze what social interaction looks like in a constructivist approach. Strategies for using social interaction to promote critical thinking will then be explored.

In order to fully understand the relationship between social interaction and critical thinking, a definition and description of social interaction must first be established. According to Kreijns, Kirschner, and Jochems (2003), social interaction is the process by which a shared understanding is developed through interaction with others. Social interaction is an essential component of knowledge construction and helps individuals to develop their understanding of concepts (Vygotsky, 1978). This process is not only a foundation for constructivist learning theory (Olusegun, 2015), but has also shown to be an important strategy for the cultivation of critical thinking skills. Palincsar (1998) noted that higher forms of mental processing have origins in social sources. Creating an environment that encourages social interactions between students can help students engage in the activities necessary to generate critical thinking

Discussions have been shown to be effective in creating the social interactions necessary to stimulate critical thinking (Osborne et al., 2018). One study on the benefits of social interaction found that the elements of critical thinking were most often demonstrated during classroom instruction (Hajhosseini et al., 2016). Similarly, Salter, Douglas, and Kember (2017) noted that loosely structured discussions encouraged divergent thinking, which was identified as an important component of critical thinking. The use of discussion has also shown to be effective in improving student beliefs about their own ability to critically think about issues. In a study examining the development of critical thinking skills in college, Espey (2018) found that students perceived classes utilizing frequent social interaction to have a greater impact on their critical thinking ability than traditional lecture classes. Social interaction and discussion in particular have shown to have a positive impact on student thinking. Incorporating this into a classroom setting could help students develop these vital thinking skills.

Although various instructional strategies have shown success in generating social interaction and cultivating critical thinking, the Socratic method is frequently mentioned in the literature as an effective strategy to encourage the type of thinking necessary to generate higher-order thinking (Lee et al., 2014). In Socratic seminars, students generate ideas through discussion and a careful questioning process requiring clarification and analysis of evidence that leads to deeper levels of thought and understanding (Kalelioğlu & Gülbahar, 2014). Yang, Newby, and Bill (2005) applied this strategy in a university-level distance learning course. It was found that encouraging social interaction through Socratic questioning produced evidence of higher levels of critical thinking, which was maintained after the exposure to the treatment. These results also suggest a relationship

between critical thinking and written discussion, which played an important role in the study.

Writing as a Strategy to Cultivate Critical Thinking

Writing is a commonly used tool to promote social interaction and cultivate critical thinking (Sanchez & Lewis, 2014). This section will review how writing has been used to promote social interaction and generate improvements in critical thinking.

The ability to express oneself through writing is an essential 21st century skill that students must develop in order to succeed in modern society. Increasingly, writing has been used as a collaborative process to not only improve the quality of writing, but also to incorporate social interaction and develop the divergent thinking necessary to impact critical thinking skills (Bean, 2011). Lin and Yang (2011) found that social interaction played a significant role in students' perceived benefits of the writing process. Students reported believing that social interaction improved the quality of their writing and increased their confidence in the ability to fulfill the requirements of the assignment. Furthermore, Belcher, Hall, Kelley, and Pressey (2015) noted that responding to peers through writing led to improved learning outcomes and students often preferred peer feedback over instructor feedback. Clearly, writing can be utilized within the classroom to develop the essential social interaction necessary to improve communication skills and generate the higher-order thinking necessary to cultivate the critical thinking skills of students.

Critical thinking has also been closely connected to writing, and evidence has been provided that suggests incorporating critical thinking into writing can stimulate enhancements in critical thinking ability (Liu & Stapleton, 2018). One study found that

students who were taught writing in conjunction with direct instruction in critical thinking demonstrated significantly higher levels of critical thinking on argumentative writing tasks (Nejmaoui, 2019). An additional study examining writing tasks that required critical thinking not only led to improvements in writing, but also lead to improved critical thinking skills (Zhu et al., 2014). This reinforces the work of Pei, Zheng, Zhang, and Liu (2017), who found a close relationship between writing ability and critical thinking. The researchers reported that growth in writing ability frequently resulted in a similar improvement in critical thinking skills. These studies suggest that incorporation of writing tasks require critical thought in conjunction with direct critical thinking instruction can lead to improvements in overall critical thinking ability.

Asynchronous Discussion

As technology use has become more prevalent throughout society, ASD has become an increasingly used teaching tool in schools (Hew et al., 2010). This section will first provide an operational definition of ASD and then review the numerous ways it has been used in education. Research will also be reviewed that studied student perceptions of ASD and its impacts on their learning.

ASD has evolved into an effective instructional tool that has been used for varied purposes and in a variety of platforms (Dipasquale & Hunter, 2018). Hew, Cheung, and Ng (2010) define ASD as “text-based computer-mediated communication environment that allows individuals to interact with one another without the constraint of time and place” (p. 572). These text-based communications consist of threaded discussions which are employed as a learning medium (Weltzer-Ward, 2014).

Although simplistic in nature, ASD has been incorporated into education for numerous instructional goals. One such application of this tool has been the development of divergent thinking. For example, Lennon (2017) studied the use of ASD to facilitate discussions on controversial subjects to help students look at issues from a variety of different perspectives. Teachers were able to guide the discussion flow to encourage inquiry and direct students to higher-level thinking. Results indicated that both active and passive participants of these discussions were able to achieve learning goals. Likewise, Hou, Wang, Lin, and Chang (2015) used ASD to develop structured class debates. Participants demonstrated a greater frequency of higher order thinking and results also suggested a connection to improved class performance. The divergent thinking demonstrated in both studies indicates that ASD can be used to help students view class material from numerous perspectives, which is an important criterion in developing meaningful learning experiences and critical thinking (Paul & Elder, 2002).

Encouraging social interaction is a commonly cited purpose for the inclusion of ASD into an instructional setting (Foo & Quek, 2019). From a constructivist perspective, the incorporation of social interaction is a vital component to any instructional design. ASD provides students with the opportunity to socially interact with course material in manner that has demonstrated a positive impact on learning outcomes (Yang, Gamble, Hung, & Lin, 2014). Alzahrani, (2017b) found a significant correlation between participation in ASD and final course grade. This suggests that the collaborative aspect of the ASD could lead to improved learning outcomes and mastery of course material. Similarly, Cheng, Paré, Collimore, and Joordens (2011) demonstrated positive effects on student performance when ASD was introduced into the curriculum. In particular, the

amount of time spent reading posts on the forum was shown to have a notably significant impact on test performance. The social aspect of ASD is clearly one of its most beneficial components and places it well within the pedagogy of constructivist learning theories.

Although studies have shown the numerous benefits of participating in ASD (Dipasquale & Hunter, 2018), it is important to help students avoid the negative behaviors that are detrimental to their learning and the learning of their peers. The negative behavior, commonly referred to as “lurking,” involves students reading the posts of their peers but not contributing posts of their own (Küçük, 2010). This lurking behavior can detract from the richness of the discussion and eliminate important perspectives from the conversation. Cheng et al. (2011) noted that some benefits ASD may still be achieved; however, the full potential of the tool is not realized if all members of the ASD are not providing meaningful contributions. Clearly, facilitators must take steps to ensure lurking is eliminated in order to ensure that ASD is achieving its maximal effectiveness.

Despite the potential for negative behaviors, ASD has shown to be an effective instructional tool and has grown to be increasingly widespread. Because of this, it is important to understand how students perceive this tool and its impact on their educational growth. In a study on the impact of a collaborative ASD learning platform in a face-to-face class, results showed that students appreciated the ability to engage with course content in various ways and felt it had a positive impact on their class performance (Swart, 2017). Another study found that students preferred to engage in ASD over traditional face-to-face discussions (Guiller et al., 2008). Additionally,

students demonstrated more evidence of critical thinking within ASD when compared to traditional classroom discussions. Perhaps one of the factors contributing to this preference is a sense of comfort in communicating virtually over face-to-face. Bardakci, Arslan, and Can (2018) found that the lack of self-confidence was one of the primary boundaries that prevents students from participating in classroom activities. Furthermore, students were more comfortable to freely express ideas in an online environment when compared to the traditional classroom setting. These studies suggest that ASD can be used to enhance student perceptions of their ability to critical thinking about course content.

In addition to the clear positive impacts on learning, studies have shown the incorporating ASD into the instructional environment can have a positive impact on the development of a student's critical thinking skills. By incorporating elements of social interaction and writing into one instructional tool, ASD possesses many elements which can contribute to this vital 21st century skill (Gao, Guo, & Wang, 2018). Significant evidence has been provided that suggests adding ASD into the instructional design of a class can lead to growth in critical thinking (Hall, 2015). Therefore, it is important to discuss how ASD can be used to achieve this growth.

Strategies to Promote Critical Thinking within Asynchronous Discussion

As we move into a 21st century learning environment, many of these interactions can now be enhanced through the use of technology through its ability to support conversation and collaboration into the learning environment (Jonassen et al., 1995). ASD has frequently been identified as a learning tool that incorporates the elements of Constructivism into a 21st century learning environment aimed at developing essential

critical thinking skills (e.g., Szabo & Schwartz, 2011; Zhao & Chan, 2014). With that being said, significant research has been performed to improve the quality of ASD and ensure critical thinking goals are achieved. This section will review strategies that have been used to enhance the development of critical thinking in ASD. It will review how instructional design, instructor facilitation, and student behavior have been used to create an environment that promotes the development of critical thinking skills.

Improving the Instructional Design of ASD to Promote Critical Chinking

Although significant evidence has shown that ASD can lead to the cultivation of critical thinking, it is important to identify the specific instructional strategies that have shown to be effective in generating these thinking skills. The following section will review how (a) approach, (b) scaffolding, (c) question prompts, (d) grouping, and (e) rubrics have been used to stimulate critical thinking within ASD.

Approach. There are numerous approaches to ASD that have been utilized to cultivate critical thinking. Schindler and Burkholder (2014) identified several basic approaches to ASD which have shown to be most frequently used for the promotion of critical thinking. One such approach is the cased-based approach which has been used in many disciplines and encourages the application of conceptual principles to real-life practices. Koole et al. (2012) incorporated these discussions into dental education courses to encourage active learning and provide students with an opportunity to relate theory to practice and encourage critical thinking. Another commonly used approach is problem-based design. This focuses on presenting students with an ill-structure problem which they must collaboratively solve through discussion. de Jong, Verstegen, Tan, and O'Connor (2013) applied this approach to prepare masters students to adapt to the

problems they may face within public health. Although positive learning results were reported, Wu, Hou, Hwang, and Liu (2013) found that problem-based discussion resulted in high frequencies of low-level discussions which were not conducive to the development of critical thinking. Finally, the debate approach centers ASD around an argument. As with traditional face-to-face debates, students are assigned a side of an issue and tasked with developing an argument for their position. Darabi, Arrastia, Nelson, Cornille, and Liang (2011) found that students exhibited more complex thought within debates and engaged in frequent critical thinking, especially when attempting to justify their position to their classmates.

Scaffolding. Within the instructional design of ASD, it is important that a plan be in place to provide instructional support to students in order for them to reach learning goals that they would not be able to master alone. Spatariu and Winsor (2013) noted that providing this learning support increases the quality of posts and can help guide students to higher levels of thinking. In a study performed on undergraduate students, Ak (2016) found that providing students with sentence starters for their discussion posts led to more task-related learning activity. This suggests that sentence starters can be effective in guiding students to developing posts that demonstrate the targeted higher-order thinking that is necessary in the cultivation of critical thinking skills. Similarly, Gao (2014) found that incorporating discussion labels (e.g., questioning, challenging, building) was effective in generating the types of posts that were desired by the instructor. Students who effectively used the discussion labels more frequently extended their thinking and overall led to a deeper discussion when compared to the control group. Incorporating

these scaffolds into an ASD environment could guide students to targeted higher-order thinking, and lead the development of the desired critical thinking skills.

Question prompts. The development of properly constructed question prompts can play an important role in creating an ASD environment that is conducive to the cultivation of critical thinking. In a study on undergraduate students, Liu and Stapleton (2018) found that utilizing discussion prompts that contained problem-solving as one of the main tasks led to more diverse language and enhanced critical thinking. Infusing these types of questions into ASD is essential to creating an instructional design that stimulates critical thinking. Tiruneh, De Cock, and Elen (2018) noted that these types of questions must be systematically infused into the curriculum and play an important role in the student's learning process. Aloni and Harrington (2018) suggested numerous strategies for creating effective question prompts which include targeting Bloom's Taxonomy's highest levels, using creative approaches such as role-playing and debates, and focusing on the use of divergent prompts instead of convergent questions. It is evident that designing an ASD environment focusing on these carefully chosen question prompts can lead students to display critical thinking skills and improve their ability to interact with their peers at a higher cognitive level.

Grouping. Group size can play an important role in promoting critical thinking within ASD. Although ASD is capable of hosting a large number of participants in a discussion, researchers suggest that smaller discussion groups are more effective in generating critical thinking (Scanlan & Hancock, 2010). One study on the impact of group size on higher-level knowledge construction in ASD found that smaller discussion groups demonstrated critical thinking more frequently in their interactions (Hew &

Cheung, 2011). The authors suggested that students participating in smaller discussion groups were more likely to engage with their classmates in meaningful discussions. Likewise, Afify (2019) found that small (n=5) and medium-sized (n=12) ASD groups demonstrated greater critical thinking improvements than those students participating in large discussion groups (n=32). This suggests that instructional designers should carefully manage the size of their discussion groups, and in larger classes create multiple sections in order to achieve maximum development of critical thinking in students.

Rubrics. Rubrics have shown to be effective in outlining the expectations of a discussion and can help guide students to developing responses that demonstrate the target thinking of the assignment. One study found that students indicated higher satisfaction with the course, increased confidence in their ability effectively complete ASD posts, and increased discussion grades when given a rubric prior to the completion of the assignment (Wyss et al., 2014). Another study focusing on the development of higher-order thinking found that students who were given rubrics prior to engaging in ASD more frequently demonstrated higher level thinking than those who do not receive the treatment; although, no significant difference was found in test performance (Giacumo et al., 2013). However, Giacumo and Savenye (2020) found that providing too much guidance in discussions can have a negative impact. Within their study, students who received rubrics showed positive results; however, students who received a rubric and instructor prompting scored lower than students who received no guidance at all. These results suggested that providing clear and concise performance expectations can positively impact results while too much instruction can negatively impact a student's ability to meet expectations.

Strategies for Facilitating ASD to Promote Critical Thinking

The facilitator plays an important role in managing student discussions and ensuring consistently high expectations of posts. Chiu and Hew (2018) stated that properly facilitated ASD can result in better learning outcomes and performance. Therefore, it is important to identify effective facilitating strategies to cultivate critical thinking. The following section will describe the impact of (a) feedback, (b) timeliness, (c) setting expectations, and (d) post frequency.

Feedback. ASD should be primarily student driven and facilitators should allow this to happen by limiting their direct involvement within the discussion (Belcher et al., 2015). Despite this fact, most students prefer an online environment with some instructor involvement (Hew, 2015). Facilitators do play an important role in guiding students to meeting the expectation of the discussion by providing targeted and meaningful feedback. When attempting to cultivate critical thinking, it is vital that facilitators provide positive feedback to discussion submissions that show evidence of higher-order thinking (Beckmann & Weber, 2016). Furthermore, Lewandowski, Barneveld, and Etmer (2016) stated that facilitators can help students move towards effective discussion practices by incorporating targeted prompting into their feedback. This prompting includes logistical, subject matter, application, process and affective. Incorporating each of these strategies into the feedback provided by the facilitator was shown to lead to deeper and more meaningful discussions. Chakrabarti (2010) noted that instructor feedback had a strong positive effect on ASD quality and was essential in maintaining interest and motivating students to participate. Aloni and Harrington (2018) also emphasized the facilitator role in communicating the purpose and value of the discussion through feedback. In order to

cultivate critical thinking within ASD, facilitators must provide careful and pointed feedback targeted at encouraging the desired critical thinking behavior.

Timeliness. The timing of facilitator feedback has shown to play an important role in both student satisfaction with the course and student learning (Schindler & Burkholder, 2014). Facilitators must decide on how to plan their feedback schedule in order to allow students the necessary wait time to encourage critical thinking while maintaining a positive and encouraging social presence within the course (Yang et al., 2014). Skramstad, Schlosser, and Orellana (2012) found that most students preferred instructor feedback within 24 hours of their posting. Although this may not be possible in all scenarios, providing regular and timely feedback is essential in developing a social, cognitive, and teaching presence, which are three vital components of an ASD environment designed to cultivate critical thinking (DeNoyelles et al., 2014).

Frequency. Effective ASD designs include student led discussions with limited yet well-timed instructor involvement. Maddix (2012) warned that too much instructor involvement within ASD can stifle student creativity and have a detrimental effect on the development of their critical thinking skills. However, Lewandowski et al. (2016) found that some facilitator involvement within ASD can help guide the discussion to greater depths of thinking. Arend (2009) added that critical thinking can best be encouraged when instructor participation is less frequent but more purposeful. Responding to every topic within a discussion can result in the increased likelihood of students adapting their viewpoints to converge with the facilitator's (Bliss & Lawrence, 2009). When it comes to frequency, facilitators should adopt a "quality over quantity" approach to the

frequency of their contribution, focusing on encouraging student contributions that demonstrate critical thinking.

Student Behavior that Promotes Critical Thinking

Studies show that certain student behaviors are conducive to the generation of critical thinking within ASD (Goggins & Xing, 2016). The process of both reading and responding to peers is essential to the establishment of a successful discussion board. Therefore, it is important to identify the student reading and posting behavior that leads critical thinking. The following section will describe the desired student behavior, including reading behavior and posting behavior. This section will conclude by describing negative student behaviors that can be detrimental to the discussion and inhibit the cultivation of critical thinking skills.

Reading behavior. Much of a student's time participating in ASD is devoted to reading and interpreting the posts of others. Wise, Speer, Marbouti, and Hsiao (2013) define this process as "online listening" and state that it is essential to the cultivation of critical thinking within ASD. One study on high school students in Taiwan indicated that the length of time participating in ASD was positively correlated to higher performance on assessments involving critical thinking (Lai & Hwang, 2014). This suggests that students who devote more time to reading the posts of their peers are exposed to more diverse perspectives and are better prepared to approach issues in a more critical manner. Likewise, Goggins and Xing (2016) found that the number of times that students read posts had a significant impact on learning performance. Clearly, student reading behavior plays an important role in the success of an ASD and measures should be taken to encourage careful reading of discussion posts.

Posting behavior. Similar to reading behavior, studies have shown that the frequency and length of student discussion posts have a significant correlation to learning and critical thinking within ASD (Goggins & Xing, 2016). In a study focused on improving the depth of thinking within ASD, Williams et al. (2015) found that extended posts produced significantly more divergent thinking while shorter posts correlated to significantly less instances of higher-order thinking. This suggests that providing a length requirement to posts could contribute to increasing the presence of critical thinking within ASD. Additionally, Gao et al. (2018) found that contributions that incorporated experience and external sources resulted in significantly more evidence of critical thinking than posts which relied on opinion or one information source. Therefore, encouraging students to combine multiple sources of information into their discussion posts could lead to increased levels of higher-order thinking and the cultivation of critical thinking skills.

Chapter Summary

With a rapidly advancing society, critical thinking is becoming one of the most essential skills that can contribute to an individual's success in life (Živković, 2016). This skill is not one ability, but a combination of attributes that contribute to an individual's decision on how to interact with world. Clearly, it is vital that educators utilize evidence-based approaches to help students cultivate their critical thinking skills. Constructivism has shown to be an effective approach in the generation of these skills. Within this approach, the use of social interaction and writing have proven to be effective to in achieving these learning goals. ASD combines both of these strategies and significant research has shown that well-designed discussions within ASD lead to

increased divergent thinking and the cultivation of critical thinking (e.g., Osborne et al., 2018). Creating student-driven discussion through effective instructional design and facilitation can lead to desired student behavior which has shown to be effective in the cultivation of critical thinking (Schindler & Burkholder, 2014).

Research has provided evidence that ASD can be effectively used to cultivate critical thinking (Hew et al., 2010); however, most of this research is focused on university students and distance education. Very little research has been performed investigating how ASD impacts public high school students or the instructional design that is most effective in cultivating these skills within this group.

As public schools across the country are increasingly adopting technology platforms which include one-to-one initiatives, it is important to develop instructional methods using this technology to cultivate the critical thinking skills necessary to prepare them to succeed in the 21st century. Previous research shows that ASD is a promising tool to accomplish this, and further study is required to demonstrate its impact on students and provide educators a viable strategy to develop the critical thinking of their students.

CHAPTER 3

METHODS

As noted in previous sections, the purpose of this action research was to evaluate the impact of asynchronous online discussions on the critical thinking skills of high school language arts students. Two research questions will be addressed within this study: (1) To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of language arts? (2) How do language arts students perceive the use of asynchronous online discussions to impact their critical thinking skills?

Research Design

As an educator, it is important that I take an active role in the research I am conducting within my classroom. It was vital that in my research I continued my role as an effective teacher while implementing instructional strategies that I believed would be most effective in accomplishing learning goals. Therefore, action research was the most appropriate design to address my research questions. This type of research allowed me to maintain my role as an instructor while studying how asynchronous discussion impacts my students' critical thinking skills. Mertler (2017) noted that action research is particularly well-suited to classroom teachers as it requires that the researcher plays a "participative" role throughout the research process (p. 18). Furthermore, as a classroom teacher I acknowledged the value of improving the global education system; however, my primary concern was improving the learning of the students within my classroom and

within my school. This focus was closely aligned with the goals of action research which aim to create a series of practices that directly impact the community being studied (Gustavsen, Hansson, & Qvale, 2008) and to generate “timely action and inquiry” (Torbert & Taylor, 2008, p. 239).

Action research is defined as a “family of practices of living inquiry that aims, in a great variety of ways, to link practice and ideas in the service of human flourishing” (Bradbury & Reason, 2008, p. 1). It is a systemic inquiry conducted by educators that considers the unique characteristics of their environment in order to improve their effectiveness in their own practice (Mertler, 2017; Parsons & Brown, 2002). The research process follows a basic cyclical four-stage procedure of planning, acting, developing, and reflecting (Mertler, 2017). Although many methods follow a similar procedure, action research is distinguished from other research methodologies by its central focus of achieving change within the immediate context of the researcher (Small, 1995).

Six key principles characterize action research: “(1) grounded in lived experience, (2) developed in partnership, (3) addressing significant problems, (4) working with people, (5) developing new ways of seeing the world, (6) leaving infrastructure in its wake” (Bradbury & Reason, 2003, p. 155). In general, these characteristics give action research the advantage over other methods when the goal is to enact change on a targeted population. Also, action research can help connect theories developed in a traditional research setting to what actually takes place in the real world (Johnson, 2008). In my research, the ability to take an active role in the study as a research insider and closely

work with the participants significantly aided my ability to address my research questions while improving as an educator and developing my students as learners.

For my study, a convergent parallel mixed methods design was utilized to answer my research questions most comprehensively. This design allows the researcher to merge qualitative and quantitative data to provide a complete understanding of the issue (Creswell & Creswell, 2018). Because there are many factors that led to my research problem, it was important to generate many sources of data in order to most effectively address the research problem and examine the data from multiple perspectives using multiples instruments. This design also aligned closely with the principles of action research, which emphasizes the use of all appropriate resources to most effectively enact the change required to address the research problem (Mertler, 2017).

Setting

This action research took place at large urban high school located in the Lowcountry of South Carolina. As noted in chapter 1, the school was composed of a highly diverse student body of 59% minority students, with 34% of the total population coming from an economically disadvantaged home, qualifying it for Title I funding (South Carolina School Report Card, 2018). The study took place in English 1 Honors classrooms with curriculum guided by the South Carolina College- and Career-Ready Standards for English Language Arts. These standards outline the necessary skills that students are expected to master in order to reach the learning goals outlined by the state. Along with these standards, curriculum was guided by a district-level initiative to increase the use of technology in the classroom. Laptops were purchased for each student in the Fall of 2020. This gave each student access to technology hardware in

each class throughout the school day. With this major investment came the expectation that students use these devices frequently during class in a manner that was both collaborative and innovative. Consequently, this research study will play a major role in pioneering the instructional strategies that are used within the school, especially the strategies that aim to develop critical thinking.

Participants

Students were invited to participate in the study based on their enrollment in my English 1 Honors course. Honors classes at this school are self-selected and students do not need to demonstrate evidence of advancement to enroll in them. Therefore, not all the students in the class were performing above grade level as would be expected in a traditional high school honors class. Consequently, a wide range of abilities were represented within the sample. The sample was made up of two different classes with an average of 25 students per class. The total sample size was 46 students, comprised of a near equal ratio of male and female students. Although some students were enrolled during limited portions of the study, only data from students who were present at all points provided relevant data. It is also important to note that asynchronous online discussion was new to most of these students. Although most of them use social media and text messaging frequently throughout the day, this was the first time many of the students have conducted online discussions in an academic setting.

Innovation

This section will describe in detail how the innovation of this research, an asynchronous online discussion, took place. It will begin by providing a brief description of the academic context where the innovation will occur. Next, the instructional design

of the ASD will be described with connections to prior research. The roles of the participants of this innovation will then be discussed, including the instructor and the student. Finally, an innovation schedule will be outlined which provides a daily schedule for how the innovation progressed.

Context

The innovation was implemented during a six-week English 1H unit on argumentation. This unit provided instruction on the basic elements of rhetoric, including logos, ethos, and pathos, with the goal of improving the students' ability to create well-supported arguments, analyze the arguments of others, look at issues from multiple perspectives, and think critically. Students were introduced to various argumentative speeches (e.g., Martin Luther King's "I Have a Dream"), in addition to various other argumentative writings. At the end of this unit, ASD played an important role as students took what they learned and applied it to their discussion contributions.

Instructional Design of the Innovation

The instructional design of this innovation was grounded in the principals of constructivist theory, focusing on creating a learning environment which stimulated social interaction through collaboration and discussion (Jonassen et al., 1995). This innovation is divided into four key components that include: approach, communication of expectations, prompts, and roles. Each of these components will be discussed in detail below. Table 3.1 provides an outline of the instructional strategies that were used within each component to target critical thinking.

Table 3.1

Components of Instructional Design Targeting Critical Thinking

Instructional Design Component	Critical Thinking Strategy	Innovation Component
Approach	<ul style="list-style-type: none"> Online Debate (Aloni & Harrington, 2018; Schindler & Burkholder, 2014) 	Students engaged in a weeklong asynchronous debate.
Communication of Expectations	<ul style="list-style-type: none"> Discussion Rubric (Giacumo et al., 2013) ASD counts as moderate amount of course grade (Hew & Cheung, 2011) Provide examples and non-examples of acceptable discussion contributions (Huang, 2017) 	The Holistic Critical Thinking Scoring Rubric (Insight Assessment) was used to assess student posts in order to assign a class grade and determine each student's depth of thinking. Students were also provided with examples and non-examples of acceptable posts during the weeklong training period.
Question Prompts	<ul style="list-style-type: none"> Open-ended questions focusing on divergent thinking (Dipasquale & Hunter, 2018) Targeted at upper levels of Bloom's Taxonomy (Jin & Jeong, 2013) <p>Relevant to students' lives (Mehta & Al-Mahrooqi, 2014)</p>	Discussion prompts were open-ended and required students to analyze topics from multiple perspectives. Topics were selected based on student interest and relevancy to their lives.
Roles	<p><u>Instructor</u></p> <ul style="list-style-type: none"> Encourage posts that demonstrate evidence of critical thinking by providing written feedback within the discussion board through active monitoring and written feedback 	<p><u>Instructor</u></p> <p>The instructor monitored student posts through the course of the debate and posted encouraging feedback to students who met critical thinking expectations. Instructor</p>

Instructional Design Component	Critical Thinking Strategy	Innovation Component
	(Dipasquale & Hunter, 2018) <ul style="list-style-type: none"> • Focus on highlighting important posts, pointing out themes, and correcting inaccurate posts (Y. Wang & Chen, 2011) • Provide limited but purposeful contributions and allow students time to think through issues (Arend, 2009) 	feedback was limited but purposeful to allow students to think through issues.
	<u>Student</u> <ul style="list-style-type: none"> • Devote significant time to reading posts before responding (Lai & Hwang, 2014) • Incorporates external sources or experiences into post (F. Gao et al., 2013) • Makes frequent posts of extended length (Williams et al., 2015) 	<u>Student</u> Students were allotted one day each week where they were required to read and reflect on their classmates' posts. They were also required to incorporate outside resources into each of their debate contributions. Finally, requirements of post frequency and post length were clearly outlined for students at the beginning of each debate.

Approach. The instructional design of the ASD took an approach centered on debate as described in Aloni and Harrington (2018) and Schindler and Burkholder (2014). In this approach, students were required to take a position on an issue and justify their response using solid logical reasoning and appropriate evidence. Within this innovation, students were assigned a position on a relevant issue (e.g., the abolition of the death penalty) and given the task of writing an argument that supported their position.

Aloni and Harrington (2018) noted that assigning students to sides of an argument can help prevent students from relying solely on opinion to support their argument. Students were encouraged to seek outside resources in order to strengthen their arguments and counterarguments. Students were also encouraged to point out logical fallacies and inconsistencies in reasoning. These asynchronous took place over the course of a week as students were required to respond to others on the opposing side of the argument. They responded to all students, with well-reasoned and research-backed replies, who attempted to refute their own argument.

Communication of expectations. In order for students to receive the full benefit of the innovation, they need to understand its expectations and see its importance (Hew & Cheung, 2011). This study used The Holistic Critical Thinking Scoring Rubric (HCTSR) which was developed by Insight Assessment (see Appendix A). In order to further clarify expectations for students, examples and non-examples of successful discussion posts were presented and discussed with students (Huang, 2017). The facilitator also communicated the significance of ASD to students and stress the importance of devoting time and energy to meeting the expectations of each assignment. Additionally, students received class grades for their participation and acceptable contributions to the ASD. Hew and Cheung (2011) noted that providing classroom grades to these contributions helps the student place value on the ASD and devote increased mental effort towards their contribution.

Prompts. The discussion prompts utilized in this innovation were open-ended and required students to look at issues from multiple perspectives in order to develop a solid argument and develop their counter-argument response to other students (Dipasquale &

Hunter, 2018). These questions were relevant to the students' lives and will be targeted at the upper levels of Bloom's Taxonomy (Seddon, 1978). All discussions took place on the Schoology application, which is the standard learning management system used throughout the district. A new discussion prompt was assigned each week and questions escalated in complexity as students became more experienced and accustomed to the ASD format and expectations. This complexity was determined by the number of outside sources required for the response and by concepts that students were asked to discuss. For example, the prompt from Week 1 was a concept that was familiar to students and required no outside sources while the prompt for Week 5 required three outside sources and required students to research multiple aspects of the prompt (e.g., What is a law and why do we follow them?). Table 3.2 displays the discussion prompts for each week.

Table 3.2

Weekly Discussion Prompts

Week	Prompt
1	Should students be required to wear school uniforms at Fort Dorchester High School?
2	Should homework be banned? Incorporate at least one outside source into your answer.
3	Should limits be placed on the amount of screen time teens are allowed to experience each week? Incorporate at least two outside sources into your answer.
4	The second amendment states that "a well-regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed." Based on this definition, do you think the United States government has the right to create laws that ban assault style weapons? Incorporate at least three outside sources into your answer.
5	Martin Luther King argued that an "unjust law is no law at all" and, therefore, we should only be required to follow just laws. Should you

follow all laws or just the laws that you deem just? Incorporate at least three outside sources into your answer.

Discussion Roles

The description of the discussion roles within this ASD were divided into two categories: instructor and student. Both roles played an important role in the ASD experience and will be discussed in detail below

Instructor role. The role of the instructor was to facilitate students towards developing posts that demonstrated critical thinking. However, researchers have shown that the instructor should limit involvement within ASD to avoid biasing students towards the instructor's opinion (Aloni & Harrington, 2018). The instructor's goal was to develop a student-centered ASD with encouraging responses on student posts that demonstrated evidence of the desired critical thinking behavior while refraining from inserting their opinion into the discussion. In this intervention, the instructor refrained from commenting on students' initial posts each week to avoid influencing them to think a certain way. After students responded to each other in the second round of discussion posts, the instructor posted comments on student contributions that demonstrated the desired characteristics of critical thinking. In addition, posts that do not meet expectations received probing comments to think deeper, such as "what are some other ways you could look at this issue?" These comments were made by the instructor directly onto the ASD platform. After each week, the instructor also provided a report to students highlighting themes of the week's discussions that were positive as well aspects that students need to work on for the following week's discussion.

Student role. In addition to contributing posts, a primary role of the student was to closely read their classmates' posts. Students were expected to spend significant time engaged in this behavior, which has shown to enhance the quality of discussions as well as encourage divergent thinking (Lai & Hwang, 2014). The instructor ensured this happened by clearly outlining expectations during the training period, and actively monitoring posts to ensure students contributed meaningful posts that showed evidence of thought. Since all discussion posts were made during class, the instructor monitored each student to ensure they were devoting appropriate time to their contributions. Also, each post a student made was expected to fulfill the requirement of the HCTSR which detailed expectations of posts.

Prior Instruction

Before beginning the intervention, students received instructions on the basics of argumentative writing and rhetoric. This instruction focused on the principals of logos, ethos, and pathos as well as identifying logical fallacies (e.g., ad hominem). They were then exposed to various pieces of argumentative writing such as Martin Luther King's "Letter from a Birmingham Jail" and asked to analyze them for aspects of rhetoric and evaluate them on their quality of argument. They also watched various persuasive speeches and were asked to perform the same analytical and evaluation procedures. The objective of this prior instruction was to familiarize students with the components of argumentation to prepare them to engage in a quality debate with their classmates.

Innovation Schedule

Before the ASD started, a week-long training period took place to introduce students to the concept of critical thinking and teach them how to use the ASD platform.

Students were shown various examples and non-examples of appropriate ASD posts. Students were also given a schedule of weekly prompts, put into debate groups consisting of two students (i.e., one student on each debate side), and assigned positions on each topic. Clarifications were provided for any questions that students may have had at this time. At the conclusion of this training period, a practice mini-discussion forum was held. This was an hour-long period where students engaged in a condensed version of the weekly debate schedule. The following topic was used: “Should violent video games be banned for teenagers?” The instructor stopped after each phase to identify different discussion contributions that demonstrate desired thinking. The goal of this training period was to provide students with the necessary information to engage in ASD properly and efficiently at the beginning of the innovation.

Each week of the intervention followed a consistent routine, allowing students to quickly acclimate to the ASD procedures. It is important to note that during the week-long training period, students were informed of their debate topics and groups for each of the five weeks of the intervention. The schedule that was followed each week is outlined below in Table 3.3.

Table 3.3

Weekly Schedule

Day	Task
Monday	Initial post due
Tuesday	Reading period
Wednesday	Response to classmates due
Thursday	2 nd rebuttal posts due

The innovation took place over a five-week period, with each week featuring a new discussion prompt. The prompts grew increasingly complex as the innovation progressed. This scaffolding helped students gain confidence in their initial interaction with ASD and remain comfortable as the prompts became increasingly challenging (Nazleen & Rabu, 2013).

As noted above, students will have already received their debate topics and groups during the training period. On Mondays, students submitted their initial post to the discussion board. These posts were expected to meet the guidelines outlined in the ASD rubric. At this point the instructor did not respond to any posts unless there was something obviously wrong (e.g., the student answered the wrong prompt). On Tuesdays, students were given the task of reading all the posts within their debate group and begin formulating a response to those on the opposing side of the argument. On Wednesdays, students submitted their response to their partner who was on the opposing side of the debate. At this point, the instructor also began commenting on posts of students. The instructor's role followed the guidelines set forth in the section above. On Thursdays, students provided their response to their partner who commented on their initial post. These posts directly addressed the arguments made against their initial post. Finally, on Fridays, students reflected on the debate as a whole with their last discussion post and discussed what they learned during the process. Each week of the innovation will follow this process with different topics and different debate partners.

Data Collection

In order to most completely and thoroughly address the research questions, four separate data sources were utilized that were comprised of both qualitative and quantitative data. The four data sources were (1) CCTT, (2) HCTSR, (3) student focus group interviews, and (4) student survey. Table 3.4 aligns the research questions to each data source.

Table 3.4

Research Question and Data Source Alignment

Research Question	Data Source
RQ1: To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of language arts students at Fort Dorchester High School?	<ul style="list-style-type: none">• Cornell Critical Thinking Test• Holistic Critical Thinking Scoring Rubric• Student Focus Group Interviews
RQ2: How do language arts students at Fort Dorchester High School perceive the use of asynchronous online discussions to impact their critical thinking skills?	<ul style="list-style-type: none">• Student Focus Group Interviews• Student Survey

Cornell Critical Thinking Test (CCTT)

All participants took the CCTT before the intervention as a pre-test and at the end of the intervention as a posttest. This assessment was aligned to RQ1. The CCTT is a

71-item multiple choice assessment of critical thinking that is intended to be taken by students in grades 4-12. The test uses the definition of critical thinking put forth by Ennis, Millman, and Tomko (2005) which states that “critical thinking is reasonable and reflective thinking focused on deciding what to believe or do” (p. 1). Based on this, four key aspects of critical thinking were identified and include (1) induction, (2) observation, (3) deduction, and (4) assumption. Each question on the test is tied to at least one of the aspects of the identified aspects of critical thinking and assesses students’ ability to utilize these skills.

Numerous studies have shown that the CCTT is both a reliable and valid assessment (Ennis et al., 2005). Previous studies using this assessment have reported scores of .67 to .90 on the Kuder-Richardson. Scores above .70 indicate high levels of reliability. In addition, content validity is established by adhering closely to the cognitive skills of critical thinking as outlined in (Ennis et al., 2005). Further, content validity is established by the prevalence of the adoption of the test by scholars, human resource professionals, and large corporations (Ennis et al., 2005). The construct validity of the CCTT was established by correlating the results of the test to other measures that examine the same construct. Table 3.5 shows the correlations between the CCTT and other tests measuring critical thinking.

Table 3.5

Correlations between CCTT and other Critical Thinking Tests

Test	Correlation of Result
<i>Watson- Glazer</i>	range from .41 to .49
<i>Logical Reasoning Test, Part II, Form A</i>	.50

Test	Correlation of Result
<i>Ottis-Lennon</i>	Range from .44 to .74
<i>Houghton Mifflin Cognitive Abilities Test</i>	.53
<i>California Test of Mental Maturity</i>	.49
<i>SCAT Verbal</i>	.45
<i>Scholastic Aptitude Test</i>	.52

The Holistic Critical Thinking Scoring Rubric (HCTSR)

The HCTSR was used to assess the level of critical thinking present in student discussion posts. With this rubric, points were awarded for accurate interpretations, identifying important arguments, analyzing alternative points of view, justifying key results, and correctly following evidence. Students could earn up to 4 points for a perfect score (see Appendix A for complete rubric). The HCTSR will be used to analyze each of the four discussion posts (initial, response, rebuttal, and reflections) made each week during the intervention to provide evidence of how student critical thinking skills have evolved. All student posts will be scored with the HCTSR at the end of each week. Two separate graders will score each post to establish inter-rater reliability.

Student Focus Group Interviews

Focus group interviews gave me the opportunity to gain valuable information through open-ended questions, as well as probes, for further clarification and deeper understanding (Mertler, 2017). Interview questions were developed by the researcher to closely align with the critical thinking criteria of the CCTT. An expert reviewed these questions to confirm the appropriateness of content and language from my target

audience. Students were also selected to preview the questions to confirm that they were understandable.

Student focus group interviews took place at the conclusion of the intervention. Four groups of four students were invited to participate in these focus group interviews which lasted approximately 30 minutes. The interviews were audio recorded and transcribed, and handwritten notes were be taken while the focus group took place. Interview questions were aligned to RQ1 and RQ2 and asked students to describe their perceptions of asynchronous online discussion and its impact on their critical thinking (e.g., *Describe your overall experience with online discussion*). Table 3.6 lists each interview question (see Appendix B for complete interview protocol). This data was used to develop a detailed description of student perceptions of the intervention.

Table 3.6

Focus Group Interview Questions

Question
1. Describe your experiences with online discussions over the past 6 weeks.
2. Describe your interactions with your peers during online discussion.
3. How do you think online discussions impacted your understanding of rhetoric?
4. Describe how online discussions impacted your ability to look at issues from different perspectives.
5. Describe how you think online discussion impacted your critical thinking ability.

Student Survey

The student survey was administered online via a Google Forms survey to all students at the conclusion of the innovation. All students who completed the intervention will be invited to complete the survey. The survey was an adapted version of the *Perceptions of Asynchronous Online Discussion Questionnaire (PAOD)*, which Lee (2013) found to be valid and reliable ($\alpha = .90$) (see Appendix C for alignment between original survey questions and adapted survey questions). Modifications to the PAOD were also examined by an expert to confirm that changes were appropriate. These questions asked students to numerically rate their level of agreement with different statements about the intervention. Table 3.7 provides a list of each question that was asked on the survey.

Table 3.7

Survey Questions

Question
1. Online discussions help me learn about rhetoric.
2. Online discussions help me understand the relationship between rhetoric and society.
3. Online discussion help me better understand class lessons.
4. Online discussions help clarify some rhetorical strategies.
5. Online discussions help integrate rhetorical concepts of knowledge.
6. Participating in online discussions promote my learning motivation.
7. I enjoy participating in online discussions.
8. Online discussions are boring.

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9. Online discussions are time consuming.
 10. Online discussions are stressful.
 11. Online discussions help me ability of reading persuasive texts.
 12. Online discussions improve my persuasive writing ability.
 13. Online discussions improve my critical thinking skills.
 14. Online discussions improve my ability to look at issues from different perspectives.
 15. I am satisfied with my own performance in online discussions for this course.
 16. I am satisfied with interaction with my classmates in online discussions for this course.
 17. I am satisfied with my instructor's feedback in online discussions for this course.
-

Wallace, Kelcey, and Ruzek (2016) note that student surveys of their learning environment can be both “reliable and predictive of learning” (p. 1836). Quantitative data will be gathered from this data source and will be aligned with RQ2. This data will be used in conjunction with the student focus group interviews to address RQ2.

Data Analysis

The following section will discuss how data was analyzed to address RQ1 and RQ2. Table 3.8 describes how each research question was studied with a qualitative and a quantitative data source.

Table 3.8

Research Question, Data Source, and Data Analysis Alignment

Research Question	Data Source	Data Analysis
RQ1: To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of language arts students at Fort Dorchester High School?	<ol style="list-style-type: none"> 1. Cornell Critical Thinking Test 2. Discussion Post Rubric Scores 3. Student Focus Group Interviews 	<ol style="list-style-type: none"> 1. Descriptive statistics and paired t-test 2. Descriptive statistics and repeated measures ANOVA 3. Inductive analysis
RQ2: How do language arts students at Fort Dorchester High School perceive the use of asynchronous online discussions to impact their critical thinking skills?	<ol style="list-style-type: none"> 1. Student Focus Group Interviews 2. Student Survey 	<ol style="list-style-type: none"> 1. Inductive analysis 2. Descriptive statistics

Quantitative Analysis

Three sources of quantitative data were used for this study: The Cornell Critical Thinking Test (CCTT), The Holistic Critical Thinking Rubric (HCTSR), and the student survey. On the CCTT, test scores were calculated with the following formula: correct answers minus one half the number of wrong answers. This formula accounts for guessing as recommended in Ennis, Millman, & Tomko (2005). Pre- and post-test scores were compared using a paired t-test to determine if scores on each test result in a statistically significant difference with an alpha level of .05 (Adams & Lawrence, 2018). This data was used to provide evidence of whether student critical thinking skills improved over the course of the intervention. Discussion board posts were scored using the HCTSR. Descriptive statistics were used to analyze each week's critical thinking

performance by comparing the weekly means of each subscale. In addition, a repeated measures ANOVA was conducted comparing the results of Week 1, Week 3, and Week 5. This data provided evidence of how critical thinking skills developed throughout the intervention.

For the student survey, Likert data was analyzed using descriptive statistics of central tendency. The mean and standard deviation were used to present the results. This data was used to describe how students perceived different aspects of the intervention, as well as their own perceptions of how their abilities to think critically think were affected by the intervention.

Qualitative Analysis

Qualitative data will be used in conjunction with quantitative data to thoroughly address RQ1 and RQ2. Data analysis of student interviews began with the transcription of the entire interview recording into text. Following this step, student interviews and discussion board posts were systematically analyzed using inductive analysis (Mertler, 2017). Data was first analyzed using in vivo coding and values coding in Delve to chunk sentences into conceptual categories (Corbin & Strauss, 1990). The next stage of analysis was pattern coding to categorize coded elements by looking for patterns or repeated elements (Creswell, 2017). Codes with similar ideas were grouped together into the same category. At the final level of analysis, I reflected on all stages of the process in order to determine any patterns or relationships that may emerged. Broad themes about the data were generated inductively, which addressed RQ1 and RQ2. Findings were represented in a descriptive narrative that provided “thick and rich” description of the emergent themes and student perceptions of the intervention (Creswell, 2014, p. 260).

This description was extremely detailed and utilized numerous examples in order to allow the reader to accurately visualize how the study took place (Creswell & Miller, 2000).

Procedures and Timeline

The procedures and timeline for this study included four phases: Phase 1: Participant Identification, Phase 2: Participant Training, Phase 3: Data Collection, and Phase 4: Data Analysis. Each of the phases will be discussed in detail in the following section. Table 3.9 is also included to detail the time frame for each of the phases.

Table 3.9

Timeline of Participant Identification, Participant Training, Data Collection, and Data Analysis

Phase	Expectation	Time Frame
Phase 1: Participant Identification	<ol style="list-style-type: none"> 1. Identify participants 2. Distribute parent letter 3. Determine groups for interviews 4. Obtain assent and consent 	2 weeks
Phase 2: Participant Training	<ol style="list-style-type: none"> 1. Train students on use of ASD platform 2. Train participants on expected discussion contributions and moderation. 	1 week
Phase 3: Data Collection	<ol style="list-style-type: none"> 1. Administer critical thinking pre-test 2. Implement ASD innovation 3. Administer critical thinking post-test 4. Administer student perceptions survey 5. Conduct focus group interviews 6. Score discussion posts with rubric 	5 weeks

Phase 4: Data Analysis	<ol style="list-style-type: none"> 1. Transcribe student interviews 2. Analyze interviews with inductive analysis 3. Descriptive statistics (student survey) 4. Paired <i>t</i>-test (critical thinking pre- and post-test and rubric scores) 	5 Weeks
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Phase 1: Participant Identification

Participant identification for this research began in the Fall of 2021. All students enrolled in my English class during this semester were considered for participation. Once participants were identified, a letter was sent to parents providing the necessary information for them to provide informed consent for their child. Students were also asked to assent to participate. Once informed consent and assent were obtained, all students were given the opportunity to volunteer to participate in group interviews at the conclusion of the study.

Phase 2: Participant Training

During Phase 2, participants were first trained on how to use the ASD platform. They were given instruction on how to navigate the program and allowed to familiarize themselves with its operation. Particular attention was paid to ensuring students were able to contribute discussion posts and respond to the posts of their peers. Once students were proficient with the program, they were given instruction on the expectations of ASD contributions. These instructions included resources such as the rubric and examples of successful and unsuccessful posts. Finally, students participated in a practice discussion board activity to ensure they were able to meet the expectations of post contributions.

Phase 3: Data Collection

Participants began Phase 3 by completing the CCTT pre-test. This test was not analyzed until Phase 4. After students completed this initial assessment, the ASD innovation began. All participants were expected to contribute to the discussion boards as outlined in the rubric they received in Phase 2. At the conclusion of the ASD innovation, students were administered the critical thinking post-test. This data was compared to the pre-test in Phase 4. Next, all students were given the student survey. The final stage of Phase 3 was focus group interviews. Groups of participants selected in Phase 1 were interviewed about their perceptions of the ASD intervention. The interview was audio recorded and the interviewer took notes as the focus group interview proceeded. These interviews lasted between 20 and 30 minutes.

Phase 4: Data Analysis

The voice recording from the group interviews was first transcribed. The transcriber was careful to transcribe the exact words that were used during the interview process. Following transcription, data was coded for themes using the inductive analysis process described previously. Next, data from the student survey were analyzed using descriptive statistics. These statistics were used to support the themes generated during the interview analysis. Finally, the pre- and post-critical thinking test was compared using paired *t*-tests to determine if there was a significant difference in scores on the assessments.

Rigor and Trustworthiness

In research, it is important that findings accurately describe the phenomena that occurred during the course of the study and measures are taken to ensure the rigor and

trustworthiness of the results. My study employed numerous methods to ensure the trustworthiness of the findings. The methods of prolonged exposure, thick and rich description, and statement of subjectivity and reflexivity have been discussed in previous sections. The methods of triangulation, peer debriefing, and member checking will be discussed in the following section.

Triangulation

Mertler (2017) states that triangulation is the process of relating multiple sources of data in order to obtain a more comprehensive description of the phenomena and increase the accuracy of the results. This study used triangulation to check for consistency between qualitative and quantitative data sources (Patton, 1999).

In this study, the findings for each research question were triangulated using multiple sources of data. Data from the CCTT, HCTSR, and focus group interviews were compared to generate more trustworthy themes about RQ1. Likewise, data from student focus group interviews was related to data from the student surveys in order to corroborate findings about RQ2. By triangulating the findings for both research questions, a more comprehensive and trustworthy result was achieved in this study.

Peer Debriefing

Peer debriefing is a process by which the data, methods, and results are reviewed by an individual who is familiar with the research being conducted (Mertler, 2017). Creswell and Miller (2000) states that in this process a “peer reviewer provides support, plays devil’s advocate, challenges the researchers’ assumptions, pushes the researchers to the next step methodologically, and asks hard questions about methods and

interpretations” (p. 129). This process deterred me from overlooking important details and ensured all aspects of the study were thoroughly supported and explained.

Peer debriefing took place at two levels for this study. First, my cohort colleagues provided continuous feedback about every aspect of my research throughout the course of my study. Second, my dissertation chair performed a comprehensive review of my research to ensure my findings were accurate and every aspect of my research was clear and fully described.

Member checking

Lincoln and Guba (1985) define member checking as a process by which the results of a research study are shared with the “stakeholding groups from which the data was originally collected” in order to verify the accuracy of the findings (p. 314).

During the process of member checking, participants were given a report of the findings from my research study. After participants were given adequate time to review the findings of the study, I met with them in groups of five to discuss.

Researcher’s journal

A researcher’s journal was kept to document observations and experiences that occurred throughout the intervention. Creswell and Creswell (2018) note that this documentation can help ensure that results are reliably reported by the researcher. In addition, if changes needed to be made during the intervention (e.g., circumstances required the debate topic to be altered), this would have been documented in the researcher’s journal to make sure the results reflected what took place during the intervention.

Plan for Sharing and Communicating

The findings of my action research study were shared with all stakeholders at various levels of involvement. First, at the conclusion of the study, research participants were given a presentation that outlines the findings of the research. Participants were also given an electronic survey link which allowed them to make recommendations about improvements or suggest additional inquiries. Parents were also sent a brief written summary of the findings and an opportunity was given for them to address any questions or concerns they may have had. Second, I will present my findings to my colleagues within my school at a weekly professional development session. This presentation will be brief and focused and include only information that teachers may find valuable as noted by Mertler (2017). Finally, findings will be presented district-wide at our annual professional development conference, Learning by Design. This will be a more detailed presentation and district attendees will receive more information about the methodologies used in the study. Throughout the sharing process, I will ensure that confidentiality and anonymity was maintained; no personal information that could tie students to the study was used and pseudonyms were used when names were required (Mertler, 2017).

CHAPTER 4

ANALYSIS AND FINDINGS

The purpose of this action research was to evaluate the impact of asynchronous online discussions on the critical thinking skills of high school language arts students.

This study was guided by two research questions:

1. To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of high school language arts students?
2. How do high school language arts students perceive the use of asynchronous online discussions to impact their critical thinking skills?

To investigate these questions, all participants completed the Cornell Critical Thinking pre- and post-intervention as well as a student survey. In addition, student discussion posts were evaluated using the Holistic Critical Thinking Scoring Rubric. Finally, 16 students participated in focus group interviews which were coded for analysis. The findings of this study will be discussed below and are divided into two sections: (1) quantitative and (2) qualitative.

Quantitative Findings

The results of the quantitative data analysis from each of the instruments will be discussed in this section. Quantitative data were collected using three instruments: (1) The Cornell Critical Thinking Test (CCTT), (2) The Holistic Critical Thinking Scoring Rubric (HCTSR), and (3) a student survey on perceptions of critical thinking during

asynchronous online discussion. The information discussed in this section will present the descriptive statistics for all instruments and inferential statistics for the CCCT and HCTSR. This section will begin with the presentation of the results of data collected from the CCTT, followed by the HCTSR, and conclude with the student survey data.

Cornell Critical Thinking Test

The Cornell Critical Thinking Test (CCTT) was administered to participants at the beginning and end of the intervention. The test contained 76 multiple choice questions with each question containing three answer choices. Questions were grouped into four separate critical thinking subscales: (1) induction, (2) observation, (3) deduction, and (4) assumption. Students were given 50 minutes to complete the test as recommended in Ennis et al. (2005).

Reliability for this instrument was established using Cronbach's alpha to measure internal consistency. According to Adams and Lawrence (2019), values of .70 or higher are considered to be internally consistent. Table 4.1 displays the results of each Cronbach's alpha calculation. Both the pre-test and the post-test met the acceptable value of consistency with scores of .92 and .79 respectively. Subscales such as induction, deduction, and assumption on the post-test failed to achieve acceptable levels of consistency; although, previous studies have demonstrated internal consistency on these subscales (e.g., Ennis, 2005). This will be discussed later as a limitation of the study.

Table 4.1

<i>Internal Consistency for Cornell Critical Thinking Test</i>		
Cronbach's Alpha		
Subscale	Pre-Test	Post-Test
Induction	0.67	0.34
Observation	0.80	0.60
Deduction	0.91	0.79
Assumption	0.77	0.64
Total	0.92	0.79

Descriptive statistics. First, descriptive statistics were calculated for the total test and each subscale. The mean for each subscale was generated by calculating the average number of correct responses. Overall, mean test scores improved in every area. Table 4.2 displays the results for each measure. Total score on the post-test ($M = 42.12$, $SD = 12.40$) was higher than on the pre-test ($M = 35.29$, $SD = 12.40$). Among subscales, Deduction saw the highest mean increase (3.41) between the pre-test ($M = 7.09$, $SD = 4.68$) and post-test ($M = 10.50$, $SD = 3.26$). Induction saw the lowest increase from pre-test ($M = 14.96$, $SD = 3.44$) to post-test ($M = 15.42$, $SD = 2.53$) for a total difference of .46. Inferential statistics were then used to determine if these mean differences were statistically significant. To determine the type of inferential test that was appropriate for the data, a Shapiro-Wilk test was performed on each data set to determine if the scores were normally distributed.

Table 4.2

Descriptive Statistics for Cornell Critical Thinking Test (n = 45)

Subscale	Pre-Test		Post-Test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Induction	14.96	3.44	15.42	2.53
Observation	10.56	4.47	12.23	3.24
Deduction	7.09	4.68	10.50	3.26
Assumption	2.69	2.50	4.20	2.32
Total	35.29	12.40	42.13	7.79

Shapiro-Wilk test. The Shapiro-Wilk test was performed on the pre-test and post-test total scores and the scores for each subscale to determine if data were normally distributed. Data sets with *p*-values above .05 indicate a normal distribution while data sets with values below .05 are not normally distributed (Adams & Lawrence, 2019). Based on these results, the type of inferential test was determined. Normally distributed data were analyzed using a paired sample *t*-test while data sets that were not normally distributed were analyzed using a Wilcoxon signed rank test. Table 4.3 displays the results of each test and the corresponding inferential test used. Based on these results, Total, Induction and Assumption were normally distributed and were analyzed using a paired sample *t*-test. Data for Observation and Deduction had abnormal distributions and were analyzed using a Wilcoxon signed rank test.

Table 4.3

Shapiro-Wilk Results for Cornell Critical Thinking Test

Subscale	Shapiro-Wilk			Inferential Analysis Used
	<i>W</i>	<i>df</i>	<i>p</i>	
Induction	0.97	45	0.27	Paired sample <i>t</i> -test
Observation	0.97	45	0.04	Wilcoxon signed rank test
Deduction	0.95	45	0.03	Wilcoxon signed rank test
Assumption	0.94	45	0.27	Paired sample <i>t</i> -test
Total	0.97	45	0.40	Paired sample <i>t</i> -test

Note: $p < .05$ indicates abnormal distribution

Paired sample *t*-test. Paired sample *t*-tests were conducted to determine if there was a statistically significant change between the pre-test and the post-test in the total scores and scores for Induction and Assumption. A paired sample *t*-test reports the likelihood that that difference between two tests taken by the same sample group is due to chance (Adams & Lawrence, 2019). Cohen's *d* was calculated to determine the effect size. Table 4.4 displays the results of the paired *t*-test for each of the previously mentioned normally distributed data sets. The results of the paired sample *t*-test on the Total test score indicated a significant change from the pre-test ($M = 35.29$, $SD = 2.50$) to the post-test ($M = 42.54$, $SD = 7.78$), $t(44) = 3.76$, $p < .001$, $d = 0.56$. In addition, the subscale of Assumption resulted in a significant change from the pre-test ($M = 2.69$, $SD = 2.50$) to the post-test ($M = 4.31$, $SD = 2.33$), $t(44) = 3.32$, $p < .001$, $d = .50$. Scores on the subscale of Induction did not result in a significant change between the pre-test ($M = 14.96$, $SD = 3.44$) and the post-test ($M = 15.50$, $SD = 2.48$), $t(44) = .077$, $p = 0.44$, $d = .12$.

Table 4.4

Paired Sample t-test Results for Cornell Critical Thinking Test (n = 45)

Subscale	Pre-Test		Post-Test		<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Induction	14.96	3.44	15.50	2.48	0.77	44	0.44	.12
Assumption	2.69	2.50	4.31	2.33	3.32	44	<.001	.50
Total	35.29	2.50	42.54	7.78	3.76	44	<.001	.56

Wilcoxon signed-rank test. The subscales that were not normally distributed were analyzed using the Wilcoxon signed-rank test, a test used to compare the difference between non-parametric data without the assumption of normality (Adams & Lawrence, 2019). The test was performed on the subscales of Observation and Induction. As with a paired *t*-test, the Wilcoxon signed-rank test measures the likelihood that the differences between the two tests is due to chance alone. Statistically significant results occur when the resulting *p*-value from the Wilcoxon signed-rank test is .05 or less. In addition, the effect size of the intervention was determined by using the rank-biserial correlation analysis which is represented by *r*.

Results from the Wilcoxon signed-rank test on subscale of Observation indicated a significant change between the pre-test (*Mdn* = 11.00, *SD*=4.47) and the post-test (*Mdn* = 13.00, *SD* = 3.28), $z = -2.05$, $p = 0.04$, $r = -0.38$. Deduction also indicated a significant change between pre-test (*Mdn* = 11.00, *SD* = 4.47) and the post-test (*Mdn* = 9.00, *SD* = 4.68), $z = -3.94$, $p < .001$, $r = -.072$. Table 4.5 displays the results of each of the Wilcoxon signed-rank tests that were performed.

Table 4.5

Wilcoxon Signed-Rank Results for Cornell Critical Thinking Test (n = 45)

Subscale	Pre-Test		Post-Test		Z	p	r
	<i>Mdn</i>	<i>SD</i>	<i>Mdn</i>	<i>SD</i>			
Observation	11.00	4.47	13.00	3.28	-2.05	0.04	-0.38
Deduction	9.00	4.68	11.00	3.33	-3.94	<.001	-0.72

Discussion Post Rubric Scores

Each student's initial post from week 1, week 3, and week 5 were scored using The Holistic Critical Thinking Scoring Rubric (see Appendix A). Each discussion post could receive a maximum score of 4 and a minimum score of 1, depending on how well the post fulfilled the requirements of the rubric. Each post was scored by two separate graders, and the average of the two scores was used as the overall score. The researcher served as one of the graders and the other grader was an experienced English teacher who is also a certified Advanced Placement test scorer. To ensure reliable scoring, all scores from both graders were analyzed for intraclass correlation, which is a measurement of agreement between each rater's score (Adams & Lawrence, 2019). Results from this test showed that the raters had an interclass correlation of .86. According to Fleiss et al. (2003), values above .75 are considered to have acceptable reliability. Descriptive statistics were then evaluated to begin the data analysis process.

Descriptive statistics. Each student's score was determined by averaging both rater's rubric score for each student's post. All scores for each week were summed up to generate a weekly mean score. Table 4.6 displays the descriptive statistics of students' scores for discussion forum posts, including each weekly mean and the standard deviation. Week 5 had the highest overall mean ($M = 3.07$, $SD = .77$) and had the highest

growth between measured weeks. Mean weekly rubric scores also increased from Week 1 ($M = 2.21$, $SD = .79$) to Week 3 ($M = 2.38$, $SD = .71$). These statistics indicate that student critical thinking skills improved each week as measured by the rubric. To determine if a statistically significant difference existed across the three time points, a repeated measures ANOVA was used (Adams & Lawrence, 2018). Hays (1988) indicates that when the number of observations is greater than 30, the sample means will be approximately normally distributed. Therefore, the repeated measure ANOVA was determined to be appropriate for this study.

Table 4.6

Descriptive Statistics for Student Rubric Scores ($n = 46$)

	<i>M</i>	<i>SD</i>
Week 1	2.21	0.79
Week 3	2.38	0.71
Week 5	3.07	0.77

Repeated measures ANOVA. The first step in conducting the ANOVA was to determine if there was sphericity in variances between groups. Sphericity is the assumption that variances between groups are equal (Adams & Lawrence, 2019). To test this assumption, the Mauchly's Test of Sphericity was used. This measure tests the null hypothesis that variances between groups are equal. Therefore, statistically significant results ($p < .05$) indicate a violation of the null hypothesis and show that variances are not equal. Results from the tests conducted on rubric data indicate that the assumption of sphericity had not been violated, $\chi^2(2) = .95$, $p = .35$. Based on these results, it was determined that the variances between groups were equal and a spherically assumed repeated measures ANOVA was conducted.

The repeated measure ANOVA was conducted to analyze the impact of the intervention on student discussions posts throughout the course of the study. As presented in Table 4.7, there was a statistically significant impact of the intervention on rubric scores, $F(2, 45) = 10.09, p < .001$. The Eta squared coefficient was used to determine the percentage of the variability that could be accounted for by the intervention (Adams & Lawrence, 2019). Results of this test ($\eta^2 = .26$) demonstrated a large effect size that accounted for 26.3% of the variance between groups.

Table 4.7

ANOVA Results for Student Rubric Scores (n = 46)

	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η^2
Between Groups	18.96	2	9.48	10.09	<.001	.26
Within Groups	25.65	45	0.57			
Total	44.61	47	10.05			

Because a significant difference was found in the repeated measure ANOVA, post hoc tests were conducted to find how each week differed from one another. These tests compare each group with every other group. Results were adjusted using Bonferroni's correction for multiple comparisons. According to Table 4.8, there was a statistically significant difference between Week 1 and 5, $t(45) = 5.36, p < .001$, and between Week 3 and 5, $t(45) = 4.28, p < .001$. No significant difference resulted between Week 1 and 3, $t(45) = 1.86, p = 0.84$. These results indicate that students began showing significant differences after the third week of the intervention and showed additional progress after five weeks. This suggests that time of exposure played a role in the intervention's

impact, indicating that the longer a student was exposed, the greater the impact on their critical thinking.

Table 4.8

Post Hoc Results for Student Rubric Scores

		M _D	SE	<i>t</i>	<i>d</i>	<i>p</i>
Week 1	Week 3	-0.17	0.16	1.09	0.16	0.84
Week 1	Week 5	-0.86	0.16	5.36	0.79	<.001
Week 3	Week 5	-0.69	0.16	4.28	0.63	<.001

Note. *p* values adjusted for multiple comparisons: Bonferroni.

Student Survey

Students completed the survey after the conclusion of the intervention. This survey measured student perceptions of how they perceived the intervention to impact their critical thinking skills. It was administered to students in class and was completed during a single class period (n=43). Several students had to complete the survey on a different date who were absent for the original administration. The survey contained 17 items which were divided into 5 subscales: (1) cognition, (2) affection, (3) reading and writing skills, (4) critical thinking skills, and (5) efficacy. All items were 5-point Likert-style statements that asked students to rate their level of agreement with 5 indicating “Strongly Agree” and 1 indicating “Strongly Disagree.” (See Appendix C).

Table 4.9

Cronbach’s Alpha Results for Student Survey

Subscale	α
Cognition (1-5)	0.85
Affection (6-10)	0.35
Reading and Writing Skills (11-12)	0.73
Critical Thinking Skills (12-14)	0.75

Efficacy (15-17)	0.83
Total	0.88

Reliability for this instrument was established by calculating internal consistency using Cronbach's alpha, which determines the correlation between items within the same subscale (Adams & Lawrence, 2019). Alpha values above .70 ($\alpha > .70$) are considered to have acceptable reliability and are interpreted as internally consistent (Gliem & Gliem, 2003). Table 4.9 displays the results of each alpha measurement. As a whole, the survey achieved acceptable levels of internal consistency ($\alpha = 0.88$). Four of the five subscales also had acceptable internal consistency. Affection was the lone subscale that failed to reach an acceptable standard ($\alpha = 0.35$). This will be discussed later as a limitation of the study.

Descriptive statistics. Data from the survey were first analyzed using descriptive statistics. The mean and standard deviation was calculated for each question and for each subscale. Table 4.10 displays the results of these tests for each item and subscale. All subscale means fell between 3.92 and 3.34, indicating that student most student responses fell between the levels of "Neither Agree nor Disagree" and "Agree." The subscale with the highest mean score was Critical Thinking Skills ($M = 3.92$, $SD = 0.09$) indicating students had the highest level of agreement with items within this subscale. Affection had both the lowest mean score as well as the highest standard deviation, which indicates the most variability among responses ($M = 3.34$, $SD = 1.07$); however, these results still show moderate levels of agreement. Among individual items, Item 14 (*Online discussions improve my ability to look at issues from different perspectives*) had a high level of agreement ($M = 3.93$, $SD = 1.00$). Within the same subscale, Item 13 (*Online*

discussions improve my critical thinking skills) had the second highest level ($M = 3.91$, $SD = .86$). Item 8 (*Online discussions are boring*) had the lowest level of agreement and the highest standard deviation ($M = 3.16$, $SD = 1.16$).

Table 4.10

Descriptive Statistics for Student Survey (n = 44)

Subscale	Question	<i>M</i>	<i>SD</i>
Cognition	1	3.61	0.94
	2	3.64	0.91
	3	3.55	1.01
	4	3.57	1.07
	5	3.50	1.15
	Subscale Total	3.57	1.01
Affection	6	3.23	1.01
	7	3.36	1.10
	8	3.16	1.16
	9	3.66	0.91
	10	3.37	1.14
	Subscale Total	3.34	1.07
Reading and Writing Skills	11	3.77	1.01
	12	3.75	0.94
	Subscale Total	3.76	0.97
Critical Thinking Skills	13	3.91	0.86
	14	3.93	1.00
	Subscale Total	3.92	0.93
Efficacy	15	3.66	1.01
	16	3.66	1.06
	17	3.93	0.90
	Subscale Total	3.75	0.99

In summary, pre- and post-test data from the Cornell Critical Thinking Test was analyzed using a paired sample *t*-test or a Wilcoxon signed-rank test based on normality results from the Shapiro-Wilk test. Results from these tests indicated a significant difference between the pre-test and post-test in total score and the subscales of Assumption, Observation, and Deduction. Discussion post rubric scores were analyzed

using a repeated measures ANOVA. Results of this test indicated a significant difference from the repeated measures. Post hoc tests revealed no significant change between Week 1 and Week 3 of the intervention; however, there was a significant difference between Week 1 and Week 5 as well as Week 3 and Week 5. Finally, descriptive statistics were used to analyze the data gathered from the student survey. Results of these tests showed that the subscale of Critical Thinking Skills had the highest mean score, and students reported the highest levels of agreement with Item 14 (*Online discussions improve my ability to look at issues from difference perspectives*) and Item 13 (*Online discussions improve my critical thinking skills*).

Qualitative Findings & Interpretations

Qualitative data for this study were collected through four focus group interviews. This data was used to address both research questions. These interviews allowed me to gain further insight into student experiences within online discussions and generate themes which emerge from these experiences. The following section will describe the data analysis process and explain how themes were generated. It will begin with a description of participant selection, followed by a description of the data analysis process, and conclude with the presentation of findings.

Participant Selection

All participants within the study had the opportunity to volunteer to take part in the focus group interviews. To volunteer, participants were required to be members of my English 1 class and have completed the entire asynchronous discussion unit. Participants were asked to provide their honest opinions of the unit regardless if these opinions were positive or negative. A total of 16 participants volunteered to take part in

the interviews (11 females and 5 males). All Participants were in ninth grade and between the ages of 14 and 16. Class grades of the participants ranged from a 96% to 73%. In total, five participants had A's, eight participants had B's, and three participants had C's. There was no grade requirement for participation in the interviews, and no individual that met the participation requirements was denied the opportunity to take part in the interview. Table 4.11 displays demographic information about the participants of the focus group interviews. Pre-Assessment range was determined based on student scores on their first attempt on the Cornell Critical Thinking Test. Scores were compared to the testing norms described in Ennis, Millman, and Tomko (2005). Students who scored in the 35th percentile or below were considered Low (n = 9), students who scored between the 36th and 65th percentile were considered Medium (n = 31), and students who scored in the 66th percentile and above were considered High (n = 6). Students were assigned to groups based on their availability to participate in the interviews. Each interview was composed of four students.

Table 4.11

Participant Demographics

Pseudonym	Gender	Ethnicity	Pre-Assessment Range	Group
Linda	Female	White	Low	1
Jason	Male	African American	Medium	1
Sarah	Female	Asian	Medium	1
Nancy	Female	White	Low	1
Alice	Female	White	High	2
Jenny	Female	Hispanic	Low	2
Timothy	Male	White	Medium	2
Lauren	Female	White	Medium	2
Anna	Female	African American	Medium	3
Kevin	Male	African American	Low	3
Thomas	Male	Asian	Low	3
Denise	Female	White	Medium	3

Pseudonym	Gender	Ethnicity	Pre-Assessment Range	Group
Lucy	Female	White	Low	4
Jeffery	Male	African American	High	4
Donna	Female	Asian	Medium	4
Emma	Female	African American	Medium	4

Analysis of qualitative data

Qualitative data was generated from four separate focus group interviews. Interview data was collected using Audacity and transcribed using Microsoft Word's voice-to-text plugin, Dictate. The transcripts generated by Dictate were compared to the original recordings and edited to ensure the accuracy of the transcription. Once the accuracy of the transcripts was confirmed, they were uploaded into Delve as separate files for first-cycle coding.

Inductive analysis was used to code, categorize, and generate emergent themes from the data (Mertler, 2017). Data was analyzed by reviewing the interview transcripts and assigning codes to information related to the study. According to Saldana (2021), a code is "a short word or phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (p. 5). The purpose of these codes is to look for common characteristics from which statements can be made to connect the participant experiences (Creswell, 2014). Table 4.12 displays the number of codes that were generated from each focus group.

Table 4.12

Summary of Codes Generated

Source	1 st Cycle Codes	2 nd Cycle Codes	Total
Focus Group 1	74	52	126
Focus Group 2	70	50	120
Focus Group 3	47	39	86
Focus Group 4	39	36	75
Combined Total	230	177	407

Two cycles of coding were conducted to analyze the focus group interviews. The first cycle utilized two rounds of coding: in vivo, and values coding (Saldana, 2021). The second cycle utilized two rounds of pattern coding to organize data into similarly coded categories (Saldana, 2021). These categories were then used to elicit emergent themes. Throughout this process, a researcher's journal was maintained using analytic memos to document my thoughts, questions, and ideas about the data. The following sections will provide a detailed description of my first-cycle and second-cycle coding process.

First-cycle coding. All first-cycle methods were conducted using the qualitative coding tool, Delve (<https://delvetool.com>) to organize data and apply codes to meaningful units of text. Two rounds of coding were conducted for the first cycle, using a different method for each round. The first round utilized in vivo coding and the second round employed values coding. Within Delve, a separate project was created for each round of coding to most efficiently analyze the data gleaned from each round. First-cycle methods

were selected based on their connection to the research question and their ability to generate meaningful data.

In vivo coding. In vivo coding was used for the initial round of transcript coding. This method “uses words or short phrases from the participant’s own language in that data record as codes” (Saldana, 2021, p. 365). One of the benefits of this method is that it honors the voice of the participants and captures their experiences and perceptions in their own words (Mertler, 2017). Each focus group transcript was organized into a separate file in Delve. Transcripts were coded separately then codes were compared after all four transcripts were coded. Codes were assigned to meaningful units of text and quotation marks were used to indicate that these codes were the participant’s exact words (Saldana, 2021). For longer sentences with more details, several codes were assigned to exhibit the full meaning of the text. For example, in Figure 4.1 the second sentence contained several meaningful units and was coded as “able to really take a deep dive into information” and “describe to my kind of opponent and what I mean by it.” Each code expressed a different idea; therefore, it was important to capture the layers of meaning with multiple codes. The first round of in vivo coding resulted in 230 separate codes.

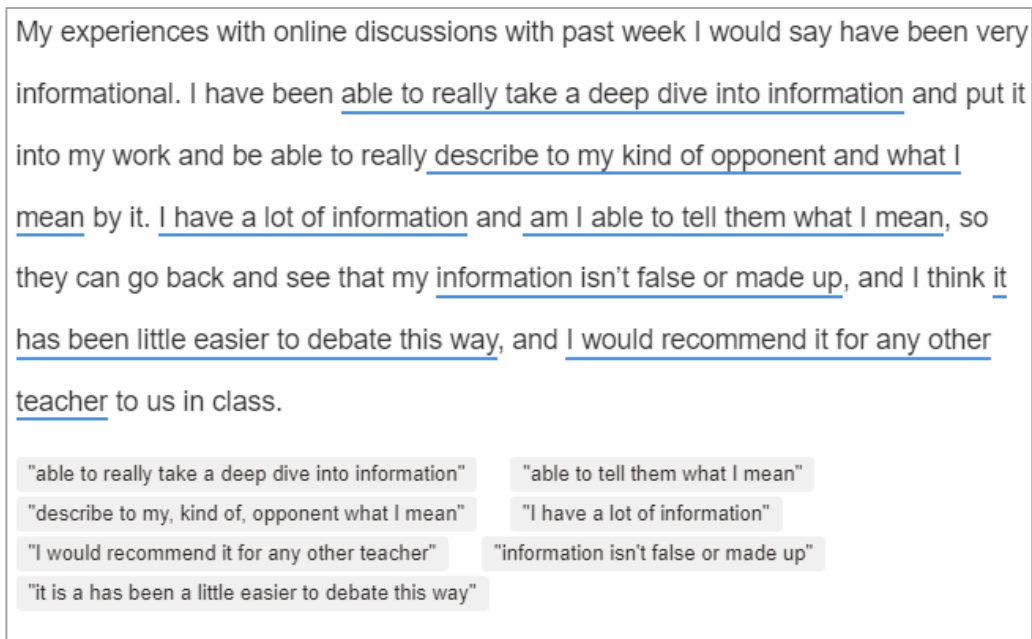


Figure 4.1. In vivo coding in Delve

Values coding. In the second round, values coding was used to analyze the transcripts. This method was selected because it aims to capture the participants' values, attitudes, and beliefs about their experiences (Saldana, 2021). This method allowed me to gather evidence of how participants valued asynchronous discussions and how they believed it impacted their critical thinking. Saldana's (2021) definition of the values, attitudes, beliefs was used to clearly distinguish the three terms from one another: "A value is what you think/feel is important. An attitude is how you think/feel about something or someone. And a belief is what you personally think/feel to be true" (p. 168). Codes were labeled with a V, A, or B to show which of the three terms to which the code was connected. For example, in Figure 4.2 the first sentence is coded "V: seeing different perspectives" because the individual is stating that it is important to hear multiple perspectives, including the perspective of those that are often reluctant to speak in person. The second sentence was coded as "A: online debates help eliminate anxiety

of speaking” because the participant was expressing his/her attitude that speaking can cause anxiety and a virtual environment could alleviate this anxiety for some individuals. Finally, the last sentence was coded as “B: discussion improved communication skills” because the statement reflected the individual’s belief that engaging in discussions can improve one’s ability to effectively communicate with others. In this round, some codes were used multiple times, for example “V: treating others with respect” was used seven times. As performed in the first round, transcripts were analyzed one at a time and codes were assigned to meaningful units of text. This round resulted in 177 values codes.

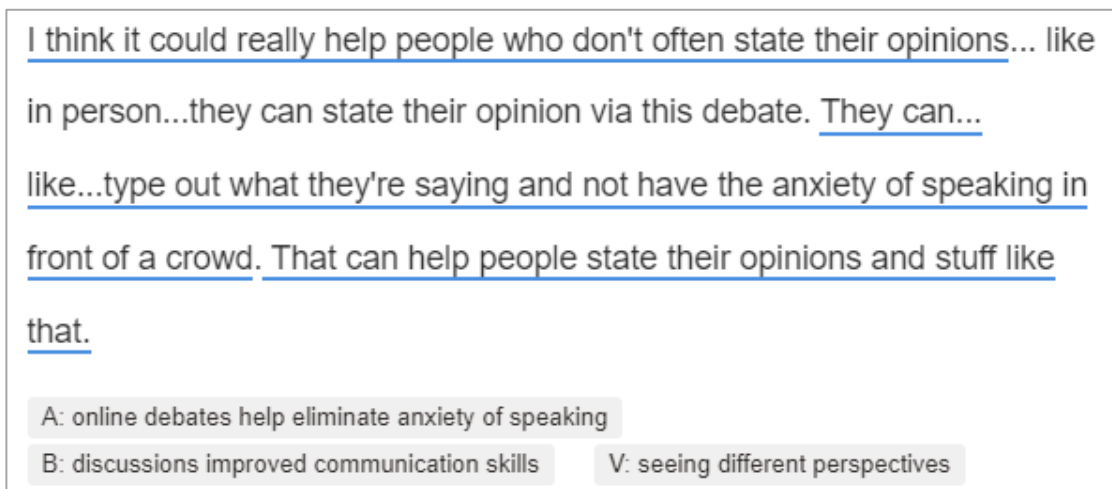


Figure 4.2. Values coding in Delve

Peer debriefing. After each round of coding, my dissertation chair and I reviewed all of my codes to ensure that they accurately portrayed the data and captured the necessary information. During the review process, he questioned the meaning behind some of the codes, asked for clarifications, and made suggestions to improve the quality of the study. For example, when reviewing in vivo codes, we discussed how more meaningful data could be extracted by analyzing the transcript by meaningful units rather than by sentence. This allowed me to greatly expand my data collection and more

accurately portray participant perceptions. During our second round of debriefing, we had an extended discussion about the distinctions between attitudes, values, and beliefs. In addition, he questioned several codes and asked me to explain why I placed them in the category that I did. For example, we discussed how “A: it is important for both partners to fully participate” seemed more like a statement of value rather than an attitude. We both agreed that it was best to change this code to a value. This process was repeated for several other codes to ensure that they were categorized correctly and that they represented the statements of the participants.

Transition to second-cycle coding. After the first-cycle coding was complete, all codes were downloaded from Delve into a Microsoft Excel document. All codes from the first round of in vivo coding were combined and all codes from the second round of value coding were combined. Next, I began looking at the data to identify initial categories that could help guide my second-cycle coding process. Related codes were grouped together and given categories reflecting their unifying idea. Figure 4.3 displays an example of how the codes were organized. From this initial categorization process, ten categories were generated: (1) Gathering Information, (2) Evaluating Information and Adjusting, (3) Connecting and Interacting with Peers, (4) Structure of Debates, (5) Encouraging Participation, (6) Perceptions of Debates, (7) Writing Skills, (8) Critical Thinking, (9) Understanding and Using Rhetorical Concepts, and (10) Looking at Different Perspectives. These initial categories allowed me to begin analyzing data and reflecting on the experiences of participants as I transitioned to the second cycle of coding.

A	B	C	D
Round 1 In Vivo (230 codes)	Round 2 Values (178 codes)	Category 1: Gathering Information	Category 2: Evaluating Information and Adjusting
"able to really take a deep dive into information"	A: being absent on debate days made it hard to catch up	"debates, gathering information, citing sources"	"have to take a deeper look"
"describe to my, kind of, opponent what I mean"	A: could tell how much argumentative position was enjoyed by other people	"I have a lot of information"	"able to really take a deep dive into information"
"I have a lot of information"	A: debate forces students to "take a deeper look" into topics	"able to gather stronger evidence towards our opponents"	"information isn't false or made up"
"I am able to tell them what I mean"	A: debate forces students to "take a deeper look" into topics	"helps to educate yourself on one topic"	"deeper look into a lot of our arguments"
"information isn't false or made up"	A: debate forces students to "take a deeper look" into topics	"it was informative"	"if you rushed it then our quality was crap"
"it is a has been a little easier to debate this way"	A: debate forces students to "take a deeper look" into topics	"I am about to use that to respond"	"I understand it a bit more"
"I would recommend it for any other teacher"	A: debate forces students to "take a deeper look" into topics	"come up with solid evidence"	"I know what to be looking for now"
"digital learning has been easier"	A: debate forces students to "take a deeper look" into topics	"difficult to find information"	"it made me dig deeper"
"able to gather stronger evidence towards our opponents"	A: debate forces students to "take a deeper look" into topics	"challenging to find the exact information"	"focus on how your decisions could either help or hurt the other person"
"we were able to create strong written conversation"	A: debate forces students to "take a deeper look" into topics	"we were restricted to websites"	"take more time and plan or battle and make it even harder"
"we made strong points that changed people's original opinions"	A: debate forces students to "take a deeper look" into topics	"some topics didn't have much information"	"learning how to make sure I didn't make their mistakes"
"I would very much recommend it"	A: debate forces students to "take a deeper look" into topics	"hard to pick and choose website to find information"	B: original opinions were changed
"online debates were pretty no difficult but still challenging"	A: debate forces students to "take a deeper look" into topics	"difficulties with trying to find evidence to back it up"	A: debate forces students to "take a deeper look" into topics (18)

Figure 4.3: Transition to second-cycle initial categories

Second-cycle methods. Two rounds of pattern coding were used as the second-cycle method of coding. This method organizes data into categories which reflect similar themes and ideas (Saldana, 2021). The codes generated from first-cycle coding in Delve were uploaded into a Microsoft Excel document. All in vivo codes were placed into one column, and the values codes were placed in the next column. I began the process by first reading through the codes several times looking for patterns and related data. Next, I began to group codes that were related together by placing them within the same column in Excel. This process was repeated until all codes had been placed into a group that reflected a common idea. For example, the codes “*helped me use logos more strategically*” and “*able to branch out and explore using logos*” were combined with other codes into the category “Use of Rhetorical Strategies.” Figure 4.4 displays an example of four patterns that emerged from the data with the resulting pattern code. After finishing this initial pattern coding process, I met with my dissertation advisor to review

the patterns that I generated to ensure the pattern codes accurately reflected the information they represented. The first stage resulted in 32 pattern codes.

Use of rhetorical strategies	Improving understanding of rhetorical concepts	Challenge of understanding and using rhetoric	Value of using rhetoric
"helped me use logos more strategically"	"got a deeper understanding of the rhetoric we were using"	"didn't have a good past with rhetoric"	"emotion, it could persuade your argument"
"able to branch out and explore using logos"	"helped me understand more pathos"	"logos is kind of difficult"	"help with your arguments"
"using the best wordings and using rhetoric and logical fallacies"	"I understand it a bit more"	"easier to find pathos and ethos to state your claim"	"I did understand those three...rhetorics...and it made my argument a lot better"
"I use a lot of statistics, that actually works"	"let me understand logos"	"emotional appeal really cause I think it was the easiest"	"can make your argument stronger"

Figure 4.4: First stage of pattern coding

After the first round of pattern coding, codes were placed into groups that shared a common idea. Once these groups were made, they were categorized once again to reflect the idea that connected the grouped information. For example, the pattern codes *Using writing to express opinions*, *Use of writing strategies*, and *Improving writing skills* were combined to create the category "Developing writing skills through practice." Figure 4.5 displays how these pattern codes were grouped and the category that resulted from this grouping. Once my categories were created, I met with my dissertation advisor and explained my rationale for each category. The emphasis of this meeting was making sure each category represented the specific information covered by the category description. I explained my rationale for each category, and we discussed if they were

clearly worded and representative of the data. Based on this discussion, the wording of some categories was changed. For example, we decided that the category *Developing and Applying Writing* was unclear and decided to change it to *Developing Writing Skills Through Practice*. This round of coding resulted in nine categories: (1) Gathering and examining information, (2) Developing writing skills through practice, (3) Interacting with peers, (4) Perceptions of debates, (5) Seeing and being open to different perspectives, (6) Understanding and using rhetorical concepts, (7) Impact on critical thinking skills, (8) Perceptions of debate structure, and (9) Learning from interactions.

Category 2: Developing writing skills through practice	Using writing to express opinions	Use of Writing Strategies	Improving writing skills
	"describe to my, kind of, opponent what I mean"	V: peer editing	"helped me be more articulate"
	"I am able to tell them what I mean"	B: important not to rush	"helps communication-wise"
	V: describing	B: writing more allows more thorough answer	"I started fixing my problems and making it better"
	"help people state their opinions"	"careful with your words and not sound offensive"	"got better the more you did it"

Figure 4.5: Categorizing pattern codes

The final round of the pattern coding process consisted of analyzing categories to find emergent themes. I reviewed my categories as well as my researcher's journal on multiple occasions in order to provide ample time to reflect on my data. Categories that represented similar ideas were combined and a unifying theme was generated that described the connection between categories. For example, the categories *Developing*

writing skills through practice and *Understanding and using rhetorical concepts* were combined because they connected to the concept of making improvements in writing, which resulted in a theme of the study. Below each category, the pattern codes were placed that were encompassed by that category. This process was repeated until all categories were grouped. All themes were composed of at least two categories and one theme contained three. Figure 4.6 provides an example of how two categories were combined to create a theme. This organization process was used to guide the entire theme generation process.

Theme 4	
Debates positively impacted student ability to create written augments.	
Category 2: Developing writing skills through practice	Category 6: Understanding and Using Rhetorical Concepts (39)
Using writing to express opinions	Use of rhetorical strategies
Use of Writing Strategies	Improving understanding of rhetorical concepts
Improving writing skills	Challenge of understanding and using rhetoric
	Value of using rhetoric

Figure 4.6: Grouping categories to form a theme

In conclusion, the qualitative data analysis resulted in four themes and nine categories. To ensure that these findings accurately reflected the experiences of the participants, member checking was conducted with each participant of the focus groups. Member checking is the process of sharing data with stakeholding groups to verify the accuracy of findings (Lincoln & Guba, 1985). A short individual meeting was conducted

with each participant to discuss the themes generated from the study. In this meeting, participants were given a list and description of each theme. They were given the opportunity to ask questions and provide feedback about the findings of the study. All participants agreed that the findings accurately portrayed their experiences during the intervention. These findings will be described in the section below.

Presentation of Findings

Four themes were generated from the focus group interviews. Table 4.12 displays each of the themes along the categories, pattern codes, and examples of first-cycle codes from which the themes were derived. For example, first-cycle coding generated the in vivo code *“helped me look for details”* and the values code *A: debates encourage students to “take a deeper look” into topics*. These codes were combined with others reflecting a similar idea into the pattern code *Closely Examining Information*, which describes how students closely examined information from the debates for important details. This was combined with the pattern code, *Gathering Sources*, to form the category *Gathering and Examining Information*. The category describes how students believed that debates encouraged them to find sources for their debates and closely examine them for important information related to their topic. This was then combined with the category, *Seeing and Being Open to Different Perspectives* since both categories related to different dimensions of engaging in critical thinking (Facione, 1990). The resulting theme from these two categories was “Online debates engaged students in multiple dimensions of critical thinking.” In the following section, each theme and category will be presented using thick, rich descriptions utilizing verbatim quotes from

focus group interviews (Creswell, 2014). To maintain confidentiality, participants will be referred to with pseudonyms and no identifying information will be provided.

Table 4.12

Themes Derived from Data Analysis

Themes	Categories	Pattern Codes	First-Cycle Codes
Students had positive perceptions of the debate experience.	Perceptions of Debate Structure	Importance of both partners contribution	B: partner groups played an important role in success of debate
		Debate topics	"the topic made a big deal"
		Amount of time given	"didn't give us enough time like right away"
		Online vs. face-to-face discussion	A: Easier to debate online (2)
		Removing barriers of class participation	"help people who don't often state their opinions, like, in person"
		Challenge of finding information	A: limited resources made it difficult to find information
	Perceptions of Debates	Recommend for future use	"recommend it for any other teacher to use in class"
		Overall impressions of debate experience	"good experience"
		Enjoyment	"kinda fun to kind of have that argument back and forth"

Themes	Categories	Pattern Codes	First-Cycle Codes
Students learned from peer interactions within the online debates	Interacting with peers	Communicating with peers	"able to connect with people and have arguments"
		Comfortable and respectful environment	"family environment"
		Negative peer interactions	"sometimes it got hard because of judgement of others"
		Positive Peer Interactions	"the interactions...I enjoyed them a lot"
	Learning from peer interactions	Learning from peer mistakes	"learning how to make sure I didn't make their mistakes"
Online debates engaged students in multiple dimensions of critical thinking	Gathering and examining information	Understanding the impact of words	"focus on how your words could either help or hurt the other person"
		Evaluating peer discussion posts	
		Closely examining information	"helped me look for details"
		Gathering sources	"able to gather stronger evidence towards our opponents"
	Seeing and being open to different perspectives	Seeing classmates' perspectives	"helped me understand other people's sides of the issue"

Themes	Categories	Pattern Codes	First-Cycle Codes
	Impact on Critical Thinking	Looking at debate topics from different perspectives	"helps me look at issues from different perspectives"
		Open to new ideas	"more open and accepting to new ideas"
		Perceived impact on critical thinking	"online debates helped me improve critical thinking skill a lot better"
		Value of critical thinking	"critical thinking was very useful in helping me"
Debates positively impacted students' ability to create written arguments	Developing writing skills through practice	Using writing to express opinions	"describe to my, kind of, opponent what I mean"
		Use of writing strategies	"you really have to go into detail"
		Improving writing skills	"helped me be more articulate"
	Understanding and using rhetorical concepts	Use of rhetorical strategies	"I use a lot of statistics, that actually works"
		Improving understanding of rhetorical concepts	"got a deeper understanding of the rhetoric we were using"
		Challenge of using rhetoric	A: understanding rhetoric is difficult
		Value of using rhetoric	"I did understand those three... rhetorics...and it made my argument a lot better"

Theme 1: Students had positive perceptions of the debate experience.

Students reported positive perceptions of the way the debates were structured, and they believed that it was an enjoyable experience that they would recommend to others for future use. Structure refers to all of the design elements that were organized to create the debates for students. Examples of these structural elements include debate topics, amount of time given, and grouping. This theme emerged as students discussed their feelings about the structure of the debates and their overall experience engaging in the intervention. This theme is composed of two categories: (1) Perceptions of debate structure and (2) Perceptions of debates.

Perceptions of debate structure. This category reflects how students viewed the design of the intervention and their perceptions of the components that created the debate experience. Participants noted that there were certain elements of the debate structure that had a large impact on their experience. For example, the importance of each partner's contribution was cited as vital to the success of the debates. Many participants believed that partner groups played an important role in the quality of their experience. For example, Sarah stated: "It just kind of depends on who your partner is and...kind of...if you talk to that person." One of the positive aspects of grouping for Sarah was the creation of a competitive atmosphere that she enjoyed:

It also kind of gave you some competition but like in a good way because it is always fun with people that you know. And then there are people in the class who are fun to argue with because they don't really give you a point to argue.

However, when Nancy was grouped with an individual that was not contributing properly, she felt as though it hurt her motivation and said:

Sometimes it was hard because you're going hard and you're doing all of this, and your partner isn't. It kind of makes you think, what's the point?

Despite, sometimes being disappointed by the efforts of their classmates, students felt comfortable interacting in an online setting, especially when compared to face-to-face interaction. Alice stated:

I think that...like...we all did a good job at getting along or at baseline being mature. We were respectful enough to be able to get along as a class. It feels comfortable. I felt safe talking to people.

Students felt that it was easier to debate online than face-to-face, which improved the quality of their experience and helped them interact with their classmates.

Students also noted that the topics played an important role. According to Linda, a lot of her enjoyment of the debate “depended on the topic and what we were talking about.” Jason added that “if we went to more complex topics, I would have more thoroughly enjoyed it, but, nevertheless, I still enjoyed it.”

Although most students had positive opinions about the structure of the debates, some felt that the amount of time they were given was not adequate to construct well-thought-out responses. This was especially true in the beginning when students were new to the process and required more time to plan their discussion contributions. Lauren stated that “you didn't give us enough time, especially in the beginning.” Adding to this early struggle was the fact that it was often challenging to find information. School network restrictions only allowed students access to certain websites. Some students found this frustrating and thought that it made it more difficult to find reliable information to support their arguments. Despite this struggle, students felt that they

improved throughout the intervention and developed strategies to access reliable information about their topics.

In addition, students felt that engaging in these debates online helped to remove some of their barriers to class participation (e.g., anxiety caused by public speaking). Jenny added that the online environment helped take away some of the anxiety that she sometimes felt when speaking in front of crowds: “They can...like...type out what they’re saying and not have the anxiety of speaking in front of a crowd.” This removed some of the traditional barriers that prevented students from interacting with their peers. As a result, the online format resulted in more students contributing their opinions to the debates and more perspectives being heard by the class.

Perceptions of debates. This category encompasses student perceptions about their overall experience within the intervention. As opposed to the previous category, which focuses on student impressions of the structure of the debates, this category is comprised of student opinions about their overall experience, value, and enjoyment. Overall, students felt they had a good experience within the online debates and would recommend using them in the future. Timothy summed up the opinions of most of his classmates when he said, “My experience....it was pretty fun.” Jason had a similar experience: “So...like...online discussions...I found them really enjoyable.” Students appreciated the opportunity to interact with each other on a more personal level than they were used to. Sarah noted that it was “kinda fun to have that argument back and forth between you and your partner.” In addition, many students stated that they would recommend this experience to be used in other classrooms. For example, Jenny stated

that “I would recommend it for any other teacher to use in class,” and Lauren expressed a similar opinion: “I think it is something that should be included in every class.”

Theme 2: Students learned from peer interactions within the online debates.

students believed that in addition to learning from instructor feedback and research, they also learned from their peer interactions within the debates. The literature states the incorporating social interactions into instruction is an effective strategy to promote learning (Jonassen et al., 1995). Asynchronous online discussion has been shown to be an effective method of encouraging these social interactions (Yang et al., 2005). Students learned as they evaluated their opponents’ arguments in debates and used these arguments as models to help improve their future debate performance. This theme is composed of two categories: (1) Interacting with peers, and (2) Learning from interactions.

Interacting with peers. Peer interaction was a major component of this study. This category was generated as students described their perceptions of these experiences. Overall, students had a favorable impression of their interactions and felt that they were successful in communicating with their peers. According to Lauren, they were “able to connect with people and have arguments.” Jason stated that “I feel like with my peers I was able to communicate more, and I really thought that we kind of almost had a family environment.” Jenny agreed that she felt a closer bond with her classmates and stated that “I think that we were able to connect more as a group. To have a common understanding of one topic from both sides.” The online peer interactions allowed students to listen more closely to what was being said without the worry of being interrupted or distracted. Anna stated that it was nice to “take a breather and listen to my

opponents.” In addition, it was important to students that a comfortable and respectful environment was established. Kevin described this feeling when he said:

I believe that we all did a good job at getting along or, at baseline, being mature enough to...we were respectful enough to get along in the class. It feels comfortable. I felt safe talking to people.

Thomas expressed similar feelings of mutual respect:

I think everyone was pretty respectful throughout the discussions, so I think that by keeping the baseline respect, everybody was able to be a bit more understanding of each other and more open and accepting to new ideas.

Although, some students did experience some negative peer interactions. There were some instances where students experienced negative judgement from their peers on their discussion contributions. Nancy felt that “sometimes it got hard because of judgment of others.” However, most students felt that they had predominately positive peer interactions throughout the debates and felt that their peer interactions were enjoyable.

Learning from interactions. Within the constructivist approach, social interaction is seen as a vital component of the learning process (Jonassen, 1991). This category emerged as students described how they learned from their peer interactions within the debates. As students interacted within the debates, they were able to learn from each other’s arguments, specifically each other’s mistakes, to improve their own argumentative writing abilities. For example, Jason stated:

When they were analyzing my arguments and my counter arguments and how I went wrong...I learned from that. I really enjoyed that. I also had fun countering their arguments and learning how to make sure I didn’t make their mistakes.

These peer interactions helped students learn to be better writers and better thinkers as they collaborated within the debates to explore the many different aspects of their topic. Students state that they from evaluating their peer's discussion. Many students believed that this evaluation process helped them learn to avoid mistakes within their own debate posts. For example, Denise noted that:

There were times when my classmates would rant on about a topic that wasn't even related to what we were talking about, and sometimes they would keep ranting on about things that weren't related at all.

Lucy shared a similar experience: "Some people wrote 800 or more words to a response instead of stating their opinion and that made their argument crappy...not quality."

Students were also able identify when their peers used logical fallacies in their arguments such as targeting the character of the writer instead of the argument. Lauren noted that "I saw some others going after the writer and not their argument." Kevin had a similar experience, stating, "They made low jobs at my argument." However, as students evaluated each other's posts, they learned to use these models to improve themselves.

Lauren noted that "it showed what not to do because some others weren't doing it right in their writing." Furthermore, students were able to understand the impact of their own words and understand how they could either help or hurt their argument. Sarah described how she learned from her interactions as she described how "online discussions helped me think about details, and the points that I was using, and what I was saying, which helped me make that point." Lauren added that "bouncing things back forth" helped her learn and become a better writer and arguer by carefully thinking about her word choice

and how these decisions could impact her overall argument. In general, students were able to collaboratively learn to be better writers, arguers, and critical thinkers.

Theme 3: Online debates engaged students in multiple dimensions of critical thinking. Critical thinking is characterized by multiple generalized thinking abilities (Facione, 1990). As students participated in the debates, they engaged in multiple dimensions of critical thinking which helped them successfully complete the process. Specifically, this theme reflects how students believed that they were encouraged to view information from multiple perspectives and engage in a divergent thinking process as they examined and analyzed multiple sources of information (Paul & Elder, 2012). This theme consists of three categories: (1) Gathering and examining information, (2) Seeing and being open to different perspectives and (3) Impact on critical thinking skills.

Gathering and examining information. An important part of the debate design was the requirement that students use reliable sources to support their arguments. Students engaged in a process of gathering and examining sources to use as evidence in their arguments. Darabi et al. (2011) found that students who used sources to support their arguments exhibited more frequent complex thoughts within debates. Likewise, students in this study noted that gathering sources and examining them for reliability helped them gain a better understanding of their topic and the issues surrounding it. Jenny felt that each week she gained a firm understanding of her debate topic by closely examining outside information because, according to her, “It really helps to educate yourself on your topic.” Although most students acknowledged that using sources was important, some students expressed difficulties gathering the right information. Lauren felt the requirement of gathering outside sources created a challenge:

I had some difficulties with trying to find evidence to back up my argument instead of just using my own words. I mean there is nothing wrong with using your opinions, but when you are mandated to use online resources it's kind of harder.

Lauren did admit that "you got better the more you did it." Despite the added challenge, most students were able to see the benefit of using reliable sources in their writing. Jenny explained that examining the sources helped her choose the most reliable information: "I have a lot of information, and I am able to tell them what I mean, so they can go back and see that my information isn't false or made up." This process of examining information also included closely analyzing the arguments of opponents in the debate. Jeffery noted that "online discussions helped me look for details, and the points that they were using, and what they were saying and helped me make my point." Overall, this process of gathering and closely examining information encouraged students to critically think about the information they encountered in order to determine how best to utilize it within their debates.

Seeing and being open to different perspectives. The most frequently brought up subject within the focus group interviews was that debates helped participants look at issues from different perspectives. For students to be successful in the debates they had to understand both sides of the argument and anticipate their opponent's response.

Donna stated:

It helped me look at both sides of the argument instead of just one side of the argument. So...it made me dig deeper to look at all the different points of view.

Like I am trying to defend this topic, but I kind of agree with this person because they do make some good points, and they do have reason for saying this.

Lucy added that “it definitely helped me understand how some people look at things differently from you.” An added challenge to the debates was students were not always given a side of the argument that they agreed with, so there were times where they had to be open to new ideas and argue from a perspective that was not their own. This caused some participants to change their original opinions and think about issues in different ways. Nancy explained:

When you look at it from different perspectives you see there’s always pros and cons...you know...to each thing. And you giving us topics made me look at stuff in a different way.

Clearly, students were given many things to critically think about as they experienced the process. Kevin felt that he was not given enough time to perform the necessary thinking to fully to advantage of the debates and said, “A longer period of time would have helped, but obviously no matter what, it’s impossible to look at all the sides.” However, students felt they improved each week of the intervention and were able to be more efficient with their time and were more prepared to consider the multiple perspectives of topic. Nancy stated that “it definitely helped me out...to think faster.”

Impact on critical thinking skills. This category was created as students described how they perceived their critical thinking skills were impacted by the intervention. As students were placed into situations that required them to engage in different dimensions of critical thinking, they perceived that these skills were improved. Sarah believed, “Online debates helped me improve my critical thinking a lot better and

helped me learn from different sectors.” Some students felt that this improvement was the result of being placed into a situation where they were required to utilize these skills. For example, Emma stated that “it impacts our critical thinking by making us use our brain.” In addition to improving their critical thinking ability, students were also able to see the value in this skill. Nancy stated:

It definitely helped me out...to think faster if you know what I’m saying. It’s like coming up with that argument and all that. I’m just looking at all the different issues that are things. I think the critical thinking was very useful in helping me.

Overall, students believed that they improved their ability to critically think about issues and that these improvements had value to them, even outside the language arts classroom.

Theme 4: Debates positively impacted student ability to create written arguments. Theme 4 emerged as participants described how their argumentative skills improved over the course of the intervention. This theme is comprised of two components: understanding rhetorical concepts and developing writing skills. It is through the mastery of these two concepts that students developed the ability to craft well-developed written arguments, an essential ability in the language arts classroom and a 21st century skill (Pellegrino & Hilton, 2012). This theme reflects student beliefs that online debates improved their writing skills and that by engaging in these debates they were able to better understand and utilize argumentative concepts that had been discussed in class. This theme contains two categories: (1) developing writing skills through practice and (2) understanding and using rhetorical concepts.

Developing argumentative writing skills through practice. This category reflects student beliefs that the opportunity to practice argumentative writing within debates

helped them improve this skill, helping them use writing to express their opinions.

Although students were provided with an introduction to argumentative writing as prior instruction to the intervention, some still did not feel confident in their ability. Kevin stated:

It wasn't the greatest at the beginning because everyone was...like...kind of new to it, so it was a very slow to start off, and then once we got into a rhythm, the arguments started getting good.

Kevin's point reflects the idea that students' ability to use writing to express opinions improved as they practiced their argumentative writing each week. Lauren noticed similar improvements in her writing each week, stating "I started fixing my problems and making my writing better." Students noted that as the intervention progressed, they learned to use strategies to improve their writing. Sarah admitted that in the beginning she did not take enough time in the writing process, and, as a result, her writing suffered: "If you rushed it, then your quality was crap." Thomas agreed adding that "you need to take more time to develop a battle plan." Some students also began peer-editing each other's arguments to improve the quality of their product. As students continued to gain more experience in writing and using strategies, they noticed an improvement in the quality of their product. Emma noted that the debates helped her "be more articulate in her writing." Timothy noticed that his classmates began to eliminate the logical mistakes from their writing and said, "We actually started to defend our points." Overall, students were able to communicate their ideas more effectively with writing as they continued to practice this skill over the course of the intervention.

Understanding and using rhetorical concepts. This category relates to the theme as it reflects how students felt they were better able understand and use rhetorical concepts as they progressed through the debates each week. The ability to identify and utilize these concepts can improve an individual's ability to write and think argumentatively (Aloni & Harrington, 2018). During instruction prior to the intervention, students were introduced to rhetorical concepts, including logos, ethos, pathos, and logical fallacies. Students were taught how to identify these concepts while reading and how to implement them into their writing to improve their arguments. Before engaging in the intervention, some students had found it challenging to grasp these concepts. For example, Kevin stated, "Personally, I didn't have a good past with rhetoric or any of the logical fallacies. I think that...like...a lot of people say using logos is kind of difficult, I guess." Despite the early difficulties, students began to feel more comfortable using rhetorical strategies as they experienced them within debates. Jason noted that as he gained more exposure, he "understood a lot more." Alice had a similar experience, adding:

We got a deeper understanding of the rhetoric we were using by getting it in our writing, and since it's the topic of things we worked on the past couple weeks, I think we got a better understanding.

Overall, students felt more equipped to engage in arguments and saw the value of incorporating rhetorical strategies into their writing. Lauren stated that "I did understand those three...rhetorics...and it made my argument a lot better."

Chapter Summary

This study utilized qualitative and quantitative data to examine the impact of integrating asynchronous online discussions into the high school language arts classroom. Quantitative data was collected from the Cornell Critical Thinking Test, discussion post rubric scores, and the student survey. Results of these instruments indicated significant impacts on student critical thinking skills. Qualitative data was collected through focus group interviews. Data analysis of these interviews resulted in four themes: (1) Students had positive perceptions of the debate experience, (2) Students learned from peer interactions within the online debates, (3) Online debates engaged students in multiple dimensions of critical thinking, and (4) Debates positively impacted students' ability to create written arguments. The integrated qualitative and quantitative findings of this study along with their implications will be discussed in Chapter 5.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

This chapter will discuss the results of the study and position them as they relate to existing literature on critical thinking and asynchronous online discussions (ASD). The purpose of this action research was to evaluate the impact of asynchronous online discussions on the critical thinking skills of high school language arts students.

Quantitative data was collected with three different methods: (1) The Cornell Critical Thinking Test (CCTT), (2) The Holistic Critical Thinking Scoring Rubric (HCTSSR), and (3) student survey results. Qualitative data was collected through focus group interviews with participants. Quantitative data indicated a significant increase in student critical thinking as well as positive perceptions of ASD on their critical thinking ability. Qualitative data resulted in four themes: (1) Students had positive perceptions of the debate experience, (2) Students learned from peer interactions within the online debates, (3) Online debates engaged students in multiple dimensions of critical thinking, and (4) Debates positively impacted students' ability to create written arguments. This chapter will include the following sections: (1) discussion, (2) implications, (3) limitations, and (4) conclusion.

Discussion

Qualitative and quantitative data was integrated to address each of the study's research questions. This allowed for a more complete understanding of the phenomena which took place within the intervention and provide the most accurate description of

how student critical thinking skills were impacted. The following sections will discuss how the findings of this study answer each of the research questions and will situate these findings within existing literature and theory.

Research Question 1: To what extent will the integration of asynchronous online discussions into the English curriculum impact the critical thinking skills of high school language arts students?

The findings from this study indicate that asynchronous online discussions positively impacted critical thinking skills when integrated into the English curriculum. The data from three instruments were combined to arrive at this result: (1) CCTT, (2) HCTSR, and (3) focus group interviews. Each instrument provided a unique perspective on how critical thinking skills were impacted by ASD.

Pretest and posttest scores on the CCTT provided evidence that critical thinking skills were positively impacted by ASD. Paired sample *t*-tests and Wilcoxon signed-rank tests showed that posttest scores were significantly higher than pretest scores. In addition, multiple thinking subscales of the CCTT resulted in significant improvements between the posttest and pretest. The most notable improvements were seen on three subscales: (1) Assumption, (2) Observation and (3) Deduction. This provides evidence that the intervention had a multifaceted impact on the student's critical thinking, impacting some subscales more than others. Since critical thinking is comprised of a series of abilities and thinking processes (Burbules & Berk, 1999), it is important to note the specific skills that resulted in the greatest impact from the intervention. Likewise, students demonstrated significant improvements in critical thinking in their writing based on the HCTSR. Results of the repeated measures ANVOA showed a significant

difference from the beginning of the intervention to the end. Post hoc tests revealed that the majority of this improvement occurred between Week 3 and Week 5, suggesting time of exposure had an impact on changes in critical thinking skills. This indicated that longer exposures to ASD could result in a greater impact on critical thinking skills. Finally, focus group interviews revealed two themes that suggested an impact on critical thinking: (1) Online debates engaged students in multiple dimensions of critical thinking and (2) Debates positively impacted students' ability to create written arguments. These themes indicated that students were encouraged to use their critical thinking skills within ASD and resulted in improved thinking and argumentative writing performance.

The results of these measures support previous studies that found that critical thinking is a skill that can be cultivated when students are placed in the appropriate environment (Mehta & Al-Mahrooqi, 2014). Participants in this study demonstrated increased critical thinking skills across three measures, which provides evidence that ASD can be used as an effective instructional strategy to cultivate the critical thinking skills of students. This study supports Zhou (2015), who found that utilizing ASD can promote critical thinking in higher education. While much of the research on this topic has been performed in higher education, the findings of this study suggest that ASD can also be used to cultivate these skills at the secondary level. These results indicate that ASD can have similar impacts at the secondary level. Although Wu et al. (2013) found that ASD could result in lower-level discussions, the findings of this study indicate critical thinking improved the longer students engaged in ASD, resulting in more higher-level discussion, which corroborates the findings of Arend (2009) and Ekahitanond (2013).

With the positive impact of ASD on critical thinking indicated on the CCTT, HCSTR, and focus group interviews, there is evidence that ASD can be used cultivate critical thinking. One element of this tool that could lead to this positive impact is its use of constructivist principles, in particular social interaction. Perrow (2017) identified social interaction as an important learning strategy within constructivism as well as a tool to cultivate critical thinking. Discussion has been shown to be effective in generating social interaction that stimulates social interaction (Osborne et al., 2018). Students that participated in ASD within this study engaged in this social negotiation process that allowed them to develop the array of thinking skills that comprise critical thinking. In particular, results of the CCTT provided evidence that students improved their thinking skills in the areas of observation, deduction and assumption. The social interactions that took place within this study impacted student abilities to think about issues and opened their minds to different perspectives. Guiller et al. (2008) found similar results, noting that the close relationship between critical thinking and constructivism make it an ideal design approach to target these thinking skills. Likewise, the findings of this study support Hurst et al. (2013), who found that constructivist environments featuring a focus on discussion to be effective in the cultivation of critical thinking.

A key premise of this study was that the elements of writing and argumentation within ASD could encourage students to engage in more frequent critical thinking (Liu & Stapleton, 2018). Results from the HCSTR and focus group interviews supported this idea as levels of critical thinking increased each week of the intervention. Additionally, focus group interviews supported this idea as students indicated that the writing process encouraged them to think about issues from multiple perspective, which helped them to

develop their argumentative writing ability. Darabi et al. (2011) found similar results, providing evidence that students exhibited more complex thoughts within ASD, especially when making arguments to justify their position. Within this study, students found this justification helped them look at issues from different perspectives and helped them anticipate how their opponents might respond.

When considering future redesigns of this intervention, several elements could improve its impact on critical thinking. First, allowing students additional time to complete their responses could lead to greater depth of thought and opportunity to consider additional perspectives. Some students noted that there were occasions when limited time constraints prevented them from contributing their best work to the discussion. This is supported by the findings of Wise et al. (2013) who found that length of time participating in ASD was positively correlated to improvements in critical thinking. Another improvement in a redesign would be to provide students with more access to outside resources to improve their ability to gather and critically examine information (Gao et al., 2013). Students in this study were restricted by the district's network firewall, which prevented them from accessing many resources. Incorporating these two elements into the intervention could lead to even greater impacts on critical thinking.

Research Question 2: How do high school language arts students perceive the use of asynchronous online discussions to impact their critical thinking skills?

Findings from the student survey and focus group interviews indicated that students perceived that ASD had a positive impact on their critical thinking skills. On the student survey, students responded with high levels of agreement on three subscales: (1)

reading and writing skills, (2) critical thinking skills, and (3) efficacy. Furthermore, students had particularly levels of agreement on two specific questions: (1) *Online discussions improve my ability to look at issues from different perspectives* and (2) *Online discussions improve my critical thinking skills*. In the focus group interviews, two themes emerged which reflected students' perceptions of the ASD: (1) Students had positive perceptions of the debate experience, and (2) Students learned from peer interactions within the online debates. The results of both measures indicated that students perceived that their critical thinking was positively impacted by engaging in ASD.

Previous studies have shown that reading and interpreting the posts of peers can be effective tool in developing critical thinking (Wise et al., 2013). Additionally, Pei et al. (2017) found a close relationship between writing and critical thinking. Results from this study indicated a similar connection between reading, writing, and critical thinking. In focus group interviews, students indicated that this process of reading and writing helped them better understand class concepts such as rhetoric. In addition, they used the posts of peers as models of good and bad examples of argumentative writing. Similarly, results from the student survey indicated that students perceived that ASD helped them to understand the importance of rhetoric well as incorporate these concepts into their writing.

In addition, students described positive perceptions of their overall ASD experience on both the student survey and in focus group interviews. In focus group interviews, students described how the structure of the ASD allowed them to engage with their classmates in a comfortable and structure format. This motivated them to participate

and encouraged more students engage with the class activity than would normally occur in a traditional face-to-face format. Likewise, student survey results indicated that ASD promoted student motivation to learn as well created an enjoyable experience. These results support the findings of Guiller et al. (2008) who found positive perceptions of ASD and a preference to engage in ASD as compared to face-to-face instructions. Additionally, student perceptions of feeling more comfortable and motivated to participate in the online environment corroborate the findings of Bardakci et al. (2018).

Students also indicated that ASD helped them connect with course content and extend their thinking about this information through social interaction. The findings of the student survey provided evidence that students perceived that their participation in ASD helped improve their self-efficacy to meet class learning expectations. Likewise, in the focus group interviews, student stated that they were able to learn from their peer interactions with ASD, which helped improve their performance. Foo and Quek (2019) identified similar impacts, noting that social interaction is one of the most commonly cited purposes for incorporating ASD into the instructional setting. Similarly, Yang et al. (2014) demonstrated positive learning outcomes in students after social interaction within ASD. These results also corroborate the finding of Alzahrani (2017) who suggested that participation in ASD could lead to improved learning outcomes and mastery of course content. From a constructivist point of view, these findings may be explained by the fact that ASD engaged students in a process of social interaction and reflection which encouraged diverse perspectives and making connections (Howard & Brady, 2015).

To improve student perceptions of the intervention's impact on their critical thinking skills, two changes could be made to a future redesign of the intervention. First,

results of this study indicated that students felt that different debate topics would have helped motivate them to participate. This could help create topics that are relevant to student's lives, which Mehta and Al-Mahrooqi (2014) found to be an important component of well-designed ASD. Second, increasing the group size to four participants could help eliminate issues that resulted when students were paired with an individual who did not put forth an adequate effort towards their contribution. Students noted that this type of circumstance decreased their motivation and prevented them from taking advantage of this learning opportunity.

Implications

There are numerous implications that resulted from this action research process. As an action research study, one of my goals is to help other teachers within my context improve the critical thinking skills of students. On personal level, engaging in this process has changed the way I research, design, and implement lessons in my own classroom. The discussion of implications is divided into the following sections: (1) implications for teaching secondary language arts, (2) personal implications, and (3) implications for future research.

Implications for teaching secondary language arts

The findings of this study resulted in several implications to help secondary language arts teachers improve their students' academic achievement and critical thinking abilities. The following section will present several implications for secondary language arts teachers as a result of the findings of this study. The implications that will be presented include: (1) expose students to different perspectives, (2) provide opportunities

for discussions, (3) encourage students to gather and analyze information, (4) incorporate writing into lessons, and (5) course design.

Expose students to different perspectives. Teachers are often guilty of providing students with very limited perspectives on the subject matter they teach. However, it is clear that in order to improve critical thinking skills, students must be exposed to numerous perspectives. One of the key findings of this study was that within ASD, students were exposed to numerous different perspectives on each topic, which encouraged them to think about issues critically. In the language arts classroom, the ability to carefully analyze course content is an essential skill and vital to achieving success in the class. For example, when reading a non-fiction article, students are not only required grasp the basic meaning of the text, but also analyze it for multiple implicit features such as trustworthiness, bias, and word connotations. ASD can help students cultivate these critical thinking skills and apply them to the language arts classroom.

Provide opportunities for discussion. Discussion has been shown to be an effective tool for learning and cultivating critical thinking (Hurst et al., 2013). Classes with higher levels of discourse have been shown to reach higher levels of academic achievement and critical thinking (Zhao & Chan, 2014). In the language arts classroom, students need to be provided with the opportunity for discussion to extend their learning and develop their ability to think about issues differently. These discussions can come in multiple ways, whether it is face-to-face or electronically. This study has indicated that ASD can be a successful method to incorporate this vital discussion into the classroom while encouraging maximum class participation and removing some of the traditional barriers that prevent some students from contributing to discussions (e.g., social anxiety).

Encourage students to gather and analyze information. The process of gathering and analyzing information that is relevant and reliable is an essential skill in the language arts classroom as well as an important component of critical thinking (Facione, 1990). Although research is a well-known aspect of the language arts curriculum, this process of gathering and analyzing information does not have to be limited to assigning research projects. This process can be extended to all units of the curriculum. By gathering and analyzing relevant information about the current unit of study, students are able to extend their learning and create new mental constructs, which makes the learning more meaningful (Bloom et al., 1956). This is also an essential skill that students must be prepared to use to meet the demands of a 21st century workforce (Pellegrino & Hilton, 2012).

Incorporate writing into lessons. One of the primary goals of the secondary language arts classroom is to teach students to be effective communicators, especially through writing. Studies have shown that writing can be effective tool to improve learning outcomes and cultivate critical thinking (Nejmaoui, 2019). Additionally, a close relationship exists between writing and critical thinking, and growth in writing ability often results in critical thinking (Pei et al., 2017). Results of this study suggested that writing can be a very social process that can help students look at issues from different perspectives while social constructing new knowledge with their peers. Furthermore, utilizing writing as a social process can enhance the quality of writing and improve students' perceived benefits of the process (Belcher et al., 2015). Therefore, writing should also be used as a social activity within the classroom, using strategies such as ASD or peer editing. This writing should provide students the opportunity to interact

back and forth and engage in the social interaction process that is vital to critical thinking (Bean, 2011).

Course design. The findings of this study resulted in several implications for the instructional design of the secondary language art classroom, especially when incorporating ASD into instruction. First, students indicated that topics played an important role in their enjoyment and motivation to contribute meaningful responses. Providing students with a degree of topic choice can help students receive the maximum impact from the design. Secondly, grouping is very important, and it is necessary to consider how individuals will work together within the lesson. Within this study, students indicated that when they were paired with an individual who was not properly participating, their learning experience was hurt as well as their motivation to input their maximum effort. Therefore, it is important for educators to take measures to ensure all students receive maximum benefits from their lesson and take action when students are not putting forth effort. Finally, students need to be given the proper amount of time to think and develop carefully thought-out contributions, especially when critical thinking is the goal. Students in this study felt they were rushed at times, which prevented them from putting forth their best effort. Allowing students time to consider different perspectives of a topic and gather information can help improve learning outcomes and cultivate critical thinking.

Personal Implications

Developing this action research dissertation has resulted in a great deal of personal growth. In particular, it has changed the way that I conduct research and the way that I address issues within my own personal context. This experience has led me to

be a more effective educator and a leader within my school community. These personal implications will be discussed in the sections below. It will consist of three topics: (1) reflection on action research, (2) reflection on mixed methods, and (3) insights for my current role.

Reflection on action research. Conducting an action research process within my own classroom has helped me understand the importance of using data to drive instruction in an effort to improve the learning outcomes of the community of learners that I work with. The world of education is extremely diverse, and there is no one solution that will solve every problem in all contexts. Through action research, I was encouraged to consider the unique circumstances that students experience within my sphere of influence (Mertler, 2017). Although the results of this study may be successfully applied to other classrooms and other contexts, I know for a fact that the students that I work with on a daily basis will benefit from these practices. Additionally, the cyclical nature of action research means that this process will continue. I will continue refining the practices that I have developed within this study to improve the learning outcomes of my students.

Reflection on mixed methods. Adopting a mixed methods design to research has resulted in the most complete description of the phenomena that took place within my study (Creswell, 2014). Combining qualitative and quantitative data provided different perspectives and provided a more detailed understanding of the experience of my students while participating in ASD. Because critical thinking is such a complex process, it was important to utilize multiple data points to help triangulate the results of the study. Furthermore, action research emphasizes using all appropriate resources to best enact the

desired change. From a more personal perspective, conducting a mixed methods study has helped me understand the value of all forms of data, both qualitative and quantitative. Each data point tells a small part a participant's story, and when all data points are integrated, a more complete description emerges.

Insights for my current role. Preparing students to meet the challenges of a modern society is one of the primary goals of my school. My research into improving the critical thinking skills of students directly supports the vision of the school. This has enabled me to connect with colleagues of all subject-areas to share what I have learned about this essential thinking skill. As a result, my leadership role within the school has grown. It has led to opportunities for me to lead professional development and continue the action research vision of connecting research with what actually takes place in the real world (Johnson, 2008).

Implications for Future Research

For action research, it is important to consider the next step of research to continue the cycle of continuous improvement. There are three future research implications that should be considered for the next stage of action research: (1) discussion forum design, (2) motivation, and (3) peer interaction.

Discussion forum design. The instructional design of ASD can prove to be essential in ensuring students receive the maximum benefit from the activity. For example, students in this student found that more time to complete the activity may have helped stimulate more careful thinking. Additionally, students felt that different topics would have helped stimulate them to think more deeply about the content. Identifying the key design features that promote critical thinking could be important researcher as

educators look to develop this important skill. Although, Schindler and Burkholder (2014) identified several key concepts of ASD design that promote critical thinking (e.g., grouping and approach), more research needs to be performed to provide additional evidence of the most effective design of an ASD instructional unit.

Motivation. As with any activity that involves peer interaction, it is important that all individuals involved are properly contributing in order to achieve the maximum possible benefit. Students in this study indicated that when their partner did not match their effort, their motivation suffered. Individuals who were not meeting the expectations set forth for them, were clearly not receiving the benefit of ASD. Additionally, their lack of effort hurt the learning outcomes and motivation of their classmates. Therefore, future research should look at the factors which motivate students to devote time and mental energy to completing ASD. This research could improve the quality of ASD and improve the performance of its participants.

Peer interaction. This study analyzed the presence of critical thinking in individual student posts; however, it did not attempt to analyze the discourse that took place between student groups. A discourse analysis of ASD could provide additional details about the peer interactions within ASD that lead to the cultivation of critical thinking. Describing this phenomenon could provide educators with additional information on designing ASD to create an ideal to environment to stimulate the peer interactions vital to generating critical thinking.

Limitations

Although results from this study provide evidence that demonstrate that ASD has a significant impact on student critical thinking skills, there are several limitations. These

limitations represent opportunities for further research. Limitations for this study fall into the following three categories and will be discussed below: (1) methodology, (2) researcher, (3) participants.

Methodology

Because this was an action research study, methodological limitations exist by its nature. The focus of this method was not to create generalizable research, but to create a series of practices that directly impact the community being studied (Gustavsen et al., 2008). Therefore, the findings of this study may be limited to the context in which the study took place as the goal of this research was to improve the effectiveness of my own practice (Mertler, 2017). In addition to the nature of action research, the study was limited by the reliability of some of the instruments. Both the Cornell Critical Thinking Test and the student survey contained subcategories that failed to meet acceptable levels of reliability. While previous studies have demonstrated the reliability of these instruments, results of this study failed to reach this level in some subcategories. Finally, the topic of each week's debate was different, and it is possible that these topics played a role in student performance in the discussions. Students may have been more motivated to perform on topics they were interested in and less motivated on topics that did not capture their attention.

Researcher

Although Mertler (2017) notes that action research is particularly well-suited to classroom teacher because of the "participative" role the researcher plays in the process, it does present some limitations to the study. My position as an insider in the study had the potential to lead to me view results more positively than the results show (Herr &

Anderson, 2005). In addition, as the teacher of participants in the study, I wanted to see students succeed and perform well on this intervention as well as in my class. It was possible that I may have unintentionally influenced students to view the intervention more positively than they would have with a different researcher. These limitations could be avoided if a different researcher implemented the intervention who did not have a vested interest in the performance of the participants.

Participants

All students in this study were composed of exclusively of 9th grade students who were enrolled in my English 1 Honors class. This represented a very narrow sample of the actual high school population. More research needs to be performed on different age groups and different achievement levels. Also, the sample sizes for all four measures were relatively small and limited to only those students enrolled in my class. Therefore, use of a random sample was not possible, which presents a limitation to this study.

Conclusion

Critical thinking will increasingly play an important role in society as we advance through the 21st century (Bok, 2005). As schools attempt to prepare students to meet the demands of a modern society, it is important that teachers are armed with the instructional strategies best suited to develop these skills. This study has provided evidence that ASD can be integrated into the curriculum to cultivate the critical thinking skills of students. As technology becomes increasingly adopted by schools across the country, ASD represents a viable, low-cost instructional strategy to help teachers of all subject areas encourage students to critically think about course content while developing these essential skills.

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APPENDIX A

THE HOLISTIC CRITICAL THINKING SCORING RUBRIC



**Stronger Reasoning & Decision Making:
Training Tools & Techniques**

The Holistic Critical Thinking Scoring Rubric - HCTSR **A Tool for Developing and Evaluating Critical Thinking**

The Holistic Critical Thinking Scoring Rubric (HCTSR) is an internationally known rating tool used to assess the quality of thinking displayed in verbal presentations or written reports. The HCTSR can be used in any training program or assessment process. Its greatest value is obtained when used by trainees to assess the quality of their own or another's reasoning. The exercise of applying this holistic evaluation leads trainees to internalize descriptions of strong (and weak) thinking.

Strong 4: Consistently does all or almost all of the following:

- Accurately interprets evidence, statements, graphics, questions, etc.
- Identifies the most important arguments (reasons and claims) pro and con.
- Thoughtfully analyzes and evaluates major alternative points of view.
- Draws warranted, judicious, non-fallacious conclusions.
- Justifies key results and procedures, explains assumptions and reasons.
- Fair-mindedly follows where evidence and reasons lead.

Acceptable 3: Does most or many of the following:

- Accurately interprets evidence, statements, graphics, questions, etc.
- Identifies relevant arguments (reasons and claims) pro and con.
- Offers analyses and evaluations of obvious alternative points of view.
- Draws warranted, non-fallacious conclusions.
- Justifies some results or procedures, explains reasons.
- Fair-mindedly follows where evidence and reasons lead.

Unacceptable 2: Does most or many of the following:

- Misinterprets evidence, statements, graphics, questions, etc.
- Fails to identify strong, relevant counter-arguments.
- Ignores or superficially evaluates obvious alternative points of view.
- Draws unwarranted or fallacious conclusions.
- Justifies few results or procedures, seldom explains reasons.
- Regardless of the evidence or reasons, maintains or defends views based on self-interest or preconceptions.

Significantly Weak 1: Consistently does all or almost all of the following:

- Offers biased interpretations of evidence, statements, graphics, questions, information, or the points of view of others.
- Fails to identify or hastily dismisses strong, relevant counter-arguments.
- Ignores or superficially evaluates obvious alternative points of view.
- Argues using fallacious or irrelevant reasons, and unwarranted claims.
- Does not justify results or procedures, nor explain reasons.
- Regardless of the evidence or reasons, maintains or defends views based on self-interest or preconceptions.
- Exhibits close-mindedness or hostility to reason.

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APPENDIX B

FOCUS GROUP INTERVIEW PROTOCOL

Introductory Protocol

Thank you for agreeing to participate in this focus group interview. The purpose of this interview is to gather information about your experiences with asynchronous online discussion over the past six weeks. Each of you will be asked a series of 5 questions; however, I may ask some follow up questions to ensure I fully understand your response. This interview will be video recorded. This interview will remain strictly confidential, and all information gathered here will be used only for research purposes. Are there any questions?

Participants will all be asked the same question before moving on to the following question. Probing questions will be asked for clarification and to stimulate participants to providing greater detail to their answers.

Questions

1. Describe your experiences with online discussions over the past 6 weeks
2. Describe your interactions with your peers during online discussion
3. How do you think online discussions impacted your understanding of rhetoric?
4. Describe how online discussions impacted your ability to look at issues from different perspectives.
5. Describe how you think online discussion impacted your critical thinking ability?

Debriefing

That concludes today's interview. Once again, I would like to thank you all for participating today. The purpose of this interview was to study the impact of online discussions on your critical thinking skills. The information you provided will be used to study this question. If there are no further questions you are free to go. Again, thank you for participating in today's interview.

APPENDIX C

QUESTION ADAPTATION FOR PERCEPTIONS OF ASYNCHRONOUS ONLINE DISCUSSION QUESTIONNAIRE

Original Question	Adapted Question
1. Online discussions help me learn biology	1. Online discussions help me learn about rhetoric
2. Online discussions help me understand the relationship between ecology and society	2. Online discussions help me understand the relationship between rhetoric and society.
3. Online discussions help me better understand the lectures	3. Online discussion help me better understand class lessons
4. Online discussions help clarify some biology concepts	4. Online discussions help clarify some rhetorical strategies
5. Online discussions help integrate biology concepts of knowledge	5. Online discussions help integrate rhetorical concepts into my writing
6. Participating in online discussions promote my learning motivation	6. Participating in online discussions promote my learning motivation
7. I enjoy participating in online discussions	7. I enjoy participating in online discussions
8. Online discussions are boring	8. Online discussions are boring
9. Online discussions are time consuming	9. Online discussions are time consuming
10. Online discussions are stressful	10. Online discussions are stressful
11. Online discussions improve my ability of science reading	11. Online discussions help improve my ability of reading persuasive texts
12. Online discussions improve my ability of science writing	12. Online discussions improve my persuasive writing ability

Original Question	Adapted Question
13. Online discussions improve my critical thinking skills	13. Online discussions improve my critical thinking skills
14. Online discussions improve my analytical skills	14. Online discussions improve my ability to look at issues from different perspectives
15. I am satisfied with my own performance in online discussions for this course	15. I am satisfied with my own performance in online discussions for this course
16. I am satisfied with my classmates' feedbacks in online discussions for this course	16. I am satisfied with the interaction with my classmates in online discussions for this course
17. I am satisfied with my instructors' or teaching assistants' feedbacks in online discussions for this course.	17. I am satisfied with my instructor's feedback in online discussions for this course.

APPENDIX D

IRB APPROVAL



OFFICE OF RESEARCH COMPLIANCE

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH APPROVAL LETTER for EXEMPT REVIEW

Evan Way
113 Danielle Ln
Summerville, SC 29483

Re: Pro00110583

Dear Mr. Evan Way:

This is to certify that the research study *Preparing Students to Think in the 21st Century: The Impact of Asynchronous Online Discussions on Critical Thinking Skills in a High School English Class* was reviewed in accordance with 45 CFR 46.104(d)(1), the study received an exemption from Human Research Subject Regulations on 7/13/2021. No further action or Institutional Review Board (IRB) oversight is required, as long as the study remains the same. However, the Principal Investigator must inform the Office of Research Compliance of any changes in procedures involving human subjects. Changes to the current research study could result in a reclassification of the study and further review by the IRB.

Because this study was determined to be exempt from further IRB oversight, consent document(s), if applicable, are not stamped with an expiration date.

All research related records are to be retained for at least three (3) years after termination of the study.

The Office of Research Compliance is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). If you have questions, contact Lisa Johnson at lisaj@mailbox.sc.edu or (803) 777-6670.

Sincerely,

Lisa M. Johnson
ORC Associate Director and IRB Manager