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Table of Contents

Standards-Based Grading in a Secondary Mathematics Classroom

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Mathematics classes are full of students who think they either are a math person or they are not. However, recent research about the brain's plasticity has emerged that may be transformative for these students and the world of education. Many studies have revealed that brains grow and rewire during and after mental tasks (Boaler, 2016). With this new research, growth mindset, which describes when students believe they can get smarter, and they understand that effort makes them stronger, has become a more common belief in education. One of the greatest areas of influence on student mindset is assessment and evaluation (Ehlert, 2015). Standards-based grading is a grading technique that aims to focus more on learning rather than the grade outcome and helps increase achievement ("What is standards based grading?", n.d.). . It does this by breaking down the subject matter into smaller objectives or learning targets that the students should master by the end of the unit or the end of the course. All of these targets put together make up a checklist for the material students need to master before the end of the course (Hartnell, 2016). By eliminating the stigma of a single letter or number grade, allowing students to make mistakes without penalty, and enabling students to easily determine how and where improvement can take place, this grading system promotes development of a growth mindset.

Literature Review

Student mindset is a growing matter of interest in current educational research. Two of the most common factors that contribute to negative attitudes and low motivation in mathematics, which influence student mindset, are low mathematical self-esteem (Boaler, 2014; Myers, Wang, Black, Bugescu, & Hoeft, 2016) and negative messages about student potential (Boaler, 2016). Students' perceptions of their ability in math have the strongest relationship to their self-esteem. As students "learn" that they are not good at math, their sense of self-worth and aspirations for themselves deteriorates (American Association of University Women, 1991). Students who are encouraged to view ability as malleable show greater enjoyment of the

academic process, greater academic achievement, and obtain higher grade point averages than their counterparts (Aronson, Fried, & Good, 2002).

Teacher beliefs about the nature of mathematics and their students' ability predicts student mindset and ability in math (Upadyaya and Eccles, 2015). The way teachers evaluate students and give them feedback tells students what they believe about their ability (Schullo & Alperson, 1998). One way teachers can evaluate students to facilitate a growth mindset is by using Standards-Based Grading. Students note that they viewed the standards-based grading as "clearer and more fair," more reflective of their knowledge, and more accurate in assessing students' specific strengths and weaknesses (Buckmiller, Peters, & Kruse, 2017). The feedback and communication that standards-based grading promotes helps teachers communicate growth mindset characteristics to students.

The current study investigated the perspectives of teacher, students, and parents in a secondary mathematics classroom that used a standards-based grading system.

Methodology

This action research study was conducted in the spring of 2018 in a secondary math class at a mid-sized public high school in the southeast. The demographic distribution of the students at the school is forty-two percent Caucasian, thirty-seven percent African American, fourteen percent Hispanic, four percent Multiracial, and two percent Asian. In 2016, the school received a performance grade of a B, meeting expected growth. The school has a graduation rate of ninety two percent. Seventeen students and one teacher participated in the study. The researcher conducted all the focus groups and interviews.

Students completed a general survey about their perceptions of standards-based grading. Students who participated in focus group interviews were asked questions that sought to gain more specific information about students' opinions and preferences on standards-based grading. The teacher was given an option to complete a survey or an in-person interview and chose an in-person interview. The interview questions focused on the process of implementing standards-based grading, how they convert the grades to traditional grades for report cards, and the reactions they have received from administration, parents, and students.

Data Analysis

The questions on the general student survey where students must select an answer were transformed into quantitative data by calculating how many students chose each answer for each

question. This provided a picture of students' opinions and perceptions of standards-based grading. The open-ended questions on the survey along with the recorded responses in the focus groups were analyzed and coded to find common opinions and themes across the responses. The teacher interview was also analyzed and coded to find common opinions and themes. All these different data sources provided a picture of what student and teacher perceptions of standards-based grading are.

Results

When Ms. X gives students' tests back, they are broken up into sections based on the objective covered by that section, and each of those objectives are counted as a separate test score in the gradebook. An example of what this might look like can be found in Figure 1.

Figure 1. Traditional vs. Standards-Based Report Card.

Retrieved from https://www.teacherease.com/standards-based-grading.aspx

If one test has six standards, then they have six separate grades from that one assessment. For each section, they are given a numerical score on a scale of five of ten. For example, Mrs. X explained, "instead of just putting in your gradebook that it was a unit two test, you [are] breaking it down and telling them what the objective was." Since Ms. X doesn't teach in a school that does standards-based report cards, at the end of the semester she converts the standards-based grading score to a traditional grade of an A, B, C, D, or F. She uses a scale of five to ten rather than one to four, so it lines up with putting the grades on a scale of 100. At the end of the semester she just does a total point score and it ends up converting easily.

To score each section, she looks at the students' answers and determines the number of points on the following scale: "is it perfect, [is there a] minor mistake, conceptual mistake,

multiple conceptual mistakes, I can barely get started, and I don't know anything." Based off these categories, she gives the students a score from five to ten corresponding to the scale mentioned above. The scale she uses can be found in Figure 2.

	Level	Description
	10 Ninja Master	**Complete understanding of the concepts, no mistakes** I completely understand this and I could do 20 more just like this, and I can apply this skill in the future. Can I help explain this to someone else?
	8-9 Ninja Junior	**Strong understanding of the concept but making mistakes** I understand the process but when I do it on my own I may get a wrong answer. Where am I going wrong?
	7 Ninja Apprentice	**Basic understanding of the concept but needing more practice** I can start but then I get stuck. I'm getting there but I need some more practice on this, this, and this.
	5-6 Ninja Beginner	**Very little understanding of the concept** I'm trying to follow, but can you slow down? Can you show me that again? I'm not sure I know how to start.

Figure 2. Scoring Scale Retrieved from http://typeamathland.blogspot.com/

She said when grading students' tests, "It's not about the particular mistake they're making, I'm looking at the overall understanding." The grade breakdown, Ms. X added, has students look more closely at what is going on. She said, "If you give students a 73 back...it doesn't really give them any information to move forward."

One of the reasons Ms. X uses a standards-based grading system is because she feels like it is a more objective way of grading. Instead of deciding how many points each question is worth and how many to take off for each mistake, she has a consistent way of evaluating. She said, "I feel like [grading traditionally] ends up super subjective...whereas [with standards-based grading]...overall you're going to come up with a pretty consistent way of evaluating."

She also feels that it's a better representation of students' knowledge of the material, and overall increases their knowledge in her class because they are constantly being held accountable for the concepts. She believes it gives students a better understanding of what they are struggling with, so they know what to study and what concepts to work on more. Overall, she believes that standards-based grading benefits the students more than a traditional grading system. She concluded her interview by saying she wouldn't rather grade any other way. When asked how students feel about the grading system, Ms. X said, "They absolutely love it and I have so many students who come back to me the next year and say...I miss the way you grade."

On the written survey, students were asked how they felt about the standards-based

4

grading system used in this class. To answer, they were given the choice of a smiley face, a neutral face, or a sad face. Seventy-one percent of students chose the smiley face, eighteen percent chose the neutral face, and eleven percent chose the sad face. Seventy-six percent of students said that if they had the option of taking a class with a standards-based grading system they would choose it over a class with a traditional grading system. Forty-seven percent of students said if they had the option they would want all their classes to be graded this way, whereas fifty-three percent of students said they would not. Seventy-six percent of students said that this grading system is a more accurate representation of what they know about the material, twelve percent said it is the same as traditional grading, and another twelve percent said it is not a more accurate representation. Fifty-nine percent of students said standards-based grading is easier to understand than traditional grading. In the focus group interviews, six of the eleven students said that they prefer standards-based grading to traditional grading.

Overall, the students expressed positive opinions of standards-based grading. Over three-quarters of the students surveyed said that they would choose a standards-based grading system over a traditional grading system which shows how positively they view it.

Ms. X and her students shared the same positive outlook on standards-based grading. Overall, they prefer it to a traditional grading scale. Both students and Ms. X mostly said that they feel standards-based is a more accurate representation of their knowledge.

Conclusions

Overall, the parents, students, and teacher expressed extreme positivity when reflecting on the standards-based grading system used in their class. Students spoke of how helpful it was to have their grade broken down into specific objectives and how they were able to better see what they needed to study and work on for the future. The benefits in communication with parents was noted as well as the way it helped put everyone on the same page and give the student a path forward. Overall, students and the teacher felt that their grades improved and that they learned more with this grading system. The biggest aversion to the grading system seemed to be the fact that Ms. X only graded tests. Many students noted how this added to their stress during exams, and they suggested grading other assignments to improve the grading system.

One of the limitations of this study was that students often associated Ms. X's systems of retesting and only grading tests as parts of standards-based grading. When asked about the standards-based grading system, students often commented on these two aspects instead of

focusing on the actual feedback they receive. Some negative sentiments about these two elements might have influenced students' opinions about the standards-based grading system. Another limitation was that since the school does not work off a standards-based grading system, eventually Ms. X must convert the grades to a traditional grade for the quarter and semester grades.

The results of this study have many implications for the grading systems in math classrooms. The participants demonstrated a strong affinity for the standards-based grading system and expressed that they felt they benefited from the grading system. Thus, this action research study corroborated the literature surrounding the positive impact of a standards-based grading system in classrooms. These results may encourage other teachers to continue investigating the academic effects of standards-based grading.

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How the Use of Graphic Novels in Shakespeare Instruction Affects Student Engagement

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Shakespeare is required as part of standard courses of study in English language arts (ELA) classrooms across the United States, and a variety of adaptations can help students engage with his complex texts (Turchi & Thompson, 2013). One emergent form of Shakespearean adaptation is the graphic novel, a medium that has produced increased reader engagement (Cook, 2017; Moeller, 2015). Despite these benefits, English teachers generally do not consider graphic novels "serious resources for the classroom" (Carter, 2007). Yet graphic novels are often meticulously crafted, and graphic novel adaptations of Shakespeare have the potential to engage readers in innovative ways (Wolfe & Kleijwegt, 2012). While scholars have written literary criticism of graphic novel versions of Shakespeare (Wolfe & Kleijwegt, 2012), few practitioners have conducted action research examining how students *themselves* engage with graphic novels in dialogue with these original Shakespearean texts. As a result, this study pursues the following question: How does using a graphic novel as a supplement to a Shakespearean play affect students' engagement with both texts?

Literature Review

Visual literacy, "the use of visuals for the purposes of communication" (Avgerinou & Ericson, 1997, p. 284), and verbal literacy go hand in hand. The ability to read words is itself a way of attributing meaning to images. As Eisner (2008) writes, "the psychological processes involved in viewing a word and an image are analogous" (p. 2). Moreover, the image analysis involved in visual literacy mimics literary criticism, with students discussing the images' unique "point[s] of view" (Howells & Negreiros, 2012, p. 5). Furthermore, visual literacy is a component of multimodal instruction, instruction founded in a "variety of modes that contribute to meaning making, including linguistic, visual, audio, gestural, and spatial [modes]" (Boche & Hennings, 2015, p. 579). Each mode is unique and contains specific possibilities and limitations

for engagement (Kress, 2000). Multimodal instruction has been shown to improve student engagement with complex texts, fostering richer in-class discussions (Boche & Hennings, 2015).

As a form of multimodal literature that combines both word and image, graphic novels present a unique opportunity for students to engage in curricular activities, particularly in the study of Shakespeare. Researchers have noted the excitement with which students, including populations that may not have been inclined to read, respond to graphic novels (Moeller, 2015). In addition to positive student attitudes, the reading of graphic novels is linked with higher student achievement. As Cook (2017) notes, when students are reading complex texts, graphic novels improve reading comprehension by themselves or as supplement to classic literature. The benefits of graphic novels hold promise for the study of Shakespeare, and scholars have noted the possibilities graphic novel versions of Shakespeare's plays allow for interpreting the original texts (Wolfe & Kleijwegt, 2012). However, little educational research has investigated how students themselves engage with graphic novels as supplements to original Shakespeare plays.

Methods

The focus of this study is to examine how students' visual literacy, comprehension of each text, and engagement with both texts develop as they observe the interconnections between an original Shakespearean text and a graphic novel adaptation. The study took place during the spring semester at a large, public high school in an urban school district in the southeastern United States. Moreover, the research setting was one Shakespeare elective class in which 11th and 12th grade students of any level of English class (standard, honors, or Advanced Placement) could self-select to participate. Data comes from twenty-five students who opted to participate; of these students, two were concurrently enrolled in a standard-level English class, three in an honors-level English class, and twenty in an Advanced Placement (AP) English class.

The researcher aimed for students to compare scenes that emphasized characterization from the original text of *Macbeth* (Shakespeare, 2000) and the graphic novel adaptation of the play. Only one graphic novel version of the play, Gareth Hinds's *Macbeth* (2015), was used to provide the students with continuity in the rendering of the characters, plot, and setting. The unit began with thorough instruction in visual literacy terminology. Over the course of the intervention, students were prompted to use these terms each time they encountered the graphic novel, and the researcher added to their list of terms related to visual literacy with definitions and concepts from Eisner (2008). Students examined nine scenes in the original play and the graphic

novel, selected due to their focus on characterization. After students read the original play and the graphic novel, they paused to fill out a researcher-made handout divided into two labeled sections: one for notes on characterization in the original play and one for notes on characterization in the graphic novel. After students completed this handout, they used it to compare characterization in both texts in whole-class discussion. Students considered how the graphic novel interpreted the original text and the effects of these choices on their perception of both texts.

To triangulate data, the researcher collected multiple data sources: pre- and post-questionnaires, student worksheets, student responses to a writing prompt, and responses to a short-answer question on a summative assessment. The researcher used constant comparative analysis to code the data that was collected, and this process involved open, axial, and selective coding (Corbin & Strauss, 1990). Three groupings of students emerged from this data analysis: students who did not favor the use of the graphic novel, students who were neutral about the graphic novel, and students who favored the use of the graphic novel.

Results

Students from all groups cited the importance of personal interpretation of the original text, although their views of the graphic novel differed. Moreover, students who did not favor the graphic novel and students who were neutral about its use were generally confident in interpreting Shakespeare.

Students who did not favor the graphic novel were all enrolled in an AP English class. They noted that they found the graphic novel to be a limited interpretation that restricted their ability to interpret the original text. At the end of the intervention, they indicated that they did not feel that the graphic novel helped them comprehend Shakespeare. These students' classwork corroborates this perception as they were able to reference both texts equally as often on their characterization worksheets and their summative assessments. However, this group did incorporate visual literacy terminology on their worksheets throughout the intervention.

Students who were neutral about the graphic novel were enrolled in AP and honors English classes. These students tended to perceive the graphic novel as a "different perspective" from the original text, an interpretation that was neither good nor bad. Their overall perception of their comprehension of Shakespeare as a result of reading the graphic novel was mixed. Their work supports this perception of their comprehension as they were able to reference the graphic

novel slightly more often on their characterization worksheets, and just over half of them referenced both texts on their summative assessments. Furthermore, two-thirds of this group used visual literacy terminology throughout the intervention on their worksheets.

In addition to AP and honors-level English students, those students who favored the graphic novel included the only standard-level English students who participated in the study. Although most students indicated that they were interested in Shakespeare's work, a subset did say they were not as interested in Shakespeare and indicated that they were confused by Shakespeare's language. After the intervention, these students cited the graphic novel as a tool for visual learning. Most students in this group noted perceived gains in comprehension from reading the graphic novel along with the original text. Their work reflects this perception. Students in this group referenced the graphic novel substantially more often than they did the original text on their characterization worksheets. Moreover, on their summative assessments, most of these students referenced the original text, and almost all of them referenced the graphic novel. However, these students who support the inclusion of the graphic novel did have problems sustaining the use of visual literacy terminology throughout the intervention.

Discussion

The increased comprehension usually associated with the use of graphic novels did not apply to students who did not favor the graphic novel. These students' high level of interest in and comprehension of Shakespeare decreased the likelihood that they would need a great deal of scaffolding to comprehend the original text. Their work qualifies Cook's (2017) claims that graphic novels generally aid comprehension of the original text; it seems that students can reach a threshold for comprehension of the original text, at which point merely reading the graphic novel does not assist basic processing. Moreover, these students' conception of the graphic novel as a reductive, restrictive interpretation of the original text confirms the stigma associated with graphic novels in the ELA classroom, as discussed by Carter (2007). Their feelings of restriction due to the use of the graphic novel contrast with the generally positive attitudes of research participants toward these texts in previous studies (Cook, 2017; Moeller, 2015).

Students who were neutral perceived that the graphic novel offered a different perspective, an insight that aligns with Kress's (2000) arguments about the benefits and drawbacks of each mode in multimodal instruction. Students in this group were able to

acknowledge the options for interpretation of characterization with which the visuals in the graphic novel provided them, as well as the limitations of visuals in representing the characters.

Students favoring the graphic novel showed improved comprehension of Shakespeare, data that supports the work of Carter (2007) and Cook (2017) in illustrating how comics help readers understand material more clearly. Moreover, given the graphic novel's status as a multimodal text and an adaptation of a complex text, these students' increased understanding supports the literature regarding multimodal scaffolding as an avenue for comprehension of complex texts (Boche & Hennings, 2015). These students' positive engagement with the graphic novel also corroborates findings about students' enjoyment of graphic novels and multimodal instruction (Boche & Hennings, 2015; Cook, 2017; Moeller, 2015).

The results demonstrate that the students in each group used visual literacy skills in some capacity, whether they cited it in the form of visual learning, used the terminology of visual literacy, or critiqued the graphic novel as an interpretation with a specific "point of view" (Howells & Negreiros, 2012, p. 5). Given each group's engagement with the graphic novel in this fashion and the wide variety of instructional levels of the students, visual literacy clearly needs to become a sustained part of the curriculum in ELA classrooms.

Similarly, for graphic novels to gain traction in ELA classrooms, teachers must destigmatize the use of these texts in the classroom through the use of differentiation. However, crucial to this differentiation is that no approach to the use of multimodal instruction should be promoted as more advanced than another. Thus, the instructor should emphasize the fundamental differences between the graphic novel and other forms of multimodal instruction, noting that no one mode is superior to the others given the opportunities and drawbacks each mode affords.

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Finding the Hidden Curriculum: A Fan Fiction Project to Investigate Gender Bias

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In this study, students embarked on a fan fiction project meant to expose the gender bias in literature and to help them consider their personal attitudes toward gender. Gender bias can affect how students participate in class, the extracurricular activities they choose and even the careers they pursue (Goldstein-Schultz, 2016; Hartman, 2006). The hidden curriculum of gender does not ask students to question how gender bias functions in their community. Therefore, a fan fiction project with a focus on gender bias has the potential to move the hidden curriculum into the classroom where all students can interpret and analyze it. With this goal in mind, the following action research project seeks to answer the question: How does a fan fiction project affect students' understanding of gender bias?

Review of Literature

Fan fiction is when fans of different media genres write their own fiction that may fit into the universe of someone else's creation (Black, 2005, 2009a, 2009b; Jenkins, 2006; Jenkins, Purushotma, Weigel, Clinton, & Robison, 2009; Kell, 2009; Magnifico, Curwood, & Lammers, 2015). The concept suggests that consumption of media becomes production of media; reading or watching becomes writing in a participatory culture (Jenkins, 2006). Fans actively participate in the creation and revision of new material to interpret source texts rather than passively letting the stories end. Also called writing oneself into the story, fan fiction gives young (or old) writers the opportunity to investigate their identity in a way that is less risky than telling their personal story. In many instances writers empower themselves as heroes, write characters with different genders, sexualities or exceptionalities that are not often written into popular culture (Black, 2005).

Gender is a social construct about how sex traits are expressed (Hoffman, 2001; Schrock & Schwalbe, 2009; Weisgram, Dinella, & Fulcher, 2011). Hoffman (2001) states, "The gender ideology research ultimately reinforces negative associations with the words 'masculinity' and

'femininity' rather than reflecting an openness to explore diverse and possibly positively framed definitions of these terms" (p. 481). These negative associations with gender result in expectations of gender roles like a person telling a young girl that climbing a tree is not ladylike or telling a young boy that he is not allowed to cry because it is not manly (Hoffman, 2001). These limitations are social constructs that researchers have shown to be damaging to people's self-esteem, self-agency, self-concept (Carinci & Wong, 2009; Hoffman, 2001; Schrock & Schwalbe, 2009; Weisgram et al., 2011). However, as social constructs, these limitations are subject to change, and their reproduction is dependent on stereotypical influences in daily life (Hoffman, 2001).

The literature provided examples of intersections of fan fiction and gender in school. Fan fiction is a way for students to reconsider and reauthor texts to investigate alternatives (Black, 2005, 2009a, 2009b; Jenkins, 2006; Jenkins et al., 2009). Many of the texts on the school curriculum are representative of stereotypical gender roles (Applebee, 1993; Hartman, 2006; Lake, 1988). Yet, researchers who implemented fan fiction projects in schools assessed student engagement and achievement, not how the students changed the story (Kell, 2009; McWilliams, Hickey, Hines, Conner, & Bishop, 2010, Rish & Caton, 2011). Instead, teachers implementing curricula around the understanding of gender used gender non-conforming texts and the analysis of gender conforming texts (Goldstein-Schultz, 2016; Wasserberg, 2012). However, there seems to be a gap in the literature around the topic of teaching gender bias in schools using fan fiction as a pedagogical method.

Methods

This fan fiction project challenged students to write from the perspectives of different characters in *The Absolutely True Diary of a Part-time Indian* by Sherman Alexie (Alexie & Forney, 2007), and this study examined the impact of students considering alternative perspectives on their understanding of gender bias. For this project, students investigated the following characters: Mary, also known as Mary Runs Away; Junior's Mom; Junior's Grandma; Penelope; and Rowdy.

The assignment required students to produce a two-page work of fan fiction that investigated the perspective of a character in the text. Students were required to explore a perspective that was not already found in the text, by switching the narrative perspective, modifying a characters' gender, or changing the setting and/or time frame. The introduction to

this project was the pre-questionnaire and class discussion about gender roles. Once the pre-questionnaire was completed, the teacher-researcher went over the responses with students and had a group discussion about gender bias. Students completed pre-writing assignments, to consider how women are characterized in a book that is narrated in the first person by a male narrator. Once students completed the pre-writing activities, they wrote a first draft. This first draft was revised using a rubric, and then students submitted their improved fan fiction projects. On the last day of the unit, students completed the post-questionnaire and then the class discussed gender bias and clarified the term non-binary.

This study was conducted in the spring semester of the school year in a ninth-grade standard-level English I class at a mid-sized, urban, high school in the southeastern United States. Data comes from four students who opted to participate in the study. The researcher collected qualitative data by administering a pre- and post-questionnaire and collecting student artifacts, including fan fiction projects, pre-writing activities and post-writing reflections to triangulate the data. The researcher used constant comparative analysis with open, axial, and selective coding methods for data analysis (Corbin & Strauss, 1990). The researcher decided to code the student responses and artifacts according to stereotypical gender representation, atypical gender representation, or unbiased gender representation.

Results

The following section breaks down the results of this study student-by-student based on their questionnaires, pre-writing exercises and fan fiction projects. Student 1 is a male student. He had five stereotypical answers and two unbiased answers on the pre-questionnaire. On his post-questionnaire after the unit, he had eight unbiased answers and one stereotypical answer. In his characterization chart, Student 1's responses were mixed as he showed Penelope, Junior's Mom, and Junior's Grandma in relation to Junior, which represents stereotypical gender roles, but he did show unbiased views on Mary. This student chose to write his piece from a third-person, over-the-shoulder narrative from the perspective of Junior's best friend Rowdy. His fan fiction shows the contrast between what male characters say out loud and what they feel inside.

Student 2 is a female student who selected unbiased answers on her questionnaires, which showed minimal gender bias prior to the intervention. Her characterization chart responses were mixed with unbiased responses for Mary as well as a mixture of stereotypical and unbiased answers for Junior's Grandma and Penelope. Her answer for Junior's Mom was stereotypical.

Student 2 wrote a version of the chapter, "Dance, Dance, Dance," from Penelope's perspective as a first-person narrator. In this alternative chapter, student 2 chose only to show Penelope communicating with Roger, Arnold, and her father. This limitation in Penelope's interactions reflected what was described in the novel but did not add much depth to Penelope's character.

Student 3 is a male student who selected mixed responses of stereotypical, atypical and unbiased on his questionnaires. His responses to the characterization chart were also mixed. Student 3 wrote his fan fiction as an additional scene in Montana that was not written in the mentor text with Mary as his first-person narrator. There are stereotypical moments in terms of Mary's relationship to male characters, and value as a woman in her ability to bear children, but also unbiased moments of independence.

Student 4 is a female student and an English learner whose pre-questionnaire showed less bias than her post-questionnaire. Her responses on the characterization chart were unbiased for Junior's Mom and Junior's Grandma but she had a mixture of stereotypical answers for Mary and Penelope. Student 4 chose to write with Penelope as her first-person narrator and characterized Penelope's attitude toward Junior from the beginning of their relationship. She made the atypical argument that Penelope was uncomfortable with the unwanted attention from Junior.

Discussion

Of the four students in the case study, each showed different understandings of how to recognize gender bias in their questionnaires. Student 1 made distinct progress throughout the intervention, and the other three students had mixed results. The pre-writing activities showed a mixture of results in general. The male participants gave Junior's Mom and Junior's Grandma less autonomy than the female students. The students gave Mary the most autonomy of the female characters collectively, and Penelope, who represented a peer for these teens, was viewed with the most stereotypical bias as the pretty, popular high school girl. This description was a mostly accurate reflection of the novel, but it also pointed to the different ways in which teenagers spoke about characters who were representative of their peer groups than they spoke about older characters.

The choices the teens made in terms of what they wrote for their fan fiction projects showed comfort with younger characters as they chose Rowdy, Penelope, and Mary. Student 1, Student 3 and Student 4 managed to show more of their character's interior monologue separate

from the narration provided by the original text than Student 2. This ability to depart from the mentor text, even minimally, gave the researcher the ability to evaluate their biases in a more advanced way than Student 2. Student 1 spoke about the problems Rowdy faced when he did not have Junior for support. This male relationship where need is acknowledged showed an atypical attitude for Rowdy that was implied but not overt in the original text of *The Absolutely True Diary of a Part-Time Indian*.

The two female students gravitated toward Penelope and both touched on the love story aspect of *The Absolutely True Diary of a Part-Time Indian* in very different ways. Student 2 considered Penelope and Arnold's date at the dance, whereas Student 4 considered how the two people met and interacted at the beginning of their relationship. The fan fiction project provided a space for students to investigate these separate ideas about Penelope in a way that traditional assessments might not have provided (Black, 2005, 2009a, 2009b; Jenkins, 2006; Jenkins et al., 2009). Student 3, who wrote a deleted scene from the perspective of Mary, departed most from the original text. His story showed a mixture of bias around the trope of an unplanned pregnancy and Mary's subsequent reaction, which was strong and autonomous. This leap to write a deleted scene using the characters of the text showed advanced creativity and investigated a gendered experience.

The researcher could only draw limited correlations between the students' fan fiction projects and their understanding of gender bias. However, the written products do show consideration of masculinity and femininity even if students' understanding did not progress throughout the questionnaires.

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Poetry in the Classroom: Examining How Poetry Response Journals
Affect Student Engagement with Poetry

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According to *Bridging English* (Milner, Milner & Mitchell, 2016), there are four phases to engaging with poetry: finding, foraging, discovering, and probing. The authors suggest this final phase, probing, to be the act of analyzing a poem, examining its formal components to arrive at a theme or a meaning. Some teachers may skip the first three phases and go directly into probing. This approach gives students little time to interact with a poem in any sort of low-stakes fashion. In this study, the teacher researcher examined a pedagogy that incorporated writing and attempted to help students become more engaged with poetry while avoiding a move straight into the probing phase. Specifically, the teacher researcher sought to examine the effects of poetry response journals on students' engagement with poetry.

Review of Literature

Cantrell, Pennington, Rintamaa, Osborne, Parker, and Rudd (2017) define engagement as "participation and persistence in learning tasks and endeavors" (p. 55). Research suggests that a student's engagement has a relationship on their achievement. Meaning, their engagement with literature can have a positive effect on a student's comprehension (Cantrell et al., 2017). Gallagher (2010) suggests that to get students engaged, teachers need to bring back the concept of reading for pleasure. Beyond reading, writing is also understood as a tool to increase engagement (Bazerman, 2005). Writing to learn has been studied extensively, proving to be effective in the classroom to master content by providing a concrete way for students to engage with and learn the material (Bangert-Drowns, Hurley, & Wilkinson, 2004; Bazerman, 2005; Emig, 1977; Fry & Villagomes, 2012).

Probst (1994) found that the best way to help students in tackling text, poetry, literature, or nonfiction was to help them "find their own way through literary works" (p. 43) by teaching them how to ask appropriate questions. Questions provide students with a line of "inquiry that might guide without too tightly confining, that might support the students' readings without

dictating precisely what they will do with texts" (Probst, 1994, p. 43). These questions can help students "make sense of a text" while also helping students to foster the "crucial skill of metacognition — of thinking about their own thinking and monitoring the state of their emerging understanding" (Blau, 2014, p. 46).

Poetry can be the perfect vehicle for such inquiry; however, inquiries connected to poetry are sometimes difficult to find in the English classroom. For one, some English teachers have negative feelings about poetry, but they may also have difficulty finding a place for poetry in such a high-stakes testing environment (Hughes & Dymoke, 2011; Maranto, 2015). Yet, research shows that English teachers can use poetry to impact their students' engagement. For example, Young (2007) found that writing poetry helped students not only engage in the classroom but also in their community. By having students write their own poems, there was a level of buy-in not found when students were asked to simply analyze the poems. While Young found that incorporating the writing to learn method into the classroom via creative writing was beneficial to students, there is still something to be said about the importance of asking good questions (Blau, 2014: Probst, 1994). It is here where a gap in the research exists. Few studies exist where a researcher fuses together reflective writing with a writing to learn approach to poetry.

Methods

This study took place at an urban, public high school in the southeastern United States. The research setting was the teacher researcher's student teaching placement during the spring semester of the academic school year. All nine participants in the study were high school students in the teacher researcher's fourth period freshman seminar English class.

To begin the study, the teacher researcher gave each student a poetry response journal. Inside the journal was a direction sheet, five poems for the students to read, and an abundance of lined paper for students to record their reflections. The directions instructed the students to read each poem three times. After each reading, students were asked questions about their experience with and response to the poems. In addition to the five poems, students were instructed to find a poem each week on their own to apply these reading and writing techniques. The teacher researcher modeled the expectations for the whole group, writing about the poem in the same manner as the students.

The data were collected through three questionnaires (pre-, mid-, and post-study), student artifacts (the poetry response journals), and classroom observations. In looking at each student's

responses for all three questionnaires, the teacher researcher used constant comparative analysis to analyze the data. The analysis involved open, axial, and selective coding (Corbin & Strauss, 1990). These codes were then applied to the students' response journals. Once all data were coded, the researcher began to make sense of the codes by comparing the emerging themes to previous scholarship on teaching poetry.

Results

Over the course of the study, it became clear that each student was interacting with the poems in different ways. However, even with the abundance of experiences, many students shared similarities in what they took away from the experience. Some students felt that they were able to read poetry more accurately and more efficiently after working with response journals. Student I wrote "that the response journals helped her learn to read poetry better." She said that poetry "is not as hard for me anymore" and that she does not "dislike all poems now."

Overall, students felt successful when trying to determine the meaning of a poem. When students were asked if they felt like response journals helped them read poetry, all but one student indicated that the poetry response journals improved their understanding of poetry. For example, on her final questionnaire, Student A indicated that she was better able to "understand underlying messages" and that she could "pick up on figurative language better."

Other students discovered by the end of the study that they were enjoying the poems they were reading. Student E, for example, clearly stated that he had "come to enjoy some poems." Introducing a variety of poems for the students to consume and enabling them to find poetry on their own was instrumental in their change in attitudes. This was also important for Student E, who said, "I like poetry, I just don't enjoy doing it in class."

For many, the response journals were so different from how students have typically engaged with poems that it allowed them to read and explore poems without any pressure to come up with a right answer. Student B indicated on the pre-study questionnaire that her English teachers had made her write whole papers on small poems in the past and that she would need to "find why a poem about dogs represented the mac n cheese phenomenon." In her own words, student B indicated that she tries to read poetry "open-mindedly" and engage more "emotionally." She discovered that "certain types of poems fit certain types of people." From the start of the project, she met poetry with lots of sarcasm, but now she sees reading poems as fun and entertaining and not just monotonous work.

21

Another aspect of the study was the student's one-word descriptive ideas about poetry. Student D and Student E had the most dramatic changes from the group. Both students started by describing poetry with a negative word but were using positive words by the end of the study. Student D first described poetry as a chore. On his post-questionnaire, however, he described that he now thought of poetry as deep. He also said that when poems "are really deep [they] are good." Student E had a similar change of opinion. He initially described poems as confusing but ended the study by choosing the word fun.

Although most of the student participants noted that they thought the process was helpful or enjoyable, one student, Student H, had a very different experience. For this student, she felt like the poetry response journals put too much work on students, which made poetry less enjoyable. She said, "I used to get excited when teachers said poetry, now when teachers say it I want to cry. I like poetry on my own though."

Discussion

For this study, engagement was measured by looking at student attitude and motivation. Overall, all nine participants experienced some level of change in engagement. Unfortunately, while eight of the nine students had a positive experience, one student, Student H, did conclude the study showing a negative response to the intervention.

The teacher researcher found that students experienced a change in their enjoyment of poetry as well as a shift in understanding what poetry meant. For Gallagher (2010), pleasure was a key component in student engagement. He believes that students' desire to engage is directly tied to their enjoyment of the activity. Thus, students need to see poetry as something fun and enjoyable or they will not engage with it. The results of this study show that through this process students' enjoyment increased, thus illustrating an increase in engagement with the poems.

Another interesting aspect of the findings included a shift in perspective. Where some students came in thinking poetry was "difficult," "confusing," or "a chore," others understood poetry simply by its aesthetic properties or by its ability to transmit emotion. By the end of the study, seven of the nine participants were able to see poetry as more than one-dimensional. They acquired a more nuanced perspective of poetry. Many of the students saw poetry with a complexity that brought richness to their reading. For some, what used to be daunting or boring became interesting and deep. They were able to approach these deeper aspects of poetry with confidence, ending the study with more positive ideas about what poetry is or about what it could

be. The changes in the words they used to describe poetry supports the conclusion that there was a change in their attitudes or dispositions.

Another key component of student engagement is motivation. In their study, Cantrell et al. (2017) found that an indication of engagement was a student's persistence on a task, including how long they were able to sustain an activity. Students' persistence could be measured by how much they write in their journals. Looking at the student work, however, there was no clear change in how long the students were able to write and engage with the poems. Another way to increase motivation in a task is to add an element of choice (Cantrell et al, 2017). By giving students the ability to respond to a poem of their own choosing, the teacher researcher created a space for his students to feel a sense of ownership over their work and their learning. According to the data, eight of the nine students showed that they enjoyed selecting their own poems. This choice did help with their enjoyment of the poem and the task overall, and it created a positive space for the students to practice reading techniques. A small element of choice also helped to increase student's motivation to put effort into the response journals as well as to engage students with poetry in general.

One surprising benefit from the study was an increase in students' confidence and skill in comprehending a poem. According to the research, when students are well-engaged with texts, their ability to comprehend and create meaning increases (Blau, 2014; Cantrell et al., 2017; Probst, 1994). The results show clear growth in their comfort with reading poetry and in their comprehension of the poems. Seven out of nine students said that the journals helped them read and comprehend the poetry. The increase in comprehension is also shown in their one-word selections; for instance, Student D said, "A lot of poems have deeper meanings than you see at first glance." The work of Blau (2014), Cantrell et al (2017), and Probst (1994) supports that the success students showed in their poetry comprehension may indicate an increase in engagement.

It was clear from the results of this study that the response journals had an impact on the students. Journaling increased students' engagement with poetry, transforming their attitudes and perceptions of poetry as well as helping them to comprehend complex texts. What is not clear is whether the writing was a key factor in the students' transformation. In the future, researchers could design a project to test if the writing or the reflective questioning are key to engagement. The results of this study suggested there was an increase in engagement, but the data did not give

clear distinction as to whether it was due to the writing in response journals or that students had a new way to think about and process poetry.

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How Collaborative Writing Affects Students' Attitudes toward Writing

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For students to become better writers, practice is essential. Therefore, building students' motivation to write is of the utmost importance. However, this task is hard to accomplish when beginning writers are instructed that writing should be a silent and independent activity. Research has suggested that one potentially beneficial pedagogical intervention is collaborative writing (Begum, 2016; Bremner, 2014; Codling, Gambrell, Kennedy, Palmer, & Graham, 1996; Hirvela, 1999; Storch, 2005; Storch & Wigglesworth, 2007). However, very few studies have explored collaboration when students produce a written text together (Fung, 2010; Storch, 2005; Storch & Wigglesworth, 2007). As such, this study approaches the question: How does collaborative writing affect student attitudes toward writing?

Review of Literature

Motivation to learn is defined as "…the intention of acquiring the knowledge or skills that learning activities are designed to develop" (Brophy, 2010, p. 3). Brophy (2010) argues that motivation in the classroom is best examined through the framework of motivation to learn. Although intrinsic motivation is ideal, school is compulsory, and curriculum reflects what society dictates as valuable. While classroom activities can include choice and an authentic interest in the material, intrinsic motivation is usually accompanied by "…leisurely exploration to satisfy personal curiosity rather than sustained efforts to accomplish explicit curricular goals" (Brophy, 2010, p. 10). Under the constraints of a schedule and the pressure of standardized testing, these conditions may be difficult to provide, let alone sustain, in a classroom setting. As a result, working toward building student motivation to learn may be not only more effective but also more gratifying. By helping students find value and relevance in classroom activities, students will learn to use these benefits to motivate their participation and engagement with material that does not initially capture their interest or curiosity (Brophy, 2010).

Collaborative learning is based on the idea that knowledge is best gained by talking it out with our peers (Hirvela, 1999). From a social constructivist standpoint, learning is a social

activity regardless of context and ability level (Bruffee, 2007). When students work in groups, they provide each other with an authentic audience. The immediate feedback teaches students how to revise their work. Additionally, students are exposed to other ways of thinking and, as a result, engage in the material more deeply as they discuss and negotiate what they have learned thus far. Students are also encouraged to think reflectively as peers explain and defend their ideas to each other (Storch, 2005). Often, as knowledge is pooled together, collaboration with peers results in an end product that surpasses the quality of anything they could have produced individually (Stahl, 2006).

Research regarding collaborative writing has been found in the context of English as a Second Language (ESL) instruction. In this field, instructors firmly believe that "…students learn more effectively when asked to perform various tasks in pairs, small groups, and teams than when working alone" (Hirvela, 1999, p. 7). In ESL writing instruction, collaborative writing is often experienced in the form of writing groups, in which students provide one another with feedback from the perspective of a tangible audience. In English language arts writing instruction, the same pedagogical strategy of peer review is also used. Often collaborative learning is only utilized during the brainstorming and revision phases of writing. In a review of collaborative learning literature, Ede and Lunsford (1990) note: "Though these studies emphasize the importance of collaborative learning, all assume a single authorship as a model. Peers can work effectively at every stage of the writing process except for drafting…[S]tudents inevitably draft alone" (p. 9).

Methods

This study was conducted at a Title I, magnet elementary school located in an urban school district in the southeastern United States. Overall, the fourth-grade class consisted of twenty-three students. Data comes from the twenty-one students who participated in the study. All students in this class were identified as academically or intellectually gifted (AIG).

The collaborative writing activity for this study was the creation of a classroom opinion newsletter. Students were grouped in pairs or groups of three according to their common interests and their teacher's knowledge of classroom dynamics. Each student was given a black and white copy of the opinion newsletter, and each student group was given the opportunity to read their article aloud to the entire class.

All data collected for this research study were qualitative in nature, including pre- and

post-questionnaires, daily audio-recordings of student groups, and researcher field notes. Constant comparative analysis was used when coding the accumulated data. This involved open, axial, and selective coding (Corbin & Strauss, 1990). The teacher researcher coded attitudes toward writing, which were subsequently used to analyze the collaborative writing questions as the context through which attitudes toward writing either became more positive, remained the same, or became less positive. While five students (G, L, O, U, and V) experienced changes in their attitudes toward writing after writing collaboratively, the rest of the class did not demonstrate any shifts in their attitudes toward writing. Among these sixteen students who experienced no changes in their attitudes toward writing, five students (D, E, I, K, and P) expressed more positive attitudes toward collaborative writing after writing the opinion newsletter. Five students (A, B, N, Q, and T) showed no change in attitude at all, and the remaining six students (F, H, M, R, S, and W) experienced more negative attitudes toward collaborative writing.

Considering these results, the teacher researcher decided to focus on the groups of students who experienced no changes in attitudes toward writing, but more positive (Student Group A) and negative attitudes (Student Group B) toward collaboration. During the data analysis process, the teacher researcher began to realize that the effects of collaborative writing would be better understood through students' motivation to learn. Thus, the teacher researcher proceeded to compare the free response data from the pre- and post-questionnaires and identified themes in both student groups.

Results and Discussion

Through constant comparative analysis, student groups and their respective themes began to emerge. Student Group A, those who experienced no changes in their attitudes toward writing but expressed a more positive experience with collaborative writing revealed the theme of the knowledgeable peer. Student Group B, those who experienced no changes in their attitudes toward writing but expressed a more negative experience with collaborative writing, revealed the theme of negative feedback. Ultimately, the data reflected how collaborative writing affected student attitudes toward writing, but analysis of the data was colored by student motivation to learn.

Knowledgeable peers. Based on responses from Student Group A, a knowledgeable peer was often recognized for sharing great ideas, identifying what was wrong, making helpful

suggestions, and explaining hard or difficult concepts. When Student K wrote that they preferred to work in groups because "they can correct me and more," they were identifying an opportunity for immediate feedback that is not available when students write independently. Additionally, the social interactions that come with collaborative writing take advantage of students' zones of proximal development: "The pooling of diverse abilities provides interdependence for learners to co-construct knowledge and improve their writing skills to a greater extent than what they could achieve individually" (Fung, 2010, p. 23).

As such, teachers should think carefully and intentionally about how they group students when asking them to write collaboratively. Begum (2016) confirms that mixed ability grouping "...often boosts the achievements in the L2 classrooms in a non-threatening way" (p. 25). These opportunities to pool ideas and provide immediate feedback that come with a knowledgeable peer are also possible explanations for "...why pairs tended to produce texts with greater grammatical accuracy and complexity than individual writers" (Storch & Wigglesworth, 2007, p. 172).

Negative feedback. Based on responses from Student Group B, students suggested negative feedback involved judgement, dislike, being wrong, being picked on or made fun of, and unkind facial expressions. In this way, the immediate feedback that comes with collaborative writing may have negative effects. It can be embarrassing to share unpolished ideas with others. The students explained that "...sometimes they make fun of me," "...if you have something right maybe they disagree and they mark it wrong," "...they might juge [*sic*] me," "...other people may not like it," "...they laugh," "...they'll say everything's wrong," "they might judge my handwriteing [*sic*]," "...people sometime [sic] are mean and start to pick on you because of what you write," and "...I don't like when people are reading my stuff and make faces." A study conducted by Wilcox, Anstead, and Black (1997) corroborates these results by explaining that discomfort and apprehension toward feedback was fairly common in the intermediate grades.

Overall, when collaboration is at its best, "...engagement draws out the competence of each individual to create 'complementary' contributions... [However]...situations that involve sustained interpersonal engagement are likely to include strain and conflicts" (Fung, 2010, p. 19). As a result, it is essential that teachers create a learning environment "...where respect, rust, and care make possible not only publishable products but also rich and rewarding personal experiences" (Day & Eodice, 2001, p. 114).

Given that collaborative writing has little to no effect on student writing attitudes, writing may provide a great context in which collaborative skills can be pushed to grow and mature. In today's globalized world, it is even more essential that students learn how to work with others. Collaborative writing teaches students how to be "tactful, constructive, sympathetic, and firm all at once" (Bruffee, 2007, p. 172). Therefore, it is very important that educators remember that collaborative skills and strategies can be taught just like any other standard. Often, collaboration is taught through a sink or swim approach, leaving students with nothing but their own experiences to work with. According to multiple researchers, the most teachers do when facilitating group work is to assign student teams (Hansen, 2006; Snyder, 2009). In this way, students often face the same collaborative challenges repeatedly, without ever finding a more effective solution. In turn, collaboration may become a stressful means to an end. To fully take advantage of the benefits that come with collaborative writing, teachers must strive to set up their students for success. Teachers may want to make the quality as well as the growth in collaboration skills and strategies a major component of collaborative writing either through opportunities for reflection or as a part of their summative assessment.

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Best Practices for Educating Religiously Fasting Learners

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Abstaining from sustenance is an element of numerous religions. As a result, considering the effects of fasting on students also necessitates a call for pedagogical reevaluation. Studies have shown that regular caloric intake can improve student memory (Muthayya et al., 2007). When it comes to religiously fasting students, learners who choose hunger constructively and with deep religious intention, educators must ask themselves: What is to be done when the *effect* of a child's hunger, and not the hunger itself, is the problem? Can careful pedagogy intercede between a hungry student and a difficult day of learning?

As the most comprehensive religious fast undertaken by the lay people of a faith encountered in preparation for this paper—in terms of both duration and acceptable sources of nutrition—the Muslim fast of Ramadan will function as this study's primary example. While the studies cited here examine the effects of the Ramadan fast exclusively, by evaluating the consequences of the most comprehensive fast in both content and chronology, the cognitive effects of other fasts will also be accounted for. The conclusions of this study are most applicable to daytime fasts which preclude the consumption of both food and drink.

This paper is particularly aimed toward teachers in learning environments serving religiously heterogeneous populations. The purpose of this investigation is to determine an array of best practices for educating religiously fasting learners in diverse settings. This paper will explore the cognitive and behavioral effects of fasting among learners before providing an array of classroom, homework, and assessment policies to address the established needs.

Literature Review

To explore what practices may best assist fasting learners, it is first necessary to determine what cognitive and behavioral effects of fasting, if any, influence students' educational experiences. Some studies suggest fasting has no effect on cognitive processes (Harder-Lauridsen et al., 2017; Yasin, Khattak, Mamat, & Bakar, 2013). As this research delves into the cognitive and behavioral effects of fasting, it is worth noting that while religious fasts can be

community-oriented, learning during a fast must not be treated as a monolithic experience. The diversity of experience among fasting learners is demonstrated in Oosterbeek and van der Klaauw's (2013) findings: While forty-one percent of subjects reported studying fewer hours due to Ramadan, another twelve percent of subjects reported studying more hours for the very same reason. Though the remainder of this paper will operate on the premise that there are practices worth exploring in order to support fasting learners, more research is necessary to better define students' needs.

Farooq, Herrera, Almudahka, and Mansour's (2015) study examined the physiological and neurobehavioral effects of Ramadan fasting on eighteen boys ages nine to fifteen years old. Researchers were initially drawn to this question because "the potential negative consequences of Ramadan fasting on body composition, physical activity, sleep, and cognitive ability may impact [students'] ability to successfully engage in active learning at school" (Farooq et al., 2015, p. 890). The study found that the subjects' peak activity during the day shifted from 1:00 pm to 6:00 pm before Ramadan to 4:00 pm to 9:00 pm during the holy month.

Karaağaoğlu & Yücecan's (2000) study found that, of their 750 adult subjects, 34.3% of subjects self-reported behavioral changes while fasting. Among those who felt a shift in their daily behaviors, 83.7% felt fatigued.

Mizuno, Tanaka, Fukuda, Imai-Matsumura, and Watanabe's (2011) study of 148 fourth through sixth graders and 152 seventh through ninth graders concluded that fatigue was positively correlated with slow motor processing and decreased working memory within the fourth through sixth grade populations. Divided attention processing was positively correlated with fatigue within the seventh through ninth grade populations.

Oosterbeek and van der Klaauw's (2013) study seeks to explore the effect of fasting on Muslims in an academic setting in a majority non-Muslim society "in which teaching schedules and exam dates and times are not adjusted to Ramadan" (p. 220). The researchers examined the final grades, pass rates, exam grades, and attendance rates of assumed-Muslim students in four years of a microeconomics course. The study finds that each "additional week of Ramadan exposure reduces the final grade [of assumed-Muslim students] by almost 10% of a standard deviation" (Oosterbeek & van der Klaauw, 2013, p. 225).

Ho-Heng, Abdul-Rashid, Png, Mohamed, Yeo, & Ai-Li's (2011) study conducted regular testing at 9:00am and 4:00pm on eighteen, male seventeen- to twenty-nine-year-olds. The

findings indicated that the effects of the time of day on subjects' test performance were only significant during periods of fasting. The study found that verbal learning and memory were the most affected by a "time-of-day effect," in that scores indicated stronger processes at the 9:00am tests than the 4:00pm tests (Ho-Heng et al., 2011, p. 148).

Based on the four themes identified among the observed cognitive and behavioral trends among fasting subjects— the prevalence of fatigue, fatigue's relationship with decreased attention, potential decreases in short-term memory, and the "time-of-day effect"—it was then possible to examine educational practices engineered to minimize these obstacles to education.

Yavner (2016) investigates how experienced learners deal with fatigue in an academic setting. When subjects were asked about their ideal study method when they were not fatigued or stressed, the most common response was textbook reading. Under less-than-ideal circumstances, "students reported they needed more time and repetition under fatigue in order to learn new material" (Yavner, 2016, p. 94). Students also discussed strategic shifts from theory to applied practice as a "fatigue neutralizer" (Yavner, 2016, p. 107). Multimedia resources became more popular as students became more fatigued. Students mentioned that interactivity was essential to engagement and to the effectiveness of multimedia resources.

Based on Yavner's (2016) findings on the importance of flexibility in maximizing fatigued learning, the concept of a flipped classroom emerged as a possible approach to accommodation. Koo, Demps, Farris, Bowman, Panahi, and Boyle's (2016) study contrasted the results of two classes led by the same four instructors covering the same material: a standard lecture class in 2011 and a flipped classroom class in 2012. In all but one class meeting for 2012, students watched video lectures outside of the course to prepare for interactive class meetings which "focused on clarifying concepts and applying them" (Koo et al., 2016, p. 3). Between 2011 and 2012, there was a 21% increase in the number of students who earned an A or B as their final grade.

Methods

While this paper's topic was inspired by observations in a classroom setting, the ideas that inform this paper come from the synthesis of other scholars' dedicated research.

Four themes emerged from the existing scholarship on fasting and cognition: the prevalence of fatigue, fatigue's relationship with decreased attention, potential decreases in short-term memory, and the "time-of-day effect." For a cognitive or behavioral effect of fasting to be

considered a key theme, a comparable effect must have been observed by at least two studies referenced in the complete literature review. The prevalence of fatigue among fasters was investigated by Karaağaoğlu and Yücecan (2000); the relationship between fatigue and attention was established by Mizuno et al. (2011). Decreases in attention were also observed by Afifi (1997) and Farooq et al. (2015). However, Muthayya et al. (2007) suggest that regular caloric intake improved memory, but not attention, among young learners. The presumptive corollary to this finding is that abstaining from sustenance would similarly have little effect on learners' capacities for attention. The scholarship on fasting's effects on short-term memory capacity reaches an even more tenuous conclusion: Pollitt, Cueto, and Jacoby (1998) noted slower memory recall. Similarly, Ho-Heng et al. (2011) observed decreased working memory function among preteens. Farooq et al. (2015), however, noted a slight increase in working memory capacity. For this reason, the current study refers to this theme with reservation as *potential* decreases in short-term memory capacity. Elements of the time-of-day effect—identified by Ho-Heng et al. (2011)—were also investigated by Farooq et al. (2015). Karaağaoğlu and Yücecan (2000) also speculated that changes in periods of activity "are likely to have negative effects on the working life and school life of the individuals" (p. 130).

Given these four key identified themes—fatigue, decreased attention, potential decreases in short-term memory capacity, and the time-of-day effect—what educational practices and accommodations can be implemented to mitigate their negative effects on the learning process?

Results and Discussion

"While fasting students may display signs of fatigue in any one of their classes, special attention should be given to Physical Education" (Mirza & Bakali, 2010, p. 55). While it is obvious that fasting students ought not be made to undergo physical hardship, the quotation's first clause offers additional insight: fasting students experience consequences of abstaining from nutrition in all their courses. Yet, the current accommodations focus almost exclusively on students' bodily needs. The established practices seek to mitigate physically-evident effects of fasting: exacerbated hunger and bodily exhaustion. What less-obvious effects of fasting, if any, influence learners' experiences? Given that fasting students may experience consequences of fasting in non-physically demanding classes as Mirza and Bakali (2010) note, what elements of education must be adapted to best serve learners?

Tests should be administered either in the morning or as a take-home assessment. Of all the themes evident in the existing scholarship on fasting learners, the time-of-day effect is the most striking (Farooq et al., 2015; Ho-Heng et al., 2011; Karaağaoğlu & Yücecan, 2000). Based on the time-of-day effect, any in-school assessment ought to be scheduled for the morning when possible in order to be most representative of the student's acquired knowledge, as opposed to having that content mastery being clouded by issues of hunger and fatigue.

Teachers should provide multimedia resources with interactive components over textbook reading and craft opportunities for applied practice. As experienced learners, Yavner's (2016) subjects had the flexibility to self-select study materials, were cognizant of their material mastery strategies, and were able to articulate the ways in which they crafted accommodations for themselves in instances of fatigue. These students' enumeration of their needs when attempting to master new material when fatigued—the opportunity for a more flexible timeline, the opportunity for increased repetition of information, interactivity, and the opportunity to apply their knowledge—is significant. Based on Yavner's findings, this paper recommends the use of engaging after-school assignments in which students may interact with new material and apply the concepts they have learned. In keeping with the theme of interactivity, the use of manipulatives is encouraged.

Given the findings of Koo et al. (2016), this paper recommends a flipped classroom system. Where the technology is available, a flipped classroom would greatly benefit fasting students. Shifting instruction to the evening would also benefit fasting students in two ways. First, students would have the flexibility to encounter the new material after they have broken the fast and have more energy. Second, students who choose to study before their peak energy times would have the flexibility to allocate the time for repetition necessary to effectively master the material while fatigued—a freedom of self-direction that may be impossible in a crowded classroom. By operating a flipped classroom, educators can mitigate the time-of-day effect by employing greater student choice regarding the manner in which they receive instruction and by designing a hands-on classroom in which students come in ready to apply content. Instructors are advised to craft accommodations around the principles of interactivity and flexibility of time.

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Critical Literacy and Argument-Based Writing in Social Studies

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An abundance of research demonstrates that critical literacy pedagogy provides students with the necessary skills to analyze and evaluate language thoughtfully and empower their voices both inside and outside of the classroom (Gorlewski, 2011; Harshman, 2017; Wolk, 2003). Critical literacy can be defined as "a pedagogical approach to reading that focuses on the political, sociocultural, historical, and economic forces that shape young students' lives" (Soares & Wood, 2010, p. 487). Further, critical literacy education allows teachers to help their students "question the dominant power themes in our society and world, such as racism, sexism, corporate and media hegemonies, and the effects on the environment of individuals and systems" (Wolk, 2003, p. 102). To that end, writing can serve as a powerful tool for promoting critical literacy and empowering student voices in social studies (Bean, 2011; Monte-Sano & De La Paz, 2012; Sielaff & Washburn, 2015).

Literature Review

Teaching critical literacy involves questioning a text beyond the explicit information it contains and asking students to consider multiple interpretations or the rhetorical goals of an author, are fundamental components of critical literacy education (Jaeger, 2016; Pescatore, 2007). Also, Soares and Wood (2010) argue that students must "search for those voices missing or silenced in texts and bring them to the forefront of the classroom to agree or reject the author's point of view" (p. 488). Many students who belong to traditionally marginalized groups related to race, class, gender, sexuality, or religion, may find that their voices have been, and in some ways, continue to be devalued or misrepresented (Misco & Shiveley, 2016).

Research shows that a student's ability to identify central arguments, claims, and evidence when reading a text, and their ability to compose an effective written argument based on intertextual evidence, are among the most crucial skills for later academic success (Graff, 2010; Hillocks, 2010). However, research conducted by Applebee and Langer (2011) demonstrates that many students throughout middle and high school struggle to make informed,

critical judgments about written texts. Many high school students are still building the cognitive and metacognitive competencies required for effective writing; therefore, research suggests that effective supports around persuasive writing help scaffold students' skills and improve writing outcomes (Applebee & Langer, 2011, p. 45).

Specifically, in social studies education, research conducted by Sielaff and Washburn (2015) investigated the effects of teaching a planning strategy for argument-based writing, on writing performance among ninth-grade social studies students. The PEA (Point-Evidence-Analysis) strategy used in the study was designed to include each area of an effective argumentative response, and the results demonstrated significant improvements in students' writing skills and self-efficacies (Sielaff & Washburn, 2015, p. 179).

Finally, Dingler (2017) argues that democratic societies require citizens who possess and practice effective argumentation. The author states, "The strength and endurance of a democracy is predicated on the ability of its citizens to critically approach, and discuss, important events and ideas" (Dingler, 2017, p. 111). Further, argumentative writing instruction provides students opportunities to engage in civic discourse around important societal issues. Pescatore (2007) argues that the combination of critical literacy and current events equals "empowering literacy." The author explains that by helping students consistently focus on elements such as point-of-view and tone in their approach to news articles, students become increasingly more aware of potential biases and political motivations embedded in various sources.

This study seeks to determine the extent to which strategies to improve critical literacy through students' analysis of multiple sources impact critical thinking and analytical writing. Specifically, how do reading and writing tasks designed to foster rhetorical understandings of texts, impact critical thinking and analytic writing among high school social studies students? Further, how do those strategies affect students' attitudes and self-efficacies related to their critical analysis and writing abilities?

Methodology

The research was conducted among students my honors level tenth grade civics and economics class. Based on the total number of returned consent and assent forms, the total sample size was twenty-two students. The research used a mix of both qualitative and

quantitative data collection techniques including pre- and post-tests, pre- and post-surveys, and classroom observations.

During the unit on law and justice, I provided students with a pre-test writing assessment to determine their ability to analyze an article about the controversial stop-and-frisk practices in New York City. The essay prompt asked students to make a critical claim about the text and support their argument through their use of textual evidence. The essays were collected, reviewed, and assessed according to a grading rubric. The research period concluded with a post-test assessment, and both essays were graded according to the same rubric and focused on six key areas: thesis, reasons and evidence, analysis, organization, voice and style, and conventions.

The class engaged in a discussion about critical literacy and its role in social studies, citizenship, and democracy. I devised a question guide for critical and rhetorical analysis, as well as sentence stems for supporting students use of academic discourse. Additionally, I taught a planning strategy for argument-based writing and provided students with a graphic organizer to aid their implementation of the strategy. Lastly, I also compiled a series of field notes to document my observations as students learned and implemented the strategies.

Results

The research sought to measure student improvement and attitudes associated with two main areas: (1) critical thinking and rhetorical analysis (2) argument-based writing and use of academic discourse. Therefore, the results are presented by first outlining the quantitative and qualitative data used to measure improvement in each area, which are derived primarily from pre- and post-test writing samples from each student.

Overall, students demonstrated improvement in both critical thinking and writing ability from the pre-test writing sample to the post-test writing sample. For the six grading criteria, students could receive a maximum of five points for each category – a total of 30 points for the whole essay. The class average for the pre-test essay was 15 points, and after teaching the critical literacy and writing strategies every student demonstrated at least some improvement on the post-test essay. Further, the class average for the final essay was 23.27 points. Upon calculating the change in each student's total scores, students improved 7.27 points on average.

To measure improvement in students' critical thinking and analysis skills, the grading rubric included three criteria: (1) quality of the thesis statement (2) reasons and evidence (3) analysis. Overall, students demonstrated the most improvement in the reasons and evidence

category – with a 1.68-point change in the class average between pre- and post-tests. Students also improved in each of the other areas. The data demonstrates a 1.36-point change in analysis and a 1.27-point change in the quality of thesis statements.

Additionally, qualitative data analysis from the post-test essays revealed that student's theses contained arguments that were more specific and based on textual evidence. Students demonstrated the most improvement in the reasons and evidence category. Despite each prompt asking students to use textual evidence to support their points, very few students provided any direct quotes from the authors in their pre-test essays. While one student did not use any textual evidence in their pre-test essay, their final essay effectively integrated quotations from the articles to support their points. Moreover, the analysis criteria of the grading rubric assess a student's ability to demonstrate thorough and logical reasoning, interpret evidence with insight, and communicate genuine engagement with the text. To that end, students demonstrated significant improvement between the pre- and post-tests.

To evaluate student improvement in academic writing, the grading rubric included three measurement criteria: (1) organization and paragraphs (2) voice and style (3) conventions. Of the three categories, students demonstrated the most improvement with organization and paragraph form and sequence. For the category organization, students' pre-test writing samples averaged 2.55-points, while their post-test essays averaged 4-points. The class average for all student essays also demonstrates an overall improvement for each of the other categories; including a 1.36-point improvement for voice and style and a 1.13-point improvement for conventions.

Further, qualitative data analysis from each student's pre-test writing assessment revealed that although most students structured their essays into paragraph form, many students did not organize their ideas into cohesive paragraphs that centered on a single point. Many essays lacked effective transitions and/or an appropriate introduction and conclusion. However, an analysis of post-test essays demonstrate that every student improved their ability to organize an essay effectively. Next, essays were graded on a student's use of appropriate voice and style, and specifically, their use of academic discourse appropriate for argument-based writing. Throughout students' post-test essays, students used more sophisticated and precise language to communicate their ideas and analyses effectively.

Finally, while students learned the strategy for argument-based writing, class observations demonstrate that they began to acquire a greater understanding of how they should

construct an essay. Their questions revealed varying degrees of familiarity with academic writing, and as students made use of the sentence stems guide, they were able to articulate their points and analyses in more effective ways. Most students at all levels of ability, made substantial efforts to use the strategies and writing supports. Although all students improved, the greatest improvements came from students who scored toward the middle on the pre-test essays.

Regarding students' attitudes and perceptions, the data revealed that most students indicated that the instructional intervention was useful and that they would use the tools provided for future assignments and classes. Results from both pre- and post-survey data and classroom observations showed that although many students think it is important to consider the sources they read through a critical lens, fewer students perform this practice when presented with information The data show substantial diversity in students' self-perceptions related to their own critical analysis skills, and the results suggest that some students who were unsure about their critical analysis abilities, may have change their perceptions after the intervention.

Finally, data from post-survey questions demonstrate students' attitudes toward the critical literacy and writing strategies used in the research. A total of 15 students surveyed indicated that they either agreed or strongly agreed that they feel more confident in their ability to critically analyze a given text. Moreover, 16 out of 22 students (approx. 73%) agreed or strongly agreed that they found the PEA writing strategy helpful for constructing an argument-based essay. Lastly, 13 out of 22 students indicated that they will probably use the critical analysis and writing strategies on future assignments or in future classes.

Discussion

The present research conducted in one social studies classroom yielded results consistent with the current literature on critical literacy and writing pedagogy in social studies. Realistically, efforts to foster dispositions for critical literacy and questioning are unlikely to reveal their full impact over the course of a single study conducted within a relatively short period of time. However, the primary goal of my action research was to determine the extent to which certain tools and pedagogical strategies for teaching critical literacy and writing affect students' abilities to question the functions of information, deconstruct their own assumptions, and empower them to use writing as an alternative practice of constructing knowledge.

Although additional research is needed to answer questions about the long-term effects of writing and critical analysis strategies on students' lasting dispositions toward critical literacy

practices beyond the classroom, a couple formative conclusions emerge from the current research. First, writing can be used as a method of instruction and assessment to improve and evaluate students' abilities to think critically about a given topic or text. Second, in order for teachers to help students fully realize the benefits of writing in secondary social studies, they need to invest considerable efforts to teach supporting strategies that enhance student successes, self-efficacy, and engagement. Through writing, students have powerful opportunities to use their voices to challenge oppressive systems and practices by actively engaging as equal participants in the construction of knowledge.

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The Effects of Arts Integration on Attitude and Achievement in Mathematics

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Teaching styles that promote a fixed mindset fail in fostering student's conceptual understanding of material, as it forces students to resort to basic understanding and memorization. A fixed mindset is the belief that you are born with certain abilities; one's ability to learn is based off their inherent advantages. Individuals with fixed mindsets believe that a student may be unable to learn because of an inherent disadvantage in a discipline. We have heard countless times, the fixed mindset belief that "I am just not a math person." As opposed to a fixed mindset, a "growth mindset is based on the belief that your basic qualities are things you can cultivate through your efforts" (Dweck, 2006, p. 16). It is vital for our students to approach learning with a growth mindset to develop ownership of the learning process as well as conceptual understanding of material. By encouraging students to recognize that their intelligence is not fixed, and by using teaching methods that reach all types of learners, we can promote a love of learning optimism, and conceptual understanding.

Autin (2007) argues that motivation and understanding the purpose of mathematics will make the learning process more concrete. Engagement is emphasized in Autin's research, as he believes arts-based projects encourage creativity and appeal to a child's desire to play. As a result, these projects motivate children to learn difficult concepts such as fractions. Because the arts encourage individual expression and creativity, arts integration within all subjects encourages a child's sense of play. Rather than changing the standard of success for struggling students, Autin recognized a need for a more engaging method that would reach all learners. This study took place over the course of three days, and two groups of students participated in the collaborated project and unit lesson. To teach multiplication of fractions in an engaging manner, the researcher paired with an art educator to observe two groups of students in a mathematics and art unit, where students constructed a kite using proportions. The unit used Chinese kites and kite patterns to teach fractions through an artistic lens. When assessing achievement, quantitative data, obtained through test scores, showed significant growth. Qualitative data was obtained

through field notes and interviews with students. The researcher observed attitude growth in motivation and interest. Ultimately, Autin concluded that motivation was key in fostering enthusiasm for mathematics, and arts integration contributed to this motivation. In my own research, I focus on arts integration on student attitude and achievement in mathematics. My research addresses the question, "What are the effects of arts integration on student's attitude and achievement when learning to add fractions?"

Methodology

This action research study was conducted in the spring of 2018 in a school district in the southeast. Data was gathered from a fourth-grade class at a Title I school with 610 students. The study investigated the effect of arts integration on attitude and achievement in mathematics. Data was collected over five days, where pre and post tests were given on the first and last days of class. Lessons on each of the five days were 60 minutes long. During these lessons, students learned how to add fractions with like denominators by engaging in activities that were integrated with the arts. Lessons included activities in choreography, graffiti art, and the visual arts.

The first lesson of the intervention reviewed concepts of basic fractions, finding equivalent fractions, and simplifying fractions. Students had learned this material earlier in the year and the previous year in third grade. On the first day of the new material, the researcher used Frida Fraction, to introduce adding fractions with like denominators. Students then engaged in a learning activity by creating Lego sculptures. Graffiti art was used as a lesson activity on the second day of the new material. Students created fraction addition equations using their own pieces of street art. Students then created their own fraction addition equations and switched with partners to solve. The choreography lesson asked students to work in groups when choreographing their individual dances. Students assisted one another when recording the steps for their dance. The lesson encouraged students to think of ways to make their dance into a fraction addition equation. In this problem-based learning activity, students concluded one method of creating a fraction addition equation, was to use the total number of steps in their dance as the denominator and combine the number of steps on two different colored squares to find the total number of steps on those two colors.

Each of these arts integrated learning activities allowed students to engage in the curriculum to develop conceptual understanding. Data on attitude for this study was collected

44

through researcher field notes, student artifacts and researcher-created pre/post attitude surveys. Similarly, data on achievement was collected through researcher-created pre/post achievement tests, student artifacts, and researcher field notes.

Data analysis included a qualitative analysis of open response question on pre and post attitude surveys. Pre and post surveys were also analyzed quantitatively. This was done on questions that included a yes or no response. Quantitative analysis of pre and post achievement tests was done to measure student knowledge of adding fractions. Artifacts were gathered to check for student understanding and were used as examples of class work. Teacher notes were used to analyze class discussions, informal formative assessments and student quotes.

Results

Over the course of the five-day intervention period, themes emerged in both student attitude and achievement. Students reported feeling more confident in their mathematics ability and expressed an increase in enjoyment of class activities when mathematics was integrated with the arts. Furthermore, when teaching addition of fractions with like denominators through the arts, students learned the material. To assure the privacy of students, when students are individually referred to in the following results and discussions, numbers 1-15 will be used rather than the student's given names. These numbers correspond to those mentioned in the Pre and Post Assessment Scores.

Students completed pre and post attitude surveys, before and after the five-day intervention to provide data on student interest in the mathematics content when taught through the arts. In the post assessment survey, 100% of students reported "liking the way we learned math this week," while 87% stated "yes" to the pre-assessment question, "Do you like math?" 87% of students responded "yes" to the question "If you were able to always learn math like we did this week, do you think you would like math more?"

Though the free response data across the students was overwhelmingly positive, when asked about their attitudes towards the activities, a few students commented on the level of difficulty. Student 2 reported "It's too much work and it was a lot of using your brain for math problems". However, at the end of the week this student grew 300%.

Researcher field notes and images were collected during each lesson, compiled and reviewed at the end of each day. Through the course of the five-day intervention period, trends

began to emerge in student interest. The researcher noted that students were on task and engaged in their work.

Data gathered from the researcher's pre and post-test assessments provides evidence of student growth in achievement during the intervention period. After calculating the pretest and posttest means in assessment scores, the researcher found an average growth of 22%.

Across the five-day intervention period, formative assessments recorded in the form of student artifacts expressed student growth in their ability to accurately create and solve equations. Students were able to create fraction addition equations, switch to solve each other's equations, as well as solve equations that were given by the teacher.

Discussion

The results found in this study included similar themes to those found in the studies conducted by Simpson (2016), Braniff (2011), Iona (2014), and Cunnington (2014). Themes included growth in non-cognitive factors, student engagement and alertness, cross-cultural insights and growth in low performing students. However, unexpected results emerged in the research as well.

When introducing the arts into the classroom, students were given the opportunity for cross-cultural insights. This idea was used by the researcher to encourage culturally conscious teaching. A brief history of Frida Kahlo was given during one of the lessons, as "Frida Fraction" was used as an engaging character to introduce the content. Many of the students had Hispanic backgrounds and some recognized the artist. This gave these students the opportunity to share their knowledge of their culture with other students in the class. Furthermore, as a low-income school, many of the students live around the poverty line and are familiar seeing graffiti in their neighborhoods. After pointing out the legal difference between street art and graffiti, students created their own street art on pieces of paper. Students expressed enjoyment in this activity and spoke on their own experiences seeing street art in their own neighborhoods. These results in my research agree with Iona (2014) who also found that arts integration encouraged students to draw relationships between cultures.

Communication and collaboration skills were used when presenting fraction equations and art pieces to the class. The researcher's results reflect that of Simpson's (2016); growth in non-cognitive factors such as social skills were found when integrating the arts with other content. The choreography lesson gave students the opportunity to use movement in their

learning process. Movement through the classroom activity impacted student engagement and as a result, classroom management, which contributed to academic success and positive student attitude. Braniff (2011) saw similar results, as their research points to the impact of movement on student's alertness and attention.

Students who typically struggled excelled more than they usually did in mathematics when being taught through arts integration. Furthermore, low performing students expressed high interest towards material and reported enjoying activities. Therefore, struggling students not only achieved high scores, but were more interested in learning the content through arts integration. This is similar to Cunnington (2014) who noticed the ability arts integration methods had in reaching lower performing students.

Arts integration proved to be an effective teaching method, as students showed mastery of concepts and strong levels of growth. The arts integration method reached some of the hardest students, those with learning disabilities who typically struggle the most with math concepts. Because this population was more engaged, they reported higher levels of growth than normal. Teaching through the arts is not only an important method when growing student engagement levels among all students, but even more-so because it reaches students who typically struggle with the material.

Many of the activities encouraged communication, collaboration, and other 21st Century learning skills. Further research should be done to study the role of 21st Century learning styles, student metacognition, and culturally relevant pedagogy when the arts are integrated with content, as the arts inherently addressed these skills. Teaching adding fractions with like denominators through the arts achieved both student academic growth and growth in attitude. More research is needed to understand the long-term effects of arts integration in math and other content areas.

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Intertextuality: How the Intrapersonal and Interpersonal Intelligences
Affect Students' Engagement with Texts

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Gardner (1999) states that personal intelligences, and specifically intrapersonal and interpersonal intelligences, which are all part of the Gardner's (2011) Theory of Multiple Intelligences, allow a person to form connections with two different parts of the individual, the social and the self. In doing so, the goal should be to guide the student to see, form, establish, and understand the methods of collaboration, communication, and critical thinking. Moreover, in asking how moments, including related events and locations, pertain to the self, individuals allow themselves to develop a realistic view of their perspective as well as to understand their moods, motivations, and desires (Kincheloe, 2004). Therefore, if educators hope to create an environment that is empowering and shifts attention from a whole-class focus to an individualized form of teaching then the formation of the personal intelligences is critical. Due to the importance of individualized instruction, it is pertinent to question how students make connections with the text and, more importantly, how teachers create pedagogical approaches that consider students' intrapersonal and interpersonal intelligences.

Review of Literature

When students view literature, in all forms, they should see it as an empowering tool that addresses issues of life and the struggles through which they, or others, have endured. Literature should be an active tool within the classroom in order to shift the perspective of the reader into an ongoing form of learning that is not only empowering but also enables the student to move from a superficial approach to an interactive member of the audience or reader's world. Milner, Milner, and Mitchell (2017) describe that literature offers students an opportunity to create an intersection of art and education. The goal of the educator should be to help the student move from personal response to interpretation through their own critical perspective enabled and structured with the influence of thoughts of other members of their learning community. In this

way, the student should begin to think as an individual and then build connections with what is happening in the world around them.

Gardner (2011) introduced the Theory of Multiple Intelligences as a part of the individualized approach to learning in his book *Frames of Mind*. The intrapersonal intelligence creates an opportunity to engage with the inner self, considering reasoning and thought, which may be developed further to present a strength in which comprehension and emotions may overlap. The self, that inner most feeling, should be a driving factor in creating connections to text or to the world, building a sense of sympathy, empathy, and individuality. The interpersonal intelligence focuses on what is happening outside of the individual. The elements of the interpersonal intelligence are the capacity to make distinctions between individuals, the ability to detect changes in others, the proficiency of reading motives and desires, and the talent to use these insights to influence an action from a group or individual. The ability to see and be seen can allow for emotions and the inner parts of the individual to become evident and further develop to form character, not only one that is portrayed through literature but also as a part of everyday life (Ellison, 2001).

So then, how do we create a space for students to share and connect these thoughts and feelings with what is happening around them? As an individual, the student should be introduced to their own ability to think and speak in order to build their ideas in an informed fashion that addresses, or acknowledges, the opposite point-of-view. However, the vital components of making a connection with the self should include understanding the power of individuality and building collaborative opportunities in order to bridge the academic setting into the everyday life. In this way, the student should be able to acknowledge the intrapersonal and interpersonal elements of thought. When students are asked to write a reflection on what has been read or has been discussed, the teacher's role is to offer questions that are not only challenging but also allow students to produce their own reflective work. Charles (2010) suggests the importance of acknowledging the "I" in writing. The student is able to engage with the reading, move from a plethora of thoughts into this individualized perspective of the "I." This "I" becomes the soul reason for the writing, the reading, and the teaching. With the building of the "I" comes the incorporation of themes and ideas that allow for the overlapping of pedagogy, personal intelligences, and intertextuality.

Methods

The research setting consisted of an Advanced Placement Literature and Composition class, a course that focuses primarily on advanced literature. In this class, students are expected to produce college-level work, including but not limited to weekly essays, annotations, summer readings, novel readings, and other activities as recommended by College Board. This study consisted of sixteen students who returned consent and assent forms required to partake in this study. This study took place over the course of a unit during which students were asked to complete a daily journal entry where they reflected on how they formed connections with the text. Some of the guidance provided for reflection included how the students felt while they were reading, what they believed other people were feeling around them, how and whom they associated with throughout the reading, and how these reflections helped them understand the text. In addition, students were asked to complete annotations on their daily reading assignments.

For the purpose of this study, the teacher-researcher used the novel *The Color Purple* (Walker, 2006) in addition to supplementary materials. This novel speaks about social dynamic through the story of a black woman, Celie. As a young child, Celie learned to read and write, and soon after was removed from the school to help at home. Her father not only took her away from the academic setting but also abused her sexually, mentally and physically. This abuse resulted in two pregnancies, and her father then took the two newborns away. Celie came to despise men in her life and thus began her search for identity. As a part of this study, the students read Walker's *The Color Purple* in combination with poems and excerpts from other texts.

For this research study, multiple data sources were collected for the sake of triangulation: pre- and post-questionnaires, student journals, student essays, and the researcher's observational notes. The teacher-researcher used constant comparative analysis for coding the accumulated data from student artifacts. This analysis involved open, axial, and selective coding (Corbin & Strauss, 1990).

Results

Findings from this study respond to how the teacher's use of the personal intelligences (interpersonal and intrapersonal) as a pedagogical guide affected students' engagement with texts within the secondary English classroom. Through constant comparative analysis, several themes emerged from the data in response to students' reflection and pedagogical processes. To begin, the teacher researcher analyzed the students pre- and post-questionnaires, and trends were

highlighted that connected three or more of the participant responses to become a category. These categories were used as tools to analyze the data gathered through the different class activities. In doing so, the teacher researcher noted the differences in responses, the connections made in the writing, the structure of their response—meaning what they connected to, how, and when—in order to further understand the effects of the activities on student engagement. After completing this overview of the information, the teacher researcher used the findings to create codes to help understand what took place in the classroom and create themes from the data. These themes were used to describe and discuss the results collected throughout this study. The themes that arose included: critical thinking through connections and journaling; the role of the interpretive community; and the influence that both journaling and the interpretive community had on personal development.

Many of the class discussions that took place were based on the connections between film and text. These connections drew discussion on characters' searches for identity, power and control. While journaling, students described their anger and frustration with the inability of Celie to defend herself. Throughout this study, students were asked to consider how they have been able to engage with the text. As part of the post-questionnaire, students were asked, "Has the journaling, guided questions, and reflection time on the material helped you process the overarching story, poems, and activities?" Students offered different responses, twelve of which described reflection as beneficial.

The concepts of identity, individualization, and communication were described to be the biggest influences on student engagement with the materials. In order to better understand the novel, the students were asked to think about the meaning of the word limitation and then analyze this concept in relation to the character of Celie. This was the guide for discussion in which students were asked to consider limitations in their own lives in connection with limitations that Celie experienced as a character and how she grew out of it.

While journaling, students described their anger and frustration with the inability of Celie to defend herself. A third of the students wrote that they found it appalling to see domestic violence represented in such a vivid from. In addition, some of the words used described their emotions were "sorrowful," "confused," and "deeply sorry." These thoughts and ideas were then equated to the thought of Celie being traded like an animal when Celie's father lets Mr.__ take her along with some animals. In addition, throughout the study, students were asked to describe

the transitions that characters go through and what love means—especially for Celie. In their journals, students described love as an emotion that can be given to an individual, it can be a "bond" that helps two people get to know others, and it is a "selfless act" that may or may not be understood.

The personal intelligences reflect comprehension of the individual's abilities and strengths, combined with socio-emotional development, that allow students to engage others through class discussion. Students responded to the question, "If reading a novel alone, do you think you would make the same connections as you did with the whole class discussion?" Students responded that they were able to form better connections with the text due to the diverse perspectives of their peers. Students also mentioned their ability to understand that what was taking place in the novel was based on what their peers had been discussing.

Discussion

This study began as a way to approach literature in hopes of finding better avenues to serve students and help them engage with texts. Intertextuality, the personal intelligences, and reflective journaling were the conduit through which students could approach material in a way that helped them process, connect, and interact with materials and each other.

As a part of this study, the teacher researcher offered opportunities for students to further develop their intrapersonal and interpersonal intelligences—the way they see and think combined with the way they perceive those around them. As mentioned in the results section, students frequently described their engagement with text and their use of other people's ideas as a basis for forming their own thoughts. By reading, analyzing, and discussing, the students were able to engage with the material, understand what was taking place, and further comprehend what was happening in their world in relation to those around them.

By forming this dialogue, students were able to have an ongoing discussion that not only considered the effects that society had on Celie but also the other characters within the novel. Objectification, beatification, racism, and faith were only the beginning of the discourse within this study. Students' engagement was measured through in-class activities, though some of the students stated in their post-questionnaires that they were actively communicating with others around them in order to understand what was happening within the readings.

This study showcased the effects that intertextuality had on students engaging the personal intelligences in a way that further develops the character. Character, therefore, becomes

both the individual—the reader—and the person who is part of the story. This story became a part of the class discussion, in which the students as well as the teacher-researcher were able to observe changes, describe situations, and analyze how these various moments affected the Celie's development. By allowing these moments to become a part of the classroom, the class not only became a part of Celie but also became an opportunity to develop the emotional intelligence, which describes emotion as a guiding force of actions and conversation (Ellison, 2001). Thus, this study showed how intertextuality, the personal intelligences, and the emotional intelligences can play together as students engage with texts and decipher how the texts can be a part of their own story as well.

This study demonstrated that students' engagement with texts was affected by the classroom interaction—the interpretive community through collaboration and communication. Thus, the influence of the classroom culture played a large role in how the study took place. By allowing the students to interact with each other, they were better able to (1) understand what was happening—plot, (2) analyze the characters—character development, and (3) demonstrate the effects of intertextuality by relating the text to other literature and their lives. By offering students an opportunity to reflect on the emotional connections from their own perspectives as well as those of their peers, the students were able to relate to the literature, the poetry, and their classmates. In this way, engagement with the text was further enabled by presenting students with the opportunity to discuss, write, and reflect on what was taking place within the novel.

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"It's Definitely Fake": Using Historical Sources to Support Media Literacy in the High School Social Studies Classroom

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On June 13, 2017, President Donald Trump tweeted, "The Fake News Media has never been so wrong or dirty. Purposely incorrect stories and phony sources to meet their agenda of hate. Sad!" (Trump, 2017). More than a year later, Trump has tweeted using some variation of the term "fake news" 245 times while president (Trump Twitter Archive, n.d.). "Fake news" has been defined in various ways over the years, referring to satirical news shows (Marchi, 2012) as well as more recently to news coverage that is "intentionally and verifiably false, and could mislead readers" (Allcott & Gentzkow, 2017, p. 213). To further complicate the term, we also see "fake news" used as a label to discredit more mainstream media outlets, as can be seen in Trump's tweet. It is a complicated world of information where people are increasingly questioning if they can trust what they are seeing, even if the information is labeled as fact. While calls for media literacy instruction in school are not new (Masterman, 1989; Thoman, 1999), these conditions perhaps increase the urgency of these calls as teens report a preference for non-traditional news sources that provide an interpretation of news and not just the facts (Marchi, 2012). This study seeks to gauge how media literacy instruction that includes historical sources impacts students' ability to distinguish between current 'real' and 'fake' news stories.

Literature Review

The evaluation of sources has long been a component of social studies classes. Tally and Goldenberg (2005) have demonstrated a relationship between the use of primary sources and the development of students' historical thinking skills. This ability to critically evaluate sources, however, is not something that comes naturally to students (Wineburg, 1991). The challenge of evaluating sources seems to carry over into outside the academic sphere as well, as a study measuring civic online reasoning found students were "easily duped" (Wineburg, McGrew, Breakstone, & Ortega, 2016, p. 4). With the relative ease of publication the internet provides as

well as the wealth of information it stores, it has become increasingly important for students to learn how to navigate this information landscape.

Allcott and Gentzkow (2017) note a rising concern over fake news since the 2016 U.S. presidential election, defining fake news as "news articles that are intentionally and verifiably false, and could mislead readers" (p. 213). In addition, Marchi (2012) found that students often prefer less traditional news sources that provide an interpretation of events, thus rejecting a cornerstone of traditional journalism: objectivity. The question remains of how students can know if they are hearing a reliable interpretation of current events.

While calls for media education in the classroom are not new (Thoman, 1999; Masterman, 1989), these factors make the need for it even more apparent. Thoman (1999) argues media literacy is about drawing meaning from the symbols people take in. "It is the ability to choose and select, the ability to challenge and question, the ability to be conscious about what's going on around us" (Thoman, 1999, p. 50). In light of this need, the skill of media literacy has been included in the information, media, and technology skills of the P21 Framework for 21st Century Learning ("Framework for 21st Century Learning," 2016), and the National Council for the Social Studies' position statement on media literacy highlights it as an "essential [skill] for active citizenship in our democracy" (Sperry & Baker, 2016, p. 183).

Methodology

This study took place in the spring of 2018 at a North Carolina high school. The participants were 16 students from two sections of standard-level American History I classes. Students first took a survey covering questions such as how often and where they get their news, if they are ever skeptical of information, and how adept they think they are at spotting fake news. Students were then given a 10-question pre-test adapted from Factitious, an online game that tests users' ability to distinguish 'real' from 'fake' news ("Game Sets Sights on Fake News," 2017). The stories in the game were printed out for both the pre- and post-test.

Instruction on media literacy began the next day, and students were introduced to Newseum's ESCAPE strategy for evaluating sources ("E.S.C.A.P.E. Junk News," n.d.). This strategy walks students through examining six different concepts in regard to the evaluation of information: evidence, source, context, audience, purpose, and execution.

After instruction and whole-class practice, students practiced the strategy on their own. Students were learning about sectionalism prior to the Civil War, but students had not yet learned

about the events in the sources. Students were given one of eight different primary sources, which included accounts of the caning of Senator Charles Sumner; John Brown's raid on Harpers Ferry; and Bleeding Kansas. Students went through the ESCAPE strategy with a worksheet and then created a poster explaining why people should or should not trust the source, including a 1-10 rating of how reliable they thought the source was. Students then put their posters around the room and looked at three sources other than the one they had examined. During this gallery walk, students were instructed to decide whether they agreed with the reliability rating of sources based on the given information. After the gallery walk, students were given a post-test and post-survey. The post-test was the same format as the pre-test but with different stories.

Student work was analyzed first. This included three pieces of work: the worksheet students had used to analyze their sources, the poster they made about their sources, and their evaluation of posters during the gallery walk. I first grouped the artifacts by type of work and read through each assignment of the same kind as a group to identify themes. I assigned each theme a letter and then noted which pieces of work demonstrated which themes. These themes were then combined based on common characteristics. I then coded all student work according to the newly created themes. Observations were analyzed in a similar manner, first reading through notes and identifying themes and then coding them according to the larger themes.

Results and Discussion

Pre-test scores. Fourteen students completed the 10-question pre-test. The pre-test included six real stories and four fake stories. Student scores ranged from 40 to 80 with a mean of 57.857. Overall, students tended to overestimate the number of fake stories on the pre-test, meaning they were unlikely to be "tricked" by the fake stories. This performance on fake stories may be inflated, however. The efficacy of this test format as an accurate measure of students' ability to distinguish between real and fake news is debatable. With only two possible answers, students had a 50 percent chance of getting a question right by guessing.

Another possible explanation is that students had a general propensity for thinking a given story was fake rather than an actual ability to distinguish between real and fake news. Observations from class discussions support this, indicating students based their evaluations off of how believable the stories sounded.

Post-test scores. Fourteen students completed the post-test. Scores did not change much from pre-test to post-test, as post-test scores also ranged from 40 to 80 with a mean of 57.857.

There were 12 students who took both the pre-test and post-test. Two students' scores did not change. Five students' scores decreased, and another five students' scores increased. This mixed data make it difficult to gauge the efficacy of the instruction, and it may be more useful to draw conclusions based on tendencies students exhibited on the test. Students tended to overestimate the number of real stories on the post-test, deviating from Marchi's (2012) study, as students did not seem to distrust mainstream media.

Student work. Analysis of student work indicated students knew what to look for when analyzing a source but often struggled to apply this knowledge, tending to focus on only one or two aspects of a source, such as the facts or the source's author. Students sometimes identified facts only to conclude there were no real facts if they saw any opinions. For example, one student declared of his source, "It's definitely fake," after identifying opinions in the source despite the presence of verifiable facts.

Students' struggle to handle imperfect information is reminiscent of Barton's (1997) study, in which students lacked a strategy for dealing with such sources, leading them to dismiss sources as unreliable. It is possible students' overemphasis on the author and evidence was a kind of "path of least resistance" strategy similar to that observed by Milson (2002). Perhaps this method seemed more efficient than sifting through context and other factors. Students may have viewed the strategy as unhelpful for messier sources and may have needed more scaffolding in thinking through how to weigh both the questionable and credible aspects of sources.

Despite these challenges, many students demonstrated higher-order thinking in their evaluations. This may be due to deeper engagement with their sources, as Barton and Levstik (2004) note the importance of students asking questions *they* see as meaningful in order to engage in inquiry. Some students may have found whether they could trust their source a more meaningful question than others and been more willing to look beyond the simple facts.

Multiple students thought beyond the text of their sources and compared the information to prior knowledge. For example, one student had a newspaper article on the raid on Harpers Ferry that suggested Frederick Douglass had been involved. The student's knowledge of Douglass as an abolitionist and gifted speaker did not fit with what he read in the source, leading him to write, "I think this is fake cuz (sic) they trying to make Douglas a bad guy and knowing he's not." The use of primary sources may have helped facilitate the development of these

higher-order thinking skills, specifically historical thinking skills, as Tally and Goldenberg (2005) showed, as students sifted through information and evaluated different perspectives.

Students also applied a kind of common-sense test to sources, although this did not always lead to accurate conclusions. During the gallery walk, one student believed a source on the caning of Charles Sumner was unreliable because she was suspicious of the facts, writing, "There's no way this man survived 12-20 blows to the head." Another student was skeptical of his article on the caning of Charles Sumner, believing it sounded odd that Sumner's attacker, a member of the House, was in the Senate chamber. While these assumptions are incorrect, the ability to think in this way suggests developing skills of media literacy, as students demonstrated "the ability to challenge and question" sources (Thoman, 1999, p. 50). Being able to fact-check a story solely based on one's own knowledge is not the goal of media literacy. Rather, it is about a greater understanding of how media are a constructed representation, not a perfect reflection (Masterman, 1989). Students did this prior to instruction, but their thinking developed from vague assumptions to evaluations anchored in evidence or prior knowledge.

Limitations

The small sample size of this study is a limitation. The two sections included 60 students, but only 16 of participated in the study. Reading comprehension may also have been an issue, thus leading to limited engagement with the sources. Further, students may either have skimmed the stories or simply guessed on the pre- and post-tests. The two answer choices would not have combated the issue of students guessing as much as the traditional four-choice test. Another limitation inherent in action research is how my actions may have influenced students. Perhaps students thought I emphasized the importance of an author or facts in a story. Additionally, talking about "fake" news, may have primed students to be suspicious of their historical sources.

Conclusion

This study suggests students have a general idea of *what* to do when it comes to evaluating sources but struggle with the *how* of this skill. Historical sources may help bridge this gap, as they open the door for conversations on navigating imperfect information and help students develop higher-order thinking skills. To help students understand the skills overlap between historical sources and current news sources, teachers may need to provide a more explicit explanation. In a political climate where the term "fake news" can mean news that has been made up or can be used to discredit media organizations, the need for students to learn how

to evaluate information is more than a good skill. As one student put it, media literacy matters so people will not be "led astray like sheep."

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The Effects of Oral Presentation as a Teaching Tool on Student Attitude and Achievement

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Traditional methods of teaching mathematics mainly include oral communication, but students are rarely asked to present mathematical work orally in the classroom as a strategy for learning. According to the NCTM Teaching Practices, facilitating meaningful mathematical discourse is key to effective teaching of mathematics (NCTM, 2014). Mathematical discourse not only includes writing, but also visual and verbal communication. Verbally communicating a mathematical problem or idea effectively requires a deep understanding of the topic (Johnson, 2009). As Boaler describes in her book *Mathematical Mindsets:* "It is also good to share and discuss mistakes, because if one student makes a mistake we know that others are making them also, so it is really helpful for everyone to be able to think about them," (Boaler, 2016, p.17). Because students are presenting in front of their peers and their teacher, their audience is naturally given the opportunity to provide constructive questioning to guide the student when mistakes are made and help them discover how to correct their own mistakes in the context of the presentation. This gives students the opportunity to actively learn mathematics with positive feedback.

Mathematical discourse is not a skill to be practiced individually but is a skill that is interwoven into every part of the class structure, (Moschkovich, 2003). Mathematical discourse is exhibited in mathematical vocabulary, syntax, logical connections, writing, speaking, and demonstrating. There are many benefits to students being able to participate in mathematical discourse. Hackett and Wilson (1995) found in their work with 40 high school mathematics students that the practice of using mathematical discourse in the classroom improved students' vocabulary and ability to ask questions. Communication skills were improved as students were asked to communicate more frequently and were given more clear instruction. Student understanding of mathematics was also improved as the study continued.

It is easy to see how students would be scared of making mistakes. Rickard (2014) investigated discourse in a middle school mathematics classroom. In his case study he discovered that teachers and students continued to "provide evidence that misconceptions may serve as opportunities for thoughtful mathematical discourse and can yield important mathematical experiences for students," (Rickard, 2014, p.82). In a separate case study of 11 different secondary mathematics classrooms we see that through mistakes, students were given the opportunity to practice initiative and take ownership of their mathematics education, (Borasi, 1994). The fear of oral presentation and making mistakes in front of peers and teachers has also been shown to fade as the practice continues.

Because of the difficulty many students have with learning mathematics it is incredibly important that we search for the best ways to reach students. Because research has shown that oral presentation is a promising tool to use to teach students this study investigated the question, "Is oral presentation an effective teaching tool for improving attitude and achievement in secondary mathematics?"

This study was performed in the spring of 2018 in a public high school in the southeastern United States. The student body consisted of approximately 1,359 students, with about half of the student body being female, and half male. Approximately 87% of the student body was minority, and 73% were economically disadvantaged. The students in the study were juniors from two International Baccalaureate Standard Level Mathematics Classes. There were 21 students in one class, and 24 in the other.

The first day of the study consisted of pre-attitude and achievement assessments and an introduction to oral presentation that included a description of oral presentation with specific expectations and guidelines for the presentations. On this day students also received the problem they would present. The problems were selected from the current topic being taught in class. The last day of the study consisted of administration of the post attitude and achievement assessments. The pre- and post-achievement assessments were exactly the same, but the pre- and post-attitude assessments were phrased slightly differently. The remaining two and a half days of the study were used for the completion of the presentations.

The order in which the students presented was randomly chosen using a cup of popsicle sticks with each of their names written on them. During each of the presentation days each student was asked to stand at a white board in the classroom and demonstrate the solution to the

problem they had been assigned by writing and drawing abbreviated steps, pictures, graphs, and equations as they apply to the solution along with a verbal explanation of the solution. Students were allowed to use their notes containing the solution to the problem, but they were asked not to make note cards, or a script containing what they would say. The audience was encouraged to ask the presenter questions as they became confused, or if they believed the presenter made a mistake. Mistakes were addressed only in the form of a question. This gave the presenter the opportunity to present a complete and correct solution even if they did not begin with a correct or complete solution. This method was also intended to help the audience stay engaged with the presenter.

Attitude was assessed by the comparative results of the pre- and post-attitude surveys. The survey contained questions intended to give the researcher an understanding of the students' attitudes towards oral presentation, of how the students felt they understood the materials, and how the students perceived their peers' involvement as an audience and as presenters. The researcher also used field notes to discern how students appeared to feel as they presented.

Pre- and post-achievement surveys were used to quantify student understanding of the material in the lesson. Field notes were also taken as each student presented in order to account for the understanding each student demonstrated in their presentation. The materials students used to prepare for and complete their presentations were collected so that the researcher could understand what each student knew before presenting at the board, and what each student learned as they presented.

There seemed to be a general attitude of anxiety as we approached presentation days, but this soon disappeared as we began the presentations. The students who presented at the beginning were very slow, and they made the problems more tedious than necessary. Towards the end of the presentations it seemed that many students learned the skills for presenting from their peers. They worked more quickly and efficiently at the board. There also was an attitude of boredom towards the end of the presentations. Many students had already completed their work, and instead of copying down solutions, and diligently asking questions they mostly sat in boredom. There were however, several students who asked very insightful questions that instigated good class discussion.

Presentations allowed me to see where students were struggling more clearly. Viewing written work limits my ability to see where a student is getting confused. There were several

students who presented that typically turn in very sloppy unorganized work that earns a low score. During their presentation however, they had new means to explain their work. These students did very well on their presentations. The presentation also seemed to help these students become more organized. You could frequently see flashes of insight as students were presenting their own problems. They would organize their work in a slightly different way on the board, and this would help them see mistakes or misconceptions more clearly.

Students knew that the achievement assessments were not going to be included in their quarter grades, and many finished very quickly and did not seem to be taking the test seriously. The post assessment was done at the very end of the school year, and it was apparent that students had become apathetic about their school work or were overloaded with work from other classes. Additionally, many of the students took an excessive amount of time to present their problem. This timing stretched the presentations out longer than expected and created a lack of engagement and boredom. Students were also not required to copy down their peers' presentations. It was suggested that this would be beneficial to them and they were given all of their peers' problems so that they could follow along with the material as well as possible, but many chose to sit in silence instead.

Four of the six questions on the attitude survey had responses that were given by a Likert scale with four possible responses, and two of the questions had "yes, or no" response options. There were 25 students who completed both the pre- and post-attitude survey. In Question 1 students are asked about how confident they felt before and after their presentation. Presenting had a positive impact on student confidence. Sixteen percent of students transitioned from expressing some level of discomfort in the pre-attitude assessment to claiming confidence during the post-attitude assessment. Questions 2 and 5 asked about student understanding of their own problem, and of their peers' problems. It was clear from both pre- and post-assessment results that students did anticipate that they would understand their own problem more than the problems that their peers did. Although students generally felt that they would understand their own problems better, they still felt optimistic about understanding their peers' presentations. This is demonstrated in pre- and post-assessments for Question 5. Only, twelve percent more students reported that their peers' presentations were either "hard to understand" or "impossible to understand" in the post assessment compared to the pre-assessment. Question 3 asked about how much the students enjoyed presenting. The pre-assessment scores indicated a slightly less

polarized view than given by the post-assessment. On the pre-assessment forty percent of students reported that they would enjoy presenting "very much," or "not at all" and sixty percent of students responded with "somewhat" or " don't care." On the post-assessment however, eighty four percent of students responded with "somewhat," or "don't care," and only sixteen percent of students responded with "very much," or "not at all" indicating that students became more apathetic. Both pre- and post-assessment scores for Question 4 demonstrated that students felt that their peers respected them during their presentation. The pre-assessment results were already very high, with ninety two percent of students believing that their peers would respect them. During the post-assessment this percentage increased by four percent. Finally, Question 6 asked students how much they enjoyed listening to their peer's presentations. Both pre- and post-assessment scores indicated that students felt more neutral about their peers' presentations. During the pre-assessment twenty four percent of students responded to the question with "very much," or "I don't enjoy it at all" and seventy six percent of students responded with "somewhat," or "I don't care." During the post assessment eighty eight percent of students responded with "somewhat," or "I don't care," and only twelve percent of students responded with an enthusiastic "very much," or "I don't enjoy it at all." Students had a positive reaction to presenting; their attitudes generally improved.

Students were given about a half an hour to complete the pre- and post- assessment questions, they were allowed to use the formula packet for IB SL 1, and a calculator. The mean pre- and post-scores on the achievement assessment were 4.0, and 4.8 respectively. The highest possible score on the assessment was a 15. Students did not do well on this assessment either time, but their final scores were slightly better than their initial scores. Within their work many students lost points for leaving off units of measure, integral signs, limits of integration, and the differential (dx) at the end. Over all the students scored very poorly on both assessments, scoring under a third of the total points both times.

The achievement scores did not show remarkable improvement, increasing only slightly from the pre-assessment to the post-assessment. There are several factors that could have contributed to this. The majority of students did not focus well during the presentations, and there was not much incentive for students to diligently pay attention to their peers. Students overwhelmingly said that they understood their presentation problem more so than other student's presentations, and a large percentage of students expressed difficulty in understanding.

This indicates that one possible reason for the students' lack in achievement would be their lack of engagement with their peers' presentations. They may have understood their own presentation, but in order to get the full understanding of the unit of study students would need to be able to understand all of their peers' presentation problems. The presentations themselves did seem to have a positive impact on the students' understanding of that particular problem. The scores on the presentations were overwhelmingly high. It appeared that students put the most effort into their personal problem.

There are many ways that presentations could become a more successful teaching tool. For example, engagement could have been increased if students were asked to only do one or two presentations a day, or if students were required to complete all of the possible presentation problems before presentations began. Each student would have a more detailed understanding of the problems and could ask the presenters better questions as they presented. This would also expand the range of material the students encountered to give the students more practice. Additionally, if all of the presentation problems were graded and included in the students' quarter grades students would have been more persistent in finding the correct answer to every presentation problem. Revising the way that presentations were used in this study would help retain the benefits of students preparing for presentations while also reducing the negative consequences that the participants of this study experienced.

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Open Questions in the Mathematics Classroom

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"Mathematics" is a word that makes most people cringe. The feeling that overwhelms people just by hearing or seeing the word "math" is more than a fear or a dislike for the subject, it is an anxiety that students and adults of all ages are far too familiar with. There is a disconnect between how most students and mathematicians view math and it may be the result of how math is presented to students every day in classrooms across the nation. Math anxiety is defined as "negative emotions that interfere with the solving of mathematical problems" (Blazer & Miami-Dade County Public Schools, 2011, p.1) and affects children and adults alike. The effects of math anxiety can present themselves physically or psychologically, often lead to students avoiding math whenever possible, and can negatively impact academic performance (Maloney, Schaeffer, & Beilock, 2013). Geist (2010) suggests that changing the way that math is presented to students is the first step in overcoming math anxiety. A different math pedagogy has the power to get students to view themselves as human beings that are capable of successfully learning and understanding mathematics as "no one is born knowing math, and no one is born lacking the ability to learn math" (Boaler, 2016, p.5). Therefore, this study will look at how using open questions affects math anxiety and achievement in the mathematics classroom.

Literature Review

Over ninety percent of Americans experience math anxiety, or negative feelings that affect one's abilities to solve mathematical problems. Math anxiety affects everyone equally, regardless of gender, socio-economic status or cultural background (Carroll, 2010). Some people may experience physical symptoms because of math anxiety, while others experience negative emotions (Finlayson, 2014). The effects of math anxiety can be detrimental to students and can often linger with students for the rest of their lives, driving students toward non-math related careers. The only way to prevent math anxiety is to first understand and stop what is causing it.

Math anxiety can be caused by a student having a low self-concept of themselves (Ahmed, Minnaert, Kuyper, & van der Werf, 2012), lacking self-confidence, or fearing the idea

of failure. Some students also say their anxiety is caused by not being engaged enough during class, not knowing enough of the math content in general, or the teacher's teaching style (Finlayson, 2014).

In order to help with students' math anxiety levels, Carroll (2010) recommends that teachers incorporate activities into their lesson plans that engage all students while helping them to improve their problem-solving abilities at the same time. Research further suggests that teachers encourage students to take risks in math, have diverse teaching strategies, and teach at a pace that is as slow as reasonably possible (Finlayson, 2014).

The introduction of open questions into the classroom is one teaching method that will aim to build self-confidence in students, strengthen their problem-solving abilities and change the way that they perceive mathematics. "Open questions" in this study refers to problems or exercises that either have multiple correct answers or multiple ways to arrive at a desired answer. The goal is for students to alter the way they view themselves and realize that they have the capability to do well in math, which will also increase their self-concept and self-confidence. Research has found that using open questions has led to positive changes in student attitudes (Kulkin, 2016) and helps with individual student differences, mathematical understanding, success for students, student motivation and student efficiency (Lynch & Star, 2014).

Thus, studies have found positive correlations between the use of open questions and student achievement, student attitude, student motivation and student efficiency, but the use of open questions has yet to be related back to math anxiety. Because the causes of math anxiety are often the things that improve through the use of open questions, it is likely that the addition of open questions to the mathematics classroom will have an effect on both math anxiety levels and academic achievement. The research question for the current study is "What effect do open questions have on math anxiety and achievement in the high school mathematics classroom?"

Methodology

This study was conducted in two standard-level Math I classrooms during the Spring of 2018 at a suburban public high school in the southeastern United States. Of the 27 students in this study, 19 were female and 8 were male. The study sought to find out how the implementation of open questions affected students' anxiety levels and performance in the high school classroom.

Treatment and data collection for this study spanned the course of 4 weeks. The treatment was the use of open questions and it was implemented whenever possible and whenever appropriate over the course of these 4 weeks but was not the main focus of each day of instruction. On the first day of the study, the students took a pre-survey and a pre-test in order to gather data on their initial levels of math anxiety and prior knowledge about the unit. The researcher also took field notes during regular instruction on this day. Following the introduction to open questions, the researcher gave daily warm-ups that included open questions to increase exposure to open questions without taking time away from normal, daily instruction. During the 4 weeks, the researcher planned classwork and homework so that they included both regular questions and open questions whenever possible without changing the curriculum the students were learning. After the 4 weeks, the researcher administered a post-survey and a post-test to measure both anxiety and achievement levels.

This study measured how open questions affected both levels of math anxiety and student achievement. In order to measure math anxiety levels, data were collected using pre and post surveys and researcher field notes. Student achievement was measured with data collected using pre and post-tests, student artifacts, and researcher field notes.

The students were given surveys before and after the research was conducted to gauge how they felt about math and whether or not they believed they experienced math anxiety before being introduced to open questions. The researcher then compared these opinions about math and their experience with math anxiety to the survey results after the use of open questions.

Results

Over the course of the four weeks, the pre and post-surveys indicated that students' opinions toward math improved and students began to see math as more open-ended rather than closed-off, were experiencing negative feelings toward math less frequently, and were experiencing less math anxiety.

Homework assignments with a mix of open and closed questions were assigned to students every night for the duration of the unit. The data from these assignments showed students performed better on open questions than on closed questions.

While measuring levels of math anxiety, the researcher also wanted to ensure that students did not sacrifice achievement for lower math anxiety levels. In order to measure achievement levels, a pre-test and post-test were administered on the first and last days of the

study. The same test was used, and it had a combination of open and closed questions that covered various topics during the unit. There were not any students who earned a better score on the pre-test than the post-test which means that as a whole, the students were able to increase their levels of academic achievement.

Conclusion

Over the course of the study, many students experienced a decrease in math anxiety levels after a four-week period. One of the contributing factors to this decrease in math anxiety may have been the exposure students had to open questions.

The concept of open vs. closed questions in mathematics was new to the students and felt very uncomfortable to them at first. At the time the study was being conducted, students were being introduced to a new unit, a new style of questions, and a new teacher all at the same time, so the researcher field notes from the first few days of the study reflect students feeling overwhelmed, confused and not very enthusiastic about this new style of questions on top of other changes happening in the classroom. After warming up to the idea of open questions and the new unit, students were more relaxed toward open questions, were asking fewer questions about their homework assignments and were more eager to share what they came up with for the warm-up.

As research conducted by Jansen et al. (2013) concluded that math anxiety was not affected by the number of problems students got correct, students did not receive a grade for accuracy on the homework assignments and were never told if their answers on these homework assignments were correct or not. This allowed students to complete these assignments in a low-stakes atmosphere where the only thing they had to focus on was developing an understanding of the material for themselves through the use of both open and closed questions. What students did find, though, was that they were able to answer the open questions correctly more often than the closed questions. As the use of open questions is a teaching method that aims to increase problem-solving abilities, deepen understanding of the material and build self-confidence (Boaler, 1998), it is not surprising that students would report a decrease in math anxiety levels after using open questions during class and at home for an entire month, regardless if it was the direct cause of the decrease or not.

While the results suggest that the use of open-questions in the classroom may have been one of the causes of the decrease in math-anxiety levels that was also effective in maintaining

student achievement, there were a few limitations that should be noted about this study. This study only examined 27 students over the course of one month where students met for 90 minutes every other day. As the size and duration of this study were limited, so was the amount of data able to be collected. The study examined the trends of open vs. closed questions over the course of just four homework assignments. To further examine the effects of open questions on math anxiety in the classroom, the size, duration and number of artifacts able to be analyzed for feedback should all be increased. Additionally, further investigation could include having students label or try to address the different types of anxiety they experience instead of anxiety as a whole as students appeared to have decreased their levels of anxiety induced by lack of self-confidence and teacher's teaching methods.

The results of this study can lead to changes in the mathematics classroom. As the use of open-questions appears to have led to a reduction of math anxiety while still maintaining adequate levels of student achievement, other educators may be encouraged to try using open-questions in their classrooms to help with the issue of math anxiety that has plagued the nation. These results should also encourage further research on the subject of math anxiety, open questions or the effect that open questions have on math anxiety.

The introduction of open questions overwhelmed the students of this study at first, but by the second and third week there were more students raising their hands to participate in class than ever before. When an open question was asked, students knew that even if five other students had their hands raised, each of their answers was going to be different and worth sharing, and they were. Students were more eager to participate because they knew, even in a class of 32, that the people called on before them were not going to take their answers and that the researcher and teacher wanted to hear answers from as many students as possible. Students recognized this, student engagement increased, and the students were the ones who reaped the benefits and experienced an increase in their achievement and a decrease in their math anxiety levels.

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