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How Well Do Students Perform on A Five-Paragraph Analysis Essay When Writing Digitally Versus Handwritten?

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How Well Do Students Perform on A Five-Paragraph Analysis Essay When Writing Digitally Versus Handwritten?

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By

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DEDICATION

I dedicate this action research project to my beautiful son, Louis. He has provided me the strength and courage to continue forward on each journey that arises in life. Because of him, I am living the greatest role I have ever been given… mom.

ABSTRACT

Technology use in the secondary education setting has been increasing since the early 2000s, but with the coronavirus pandemic in 2020, when students learned remotely, technology use exponentially increased. Many districts provided devices for their students to continue their schoolwork. As we return to the classroom, should assignments remain technology-based or return to handwritten assignments? In this study, the researcher focused on identifying whether handwritten work or typing is more effective when developing a five-paragraph analysis essay in a ninth-grade classroom. Students were given the same curriculum throughout the study, but one group was given the curriculum through worksheets to focus on handwritten work, while the other group was given their assignments digitally and was able to type the information. The results are shown using an independent Mann-Whitney U test to compare the students' five-paragraph analysis essay scores.

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INTRODUCTION

Introduction

In the nine years that I have been a teacher, a complete shift in how educators deliver curriculum has overtaken the classroom. Not only are actual hardcover books becoming obsolete, but so are printed worksheets and tests. Recently, technology has inundated the classroom and replaced the standard paper and pencil. With education transforming into the digital world, educators seem to be asking whether or not this is an effective transition for students and their skills or if the idea of being entirely digital hinders students' advancements. Are students struggling to grasp the information because of this shift, and should teachers go back to handwritten procedures to help advance student skills? No matter the answers to these probing questions, the world of technology has significantly changed. Education cannot fall behind the technological advancements that continue to creep into the classroom. However, at what cost are educators willing to take because of this shift?

Brief Literature Review

As each year passes, technology within the classroom has become increasingly more common, and the pressure to utilize it for student growth has increased. Ng'ambi (2013) enforced the idea that there was an increase in emerging technology use in higher education, but little evidence had shown whether it was genuinely transforming teaching and learning practices. Much to many educators' dismays, research showed that "simply using digital tools and online writing environments does not equate to increased student learning, making it important to understand how using these tools affects student writing quality and skills" (Agee & Altarriba, 2009 as cited in Nobels & Paganucci, 2015, p. 16). Much of the research in this area

stated that students do not benefit significantly from one platform of learning than the other, but more so that if educators wanted to have a well-balanced classroom for learning, they should build in more blended components that use both online tools and paper-pencil work. Often, many of the studies concluded that there was neither an increase nor a decrease in academic skills. Instead, the online platform seemed to show improvements in certain areas like the student's excitement of completion or length in responses as long as they understood the technology associated with the assignment, and the educators could address any questions or concerns before students finished and the data was collected.

Overall, most of the studies provided positive and negative benefits to both online and handwritten platforms, suggesting there might be more information to research than just enhancing skills. One example comes from Halpern et al. (2020), who suggested that the commonality in the class has been students incorporating multimedia devices in their learning but that they were unaware of how to correctly browse for credible resources raising the issue of whether schools should do a better job at generating digital literacy both in and outside of the classroom. Another example from the literature is in the work of Eden and Eshet-Alkalai (2013), who indicated that students struggled more with their reading ability when they used a digital platform compared to reading on paper. This was a potential issue moving forward because although both formats were often showcased in the classroom throughout the year, it was becoming more common to solely utilize a digital platform.

Statement of the Problem

Technology is evolving fast, and as quickly as it is entering the world, the education system is grasping to keep up with it. Schools are spending an abundant amount of money and resources on Chromebooks and Ipads, hoping to get them in the hands of every student possible

to transform how content is taught. Abduvakhidov et al. (2021) made a claim stating that "the most important change in education is a critical view of education and the destruction of all traditional tools that make education stagnant and unable to cope with the latest technological advances" (p. 744). If education is not implementing technology correctly, then the issue of whether it is enhancing students' skills comes into question. Are schools pouring too much into technology advancements in hopes that students will do better without enough research backing this up? As educators, we know that students must understand the basics and that their futures will be filled with jobs directly connected to technology, so what exactly is the most appropriate balance. Could educators be doing students a disservice by throwing technology at them without taking the time to go back to the simplistic components of education, such as handwritten assignments, versus putting everything in an online format?

Purpose of the Study

Technology is changing education, and the ripple effects are showcased through student graduation rates. Last year, the COVID-19 pandemic hit the economy hard, including how education was being administered. Students were receiving direct instruction through a computer, therefore, utilizing technology for much of the year until schools returned to in-person learning. Much of the data from the prior year showed a drastic decrease in performance, but was that strictly connected to student technology use, or was that a residual effect of the COVID-19 pandemic? The sole purpose of this study was to determine whether or not utilizing technology in the classroom helped students achieve better academics and scores.

Research Question

How well do students perform on a five-paragraph analysis essay when writing digitally versus handwritten?

Definition of Variables. The following are the variables of the study:

Independent Variable: Modality for essay. Group A used a handwritten approach, and Group B used a keyboard.

Dependent Variable: Student performance outcome using a pre-set rubric (Appendix A) that determined which platform aided student development of skills.

Significance of the Study

Understanding the data that came out of collecting achievement scores and improvement scores when writing a five-paragraph analysis essay through paper-pencil versus an online format helped determine if students achieved the standards set forth within the classroom through both methods. This action research aimed to better understand the use of technology within education and establish whether one platform helped or hindered student skills. In gathering this data, educators could better develop efficient, practical, and appropriate lesson plans that strengthened students' competency of the subject matter at hand.

Research Ethics

Permission and IRB Approval. In order to conduct this study, the researcher sought MSUM's Institutional Review Board (IRB) approval to ensure the ethical conduct of research involving human subjects (Mills & Gay, 2019). Likewise, authorization to conduct this study was sought from the school district where the research project took place (Appendix B)

Informed Consent. Protection of human subjects participating in research was assured. Participant minors were informed of the purpose of the study via the Method of Assent (Appendix B) that the researcher read to participants before the beginning of the study. Participants were aware that this study was conducted as part of the researcher's Master's Degree Program and that it would benefit her teaching practice. Informed consent meant that the parents

of participants were fully informed of the purpose and procedures of the study for which consent was sought and that parents understood and agreed, in writing, to their child participating in the study (Rothstein & Johnson, 2014). Confidentiality was protected by using pseudonyms (e.g., Student 1) without the utilization of any identifying information. The choice to participate or withdraw at any time was outlined both verbally and in writing.

Limitations. The two groups (A and B) studied had uncontrollable differences in demographics such as age and gender. In addition, both groups were a part of different periods within the day, which hindered performance and participation. Both student groups have multiple levels of abilities that are directly connected with previous usage or confidence in their technical knowledge. Another limitation is having a univariate analysis focusing only on one outcome of the research (student performance), which does not provide the most authentic results within the study.

Conclusion

With all of the advancements in technology, the world of education is inevitably heading towards a more digital-friendly era. With that being said, does that mean that handwritten practices will become obsolete? Conversely, would forgoing handwritten assignments be the best option for student learning moving forward? No doubt, there are positives and negatives to using both types of platforms, so finding deeper data that suggests the best route is essential within the education system. The next chapter provides a brief overview of the current literature and studies being completed in this area of research regarding the enhancement of skills either through paper-pencil or an online format.

Chapter 2

LITERATURE REVIEW

Introduction

Much of the research within this field focused on whether or not one platform of learning was either helping or hindering student progress within the education system. Online platforms within the classrooms have shown that this is how the education world is shifting, but both positive and negative aspects of learning come with online platforms. For example, the research currently out there goes back and forth around whether online platforms improved student literacy skills. With how education has shifted, it is vital to understand if this is the right move for the students and their futures.

As Akbaraov et al. (2018) stated, “contemporary education has to go hand in hand with global development in various areas of human activity” (p. 61). Therefore, it is inevitable that as our world changes and technology advances, our classrooms need to reflect this transformation. However, with change comes both negative and positive aspects. One positive is that online tools increased proficiency, productiveness, and enhanced effectiveness within the lessons (Churches et al., 2010, as cited in Smith, 2014). Still, on the other hand, social connectedness was at risk of being lost, which is necessary for learning (Smith, 2014). This study dove deep into the components that digital and paper/pencil assessments brought to the classroom and focused on how well students performed on a five-paragraph analysis essay when writing digitally versus handwritten.

Context

The world is forever changing, and the way of education is following right alongside it. As of 2020, many schools were forced to go to an online learning format due to the COVID-19

pandemic, being ordered to stay home and learn. With schools returning in person, many educators chose to remain digital. As Taherbhai et al. (2012) suggested, there was a magnitude of considerable advantages directly associated with online learning and online testing compared to paper and pencil versions. Some of the benefits that arose included savings in cost due to no printing and shipping of paper, security improvement when it came to testing, and the opportunity to provide quick turnaround results for the students, teachers, and schools (Way et al., 2006, as cited in Taherbhai et al., 2012). However, did these particular advantages outweigh the outcomes of what paper and pencil learning could have had on students and their skills?

Effectiveness

One study reported that computers could assess student writing responses but that equity, efficiency, and practicality concerns needed to be brought up and discussed (Barton and Coley, 1994, as cited in Laurie et al., 2015). Educators are faced with these particular concerns when it comes to implementing technology into the classroom. Still, the success and progression of the students' skills played a large part in deciding which route, digital assignments versus paper and pencil, helped in the learning environments. Smith (2014) made a strong argument stating that "as teachers, we need to have our eyes wide open to both the positive and negative if we are to provide a reassuring voice for our students as they navigate their courses" (p. 94). Technology helps engage students in many ways but does it enhance performance? Educators need to plan for what would help their students succeed and choose between giving assignments online or through paper and pencil, all crucial aspects to consider when teaching.

When teachers are developing assignments and assessments, their goals are to measure the effectiveness of the lesson at hand while teaching the skill and deciding whether students can

comprehend the task, apply it to their learning, and showcase their knowledge of the skill to move through the curriculum. One focus that many of the studies questioned was whether or not one type of platform, digital versus paper and pencil, effectively improved skills in the classroom. In Mirza's (2020) study on whether or not digital storytelling helped with proficiency, many of the findings showcased that the participants improved their technical skills rather than their language skills due to having to overcome the technical difficulties when completing the project. This was also supported by Padgett (2000) in her thesis, where she followed a previous study done by Lous Mayer Nichols (1996), who wanted to know whether student word count increased from writing on paper to then writing with the keyboard. His findings concluded that, yes, the work completed with word processors were lengthier in word count, but that if the student's keyboard skills were highly developed along with their word processing knowledge, their ideas flowed more quickly than when using a paper and pencil technique (Nichols, 1996, as cited in Padgett, 2000)

Through these findings, there seemed to be an apparent hold on comprehension if students could not understand how the technology worked, hindering their ability to complete the task at hand. Therefore, does this mean that teachers must teach an additional component of the lesson directly connected to the technology used for the students to be successful, or should that be a skill already innate within the student's abilities. Interestingly enough, Russell and Haney (1996) piloted a study in which they had one school test a group of students over multiple years to see if their writing improved if the everyday assessments were on the computer, but the finalized assessment was on paper. What they found in their studies was that students' scores drastically decreased. Teachers believed that students had become accustomed to writing on the computer, which decreased scores when responses needed to be written by hand (Russell &

Haney, 1996). Clearly, there was a discrepancy when teachers shifted back and forth from either platform, but it made a strong case about what type of procedures needed to be completed to understand the best outcome for the students.

Efficiency

With every research question comes the positive and negative components that the researcher finds after the fact. So much of what goes into education comes from trying out different routes and seeing what works and what does not. Knowing what course to take provides the most successful pathway for students, allowing educators to choose a style of teaching that is conducive to the way students learn rather than the way the teacher feels like they learn best. Studies within this area found that the most efficient way to enhance student progress was to blend the positive aspects of using paper and pencil with online.

VanPatten et al. (2015) wrote in their study the idea that paper and pencil tests are easily quantifiable and that many instructors found it difficult to part from this traditional approach of assessment with their students. However, with all practices come change, and educators' initial thoughts of straying away from the traditional paper and pencil was inefficient in the classroom. VanPatten et al.'s (2015) study was meant to open this broader discussion focusing on the importance of moving curricula toward a more proficient platform in outcomes. This particular study, and many following, found that efficiency within students' progress tended to come from a blended instruction that used both an online and a handwriting format.

Students' lives have become central to technology use in all areas of education, including reading, writing, calculating, and even thinking (Collins & Halverson, 2010, as cited in Laurie et al., 2015). This showcased that education is forever changing and moving towards a more efficient way of teaching; therefore, one would assume that students' skills were not lost from

one platform to the other but instead enhanced or improved. In some studies, this was the case; in others, there was no regression of skills, just a lack of skills. Interestingly enough, Laurie et al. (2015) saw only one significant component of students' writings increase when using a digital platform centered around orthography, also known as the conventional use of spelling. “This most likely was due to the fact that the correction function was embedded in computer software and not available to those who wrote in the traditional sense of paper/pencil” (Laure et al., 2015, p. 6). Seeing this particular score enhancement with students who tested through the digital platform, the question became whether or not there was a connection regarding students losing their ability to spell correctly on their own if they were only allowed to perform on a computer.

Interestingly enough, since students are inundated with technology, classrooms could lean more towards a computer-based learning style than writing out their thoughts and answers on paper because the pace is much faster to complete. Blumenthal and Blumenthal (2020) surveyed the students in their study and found that many of the participants felt they could complete the tasks at hand on the tablet at a faster rate and that the functions were more manageable. Alongside this finding, Blumenthal and Blumenthal (2020) also stated that the same students who said they had high anxiety using paper and pencil did not have high anxiety when completing the tasks on the tablet. Once again, this could have been due to the notion that students were more comfortable performing tasks on items they understood and used daily and did not feel as much confidence in their skills when implementing or processing on paper and pencil. Overall, this information spoke volumes about allowing students to choose the platform they knew and felt the most confident in, which was indeed an efficient way to run a healthy classroom.

Theoretical Framework

The methodology that many researchers took focused on comparing and contrasting students' outcomes, whether grades from a rubric or answers to test questions, and seeing whether or not one format improved their skills over the other. Multiple resources chose to focus on a small set of students to study and then determined the outcome by recording the final output of work alongside surveying the test subjects and asking which preferred method they found to be the most useful. The dependent variable in the suggested studies was about the outcomes found within each area of research. In particular, many of the results saw neither an increase nor a decrease in skills and learning. More so, many of the researchers found that the possibility of using a blended approach could be the most useful. Nobles and Paganucci's (2015) findings stated, “their use of a mixed-methods approach to analyze the quantitative and descriptive data showcased students having a more positive perception of their writing through an online format” (p. 28). They also mentioned that even though many of the studies in this particular field may have been small, they were not generalizable (Nobles & Paganucci, 2015). In continuing with this research question, one should go into it with a positivist paradigm approach to better gain knowledge through the use of collecting data based on students’ scores using a set rubric (see Appendix B) in place to focus on whether or not one platform allowed for an enhancement of skills over the other.

Research Question

How well do students perform on a five-paragraph analysis essay when writing digitally versus handwritten?

Conclusions

Akbarov et al. (2018) suggested that “the terms blended learning, paperless classrooms, virtual classrooms, digital/online learning formats are all concepts and terms that inevitably should be in the vocabulary of every modern professional within educational sciences” (p. 66). Much of the research at hand stated that either format, online or paper and pencil, could be helpful within the classroom to some extent. However, with the changing of times, was one platform genuinely transforming the way students learn while the other was hindering abilities. Overall, the goal was to reach as many students as possible when teaching and find the best approach to help all learners succeed.

Chapter 3

Methods

Introduction

Education has begun to wholeheartedly embrace online learning and has continuously been integrating multiple pieces of different technology into classrooms at a rapid rate (Osterbur et al., 2015). However, as this frequency continues to increase, teachers have been left wondering whether all of this technology is helping or hindering student learning. This research study explored the idea of finding out whether students' performance of essay writing was better when using a handwritten approach versus a digital written approach.

In understanding the possibility that one platform could increase student performance, teachers could then dive deeper into their own teaching styles to learn what works the best for their students to help them be more successful. Having this type of information could open the doors for teachers in improving the way they deliver curriculum and transform the dynamics of their classroom while utilizing the tools given to them by their district.

Research Question

How well do students perform on a five-paragraph analysis essay when writing digitally versus handwritten?

Research Design

This research is a causal-comparative design sought to find a relationship between the independent and dependent variables of the study within the classroom. This is a positivistic paradigm seeking to find knowledge by using the scientific method by conducting an experiment, collecting data, and drawing conclusions based off of having sampled two groups of

high school-aged students (referring to them as Group A and Group B). The manipulated variable focused on whether students improved using a handwritten approach versus a digital writing approach in an English/Language Arts classroom. The dependent variable was the ending score results using a pre-set rubric to evaluate how well students did on the writing process. Group A, the control group, was the set of students who used a handwritten approach throughout the entire writing unit. At the same time, Group B, the experimental group, was the set of students who used their Chromebooks as their primary writing tool after the unit had concluded.

Setting

The current study took place in a city about eleven miles south of St. Paul, Minnesota. The population of the town in 2020 was estimated to be around 36,000, making it the 28th largest city in the state, with a rate of growth being about 0.59% annually. The school's student population is around 1,100 students in grades nine through twelve, with over 250 required courses and elective courses that follow a trimester schedule. The course that I will be doing my action research in is Communications 9 for ninth graders. There are currently eight teachers in the high school English department, averaging a total of seven sections within each grade level.

The high school classes function on a seven-period day, with each course being around fifty minutes in length. Class sizes range from twenty-seven to thirty-nine students throughout the year.

The school is heavily connected to the Advancement Via Individual Determination (AVID) program. It is recognized as one of the AVID National Demonstration Schools for its

high levels of implementation and success. Many of the strategies that the district focuses on within the classroom are about providing a hands-on learning approach while differentiating assignments that focus on helping all different levels of learners. AVID is also heavily based on having students collaborate on ideas through various strategies during class. Another component influenced by AVID is the idea of flexible seating; however, due to this still being a COVID-19 pandemic year, all classes are equipped with desks that must be forward facing and in row-like seating.

Each student in the high school is given a Chromebook to use throughout their four years of schooling and must be well versed in using Google email and Schoology.

The district focuses heavily on providing students an equitable space to learn while helping them navigate the throes of everyday life outside of school. The district currently operates with about 30% of the student population being on free and reduced lunches. Additionally, about 40% of the student population is black, indigenous, and people of color.

Participants

There were two groups (Group A, the control group, and Group B, the experimental group) studied throughout the research. Group A consisted of thirty ninth-graders ranging from ages fourteen to fifteen. There were seventeen males and thirteen females who made up the group and used the handwritten approach. This group had six students with an individualized education plan (also known as an IEP) and two English Language Learners (EL learners). One EL learner spoke Spanish, and the other spoke Somali.

Group B consisted of thirty ninth-graders ranging from ages fourteen to sixteen. Twenty males and ten females used a digital writing approach on their personal Chromebooks provided

by the school district throughout the research study. There were only three students on an IEP within this group and four students who were EL learners. All four EL learners spoke Spanish. In addition, this Group B had two male gifted and talented students.

Sampling. The participants in this study were chosen using purposive sampling due to me being the primary English/Language Arts teacher for ninth grade. In addition, the two student groups were selected out of five classes due to them being the closest in demographics.

Instrumentation

Students in both groups were given the same lessons within the unit leading up to writing a five-paragraph analysis essay on characterization. A pre-made rubric (Appendix A) was used to record and grade each group of students' outcomes, resulting in as minimal human error as possible. Using a rubric provided a much more reliable way to grade the student work while removing as much human bias from the process, focusing solely on the outcome of students' work, both handwritten and written digitally. The research concentrated on manipulating a single variable, the modality of the essay, to determine a cause and effect relationship that decided if one platform was more effective than the other.

Data Collection. The students were given a final writing assignment to develop a five-paragraph essay on character analysis. These were graded through a rubric, and each student was given a final score. The rubric graded the students' introduction, body paragraph one, body paragraph two, body paragraph three, and conclusion. Students were further graded on their language and style of writing. Students were given either an advanced, proficient, developing, emerging, or unsatisfactory label. Each section was worth a specific amount of points, as high as fifty points and as low as twenty-six points.

Data Analysis. An analysis was performed on the data sets collected to determine whether or not the experimental group statistically outperformed the control group. To begin with, the mean of both data sets was derived by calculating the sum of all the values in the data set (the test scores), divided by the number of the values in the data set. Therefore, if the scores had *n* values in the data set and they had values of $x_{1,}$ x_2, ….., x_n, the sample mean, commonly donated by x, was calculated as followed:

$$x = x1+ x2+.....+xnn$$

The significance of collecting the mean of both data sets was to provide an objective measure of performance that would show which data set, on average, performed better on the final essay.

Next, the standard deviation () of both data sets was calculated. The standard deviation highlighted how much the data points within a data set varied from the average. Therefore, a low standard deviation suggested that the data was closely clustered around the average. In comparison, a high standard deviation indicated that the data was dispersed around a broader range of values. This information ultimately allowed one to understand the overall shape of each data set. Moreover, the standard deviation was significant because it showed whether or not a data point was statistically significant or part of the expected variation.

Lastly, a Mann-Whitney U test was performed to show whether or not there was a significant difference between the means of both groups (control vs. experimental). That is to say, the U test provided an idea as to whether or not the difference in the mean could be attributed to the independent variable or if it happened by chance. The Mann-Whitney U test was

performed instead of a two-sample t-test, which is traditionally used because the experimental and control groups' test scores did not follow a normal distribution.

Research Question and System Alignment.

Table 1

Research Question Alignment

1 Research Paradigm	2 Research Design	3 Research Question	4 Variables	5 Instrument	6 Source and expected Sample Size	7 Data Analysis
Quantitative	Causal-Comparative	How Well Do Students Perform on Digital Assignments When Writing a Five-Paragraph Analysis Essay Compared to Handwritten Essays?	DV: Student Performance IV: Five Paragraph Analysis Essay	DV: Student performance outcome using a pre-set rubric IV: Modality for essay	9th Grade High School Participants Sample Size: 60-65 students (two out of the four COMM9 classes that I will be teaching)	All students will be scored through the rubric. Scores will be compared and contrasted from one sample class size to the other.

Procedures

To begin, each set of student groups was given the same unit to work through, which lasted six weeks. The unit focused on reading a class novel with multiple discussions surrounding character development and theme. Group A was given all of their assignments on paper copies, while Group B completed all of their assignments digitally on their individual

Chromebooks. The only exceptions in Group B were students on IEPS who were required to have a paper copy.

During the last two weeks of the unit, after the novel finished, students were given a writing assignment that focused on having them develop a five-paragraph essay on character development. Each group received sentence stems that helped them formulate their thoughts before beginning the writing process. Both groups were given four writing days to complete their rough draft. Once students completed their rough draft, they were given two class periods to complete their final copy. Group A had to write their final draft of the essay on loose-leaf paper. Group B had to type their final draft of the essay on their Chromebooks using Google Documents. Once students finished, they handed in their assignments to be graded by the pre-set rubric (Appendix A).

After all student scores were compiled based on the common rubric (Appendix A), the second stage was data analysis. After looking at both sets of scores from each group, the mean (average) of the data sets were computed to objectively measure performance to show which data set, on average, performed better on the final essay. The next piece calculated by the researcher was the standard deviation. This piece of data allowed the researcher to determine the relative spread of the data. The standard deviation showed how close the majority of the data set was to the calculated mean, indicating if one set of data was less sporadic than the other. Finally, the researcher performed a Mann-Whitney U test to determine whether or not the difference in performance between the data sets was statistically significant or if the results happened by chance. After the data analysis, the researcher had a better idea as to which modality led to higher student performance.

Ethical Considerations

Guardians of the students were sent home a letter (Appendix B) detailing the procedure of events, allowing them the opportunity to participate in the study. Guardians could opt for the students to not participate if needed. Students who did not participate were still required to complete the assignments as given within the classroom, but their scores were omitted from the finalized data. Student names were also omitted to keep identities and scores anonymous from the study. Students could drop out of the study at any time if they could not handle the tasks at hand or their well-being was compromised.

Conclusions

This chapter focused on the exact outline of the study performed in determining whether students' performances improved on five-paragraph writing essays on character analysis when using either a handwritten approach or a digitally written approach. In addition, the current sample examined whether the modality of the essay determined a significant change in scores and whether student performances improved, declined, or stayed the same.

Chapter 4

DATA ANALYSIS AND INTERPRETATION

This study aimed to determine if students wrote a five-paragraph analysis essay better using a typed approach or a handwritten approach. Students seem to struggle greatly when it comes to writing, so being able to identify areas of strength using one approach over another could help students be more successful in the classroom. Alongside that, many districts are choosing to implement technology, with many schools becoming one-to-one classrooms. Therefore, utilizing the technology and understanding whether it is hindering or helping is vital to student success.

Data Collection

The students were given a final writing assignment at the end of the unit in which they had to develop a five-paragraph essay on character analysis. The essays were graded by one teacher using a pre-made rubric (Appendix A), with each student being given a final score. The rubric evaluated students in the following categories: introduction, body paragraph one, body paragraph two, body paragraph three, and conclusion. Students were also graded on the category of language and writing style, which focused on proper paragraph indentation, sentence structure, effective transitions, and sentence formation, along with using appropriate academic language, consistent verb tense, and proper grammar and punctuation. Students were given either an advanced, proficient, developing, emerging, or unsatisfactory label in each focus area. Each focus area was worth a specific amount of points, with students being able to receive a high score of fifty points total ranging to as low as twenty-six points total.

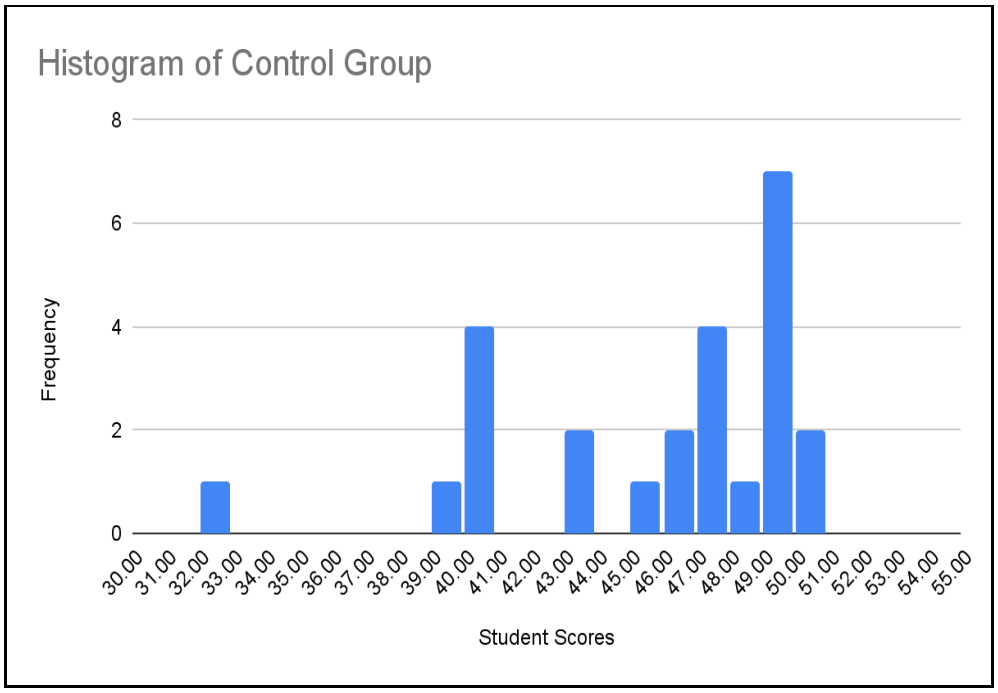
Results

RQ 1: How Well Do Students Perform on A Five-Paragraph Analysis Essay When Writing Digitally Versus Handwritten?

The scores on the five-paragraph analysis essays (both typed and handwritten) were determined using a pre-made rubric. The essays were graded out of a total of fifty points. The results of the control group (handwritten) are shown below in Figure 1.

Figure 1

Control Group A (Handwritten)



Note: This figure represents a histogram showing frequency versus student test scores in the control group.

Apart from the overall scores, the mean, median, and standard deviation were calculated. One area of the results that was looked at in more detail to better determine if one platform was more effective than the other was the rubric's focus area of language and style. The language and

style portion of the rubric was to measure a student's ability to produce correct paragraphing, sentence structure, transitions, academic language, grammar, and punctuation. The standard on the rubric was out of five points total. The breakdown of these items are shown below in Table 2.

Table 2

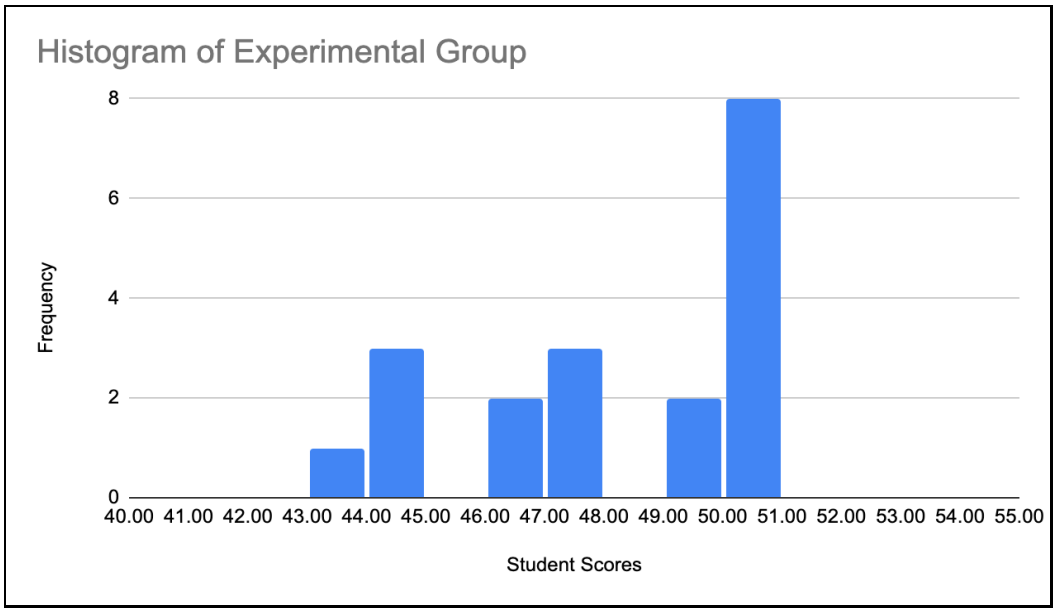
Rubric Scores (Controlled Group)

Mean	45.32
Median	47.00
Standard Deviation	4.56
Language/Style Score	3.76

The same data collection method was used for the experimental group (digital). The results of the experimental group are shown below in Figure 2.

Figure 2

Experimental Group B (Digital)



Note: this figure represents a histogram showing frequency versus student test scores in the experimental group.

The mean, median, standard deviation, and the language and style score was recorded in the same way as the control group (handwritten) results. These results are shown below in Table 3.

Table 3

Rubric Scores (Experimental Group)

Mean	47.68
Median	49.00
Standard Deviation	2.54
Language/Style Score	4.68

Because the test scores for both the experimental and control group did not follow a normal distribution, a Mann-Whitney U test was performed rather than a two-sample t-test to determine whether or not the difference between the two groups is statistically significant. The Mann-Whitney U test produced a p-value = 0.0463.

Data Analysis

Looking at the data, the students who used technology (experimental group) seemed to perform better overall than students who used pencil and paper (control group). This is clear when comparing the two mean scores (47.68 versus 45.32). Moreover, the experimental group had a smaller standard deviation compared to the control group (2.54 versus 4.56). Standard deviation is a measure of the dispersity of scores around the mean. The lower standard deviation of the experimental group suggests that in this study, using technology produced more consistent student scores around the mean.

Another data point collected was the average score obtained on the focus area of language and style on the rubric. The higher the score, the better the students performed on the following aspects: putting together correct paragraphing, sentence structure, transitions, academic language, grammar, and punctuation. The experimental group achieved a higher average score in this category alone compared to the control group (4.68 versus 3.76). This suggests that technology did play a role in helping the students with their writing skills and abilities. This is consistent with the study performed by Laurie et al. (2015), which showed that students' orthography skills increased with the use of technology.

Lastly, the Mann-Whitney U test produced a p-value = 0.0463. The null hypothesis can be rejected because the p-value is below the usually agreed alpha risk of 5 percent (0.05). This means that the difference between the two groups is statistically significant and cannot be attributed to randomness.

The results of this study are surprising because they show clear benefits of using technology which is not an exact overall theme of the current research out there. Research currently suggests that there are both positives and negatives associated with using technology in the classroom and that a blended approach would be the most beneficial for students. For example, in Mirza's study (2020), the participants improved their technical skills rather than their language skills due to overcoming the technical difficulties when completing the project or task at hand. These technological difficulties experienced in Mirza's study were not present in this experimental body of work. Students were able to navigate the digital tools independently with little to no help from the teacher.

Furthermore, Russell and Haney's study (1996) looked at a group of students over multiple years to see if their writing improved if the everyday assessments were on the computer,

but the finalized assessment was on paper. The results of their study showed that students' results drastically decreased. This could be chalked up to students being used to one mode of learning and then switching without adequate practice. The positive results that technology is beneficial for student learning in the current study could be a result of the small sample size that was studied. One could argue that perhaps the experimental group being analyzed had superior technology skills in this one instance. It is hard to definitively say that technology would be an absolute boost in academic performance. Still, the numbers show that students did significantly better typing out their essays than writing them. An expansion of the sample size of this study should be performed to truly determine whether or not this is the true outcome.

Conclusion

The rubric used, along with the mean, standard deviation, and Mann-Whitney U test, were adequate tools to show which group performed better and whether the results were statistically significant or not. The data showed that students who used technology to complete their essays performed better overall, but specifically on their ability to produce correct paragraphing, sentence structure, transitions, academic language, grammar, and punctuation. Due to the small sample size in this study, it is difficult to make any serious conclusions, but it does provide a platform for expansion and will contribute to decisions made in the future when assigning five-paragraph analysis essays.

The results of this study fail to show conclusive evidence of the efficiency of using technology versus pencil and paper for students. Even though technology plays a vital role in students' lives, using it to write a paper is a skill in its own right, and a small amount of instructional time was needed to teach students this particular skill. Further studies using a similar method are still needed to truly see if using only technology as the main platform in the

classroom is the most efficient and effective method for students versus just handwritten or a blended method.

Chapter 5

IMPLICATIONS FOR PRACTICE

This study aimed to determine whether or not students performed better on five-paragraph analysis essays when using technology versus pencil and paper. After analyzing the data, it was found that the experimental group, the students who used their Chromebook to write their essay, outperformed the control group, the students who used pencil and paper. Alongside this information, it also specifically showcased that their ability to produce correct paragraphing, sentence structure, transitions, academic language, and grammar and punctuation was more effective when using technology than when handwriting.

Action Plan

As mentioned in the previous chapter, even though the data shows better results connected with students using technology, it is difficult to make the true claim and say that this would be the best and most appropriate method to use in any class or setting. This is because the sample size of this experimental body of work was limited to only two classes in one school district and one grade level. The study would have to be scaled up in magnitude and replicated for any serious efficacy claims to be made. Having said that, as an educator who does work in a setting that produced positive results, it is difficult to not consider leaning towards using technology as a method for students when assigning essays and perhaps other work, for that matter. The Chromebook allows students to have their spelling checked by a “third party” (the computer) and have their grammar flagged as incorrect. Therefore, it can be easily corrected if students are going back and editing their work before submission.

This study could be used as a persuasion piece for administrators and district personnel when considering how much of the district budget should be allocated toward technology in the

classroom. One thing that this study did show for students is that using a Chromebook seemed to lead to positive outcomes compared to not using technology. Positive student outcomes are the purpose of the district's mission statements, and if it is the case that technology helps achieve that, it should be considered in future planning.

This study could also be used as a change agent when it comes to persuading other educators in the building to adapt to a more technology-based pedagogical approach. Many educators are content with the way things have always been done and are not open to using or implementing new methods into their curriculum without a valid reason. However, this study provides one example of how technology helped improve one classes writing skills leading to a better outcome in grades and essays. Perhaps with this example of research from the building that they are directly working in, some of my colleagues might be more open to seeing the impact technology plays out in the classrooms.

One pushback against technology in the classroom is the time it takes to teach students to use it. The students in my class did not require much time to get acclimated to the technology, but that might not be the case with other classes. At the beginning of the school year, the English Department focused on two days of using a Chromebook as an onboarding process for new freshmen coming into the building. The students' knowledge of Chromebooks during the study could have come from the two days that this information was provided. Even with this onboarding process, I would still like to propose to my department that we include a mini-unit on how to specifically use technology to write papers at the start of the school year. The logic behind this is, if students are provided with the skills upfront on how to use their Chromebook to write, their confidence could boost their performance on all of the writing assignments they will complete throughout the class moving forward. It would also save a lot of time and reteaching

for teachers because they would not have to worry about teaching the technology simultaneously and the assignment.

I have witnessed in the past the anxiety teachers have in regards to feeling as if there is not enough time to teach their own curriculum, let alone any additional items or policies that are thrown at them by the district. Therefore, using data from this study to back up the importance behind why implementing more technology into a student's education is more beneficial than not would be helpful when faced with any type of backlash or resistance from teachers.

Plan for Sharing

Overall, the entire study has been an eye-opening experience for me as a teacher. I have realized that just because something has been implemented into the education system for many years does not mean that it is still adequate for the current generations. As seen in the outcome of the student's work, technology is a positive in a student's education and ultimately has proven to help them be more successful in their writing. Of course, students should never lose the skill of handwriting, but in that same breath, students need to understand how to type and use technology to succeed in their futures. Technology is only increasing each year, and embracing it for the good will continue to set students up for success.

In moving forward, I will start small with whom I share this information due to the small sample size that this study covered. Sharing with my department would be the first step in showcasing the importance that technology can bring when implementing essay writing in the classroom. Then, I would like to perform this study again with a much larger group of students to better indicate if the study would turn out similarly or shift to favor the handwritten process.

Either way, with how education is shifting and the innovations continuously happening every year, I would suggest that teachers change with the times no matter the difficulties they

face. Students in today's world face a much different educational experience than those in the past, which is a harsh reality for some. Therefore, in order to keep students engaged, we need to challenge their thinking skills and how they go about using different modes of learning within the educational environment.

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Appendix A

	Advanced	Proficient	Developing	Emerging	Unsatisfactory
Introduction	5.0 (provides a thesis statement that links back to the context, provides the title of the novel, character's name, and directions for body paragraphs	4.0 (Introduction explains some elements of characterization as well as provides a thesis statement to link back to context, provides the novel name)	3.0 (Introduction builds a context for the essay as well as provides a thesis statement that provides direction for body paragraphs)	2.0 (introduction does not address a context for the essay but does provide a thesis statement that provides direction for body paragraphs)	1.0 (Introduction does not address a context for the essay and/or does not provide a thesis statement that provides direction for the body paragraphs)
Body #1	10.0 (Body paragraph cites the most appropriate and valid data/examples to support idea #1, discusses change where applicable, and includes transitions)	9.0 (Body paragraph cites appropriate and valid data/examples to support idea #1, discussing change where applicable and includes transitions)	8.0 (Body paragraph cites some data/examples to support idea #1, discusses change where appropriate, and include transitions)	7.0 (Body paragraph uses very few data/examples to support idea #1. Examples are vague and does not include appropriate change or transitions)	6.0 (The body paragraph does not use data/examples from the novel to support idea #1; vague and no transitions)
Body #2	10.0 (Body paragraph cites the most appropriate and valid data/examples to support idea #2, discusses change where applicable, and includes transitions)	9.0 (Body paragraph cites appropriate and valid data/examples to support idea #2, discussing change where applicable and includes transitions)	8.0 (Body paragraph cites some data/examples to support idea #2, discusses change where appropriate, and include transitions)	7.0 (Body paragraph uses very few data/examples to support idea #2. Examples are vague and does not include appropriate change or transitions)	6.0 (The body paragraph does not use data/examples from the novel to support idea #2; vague and no transitions)
Body #3	10.0 (Body paragraph cites the most appropriate and valid data/examples to support idea #3, discusses change where applicable, and includes transitions)	9.0 (Body paragraph cites appropriate and valid data/examples to support idea #3, discussing change where applicable and includes transitions)	8.0 (Body paragraph cites some data/examples to support idea #3, discusses change where appropriate, and include transitions)	7.0 (Body paragraph uses very few data/examples to support idea #3. Examples are vague and does not include appropriate change or transitions)	6.0 (The body paragraph does not use data/examples from the novel to support idea #3; vague and no transitions)
Conclusion	10.0 (The summary conclusion includes reworded thesis statement, summary/data examples from each body paragraph, finishing line addressing the purpose of the essay)	9.0 (The summary conclusion includes reworded thesis statement, a summary of ideas for each body paragraph, finishing lines, transitions)	8.0 (The summary conclusion includes reworded thesis statement, a summary of ideas, a finishing line, and a transition)	7.0 (The summary conclusion includes a reworded thesis statement, a summary of ideas, and a weak transition)	6.0 (The summary conclusion includes a reworded thesis statement, a summary of ideas from some of the body paragraphs, and no transition)
Lang/Style	5.0 (Has correct paragraphing, sentence structure, transitions, and sentence formation. Uses appropriate academic language, free of sentence errors, consistent verb tense, and proper grammar and punctuation)	4.0 (Has mostly correct paragraphing, sentence structure, transitions, and sentence formations. Free of spelling errors, consistent verb tense, and proper grammar)	3.0 (Has issues with paragraphing, sentence structure, transitions, and sentence formations. Not free of spelling errors, has some consistent verb usage, and proper grammar)	2.0 (Has issues with paragraphing, sentence structure, transitions, and sentence formations. Not free of spelling errors and some grammar usage incorrections)	1.0 (Has many issues with paragraphing, sentence structure, transitions. Not free of spelling errors, not consistent verb tense or grammar)

Appendix B

February, 2022

2930 80th Street East

Inver Grove Heights, MN 55076

Dear Guardians,

Your student has been invited to participate in a study that focuses on exploring the differences surrounding the outcome of using paper/pencil versus digital technology when writing and developing a five-paragraph essay.

Your student was selected because they are in my regular COMM9 education course for the second trimester. If you decide to participate, please understand that your student will be asked to do the following, which are your typical classroom activities that involve no risk to your student.

1. Your student will be doing learning activities, writing assignments, and final essay submission through paper/pencil worksheets and notebooks.
2. Your student will be doing learning activities, writing assignments, and final essay submission digitally (Chromebook using Word and Google Docs).

Due to this information being used to help me complete my master's degree in Curriculum and Instruction through Minnesota State University Moorhead, I must receive guardian consent to use this information in my final action research that I am required to do as part of my degree. I would like to note that even if I were not conducting this information, the students would still be completing the exact amount and type of assignments within the regular curriculum of the year.

If you sign this form, you give me consent to use the information I gather. All information that is used will be confidential; no names will be used in the outcome. Please also note that your student can choose not to participate at any time without any consequences.

I am more than happy to answer any and all questions you have regarding this study. You may contact me either through my school phone number at (651) 306-7000 Ext. 2904 or email at coryellb@isd199.org. You may also contact my advisor, Kristin Carlson at kristen.carlson@mnstate.edu.

You will be offered a copy of this form to keep for your records. In signing this form, your signature indicates that you have read the information provided above and have decided to participate in this study. I appreciate your support during this time.

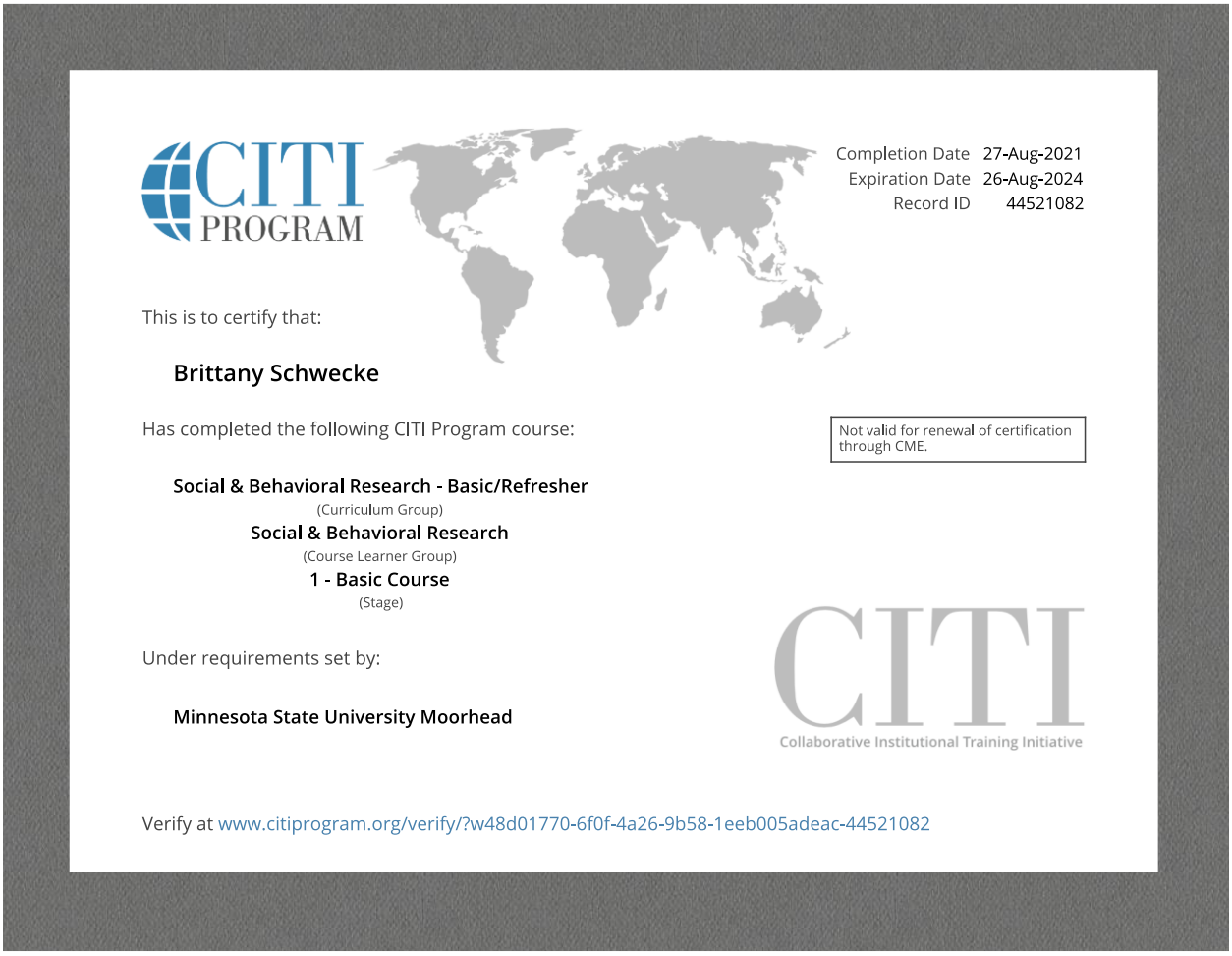
_____ _____

Signature of Guardian Date

_____ _____

Signature of Investigator Date

Appendix C



CITI PROGRAM

Completion Date 27-Aug-2021
Expiration Date 26-Aug-2024
Record ID 44521082

This is to certify that:

Brittany Schwecke

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social & Behavioral Research - Basic/Refresher
(Curriculum Group)
Social & Behavioral Research
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Minnesota State University Moorhead

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w48d01770-6f0f-4a26-9b58-1eeb005adeac-44521082