A Study of Result Differences Between
Hand-Written Notes and iPad Notes on Student Learning

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Abstract

This paper explored the idea that note-taking during a lecture was beneficial to how students understood classroom material that was presented to them. This study further investigated whether or not a student’s learning was impacted through hand-written notes or notes taken on the iPad (electronic version). Research states that though note-taking was a vital skill it was not necessarily taught to students at school, and the use of note-taking increased over time. In elementary, students worked more collaboratively in a classroom or were taught a specific skill or lesson that they then needed to implement on their own. Predominantly tactile and kinesthetic learning continued until high school and beyond. The classroom environment changed from a series of hands-on exploration to a more formal lecture format that included components of higher-level thinking, rhetorical questions, and note-taking (Peverly, Garner, & Vekaria, 2014).

This study considered the use of iPads with regard to notetaking compared to the use of note-taking by hand. Participants in this research study were male and female 11th grade students at Zeeland East and West High Schools in Zeeland, MI. Students completed a survey before and after the study. To complete the study, students took notes for two weeks using the iPad, by hand for two weeks, and by student choice for the last two weeks of the study. Results were collected throughout the study and saved on Google Sheets.

The results from the assessments, note-taking packets, and interviews showed that while students may feel they learn best when taking notes by hand on paper, the format used may have had little affect on their assessment scores. Students seemed to increase their scores and do better on the assessments as the in-class format (taking notes Monday – Thursday and testing on Friday) continued to stay the same throughout the study.
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Chapter 1 – Problem

Introduction

During the researcher’s ten years of being involved with education, there has been a huge shift in technology and the role that it plays in the classroom. The use of PowerPoints, videos, and/or document cameras is no longer effective to present material within the classroom. According to Noor-UI-Amin (n.d.), our ever-changing world needs students to be global learners and fluent in ICTs [information and communication technologies].

Educators have begun using iPads with interactive applications to teach a science class, or students have created videos on the material that they have learned in a social studies class. Smartboards have allowed teachers and students to interact with the material that is being presented. Harvel (2006) has shown that even though it’s important to push technology in our classrooms, whether it’s best practice or not, students only benefit from the push if it goes beyond timesaving and convenience. Students must also find it a need. This idea ignited the researcher’s interest on student learning and comparing student outcomes when taking notes by hand as opposed to taking notes on the iPad.

Problem

This push towards technology has caused the researcher to wonder if we were actually creating better student learners who can complete tasks independently through deductive reasoning, or if we were producing shallow thinkers who are not learning the information that is being presented to them. Based on student feedback, even with a device in their hands, students still preferred the traditional style classroom using paper notes and having paper to complete assignments. Are there significant differences in student learning between hand-written notes and iPad notes? This study sought to answer this question in hopes that we can find a better form of note-taking for our students.
Purpose of the Study

The purpose of this study was to investigate student learning when taking notes by hand and as compared to their learning when taking notes with an iPad or laptop. The researcher hoped to learn more about student learning in the classroom. Research has stated that it is vital for students to revisit their thought process and doing so in the written form created critical thinking skills. Critical thinking skills were important in education because they confirmed student learning. Student learning and note-taking skills were important because they helped students decide what was important information and what was not, and they helped students to see the connection between main ideas and supporting details (Brown, 2005). Furthermore, the researcher found this statement important because student learning is the goal of every teacher – we teach in hopes that students are learning, understanding and applying the information that is being presented to them. Even though technology is engaging and seems to be exciting for schools to promote, it doesn’t necessarily mean that student learning has been enhanced.

Justification of the Study

As mentioned earlier, investigating the retention and comprehension of classroom material by students is important since most classrooms are filled with some type of technological device. According to Johnson (2012) schools today are spending billions of dollars in the United States alone, roughly 56 billion dollars, to implement technology in schools. Using technology seems to have helped our students to be digital learners and to be competitive in today’s global market; however, pushing technology might actually be creating shallow processors, and creating learners who store information in their short term memory (Mueller & Oppenheimer, 2014).
Research Question

The question for this study is “What are the result differences between hand-written note-taking and iPad note-taking on student learning?”

Terms

Resource Room
Constitutive Definition: A remedial classroom with students who have learning difficulties where direct instruction or classwork support is offered.
Operational Definition: Resource-taught classes are available for a small percentage of students who need the most intensive level of support. The pace is slower and the amount of content covered is adjusted.

Autism Spectrum Disorder (ASD):
Constitutive Definition: A brain disorder that is caused by complex development that results in difficulty verbalizing and/or maintaining relationships.
Operational Definition: Students who need extra support in writing, who need to work on social skills in a small setting, or who struggle moving at the same pace as their general education peers.

Learning Disabled (LD):
Constitutive Definition: A person who struggles to obtain and/or retain the given knowledge at the same pace and at the same level as their peers.
Operational Definition: Students who need extra support in the reading content as a result of their disability.

Device:
Constitutive Definition: An electronic piece of equipment made for a certain purpose.
Operational Definition: In this study, an iPad or a laptop.
One-to-One (1:1):
Constitutive Definition: Technology integrated environment where each student has an individual technological device.
Operational Definition: In this study, students have school issued or personally owned iPads.

Handwritten Note-taking:
Constitutive Definition: Recording information that is being presented by hand.
Operational Definition: Students who will be taking notes by handwriting in a note packet.

Technology-assisted Note-taking:
Constitutive Definition: Recording information that is being presented by the use of a device on a word processing or other note-taking software.
Operational Definition: Students will use their iPad to take notes using an app of their choosing as the platform for their note-taking method.

Student Learning:
Constitutive Definition: When students are presented with a variety of educational experiences and learning opportunities.
Operational Definition: Student learning will be measured through weekly assessments on material that was covered in class.
Chapter 2 – Background and Review of Literature

Literature Review

Background

Note-taking in the classroom had been a solid practice in schools for years, and included a variety of note-taking components such as: working memory, digital age in the classroom, note-taking skills, and the effects of digital note-taking. Before the surge of computer technology in schools, note-taking was always in the form of using pen and paper to scribe the instructor’s lecture. In the 1970s and 1980s, note-taking lectures increased because of the relationship between linking prior knowledge to newly presented material with taking notes (Brown, 2005). During this time period, some experimental studies seemed to demonstrate that students performed better on assessments when in-class note-taking was expected compared to those who did not take notes during lectures (Brown, 2005). However, Brazeau (2006) showed that while note-taking seemed like an important skill, it was not always useful because most students took incomplete or inaccurate notes and recorded less than 50% of the lecture. Furthermore, when instructors gave their students detailed note packets, students were also less likely to pay attention to the information being presented to them due to having the notes right in front of them (Brazeau, 2006). Not only was it important to look at how or if a student took notes, but it was also important to look at working memory.

Working memory was another component to note-taking. Working memory was a factor in note-taking when looking at the student’s ability to take meaningful notes. The cognitive task to take notes while simultaneously listening to a lecture was directly related to a student’s working memory and the ability to hold and maintain content (Peverly, et al., 2014). The fact that note-taking has expanded into a computing device has created a unique
learning environment. Computer technology being pushed into teachers’ classrooms has caused the researcher to wonder which way of note-taking is actually the better way.

**Digital Age in the Classroom**

Shimoni, Barrington, Wilde, & Henwood (2013) stated that in education, most educators strived to implement best practices within the classroom. This could be a controversial subject because everyone’s idea of best practices could differ significantly due to the idea that any practice that reduced or eliminated students’ barriers could be considered best practice (Shimoni et al., 2013). Research by Kay and Lauricella (2014) has stated with technology implementation being pushed in the classroom, most educators have had an opinion on whether bringing an iPad and/or laptop was beneficial to education. Kay and Lauricella (2014) added that it could serve as a distraction due to students surfing the web and engaging in online chat forums, causing less student engagement in the classroom, and in return, could affect their overall student learning. According to an interview with Pam Varnado, a teacher at Loyola College Prep, others have embraced this concept because using a tablet or laptop is very user-friendly and can access an unlimited amount of information (Novello, 2012). Harvel (2006) has shown that with students being involved with the digital age, it could still be difficult for them to find the motivation to use an online platform for educational purposes. Most young adults have used technology for personal use that is quick and entertaining. Online education can be more time consuming which has caused students to not embrace the practice (Harvel, 2006). Harvel (2006) added there are circumstances where a student could enjoy the online environment if it’s considered easy to use or time-saving. Not only have students needed a reason to use notes, they also have required the necessary skills to use them.
Note-taking Skills

Research has indicated that students have believed that the positive results of using technology outweigh the negative results because being connected has allowed them to do real-time research and increased peer collaboration (Mueller & Oppenheimer, 2014; Debevec, Shih, & Kashyap, 2006; Holding-Kay & Lauricella, 2014; Ehrlich & Vance, 2015). While research has shown that there are benefits to using a tablet or laptop for note-taking due to the interactive forum, research has also shown that using a tablet or laptop for note-taking can institute shallow processing (Mueller & Oppenheimer, 2014; Moore-Stay & Cain, 2015). Moore-Stay & Cain (2015) have explained that shallow processing could occur because students were much more likely to write word-for-word what the instructor is saying. When students do not take the time to process the information and take verbatim notes, students were walking away with less of an understanding of a concept through their own interpretation as compared to a student who took notes through written language (Moore-Stacy & Cain, 2015). When writing by hand, the brain’s pathways were activated and information was more likely to be stored in memory storage areas due to the tactile learning that was taking place. When engaged in tactile learning, an individual is creating an active learning situation, which could help cement a concept in a learner’s mind (Willis, 2007).

Effects of Digital Note-taking

Studies have investigated the effects of using digital media within the classroom and have found that longhand note-taking is much more beneficial than note-taking using a tablet or laptop (Mueller & Oppenheimer, 2014). When writing, parallels have been found between thinking and understanding, and writing assignments not only have embraced this type of learning, but have also solidified the importance of making connections between learned material to material that is already stored in the brain (Feinstein, 2014; Stevens-Smith, 2004; Moore-Stacy & Cain, 2015). This study was designed to give further consideration to the
conflicting conclusions from studies thus far by investigating if the outcome of hand-written notes on student learning actually has different results while using an iPad.
Chapter 3 – Procedures

Description of the Research Design

The research design for this study was a mixed methods approach. Creswell and Plano-Clark (2011) stated that a mixed methods approach was when the researcher collected, analyzed, and incorporated both qualitative and quantitative data in a study to address their research question. This approach used the note-taking format as a way to differentiate participants, and then used the data to determine if there was a specific outcome with the assessment results. Included in this approach was a novel study of the book To Kill a Mockingbird by Harper Lee and grammar lessons from the textbook Grammar for High School: A Sentence Composing Approach. Students took notes on the novel and on the grammar lesson. The weekly novel study notes included: historical time period, character traits, narrative and point of view, figurative language, themes, plot, and symbols. The weekly grammar notes included: chunking sentences, opening and delayed adjectives, and opening and delayed adverbs. Data was collected through informal researcher notes (making notes on who switched note-taking tools), student weekly notes (both hand written and computer generated), student perception interview/survey, analysis of quality of notes taken by students, and student weekly assessments. Participants completed the study for one hour daily for four days a week, and on the fifth day, students would take an assessment over the weekly lesson (See Appendix B). To help reduce bias, the following format was used: two weeks with all students using the iPad to take notes, two weeks with all students taking notes by hand on paper, and two weeks of note-taking by student choice (iPad or handwritten). The data collected from the assessments will be analyzed to consider if there is a specific outcome.
Description of the Sample

Participants in this study were male and female 11th grade students (2:1 male to female ratio) in a Resource Junior Literature course at Zeeland East and West High Schools in Zeeland, MI. There were 2 sixteen year-olds, 3 seventeen year-olds, and 1 eighteen year-old participating in the study. The students were involved with the special education program by a diagnoses of a(n) Learning Disability, Emotional Impairment, Cognitive Impairment, or Other Health Impairment. These participants were from various ethnic backgrounds: European American, Asian American, Latino/a, and Mexican American. Their families’ socioeconomic backgrounds ranged from poverty to middle class.

Description of the Instruments Used

Data notes were collected and this information was entered on a spreadsheet. After each week, notes were collected from the students. On Fridays, the participants took an assessment based on the material in which they took notes, and information was entered on a spreadsheet.

Informal notes were taken while the study was being conducted to keep track of any errors that occurred during the study. A timer was used to keep the 30-minute time limit consistent throughout each lesson (novel study and grammar).

A hard copy (paper copy) of the assessment was given to the participants on Fridays. The assessment was comprised of ten multiple-choice questions (See Appendix C). The classroom teacher graded all students’ assessments and the scores were documented on a password locked classroom computer. Each student was given a number (instead of using their name) on the spreadsheet to protect each student’s privacy.
Descriptions of the Specific Procedures Followed

Participants were called at home to explain to the parents the study being conducted. The researcher allowed the opportunity for their child’s participation and consent to use their child’s test scores in this study. If the parent verbally agreed, a consent form was mailed home with a self-addressed envelope for parents to send their signed consent form back. When the returned mail containing the student’s consent form was sent back, the envelope was opened and stored in a locked filing cabinet. The only person who saw the signed consent forms was the researcher.

This study took place at Zeeland East High School (Zeeland Public Schools) during the school day (7:45am - 2:40pm) for one hour a day, for five days a week, for three months. Participants stayed in the researcher’s classroom to conduct this study.

Participation for the study was for one hour daily for four days a week. On the fifth day, students were given an assessment over the weekly lesson. The data collected from the assessments was analyzed to confirm any differences between hand-written notes and iPad notes on student learning. Powerpoint/Google Slides were used for the handwritten note-takers and for the iPad note-takers. The material was presented using Powerpoint and the students used Powerpoint notes/outline that were attached to the document. During class lecture, when students took notes by hand they filled out a paper copy of the Powerpoint outline and when students filled out notes on their iPads they used the same Powerpoint outline, but on an app of their choosing. Using the same note-taking document kept student learning the same.

To collect data on student learning, students were assessed weekly. Students were grouped for two weeks with all students using the iPad to take notes, two weeks with all students taking notes by hand on paper, and two weeks of note-taking by student choice (iPad or handwritten). The data was collected over two months.
Discussion of Internal Validity

Tuckerman & Harper (2012) stated that a study had internal validity if the results were directly related to the program or approach being investigated rather than other components not involved with the study. Based on this statement, one could argue that there could be bias since the researcher was also the classroom teacher. For example, students might have been more or less inclined to pay attention in class due to the student’s familiarity with the researcher. The students’ participation in the study and/or findings of the study did not affect the student's grade in the class, and there was no pressure for them to participate.

Discussion of External Validity

External validity affects the researcher’s capability to make generalizations based on the format used (Tuckerman & Harper, 2012). This study could easily be repeated on a larger scale with a more diverse population. Since this study was based on a small sample size, the results were quite limited and only pertain to the findings in the resource setting at Zeeland High School. This study could be repeated on a larger scale, as this was a question that could be asked at every level of learning and in every subject. A researcher could compare student learning on the note-taking format in another environment with differing backgrounds and populations.

Description of the Statistical Techniques & Methods of Analysis

Students participated in the study through interview questions, which were asked prior to the launch of the study to determine if a student preferred taking notes by hand or using the iPad (See Appendix A). These responses, along with assessment results and documenting technology being used, were recorded on Google Sheets. This allowed the researcher to analyze data and determine if there was a specific case-based conclusion based on the research.
Summary

The mixed-methods study conducted used Zeeland Public Schools English 11-1 curriculum (Grammar for High School: A Sentence Composing Approach and To Kill a Mockingbird by Harper Lee), and the study was completed during the school day. Students’ participation was voluntary with consent given by their parents. To collect the needed data, the researcher used the same note-taking format (Google Slides) for both handwritten note-takers and iPad note-takers, and then the data was analyzed to confirm any differences on student learning based on the note-taking format they used. In order to determine student note-taking preference, the researcher conducted an interview prior to the study. The students then took hand-written notes for two weeks, iPad notes for two weeks, and then choice format (hand-written or iPad) for two weeks to help reduce bias.
Chapter 4 – Results, Analysis, & Data

This mixed-methods study showed that when in-class instruction was presented in a repetitive and consistent environment, students’ tests scores improved. The researcher intended to answer the question as to whether using hand-written notes compared to notes taken electronically (iPad) increased student learning. In order to answer this question, the researcher presented lessons throughout the week (changing the note-taking format every two weeks) and gave an assessment every Friday to see if the note-taking format affected their overall score.

The students completed an interview questionnaire during the Fall 2016-2017 school year. The purpose of the questionnaire was to determine the students’ preferred method for note-taking and to discover how they think they learn best. The students completed the questionnaire in October and November of 2016.

After the researcher reviewed the note packets from the students, the researcher learned that a majority of students were taking quality notes. Quality notes were determined by scoring a 4 on the rubric (See Appendix D). Including a grading rubric for the notes allowed the researcher to determine if there was a correlation between taking quality notes and their assessment score.

The results of the assessments show that students had overall better scores when completing their notes on the digital (electronic) format than when taking notes by hand. However, the results show that students increased their overall scores during the course of the study. These results are inconclusive as to whether student scores truly increased because they were filling out notes on the iPad or whether the structured and repetitive format of the class helped increase their scores.

The interview questionnaire showed that only one student preferred to take notes on the iPad compared to taking notes by hand. This same student also felt that he learned best
when using the iPad compared to the other students. All other students believed that they learn best when taking hand-written notes on paper.

**Summary**

The researcher conducted a mixed-methods study to determine if using hand-written notes compared to notes taken electronically (iPad) increased student learning. This study may have shown that when in-class instruction was presented in a repetitive and consistent environment, students’ tests scores improved. To conduct the study, the researcher had students participate in an interview in both October and November of 2016. Based on the interview, only one student preferred taking notes in the iPad, but they all believed they learn best when taking hand-written notes on paper. For the study, the students took notes depending on the format determined by the researcher (two weeks by iPad, two weeks by hand on paper, and two weeks by choice) and then the students took an assessment over the week’s notes every Friday. The results from the interview, note-packet scores, note-taking format scores, and total averages are shown below.
## Student Interview Questions: Results

<table>
<thead>
<tr>
<th>Interviewees</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 1</strong></td>
<td><strong>Do you think you learn better by taking notes by hand or on an iPad? Why?</strong></td>
<td><strong>Do you think you learn better by taking notes by hand or on an iPad? Why?</strong></td>
</tr>
<tr>
<td>Student 1</td>
<td>By the iPad because it's more engaging than by hand.</td>
<td>It depends. I use both formats so I don't think one helps me learn better than the other.</td>
</tr>
<tr>
<td>Student 2</td>
<td>By hand because it's easier for me to follow along.</td>
<td>By hand because I'm writing the information.</td>
</tr>
<tr>
<td>Student 3</td>
<td>Maybe by hand because it's easier for me.</td>
<td>Probably by hand because I don't always have my iPad.</td>
</tr>
<tr>
<td>Student 4</td>
<td>By hand because it's easier for me to put it into my own words.</td>
<td>By hand because on the iPad it can be sloppy and hard to read.</td>
</tr>
<tr>
<td>Student 5</td>
<td>By hand because it's something I've done my whole life.</td>
<td>By hand because I'm better at taking notes by hand.</td>
</tr>
<tr>
<td>Student 6</td>
<td>By hand because it's easier for me.</td>
<td>By hand because it's easier and I can flip back and forth on the paper.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interviewees</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question 2</strong></td>
<td><strong>Do you prefer to take notes by hand or by the iPad? Why?</strong></td>
<td><strong>Do you prefer to take notes by hand or by the iPad? Why?</strong></td>
</tr>
<tr>
<td>Student 1</td>
<td>iPad because it's easier to follow along, it's quicker, and easier to read.</td>
<td>If it's fill-in notes than by hand but on the iPad if it's something to type then it's better for me.</td>
</tr>
<tr>
<td>Student 2</td>
<td>By hand because it's easier.</td>
<td>By hand because it's less distracting than writing on the iPad.</td>
</tr>
<tr>
<td>Student 3</td>
<td>By hand because I forget my iPad.</td>
<td>By hand because most of the time I don't have my iPad because it's on restriction or not charged.</td>
</tr>
<tr>
<td>Student 4</td>
<td>By hand because it's easier for me to follow along.</td>
<td>By hand because on the iPad can be sloppy so it's easier for me to study on paper.</td>
</tr>
<tr>
<td>Student 5</td>
<td>By hand because I'm better at using paper.</td>
<td>Prefer by hand because it helps me with my writing.</td>
</tr>
<tr>
<td>Student 6</td>
<td>By hand because it's easier and technology is hard.</td>
<td>By hand, hard for me to write on the iPad.</td>
</tr>
</tbody>
</table>
Note Packet Scores: Results

Figure 1. The points a student earned on their note packet. See Appendix D for scoring explanation.
Student Weekly Assessments: Results

Figure 2

![Chart: Note-Taking: Choice](chart1.png)

Figure 2. Represents the scores that students earned when participating in the choice note-taking format. The blue bar represents week 1, the light blue bar represents week 2, and the green bar represents the average score of the 2 weeks.

Figure 3

![Chart: Note-Taking: Paper](chart2.png)

Figure 3. Represents the scores that students earned when participating in the paper note-taking format. The purple bar represents week 1, the light purple bar represents week 2, and the green bar represents the average score of the 2 weeks.
Figure 4. Represents the scores that students earned when participating in the iPad note-taking format. The teal bar represents week 1, the light teal bar represents week 2, and the green bar represents the average score of the 2 weeks.
Student Weekly Assessments: Result Averages

Figure 5

Note-Taking Bi-Weekly Averages

Figure 5. Represents the bi-weekly assessment averages of the individual student scores from the choice, paper, and iPad note-taking formats. The blue bar represents the 2-week average of the choice format assessment, the purple bar represents the 2-week average of the paper assessments, and the teal bar represents the 2-week average of the iPad assessment.

Figure 6

Total Averages

Figure 6. Represents the combined student assessments averages.
The results from the assessments, note-taking packets, and interviews showed that while students may feel they learn best when taking notes by hand on paper, the format used may have had little affect on their assessment scores. Students seemed to increase their scores and do better on the assessments as the in-class format (taking notes Monday – Thursday and testing on Friday) continued to stay the same throughout the study.

When reviewing the students’ interview results, it was interesting to note that students didn’t really have a solid reasoning on why they preferred notes by hand. It really came down to simplistic reasons such as: “I always forget my iPad,” “Technology is difficult,” or “I just don’t like using my iPad.” Even though they had these thoughts or feelings, the scores did not actually reflect this. When given the choice to take notes by hand, most students didn’t do as well on the assessments compared to when using the iPad. Also, all students received a perfect score on their note-taking packets but there were some inconsistencies for the following weeks.
Chapter 5 – Discussions and Conclusions

Creating the structured environment for students allowed them to know the expectations the minute they stepped into the classroom. At times, students would complain about how the class lessons were the “same format everyday,” but based on the assessment results, the researcher noticed that the student scores seemed to increase as the study continued. In the beginning of the study, the class assessment average was 75%, and by the end of the study the class assessment average was 86%. The researcher cannot definitively say whether the increased scores were based solely on the difference in format being used (hand-written notes versus notes in the iPad), or whether creating the routine within the classroom (notes Monday – Thursday and an assessment on Friday) is what increased the class average.

Teaching the novel unit in the structured format for the mixed-methods approach allowed the researcher to reflect and determine best practices within the classroom. While creating the set format in an English class is not normally the first way the researcher would have decided to run the class, it is something to consider. Students knew they would get a set packet that contained information they needed for the week, and they knew that the assessment was on Fridays. This format seemed to deescalate the stress that is normally associated with an assessment. Also, the researcher considered that there might be a benefit to giving students multiple mini assessments in the same format as the final exam. Repeated exposure of information helps a person retain that needed information (Therrien, 2004). Boyle (2001) adds that creating an environment where the lecturer emphasizes important points in a lecture, following an organizational format that creates a step-by-step process, and allowing students processing time at the end can help students gain a better understanding of the material. In this mixed-methods study, students were given that consistent environment
by the researcher explaining the information in a step-by-step format, reiterating the important points, and allowing time to ask questions or clarification at the end of the lecture.

This study could be repeated on a larger scale because a researcher could compare student learning on the note-taking format in another environment with differing backgrounds and populations. Also, this study could have had a bias due to the researcher and the participants knowing each other prior to the study. Since the researcher was also the classroom teacher, this could have made the participants either more or less inclined to pay attention. For future studies, the researcher should work with participants whom he or she does not know. The results from this study showed that students improved their test scores over the course of the study but the cause of these results are inconclusive. The researcher recognizes that improved test score results could have been the result of the repetitive class structure and format, and not related to the format used for note-taking throughout the study.

As an educator, focusing on student success should create a constant need to try and implement the best way to present information to students. According to Boyle (2001), a lecturer’s rate of speaking is typically too fast for students to write down and process all the needed information. This can create stress for students in the classroom due to instructors not implementing a structured-learning environment for their students. This study concluded that teaching class content in a repetitive manner and implementing a set format for note-taking (paper or iPad) created an environment that allowed students to know class expectations, to thoroughly take notes, to process the needed information, and to gain an understanding of the concepts taught.


Appendix A

Sample Interview Questions

Interview Questions

Date ___________________
Interview # ______________
Interviewee ___________________________ Pseudonyms___________________

1. Do you think you learn better by taking notes by hand or on an iPad? Why?

2. Do you prefer to take notes by hand or on an iPad? Why?
Appendix B

Sample Lesson Plan

Case Study Lesson Plan

PART ONE - Novel Study (25 mins):
What are themes? Why are themes important in a book?
○ The central, recurring subject in a novel
○ Discuss: topics are not themes (love, family, etc.) but can use topics to discover the theme.
○ Use statement: *The author believes that it is important to treat characters the same way that you’d want to be treated.* OR *The author believes that life isn’t fair due to how humans treat each other.* Continue to discuss themes that are found in the novel...
What are some common themes that author’s use in novels?
○ Faith versus rational considerations, family difficulties, moral decision and social justice issues, etc.
Goal of Lesson: Have students understand some of the common themes used in the novel *To Kill a Mockingbird*

PART TWO - Grammar (25 mins):
Chunking Sentences
○ Look for the 4 stop signs: Commas, Prepositions, Conjunctions, Pronouns
○ Clauses: Subject, Verb, Object/Complement
○ Phrases: No Subject, or verb. Most common phrases are prepositional phrases.
■ What are prepositions?
Now Chunk:
○ Chunking means breaking up the sentences based on the rules above.
Goal of Lesson: To understand the basic components of a sentence.

PART THREE - Wrap Up (10 mins):
Answer questions, collect homework, etc.
Appendix C

Sample Assessment

Novel Study

1. What are themes in a novel?
   a. The main characters in the novel
   b. Central or recurring subject in the novel
   c. The conflict between two characters in the novel
   d. The exposition in the novel

2. What are some common themes author’s use?
   a. Character’s names and their problems are common themes
   b. Excitement, grotesque, and tiredness are common themes
   c. Racism, unrequited love, and class are common themes
   d. Freedom versus censorship, moral code, and political justice are common themes

3. Which option below is an example of the theme social injustice?
   a. Tom Robinson is being wrongly accused of rape because he is African American.
   b. Bob Ewell is the town drunk.
   c. Jem and Scout can’t play with Boo Radley.
   d. Walter Cunningham is drinking a coke while watching the trial.

4. Which option below is an example of the theme gender identity?
   a. Jem deciding he doesn’t want to wear overalls anymore.
   b. Scout become more feminine towards the end of the novel.
   c. Atticus Finch deciding to remarry.
   d. Aunt Alexandra becomes a tomboy.

5. Which option below is an example of the theme moral education?
   a. The children learn that Boo Radley is the one who saved them from Bob Ewell.
   b. Aunt Alexandra teaches Scout how to be a lady.
   c. Atticus Finch having a strong relationship with his children and instilling in them a social conscience.
   d. Tom Ewell deciding not to press charges against Tom Robinson.

Grammar

6. What are the four "stop signs" to look for when chunking a sentence?
   a. Adverbs, Nouns, Verbs, Conjunctions
   b. Commas, Prepositions, Conjunctions, Pronouns
   c. Chunking, Nouns, Adjectives, Pronouns
   d. Nouns, Verbs, Adjectives, Conjunctions
7. After we chunk, we commonly end up with a _______ and a _______.
   a. Clause, Phrase
   b. Verb, Noun
   c. Adjective, Noun
   d. Adverb, Phrase

8. Which sentence is chunked correctly?
   a. Susie made apple pie / with sugar and butter / and it tasted delicious.
   b. Susie made / apple pie / with sugar / and butter / and it tasted delicious.

9. Which sentence is chunked correctly?
   a. Quickly, / the cat jumped / to her.
   b. Quickly, / the cat / jumped / to her.

10. Which sentence is chunked correctly?
    a. The lion was dying, / in serious pain, / very quickly.
    b. The lion was dying, in serious pain, / very quickly.
## Appendix D

### Sample Rubric

#### Note-Taking Rubric

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Appendix E

A STUDY OF RESULT DIFFERENCES BETWEEN HAND-WRITTEN NOTES AND iPAD NOTES ON STUDENT LEARNING

Dear Parent(s) and/or Guardian(s):

My name is Rachel Bulthuis, and I am a resource room English 11 teacher at Zeeland East High School. I am currently attending Aquinas College for my Master’s Degree, and as a final part of my Master’s program, I am required to complete a study and use the data collected from my study in my thesis paper. Parental permission allows your child to participate in my study. Jon Voss, Zeeland’s Assistant Superintendent, and Brandi-Lyn Mendham, Director of Curriculum, have given permission to complete this study.

The purpose of the research is to determine the result differences of hand-written notes compared to iPad notes on student learning. Completing this case study will allow the researcher to discover if there is a benefit of using technology for notetaking in the classroom. Your child’s participation will not require any time out of the classroom and there will be no risk involved if your child is a participant. The results will be used in my thesis only. Student and parents’ names will not be used during research. Students’ names will be replaced with Student 1, 2, 3 and so on. The paper assessments collected will be stored in a secure and locked file cabinet, which is located in my classroom and only I, the teacher, have access to it. I will keep the data until thesis is complete and after thesis has been completed, I will shred and delete all data used in this study.

If your child participates in the research, he or she will be asked to take weekly assessments over the content learned during that week. Your child will participate in weekly note-taking in the format determined by your child. Your child’s participation will be daily, 60-minute class periods that will be assessed every week. There are no known risks associated with this research. You and your child’s name will never be used in the study, and your child’s name will be replaced with a number.

Participation in this research study is voluntary. You may decline your child’s participation or withdraw your child from the study at any time. Your child will not be penalized in any way should you decide not to allow your child to participate or to withdraw your child from this study. If you would like a copy of the study results, you may request a copy from Rachel Bulthuis.
Contact Information:
Questions or concerns about this study or about your child’s rights as a research participant, please contact Rachel Bulthuis at 616.748.4777 ext. 5112 or rbultthui@zps.org or Dr. Carol Winkle, my Faculty Advisor, at 616.632.2434 or winklcar@aquinas.edu. If you would like a copy of the study results, you may request a copy from Rachel Bulthuis.

Consent
By signing your name below, you indicate that you have read and understand the preceding information, have received satisfactory answers to any questions you may have had, and voluntarily give consent for your child to participate in this study knowing that you may withdraw your child at any time, if desired, without penalty. A copy of this parental permission form will be given to you and should be retained for your records.

Signature of Parent/Guardian: __________________________ Date: ________________

Printed Name of Parent/Guardian: __________________________

Child’s Printed Name: __________________________
Appendix F

September 14th, 2016

To Whom It May Concern,

On behalf of Zeeland Public Schools, Jon Voss (Assistant Superintendent) and Brandi-Lyn Mendham (Director of Curriculum and Technology) give their approval for teacher Rachel Bulthuis to complete her case study during the 2016-2017 school year.

Rachel’s study, *Result Differences Between Hand-Written Notes and iPad Notes on Student Learning*, will be conducted in her Resource English 11 class. The participants are students at Zeeland East High School and Zeeland West High School, and their ages range from fifteen through seventeen years old.

If you have any questions, please contact Mr. Voss at jvoss@zps.org or Dr. Mendham at bmendham@zps.org.

Sincerely,

Jon Voss
Assistant Superintendent

Brandi Mendham
Director of Curriculum and Technology