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The Impact of Notetaking in a Middle School History Class

Marybeth Flietstra

Capstone Project: An Action Research Project

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Abstract

The purpose of this action research project was to determine the impact of notetaking in a 7th grade World History classroom on learning and engagement. A mixed-methods study of 36 7th grade students was used to determine significant differences between notetaking styles, student performance, and engagement during short class lectures. Post-lecture assessments, Likert-style surveys, and student notes were assessed and triangulated, while interviews and survey questions were evaluated to illustrate common themes and perceptions of notetaking. Data analysis revealed that notetaking does have some impact on both academics and engagement, however, the style of notetaking made a significant difference. Additionally, analysis suggested that the cognitive tasks most closely associated with notetaking, such as handwriting speed and language comprehension, do not overly impact one's notetaking abilities. The research findings of this study may prove beneficial to middle school educators who teach content-heavy courses and struggle with student engagement and learning outcomes, especially within a lecture-based classroom environment. Instruction and modeling on the part of a teacher will greatly bolster student confidence, ability, and autonomy when it comes to notetaking.

Keywords: notetaking, engagement, middle school, lecture, cognitive skills

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The Impact of Notetaking in a Middle School History Class

Notetaking is a common and expected pedagogical practice in traditional classrooms. Incorporating writing skills that have been learned in earlier grades, students use notetaking to comprehend, capture, and code critical information from temporary sources like lectures and presentations (İlter, 2019). From middle school through higher education, lecture is the primary method used by instructors to present course material (Shernoff et al., 2003). Therefore, notetaking has become an integral component of most educational experiences and is seen as both important and conducive to academic success (Kobayashi, 2006; Oefinger & Peverly, 2020). Research suggests that the benefits of intentional and cohesive notetaking are many, including increased recall of material, deeper understanding of content, and overall academic performance improvement (Salame & Thompson, 2020).

While numerous undergraduate classrooms have undergone research studies on the efficacy of notetaking strategies within an academic setting, little is known about the impact of notetaking on the middle school experience. Most middle schoolers are unequipped with the necessary notetaking skills to make it an effective practice (Igo et al., 2009) and the cognitive demands of notetaking prove challenging. Students must interpret and retain information in their working memory, identify and transcribe the most important details, and continue to pay attention to the content being presented to them (Piolat et al., 2005). Numerous factors impact a learner's notetaking capacity including handwriting speed, language comprehension, sustained attention, background knowledge, and working memory (Oefinger & Peverly, 2020). A student's abilities related to each of these factors can influence their success in notetaking. Additionally, the changes experienced by adolescents around the time they are in middle school influence their cognitive abilities in these areas as well.

Middle school is a time of dynamic physical, psychological, and social change for adolescents. Physically, middle schoolers are experiencing puberty with intense hormonal surges (Best & Ban, 2021). Cognitively, the prefrontal cortex of the brain is being remodeled, which impacts decision-making and impulse control (Blakemore, 2018). The need for social acceptance influences a student's choices and psychological health (Goddings, 2015). These factors influence student behavior, the desire for academic success, the capacity for higher-level thinking, and engagement within the classroom. Engagement comes when students are both challenged and motivated to do well (Shernoff et al., 2003).

In a World History classroom, students are presented with a wide range of information daily. In an effort to meet state standards, educators must introduce factual information while also promoting 21st century skills such as collaboration, critical thinking, and communication into their instruction (Furman, 2017). With the goal of a modern classroom to be relevant and engaging, the desire for lecture-based classes is diminished. However, the importance of teaching content from a variety of perspectives and giving students a solid base of information to build from makes some traditional classroom practices, like notetaking, a necessary component of education. The problem is that information needs to be presented in a cohesive and engaging way in order to maintain student interest and ensure comprehension of class materials. Long gone are the days of lengthy lectures and students sitting quietly at desks passively absorbing new information. Students desire to be entertained and are easily distracted and disengaged from activities that require advanced cognitive skills. In cooperation with other valuable pedagogical practices like collaborative, project-based, and inquiry driven learning, can traditional methods like notetaking during classroom lectures support academic growth and maintain student engagement in the classroom?

The Purpose of this Study

History has long been my passion; some of my favorite middle school memories involve hearing the stories of the Oregon Trail or building a diorama of an Iroquois village. I also enjoyed the process of learning; developing my notetaking and organization skills in order to be prepared for assessments was a component of my middle school learning that has served me well as both a student and educator throughout the years. As I've developed in my practice as an educator, I've come to realize that notetaking is not a skill that many of my students enjoy or participate in effectively. Many students try to transcribe an entire lecture, while the others try to listen and remember without knowing what to write down to aid in their long-term memory of our content. While I don't lecture every day in class, I feel that it is important for students to develop the skills necessary to acquire information, and it is also vital to their understanding of World History to have background knowledge on central topics before they can engage in other more exciting activities like debates or projects.

In a 2020 study by the EdWeek Research Center, 78% of educators polled stated that the primary purpose of teaching history was to prepare students to be active and informed citizens (Ujifusa, 2020). This approach to history education suggests that students need to know the facts of history in order to engage appropriately and wisely in building their desired future. Part of teaching history is to share large amounts of factual content with students so that they can develop a better understanding of various eras of history, different cultures, and the ways that historical events have shaped the world that we live in today. At the middle school level, there is a challenge to deliver content in exciting, engaging, and intellectually stimulating ways. While the classroom should be a place of active, experiential learning, students also need to capture accurate information in order to enhance their interpretation, critical thinking, and integration of

historical facts in more interactive settings. The purpose of this study is to determine the impact and effectiveness of notetaking within a middle school classroom as it relates to both academic performance and student engagement. The research performed will help classroom teachers make appropriate decisions regarding their classroom pedagogy and determine if notetaking as a practice benefits the middle school experience.

Notetaking at the undergraduate level has been the topic of numerous research studies throughout the past fifty years. Since the introduction of computers in the classroom, researchers have expanded their research about notetaking to include important questions about the impact of digital notetaking, again, primarily at the college level (Bui et al., 2013). Most of the references within this literature review include research articles about studies done at the undergraduate and postgraduate levels, as well as the few available regarding high school and middle school notetaking strategies. Some focus on the cognitive impact of notetaking, while others focus on the difference in impact between handwritten and digital notetaking. Notetaking is a worldwide pedagogical practice, and so several articles are international, including research conducted in Taiwan, Shanghai, and Sweden. Of the sources reviewed, the majority are peer-reviewed articles found within the DeWitt Library databases. Some sources were found using Google Scholar. The final group of articles were found using the reference sections of previously cited peer-reviewed action research studies.

Review of the Literature

Notetaking is a cognitively challenging practice that is both required and expected within traditional classroom experiences. Research suggests that “taking notes in the classroom is considered as one of the important indicators of success in schools” (İlter, 2019). While notetaking is generally seen as a useful and important task, it is clear that students lack effective

notetaking skills. The impact of notetaking instruction on student success is unquantifiable. Targeted instruction, modeling, and practice of notetaking skills equips students with tools that will serve them throughout their academic careers. Notetaking encourages recall and retention of information as it helps students transfer information from their working to long-term memory. Effective notetaking increases student engagement and autonomy within the classroom by encouraging focus and the development of personal preferences and style. In all, the benefits of notetaking suggest that this practice is one of the most effective ways to support student learning within the classroom.

The Impact of Notetaking Instruction.

Notetaking is a detailed process that requires a wide range of developed cognitive skills and practical application in order to be successful. Research suggests that these skills are supported most effectively when teachers engage in active notetaking instruction (Oefinger & Peverly, 2020; Karabulut & Baran, 2021). As students acquire new information through both reading and lecture formats, intentional and strategic notetaking helps with focus, organization, and overall comprehension of new material. “The most practical way to teach students how to elaborate and organize new information while reading or listening is to teach them to take effective notes” (İlter, 2017, p.230). There are a variety of strategies and interventions that educators can employ to support students of all cognitive levels.

The practice of effective notetaking is generally not taught to students. Educators believe notetaking to be a self-acquired skill or “spontaneous learning strategy,” commonly used by students at the high school and college level (Chang & Ku, 2014, p. 278). There are numerous reasons to refrain from targeted notetaking instruction, including a perceived lack of need for such an intervention and because lecture notes and presentations are often provided to students

for the sake of efficiency (İlter, 2019). Teaching notetaking takes time and effort. As course content is a priority within the classroom, carving out space for notetaking instruction and practice is a challenge for every educator. İlter (2017) suggests, “developing efficient notetaking skills requires intense effort and time for modeling and creating and education scaffolding, and it may be difficult for teachers to help students practice notetaking activities sufficiently in class” (İlter, 2017, p. 597). Teachers feel pressure to complete curricula in time for standardized tests and other assessments. Additionally, there is little consensus on what age is appropriate to begin notetaking instruction.

Notetaking support for students is often provided by the teacher simply giving students access to lecture notes, completed notes sheets, or lecture recordings. Research suggests that these practices are damaging to student learning. By offering completed notes to students, students experience a loss in the overall cognitive effort needed to engage with the course content. When students don't need to actively engage in the material during the lecture, but can rather passively copy the content, critical thinking and working memory stimulation is limited. On the other hand, İlter (2019) suggests “Taking quality notes during lectures may help students to think deeply about the material by alleviating the cognitive burden in the working memory so that it can increase productive processes of memory” (p. 233). As students engage with material throughout a lecture, they must actively employ cognitive muscle in order to draw out key information.

Likewise, while many educators accommodate students with special needs by providing thorough copies of lecture notes or recordings, a recent study by Vekaria and Peverly (2018) suggests that these types of accommodations are not in the best interest of any student, including those with ADHD and other cognitive challenges. The advantages of active notetaking such as

increased engagement and more generative learning indicate that students benefit from the process and can be taught strategies to mitigate their weaknesses rather than rely on accommodations, such as extended time or additional supports.

Notetaking Strategies.

There are five notetaking strategies typically employed by students during lecture-type classes (Chen, 2021). These strategies include 1) copying of information (transcription); 2) key point selection; 3) comprehension monitoring; 4) organization, and 5) elaboration. Copying the information from a lecture suggests that a student attempts to make a verbatim record of everything the lecturer says or writes, even if the student is already familiar with the concepts or examples. Key point selection refers to selectively writing down the important information from a lecture. A student participates in this strategy by carefully determining, recording, and summarizing the primary points of a lecture. Comprehension monitoring is identified by Chen (2021) as ensuring full comprehension of material by asking a classmate for help or referring to the textbook or lecturer to fill in any missing information. This strategy requires a student to leave strategic spaces in their notes to add supplemental information in the future. When students employ the organization strategy, they typically use the outline method to create their notes. Finally, the elaboration strategy requires a student to think about related information, questions, and examples as they are determining what to write down. These students also tend to write down their own opinions and ideas.

The key point selection strategy is the most frequently used notetaking strategy employed by students. Chen (2021) suggests that students who employ this strategy do so because it takes the least amount of time and most easily meets the supposed criteria for notetaking, namely determining the key points of a lecture. “Because the handwriting speed is not faster than that of

listening, students' urgent need was to extract key points under time restrictions" (Chen, 2021, p. 256). Urgency is one element that impacts the cognitive skills required of notetaking, especially handwriting speed and listening comprehension.

The skill of pinpointing key ideas in a lecture is acquired and can best be supported through the practice of guided notetaking. The Guided Note Taking learning model helps teachers deliver lessons using handouts as teaching materials that have important points removed (Astra et al., 2019). Guided notes can help students because they create a framework for notetaking that reduces the cognitive demands of the practice by "ensuring the accuracy of notes, and providing students with the opportunity to focus on the most important information from a lecture" (Haydon et al., 2011 as cited in Astra et al., 2019, p. 6). Students are encouraged to think critically about their learning while educators can be confident that students' learning outcomes will be improved.

One form of guided notes that has seen positive benefits in student focus and preparation for assessments is the Cornell notetaking system. This form of notetaking is identified as a "natural learning cycle because it requires the note-taker to record, review and assess one's understanding of new information all while interacting with a single document" (Pauk, 1997 as cited in Evans & Shively, 2019, p. 10). Additional guided notes systems such as the Formal Outline Procedure, the Bartush Active Method, the Verbatim Split Method, and Sketchnoting each offer a form of systematic notetaking that can be helpful to students as they attempt to encode and study large amounts of material (Stacy & Cain, 2015).

Teacher interaction in the learning process encourages student engagement and improves information acquisition and recall. Educators are encouraged to incorporate a variety of learning strategies to help with information recall and acquisition from a lecture (Jonsson et al., 2014).

Combining notetaking strategies along with varied pedagogical practices can ensure that students are well-equipped to experience increased academic success. In addition to practicing specific note-taking skills, targeted support and increased reading comprehension programs build student confidence and ability in the areas of language comprehension and background knowledge.

These two factors influence students' notetaking skills (Oefinger & Peverly, 2020). Students who have deficits in handwriting speed and sustained attention, in addition to language comprehension and background knowledge, are best served by targeted interventions, such as the use of recordings for additional lecture exposure, pausing lectures periodically so that students can catch up, providing cue words or outlines, and encouraging note review after a lecture (Oefinger & Peverly, 2020). After-lecture note-taking strategies, such as elaboration and help-seeking, allow students to effectively revise and include additional content to their notes, which allows for deeper understanding and recall of the content.

Cognitive Impact of Notetaking.

Notetaking is a comprehensive and cognitively challenging process that is impacted by several key variables. These variables including handwriting speed, language comprehension, sustained attention, background knowledge, and working memory (Oefinger & Peverly, 2020; Vekaria & Peverly, 2018). Research suggests that when all these variables are analyzed simultaneously, handwriting speed, language comprehension, and sustained attention most poignantly impact one's notetaking skills (Oefinger & Peverly, 2020 citing the research of Peverly et al., 2007, 2012; and Peverly et al., 2014). Bui, Myerson, and Hale (2013) suggest that when "notetaking is framed as a composition of more basic cognitive abilities, it is clear that one reason why students' notes vary among one another is likely because of individual differences in these lower abilities" (p. 299). This suggests that notetaking skills can be improved when a

student works intentionally on developing in these various cognitive areas. Additionally, this suggests that students may adopt different notetaking strategies because of their cognitive strengths and weaknesses (Hüseyin, 2019).

Handwriting Speed.

Handwriting speed, or transcription fluency, is the first variable that impacts notetaking. This is typically measured as the number of words or letters written per minute (Oefinger & Peverley, 2020, p. 177). For some, handwriting speed is impacted by the physical limitations of the individual. Notetaking might not be effective because “it is possible that an individual transcribing notes by hand cannot physically write fast enough, or for a long enough period of time to produce more notes than someone who is organizing by hand” (Bui et al., 2013). Others who have conditioned themselves to write faster or practiced notetaking to include abbreviations, symbols, and contractions in their writing, may not be limited by handwriting speed when notetaking.

In today’s digital age, the transcription fluency variable presents a unique challenge, as digital composition of text on a personal device can provide significant advantages. Keyboards, for example, “allow for faster note-taking for a longer period of time” (Bui et al., 2013, p. 302). While notetaking with digital devices tends to allow students to capture more information throughout a lecture, it is probable that this type of information is verbatim transcription of the material instead of summary or personal elaboration (Stacy & Cain, 2014). Research suggests that summarization of material tends to develop a deeper cognitive understanding and engagement with course content. Digital notetakers who prioritize quantity in verbatim-style notetaking tend to have a disadvantage. Mueller and Oppenheimer (2014) suggest “laptop use can negatively affect performance on educational assessments, even—or perhaps especially—

when the computer is used for its intended function of easier notetaking. Although more notes are beneficial, at least to a point, if the notes are taken indiscriminately or by mindlessly transcribing content, as its more likely the case on a laptop than when notes are taken longhand, the benefit disappears” (p. 1166). Regardless of one’s handwriting speed or the ease at which they acquire information using a keyboard, the research is clear that that transcription fluency does impact the quality of one’s notes. Peverly et al. (2012) suggests that students with slower handwriting speed may be at a disadvantage in lectures without outlines (p. 116). By providing the main points of a lecture, teachers can support these students who may use their valuable notetaking time trying to sift through information to determine what is vital.

Language Comprehension.

The cognitive function of language comprehension refers to a student’s ability to understand the semantics and grammar, along other skills, of the spoken or written word (Kintsch, 1998 as cited in Oefinger & Peverley, 2020). Over the last four decades, researchers have disagreed about the significance of language comprehension skills as they relate to notetaking. Kiewra and colleagues (Kiewra & Benton, 1988; Kiewra et al., 1987 as cited in Vekaria & Peverly, 2018) were unable to determine a significant relationship between language comprehension and lecture notetaking. However, Oefinger & Peverly (2020) determined that language comprehension and background knowledge were the most important cognitive processes for notetaking (p. 185). In an older study, Peverly et al. (2012) suggest that language comprehension may be “as important to note-taking as it is to writing essays and related to notes once handwriting speed is sufficiently developed” (p. 122). A student’s ability to understand the information presented in a lecture format is imperative to his ability to effectively capture and record key points and information. Students who struggle with language comprehension may

find that their notes lack in depth or quality, and as such, should be supported through teacher intervention.

Background Knowledge.

Background knowledge, as stated previously, has been identified as one of the most important cognitive processes for effective notetaking (Oefinger & Peverly, 2020). Adequate background knowledge of a topic or task allows a student to correctly infer meaning, assists in language comprehension, and provides support to understand both verbal and written text (Greenberg, 2021). There are two types of background knowledge. The first is knowledge of the world. This type of background knowledge is informed by personal experience. Second, there is academic knowledge, which is developed by reading and informing oneself through newspapers and nonfiction texts. Adequately preparing students for a lecture by pre-teaching vocabulary or providing introductory materials can support the development of background knowledge which allows note-takers to be more selective and make deeper connections with course material.

Sustained Attention.

Of the many cognitive tasks required by notetaking, Vekaria and Peverly (2018) suggest that sustained attention, along with the “parallel operation of handwriting speed and language comprehension where greater fluency in the former (a basic skill) and greater skill in the latter (a higher order cognitive skill) are related to better notes” (p. 1553). Sustained attention is the ability to maintain attention on a specific task or goal-related behavior over a period of time (Cristofori, 2015). In the classroom, sustained attention is significant as it allows students to effectively engage in note-taking behaviors throughout the course of a class period, without their minds wandering, thus losing focus on the task at hand.

In a study on the lecture notetaking skills of students with and without ADHD, Vekaria and Peverly (2018) determined that sustained attention was significantly related to notes' quality. While there were no significant differences between sustained attention in postsecondary students with and without ADHD, it is possible that the students had, by this point in their educational careers, figured out how to manage their distractibility and lack of focus in a classroom setting.

Working Memory.

Working memory is the “ability to temporarily hold and manipulate a limited amount of information” (Baddeley, 1986 as cited in Bui et al., 2013, p. 299). Jonsson et al. (2014) suggests that differences in working memory capacity can be seen in how students are able to “maintain, manipulate and access task-relevant information in the face of potentially interfering distraction” (Jonsson et al., 2014, p. 385-386). While working memory influences notetaking in that students need to recall and organize information in order to take effective notes, Bui, Myerson, and Hale (2013) suggest the possibility that working memory is more important for certain note-taking strategies when compared to others.

Within a classroom, there are many factors that can influence a working memory. When information is shared in an overly complicated way or given in large quantities, it is possible for the working memory to become overwhelmed (De Jong, 2010 as cited in Costley & Fanguy, 2021, p. 657). Jonsson (2014) refers to this problem as “cognitive overload.” Low working memory capacity, combined with the other cognitively demanding aspects of notetaking influence a student's ability to store, process, and recall information. Costley and Fanguy (2021) offer an intriguing solution to the challenge of individual notetaking on working memory, by

suggesting that collaborative notetaking may help ease the burden. Students can work together to capture, store, and process information.

Recall and Retention.

Notetaking is a beneficial practice, which can help students transfer information from their working memory to long-term memory. Miller, Galanter, and Pribram (1960, as cited in Evans & Shively, 2019) suggest that notetaking is a step in the process of learning and that taking notes alleviates the burden on working memory by externally storing information to be retrieved later. Challenges to the recall and retrieval process within education are that students take inefficient notes, do not participate in effective post-lecture practices to enhance their notes, or fail to use those notes later to study the material. Developing these skills through direct instruction and practice will support student growth and assist in the retention of information.

When taking notes, students should be encouraged to focus on quality over quantity. Although information recall is important for formative assessments, the real benefit to notetaking comes when students retain information and deeply engage with the material. Students who take their own notes and review them, as opposed to simply looking at the lecturer's notes, take full advantage of the encoding process of notetaking as well as the external storage functions of the process (Beck et al., 2014). When students go back to study their notes, they engage in the retrieval process, which improves student learning by increasing meaningful notetaking behaviors and decreasing mind wandering (Schacter, 2013 as cited in Rowley & McCrudden, 2020, p. 1511).

Roediger & Karpicke (2006) emphasize the retrieval practice effect, also known as the testing effect. According to their study, when a student studies course material (such as notes) they are able to retrieve and retain information better than traditional study strategies, such as re-

reading a textbook or copying lecture slides provided by a teacher (Roediger & Karpicke, 2006 as cited in Rowley & McCrudden, 2019). Educators can support student learning by helping students determine when and how to use various retrieval practices. Rowley and McCrudden (2019) suggest “If students understand the benefits and skills associated with retrieval practice, they will be more likely to adopt more effective strategies during independent study” (Rowley & McCrudden, 2019, p. 1513). The benefit of recall and information retention strategies links back to effective notetaking instruction within the classroom. Chang and Ku (2014) state, “results show that note-taking instruction increases the levels of free recall, scores on comprehension tests, enhances problem solving and helps students learn to include more relevant ideas” (p. 279). Teachers who emphasize a variety of learning, notetaking, and memory strategies will support students in their development as individuals who take ownership of their learning.

Student Engagement and Autonomy.

Student engagement, focus, and autonomy within a classroom are challenged by a wide variety of factors. Teaching methods, social interactions, puberty, and interest in the material at hand all impact student engagement and their willingness to participate in meaningful learning activities. Shernoff et al. (2003) suggests that students experience increased engagement within a learning environment when “the perceived challenge of the task and their own skills [are] high and in balance, the instruction [is] relevant, and the learning environment [is] under their control” (p. 158). The research concludes that students are more engaged when they participate in individual and group work as opposed to listening to lectures, watching videos, and taking exams. Students who experience autonomy, choice, and challenge within their educational experience are more likely to actively engage throughout a class period.

Moosa (2020) suggests that engagement is context specific with no universal definition. Students may be engaged in one activity or course and disengaged in another, making engagement within the classroom a difficult concept to define or quantify. Shernoff et al., (2003) come to the same conclusion by suggesting that engagement within a course may be affected by contextual and classroom factors including instructional format and school subject. Although defining engagement is difficult, research suggests that there are three types of engagement: behavioral, emotional, and cognitive (Chang et al., 2016; Fredricks et al., 2004). Chang summarizes these forms of engagement by stating “Behavioral engagement refers to participating in work, doing required work, and following the rules; emotional engagement, having negative and positive poles, covers interest, happiness, anxiety, and belonging; and cognitive engagement reflects mindfulness and willingness to exercise effort to understand complicated ideas and master high-level skills (Chang et al., 2016, p. 1285). These three forms of engagement are all valuable to the academic and social growth of a student.

One way to increase engagement within a classroom is to issue appropriate challenges and provide opportunities to enhance skills. Shernoff et al. (2003) suggest that flow theory is key in the enhancement of student engagement within the classroom. In general, educators need to determine how to effectively balance challenge and skill within the classroom. Disruption of this balance leads to apathy, anxiety, or relaxation within the setting, all of which impact engagement. When students achieve a balance between their skill level and the challenges offered within the classroom, they can experience better concentration, interest, and enjoyment.

Student autonomy within the classroom is the practice of allowing students to make choices regarding their learning and schoolwork. When teachers allow students to make choices, they are encouraging the academic success and increased engagement of students. Patrick et al.

(2019) suggests that “autonomous self-regulation and/or student perceptions of autonomy in school have been shown to be associated with intrinsic motivation to learn, engagement, self-regulated learning strategies, academic achievement, positive emotions, and staying in school versus dropping out” (p. 946-947). The benefits of student autonomy and choice are numerous and tend to support positive student outcomes.

Within the Middle School context, students are at an age where autonomy, resistance to adult control, and socialization with peers, are becoming more of priority. In a study by Evans and Shively (2019) about the practice of Cornell-notetaking, the researchers concluded that although students were taught a note-taking system that was both proven and effective, about half of the Middle School students studied preferred to continue taking notes their own way. Although aware of the benefits of using a note-taking system, students wanted to assert their own independence. Evans and Shively (2019) suggest “This cognitive dissonance is a major obstacle to instruction and ‘selling’ the benefits of a note-taking system will be difficult” (p. 32). Autonomy and choice engage students by allowing them to take ownership over their learning and determine the best strategies for meaningful content acquisition and recall.

Methodology

Research Question.

I completed this action research study within my 7th grade World History classes. I sought to answer the question, *Does note-taking improve students’ learning and engagement in a middle school World History classroom?* My goal throughout the study was to determine if note taking truly was an effective way to help students engage with course content when delivered in a lecture-style format. Further, I researched various methods of notetaking to see if certain styles elicited higher levels of engagement and academic achievement.

Participants and Research Setting.

Altogether, thirty-six students participated in this action research, with nineteen from my first period World History class and seventeen from my fourth period World History class.

These classes are identical in structure and content. I teach at a private, Christian middle school in the greater Los Angeles area. The school is part of larger Preschool through 12 system. The middle school is located in an urban area and is located next to our high school. Within the school, there are 200 students between the seventh and eighth grade.

The school has a 1:1 iPad program, so throughout my study, students were encouraged to take notes via paper and pencil or digitally. Thirteen students preferred taking handwritten notes using paper and pencil and eleven chose to take handwritten notes using an Apple pencil on the iPad. One student indicated that he didn't have a preference between digital or paper and pencil as long as he was able to handwrite his notes, and not type. Only three students preferred typing their notes on the iPad and seven didn't suggest any kind of preference. They were comfortable taking notes in any format or style. When given a choice, three of them chose to write notes on paper and four chose the digital option.

The group of students who participated in the study had a wide range of academic abilities. Seven of the students surveyed had a 4.0 cumulative GPA, and eighteen fell within the 3.0 to 3.9 cumulative GPA range. Eleven students had a GPA of 2.0 – 2.9, and there were no students below a 2.0 range. At the school, students are typically grouped by their math class placement; one student is highly advanced and in a high-school level Algebra 1 class. Fourteen students are in an advanced Pre-Algebra class, and the rest meet seventh-grade requirements in a Math 7 class.

Regarding student engagement in the classroom, twenty-five students indicated that they were typically highly or moderately highly engaged in their classes. They were committed to doing well and staying on task during class. Ten students chose three out of five on the Likert-scale regarding classroom engagement and focus, and suggested that their engagement in class was dependent on a variety of factors including class topic, presentation style, and other non-academic related factors. Finally, one student chose one out of five on the Likert-scale and suggested that he hardly ever felt engaged in classroom activities and lessons.

Within the group who participated, there were four with specific learning needs. One student has a 504 plan with inattentive type ADHD. This student struggles with executive functioning and organizational skills. Reading comprehension and language skills are primary areas of concern. The second student is currently being tested for ADHD; a primary concern for this student relates to organizational skills. Both students indicated that there was little need for notetaking in the classroom and that they had low confidence in their notetaking skills. A third student has a 504 plan and experiences challenges with language skills, deficits in auditory processing, and memory. The fourth has a 504 plan for ADHD and struggles with organization, focusing, and spelling. These two students believe that notetaking is incredibly important (5 out of 5 on the Likert-scale) and indicated fairly high confidence (4 out of 5) in their abilities to take notes well.

Intervention and Timeline.

The research design for this study used several quantitative and qualitative data points. Students completed surveys, comprehension checks, five different notetaking activities, and additional short tests to measure handwriting speed, background knowledge, working memory, and sustained attention skills. Additionally, eleven students participated in a short interview,

during which I was able to ask about notetaking preferences, historical experience with notetaking, and the perceived benefits and challenges of notetaking. In our initial demographics and experience survey, 50% of the students surveyed indicated that they were fairly confident in their ability to take good, accurate notes in a lecture type setting (4 out of 5 on a Likert scale). Additionally, 50% of the students stated that they believed notetaking was very important for their academic success.

Throughout this study, students participated in short, ten-minute or less lecture-style informational input sessions. Students were asked to take notes in a variety of ways throughout the time of the lecture. These styles included “freestyle,” outline style, Cornell style, and fill in the blank notes. The primary variable was note-taking style. In the first session, sixteen engaged in “Free style” notetaking, where they were asked to take notes however they felt would best help them absorb the information. In the second session, sixteen students completed a more formatted “outline” style of notetaking. For this session, I provided students with headings for each primary topic, and asked students to complete the outline by entering information within those headings. In the third session, sixteen students completed “Cornell style notes” and in the fourth session, thirteen of the students completed fill-in-the-blank notes. In the fifth and final session, all students were encouraged to take notes digitally, in whichever format they chose.

After each lecture, students were asked to complete a formative assessment and a survey to see how much information they retained and how engaged they were in the class activities. One of the challenges that existed throughout the study was that student attendance was inconsistent. These inconsistencies impacted the number of students who took notes versus those who didn't and meant that some of the additional studies and surveys were not completed by all students in the study. One additional variable that was introduced throughout these

lectures was that the style of lecture changed a bit each session. As seventy-two percent of the students identified themselves as visual learners, I made sure to incorporate images and/or text of some kind in each lecture. The amount of displayed information varied with each session, depending on the notetaking strategy that was being used.

Cognitive Assessments.

In addition to assessing notetaking, students participated in a variety of additional tests to measure the five cognitive skills that are most closely related to notetaking: handwriting speed, language comprehension, background knowledge, sustained attention, and working memory.

To measure handwriting speed, students completed the alphabet test, where they were asked to write the alphabet as many times as possible within a one-minute time period. Students participated in two short background knowledge assessments. This was because the topics that were covered in the lectures were significantly different from day to day. The first measured background knowledge on ancient Chinese dynasties that students learned about in sixth grade. The second measured famous places throughout Asia. To measure language comprehension, students listened to a short reading about Empress Wu of the Tang Dynasty. This reading was found on Newsela, a website that curates readings of various Lexile levels for students. The reading was at a Lexile level of 1050, which was the average Lexile level of all students.

The working memory study asked students to look at and remember a combination of letters and numbers and then record what they remembered. I designed the test, but it was based off of similar working memory assessments found online by Memory Health Check and other memory loss websites. Finally, the sustained attention test was modeled after the SART test, which stands for Sustained Attention to Response Task. Students were asked to focus on a screen where numbers flashed at varying intervals for approximately five minutes. Throughout

that time, students needed to make a tally mark for every digit they saw that was not a “3”.

Traditionally, this test is computer based and measures response time in addition to accuracy.

However, due to a lack of proper testing equipment, I focused primarily on accuracy for this test.

I also recorded observations as students were completing the assessment.

Variables.

Throughout my data analysis, notetaking served as my primary variable. Students who took notes were compared to students who did not take notes in a lecture-type setting.

Additionally, the type of notes being taken throughout a lecture changed with each notetaking session. Therefore, the type of notetaking may impact the overall experience for students in a class period. If students are unfamiliar with a particular notetaking style, for example, they may have a more challenging time recording and organizing information. Finally, traditional lectures often include visuals and other data projected on the screen. As students participated in different types of notetaking options, I included as much information as necessary for their notetaking.

For example, during fill-in-the-blank notes, the presentation is text-heavy, while in the freestyle notetaking session, students will have access to pictures and slide titles will little extra text.

These modifications from day to day may impact the notetaking experience for students.

Measurement Tools and Anticipated Statistical Analysis.

As students completed assessments, surveys, and notes, I collected all of data and recorded it in Microsoft Excel and Word programs. I transcribed all interviews. Additionally, as some students preferred to take notes digitally, I created assignment spaces in our learning management system, Canvas, for students to upload their notes. All paper resources that were collected were kept secure. Grades and assignments from this action research study were not included in students’ overall GPAs or entered into our grading software. Upon completion of

research, I analyzed all information and look for correlations between student grades on assessments, engagement within the class period, and the additional cognitive tests. Additionally, using an independent samples T-Test, I sought to determine if students who participated in notetaking performed better, worse, or the same, as their control counterparts who did not participate in notetaking.

My hypothesis was that students who participate in a notetaking treatment would experience higher levels of achievement in post-lecture assessments, as well as higher levels of perceived engagement within the classroom. Having a task to achieve throughout a classroom lecture should help students to remain more focused and engaged. Additionally, the quantitative assessments provided a deeper level of insight into student thoughts and actions regarding notetaking.

To ensure validity in this research, multiple sources of data were used and triangulated. Student interviews, combined with their responses on survey questions, quantitative responses to Likert-scale surveys, and overall scores on post-lecture assessments helped to create a cohesive understanding of how notetaking has impacted the overall engagement and academic success of student participants. Regarding reliability, I have endeavored to be transparent with student participants about goals and my hypothesis for this action research. All information was collected and analyzed objectively, incorporating statistical evidence to support or disprove my hypothesis. This statistical evidence was gathered and analyzed using the independent samples T-Tests performed for each notetaking session regarding both academic achievement and engagement within the classroom. A standard deviation of higher than 0.05% between the control group and treatment (notetaking) group for each notetaking session indicated if there was a significant impact on achievement and engagement.

IRB exemption and participation.

Before beginning this study, I submitted for an IRB exemption to the Northwestern College, Orange City, Iowa, IRB committee. The notes and content discussed throughout this study are all components of a regular class period and are activities that I would typically include throughout my course. I received approval from our school superintendent and site principal before beginning all research. Additionally, I explained the project to my students and sent their parents an informational email about the research that would be conducted. All students and parents were given the option of opting out of the research, but no one chose to do so. One student from my first period World History class was not included in the data collection or analysis because she was absent for over half of the school days when this research project was introduced and conducted.

Data Collection

The research question that guided my data collection was “Does note-taking improve students’ learning and engagement in a Middle School World History classroom?” Academic achievement via test scores and classroom engagement via Likert-scale self-assessments was collected and analyzed using quantitative methods. However, student learning and impressions of engagement are difficult to quantify. Therefore, qualitative methods were also used to gauge student interest, focus, and overall impressions of notetaking and its impact in the classroom. The research took place over a three-week period from February through March 2023.

In the first week, students and their parents were informed about the action research project and permission was obtained from both my school superintendent and site principal. Students were given a demographics survey to fill out, which contained questions regarding their name, age, current GPA, and class period. Students answered Likert-style questions regarding

notetaking preference, confidence in notetaking, importance of notetaking to overall learning experience, and typical engagement within a class period. They were also asked to indicate what learning style they most strongly associated with. This introductory information served as a good baseline for notetaking strategies and preferences.

Additionally, students were asked to complete the Alphabet Task to determine handwriting speed. For this test, students wrote the alphabet as fast as they could for the duration of one minute. They were awarded one point per letter that they were able to write. If students missed a letter, it was not counted against them. However, if a letter was incorrectly placed, it was counted as incorrect. This Alphabet Task was modeled after the Handwriting Speed cognitive task presented in the research of Oefinger and Peverly (2020). These researchers suggest that there is no known reliability data for a measure of this type, but in a similar task, the DASH 17+, test-retest reliability is 0.9 and has a good predictive validity (Oefinger and Peverly, 2020, p. 180).

Students also completed a working memory assessment, which was similar to working memory checks available online through memory health websites. While individual working memory capacity continues to be researched to determine validity and reliability (Dai et al., 2019), this test was meant to determine the average working memory capacity for the middle school students participating in the study. To collect this data, students were shown sets of letters, numbers, and words of different lengths and combinations and asked to write down what they remembered. These sets varied in length from six to ten letters or digits. To determine accuracy for the working memory assessment, I awarded one point for each correct letter or number and discounted any incorrectly placed letters or numbers. The average working memory

capacity for the participants was 83.95% overall, remembering 39.5 out of 47 individual elements correctly.

Students participated in two separate background knowledge checks over the course of two days. I included two different assessments because the content being taught within the two days was significantly different. The first background assessment covered early Chinese history, which was based off content taught in 6th grade World History courses in the state of California. Students answered these questions with a low confidence rate, averaging 1.92 out of 5 on a Likert scale and adding that they guessed on most of the questions. Overall, their scores showed a 54% accuracy rate on Background Knowledge Check 1. The second background knowledge check related to famous sites throughout Asia, including the Great Wall of China, Mount Fuji, and Angkor Wat. Students similarly answered these questions with a low confidence rate, averaging 1.45 out of 5 on the Likert scale. Their scores showed a 24% accuracy rate on Background Knowledge Check 2.

In an additional test during the second week of the action research study, students completed a sustained attention test, based off the SART Task designed by Robertson, Manly, Andrade, Baddeley, and Yiend in 1997. In order collect this data, students were asked to pay attention to the numbers being projected onto the screen in our classroom for a total of five minutes. Throughout this time frame, numbers continuously flashed on the screen in a random pattern for varying intervals of time. Students made a tally mark for every digit that appeared that was not a “3”. Although the original test is designed to assess both accuracy and speed in marking the non-3 integers, students were limited to just being tested for accuracy in this sustained attention test. They were awarded one point for every tally they marked on their paper over the course of five minutes. The average accuracy for this test was 94.67%.

Each day of the action research, students participated in language comprehension checks to determine their accuracy in answering questions after a lecture-type situation. However, because some students had participated in notetaking and some had not, the overall language comprehension statistics were not consistent. Therefore, I had students complete a separate language comprehension check to aid with this cognitive tasks data collection. Students listened to a short article from Newsela about Empress Wu, a Chinese empress during the Tang Dynasty. Students indicated that they had little to no background knowledge on this person via a verbal check. The article was at a Lexile level of 1050, which was the overall average Lexile level for the 36 students participating in this study. After listening to the article, students completed a ten-point assessment, which included eight multiple choice questions and one short answer question. These assessments were collected and analyzed. Students were awarded one point for each correct answer. For the short answer question, if students answered correctly, they were awarded two points. If they included a detail from the article that was not a main point, they earned one point. If they did not answer or included incorrect information, they earned zero points for the question.

Finally, throughout each of the five days of note-taking activities, students listened to a 10-minute or less lecture on a topic related to Asia or early Chinese history. Approximately half of the students on the first four days (thirteen to sixteen students) were asked to take notes using a specific strategy: freestyle, outline style, Cornell-style, or fill in the blank. The number of students who took notes each day is inconsistent due to absences. On the last day, students were all asked to take notes digitally. After four of these short lectures, students took a post-assessment, which contained multiple choice questions related to the lecture. Students earned one point for each correct response. After the third lecture, instead of having students complete a

multiple-choice assessment, I asked students to record everything they remembered from the lecture. These results were the most inconsistent of all the days, as student responses were overall too varied in terms of specificity. For example, some students recorded that they remembered China had mountains, deserts, plateaus, and rivers, while other students accurately recorded the specific names of these geographical features. Students were awarded one point for specific details and half a point for vague details. The post-lecture questionnaire also included Likert-style scales asking students to determine their confidence in answering questions and engagement levels during the class period.

One other quantitative data point that was recorded relates to the quality of notes taken. On each day of notetaking, students were awarded one point for each data point that they wrote down related to the lecture. I also recorded the notetaking strategy used by students when they had freestyle note-taking days, which primarily included bullet points, complete transcription, and hand-made graphic organizers.

Finally, qualitative data was gathered through written responses on daily post-lecture assessments and through student interviews. I recorded all of the student responses and transcribed the student interviews. Within these data points, I looked for common themes, attitudes, and perspectives on the impact of notetaking within the classroom.

Data Analysis

The data collected throughout the three weeks of this action research study did show that there was a positive impact on both student academic achievement and engagement in the classroom, but the results were not as conclusive as I hypothesized they would be. Quantitative data analysis reveals that the style of notetaking, lecture method and teacher role in notetaking, and student choice all impact student achievement and engagement within the classroom. Fill in

the blank notes stand out as the preferred method of notetaking among 7th graders because it is perceived as “easier.” Qualitative data supports these results and offers a deeper insight into the Middle School perspective on notetaking. Finally, the cognitive tasks of handwriting speed, background knowledge, working memory, sustained attention, and language comprehension, which research suggests impacts notetaking were interesting to look at altogether. While no significant correlations between these cognitive tasks and notetaking were made, students with stronger academic skills and higher GPAs tend to outperform their classmates on cognitive tasks as well.

Student Learning and Academic Achievement.

The data gathered throughout each notetaking session was analyzed using independent samples t-tests in order to determine whether there was a significant difference in academic achievement between students who took notes (treatment group) and those who did not within two World History class periods. The first and fourth notetaking sessions revealed significant statistical differences between the control and treatment groups on the post-lecture assessments. The second and third notetaking sessions showed no significant difference between the two groups in the post-lecture assessments.

In the first notetaking session, both groups completed a post-lecture assessment out of eight points. Students in the control group averaged 4.94 points ($M = 4.94$, $SD = 2.01$) and students in the treatment group averaged 6.73 points ($M = 6.73$, $SD = 0.96$). Results of the independent samples one-tailed t-test reveal a significant difference between the groups, $t(30) = -3.14003$, $p = 0.00188$. This rejects the null hypothesis that the difference in means between the two groups is zero and concludes that notetaking (treatment) group performed significantly better than the non-notetaking (control) group and that their scores were more clustered together. This

session confirmed my hypothesis that notetaking does make a positive impact on post-lecture assessments. Students who took notes also expressed a slightly higher confidence in answering the post-lecture questions, averaging 3.9 out of 5 on a Likert-scale, as opposed to the 3.2 rating of their non-notetaking peers.

In the second notetaking session, both the non-notetaking and notetaking groups completed a post-lecture assessment out of eight points. For this session, students in the control group averaged 5.81 points ($M=5.81$, $SD= 2.0072$), while the treatment group averaged 6.57 points ($M=6.57$, $SD=1.3985$). The independent samples one-tailed t-test performed for this session indicates that there was not a significant difference between the two groups, $t(30) = -1.44604$, $p = 0.07926$. While the average points correct was higher for the note-taking group, the statistical difference between the two groups does not suggest that notetaking made a true impact on overall academic achievement. As in the first session, notetaking students in session 2 expressed a slightly higher confidence in answering the post-lecture questions, averaging 3.9 out of 5 on the Likert scale, while their non-notetaking classmates averaged 3.5.

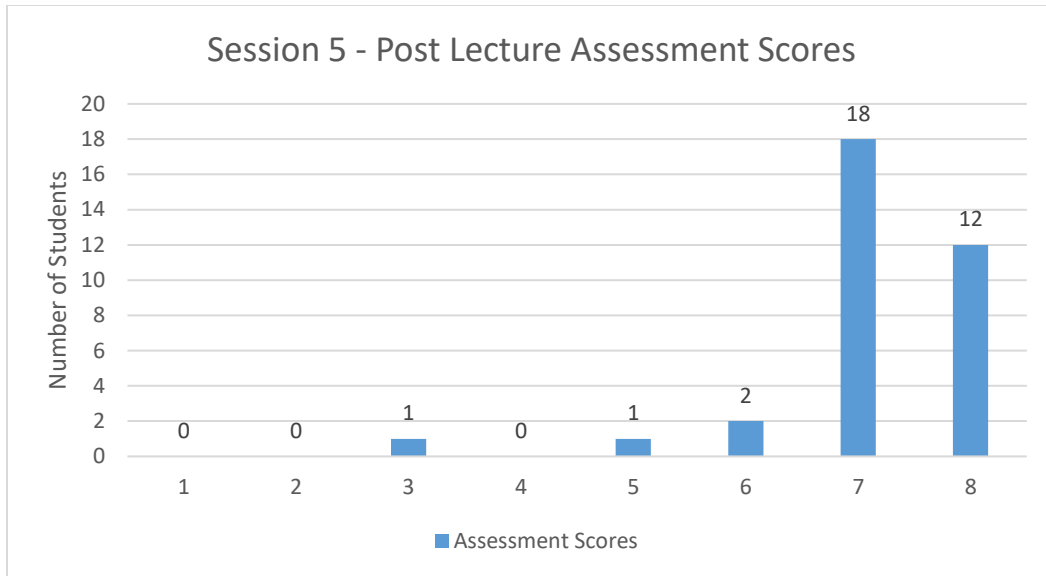
In the third notetaking session, all students were asked to write down as many details from the lecture as they could remember. This method for post-lecture assessment was too vague for students, and the quality and quantity of information provided post-lecture did not offer a clear understanding of student knowledge and data acquisition. The control group averaged 4.36 significant details following the lecture ($M=4.3611$, $SD=3.92$), while the note-taking group averaged 3.9375 ($M=3.9375$, $SD=1.9737$). In the independent samples one-tailed t-test, no statistical difference was discovered: $t(32)=0.38997$, $p=0.34957$. Not only did students who did not take notes outperform their notetaking counterparts, but they also provided more specific and meaningful data points than their peers.

In the fourth notetaking session, all students took a six-point post-lecture assessment. For this session, students in the control group earned an average of 4.90 ($M=4.9047$, $SD = 1.1791$), while students in the treatment group earned an average of 5.53 ($M=5.5384$, $SD = 0.660$). In this case, there was a significant statistical difference between the groups: $t(32) = -1.76$, $p=0.04336$. Students who participated in notetaking performed higher than their non-notetaking classmates. Students did not respond to a Likert survey regarding confidence in this post-lecture assessment, but from an observational standpoint, students seemed significantly more confident overall as they answered the post-lecture questions.

In the fifth notetaking session, all students participated in notetaking and completed a post-lecture assessment out of eight points. Students performed well on this assessment, with a mean score of 88.97 %. Figure 1 shows the score breakdown. As all students took notes in this session, it was impossible to perform an independent samples one-tailed t-test. Overall, students expressed a high confidence in answering the post-lecture assessment questions, averaging 3.98 out of 5 on the Likert-scale, which is consistent with the notetaking confidence seen in previous sessions.

Figure 1

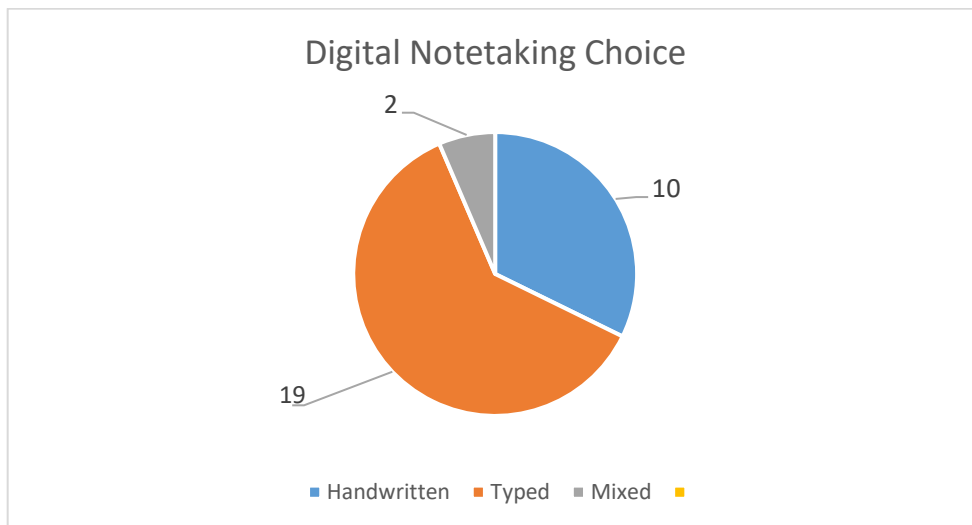
Session 5 Post Lecture Assessment Scores



The purpose of this final notetaking session was to gauge student choice when it came to digital notetaking. Within this notetaking group, several observations were made. First, students chose to type their notes more often than handwriting them using an Apple Pencil or similar device. Figure 2 shows the breakdown of student digital notetaking choice.

Figure 2

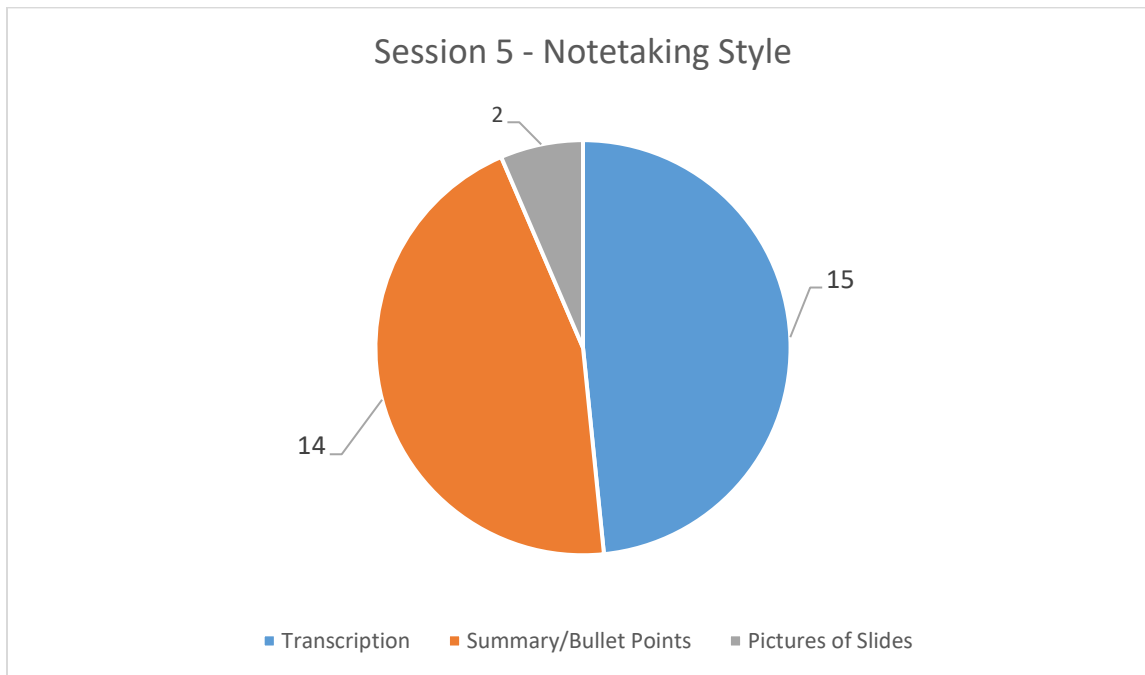
Session 5 Digital Notetaking Choice



Additionally, this final notetaking session demonstrated student preference in how they take notes. Fifteen students chose to transcribe the entire lecture by copying everything that was included in the presentation slides and adding additional details that were said in class. Fourteen students developed a summary bullet point system to gather key information. Two students took pictures of the slides and inserted them directly into their notetaking sheet. See Figure 3 for the Session 5 Notetaking Style breakdown.

Figure 3

Session 5 Notetaking Style Breakdown



This information suggests that students have developed strategies to help them gather information using their 1:1 device. While several students stated that they wished they were able to write on paper for this notetaking session, they were all capable of gathering information digitally. Interestingly, one of the students who took pictures of the slides is a student who has a

504 plan and struggles with organization and spelling. By taking pictures and then adding his own commentary, he was able to gather more information than many of his peers.

Academic Achievement – Qualitative Analysis.

Student interviews and surveys presented a variety of perspectives regarding the efficacy of notetaking on student learning outcomes and grades. Three themes stood out about notetaking and student achievement. First, notetaking helps with retention and recall of information as notes can be used as a study tool to look back on before a test or quiz. Secondly, a teacher's role within a lecture is important and impacts student notetaking. Finally, fill-in-the-blank notes are the preferred method of notetaking because they are "easy" and require less critical thinking.

Notetaking is a skill that many students use regularly and recognize its helpfulness in the classroom when preparing for formative assessments. Student 22 stated that notetaking is beneficial because "you don't have to try to remember everything in your brain." Having notes to look back on provide a way to keep things straight, which this student appreciates. Student 33 goes back to look at notes "right before a test or the end of a quarter. Or homework if I have a question on it." Student 17 goes back and summarizes notes that are taken in class before putting them away at the end of the class period. This way, note completion can be determined, and missing information can be attained in a subsequent class. Other students put their notes in their binder and don't look at them again until they have a test or quiz. Student 6 had a very negative view toward notetaking and said that notetaking is ineffective because it is boring. He stated that in previous school years, a study sheet was given out before every assessment, and students were encouraged to study from that.

One of the challenges of notetaking that was gleaned through student interviews and additional survey comments is student perception of its importance and their own role in actively

participating in the process. Several students expressed that the teachers should just give them the information that they need for a test; they saw little need for personal notetaking. For these students, notetaking seemed like a passive, “school only” process, and not a necessary skill that could be useful in years to come. Students who recognized that notetaking helps them internalize and process information, safely storing it in until they could go back and look at it later, seemed to see notetaking as a more personal, active, and engaging activity. If notetaking is required and expected in the classroom, then the process of notetaking should be a priority. If a student will be asked to look back at notes for an upcoming test or quiz, the student needs to be taught, prepared, and motivated to take notes well. Students who had received training in the notetaking process expressed higher confidence in their abilities and a more positive outlook on the benefits of notetaking.

Teacher involvement in the notetaking process makes a difference; lecture format, pacing, willingness to go back and answer questions, and passion for the topic all make a difference in students’ perception of notetaking. In Session 2, for example, Student 29 suggested that the presentation had more of a “flow” compared to other lectures, and that it was easier to take good notes and pay attention because of that. In Session 3, students admitted that exciting videos are more fun to engage with during a class period, but they learn more when a teacher stands up in front of the class to teach. Students expressed that being able to ask a teacher to slow down or clarify information was helpful. Student 24 admitted, however, that she is not at all the type of student who would ask for help if needed or raise her hand if the teacher is going too fast. Teachers need to be cognizant of student abilities and adjust their teaching style and pace accordingly.

Teaching students how to take notes and pull-out key information from a lecture is one way in which teachers can support the academic growth of their students. Throughout student interviews, several students suggested that they were never formally taught how to take notes; instead, they picked up on notetaking skills from parents who modeled appropriate behaviors for their children to learn from. The students who attended our district elementary school stated that they had begun to learn notetaking skills from their 6th grade World History teacher, and so felt much more confident in taking notes than their counterparts who had never been taught. Student 10, who did not attend our elementary school, stated that he was trained to do Cornell-style notes in elementary school, but that he “hated” them and didn’t see a benefit. For this student, notetaking seemed personally connected to his learning style; as a self-described auditory learner, he preferred to sit, listen, and answer questions, instead of writing information down.

Fill-in-the-blank notes received the most positive comments throughout my data collection. Several students suggested that fill-in-the-blank notes are easier than other types of notetaking for two main reasons. First, students are most familiar with fill-in-the-blank notes. This style has been used throughout many elementary school experiences, and students know what is expected of them. Second, students do not have to make the cognitively challenging choice of deciding what information to include within their notes. Instead of “writing down what’s interesting,” they have prepared sheet with headings, spaces, and key facts already emphasized. Student 9 stated, “Fill in the blank notes are my favorite type of notetaking because it already has the key ideas bullet printed. Also, it's easy to keep up with the notes because you usually only have to write one word...I felt the most engaged and focused today because I was taking notes and I wasn't falling behind because it was fill in the blank.” The speed of a lecture was mentioned in several surveys; teachers who rush through material create a stressful learning

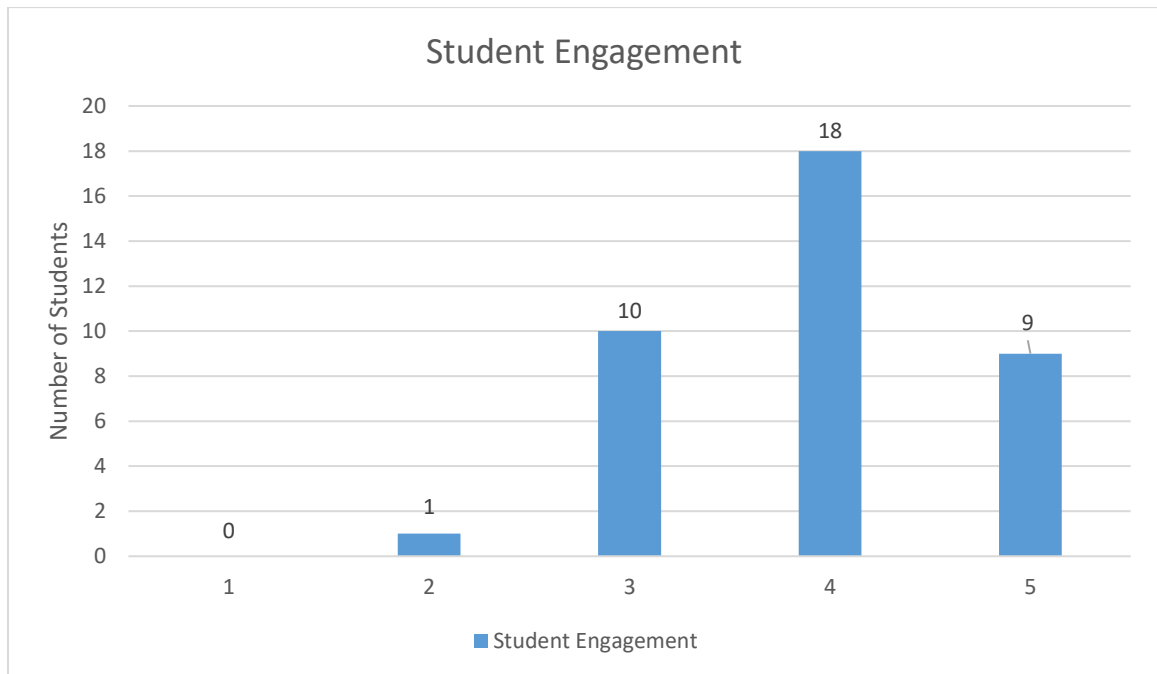
environment for students who need time to process and choose key points. Fill in the blank seems to eliminate the stress of not knowing what to write down and allows student focus to be more on the lecture and less on their notetaking process.

Engagement – Quantitative Analysis.

Additional independent samples t-tests were conducted in order to determine student engagement among the notetaking students and those who did not. In the demographics questionnaire at the beginning of the study, I asked students to rate their general levels of engagement within a class period, as can be seen in Figure 4. Students suggested that they were typically fairly engaged within a class, by actively paying attention, answering questions, and staying on task.

Figure 4.

Student Engagement within a typical class period.



In session one, students completed a Likert-scale survey on their engagement within the class period on their engagement and focus on the lecture. Students in the control group

averaged 2.73 out of 5 ($M = 2.73$, $SD = 1.4589$) for their engagement throughout the class period, while students in the treatment group averaged 4.4 ($M = 4.4$, $SD = 0.5071$). The independent samples one-tailed t-test indicates that there was a significant difference between the two groups, $t(30) = -4.194303$, $p = 0.00011$. Students who took notes were more consistently engaged in the classroom lecture and experience than those who did not.

In session two, students completed the same Likert-scale survey. This session utilized an outline format for notetaking. In this session, students in the control group averaged 3.56 out of 5 ($M=3.56$, $SD = 0.96$), while students in the treatment group averaged 4.06 ($M=4.06$, $SD = 1.06$). In this independent samples one-tailed t-test, there was not a significant statistical difference between the control and treatment group as shown here: $t(30) = -1.39403$, $p = 0.086774$. This suggests that notetaking did not make a large difference on the engagement of students within the class period.

In session three, students indicated their engagement through written responses. Scores for their engagement were determined by these responses. This session utilized Cornell-style notetaking and a video lecture. In this session's independent samples one-tailed t-test, students in the control group averaged 4.36 ($M=4.36$, $SD=3.92$), while students in the treatment group averaged 3.94 ($M=3.94$, $SD=1.97$). In the independent samples one-tailed t-test, there was no significant statistical difference between the two groups: $t(32) = 0.38997$, $p = 0.34957$. As the control group showed a higher mean average, it is clear that the non-notetaking students were more engaged than those who were taking notes.

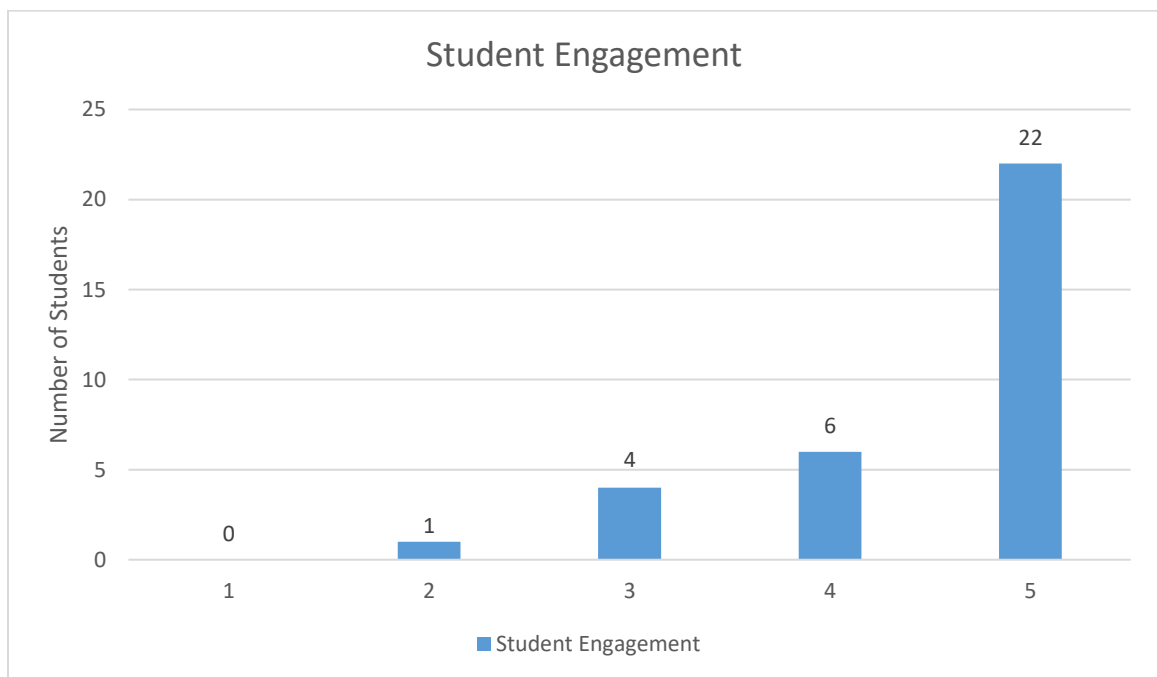
In session four, students completed a Likert-scale survey for their engagement during fill-in-the-blank notes. Within this session's independent samples one-tailed t-test, the control group averaged 3.5 out of 5 on the Likert-scale ($M=3.5$, $SD=0.94$) while the treatment group averaged

4.5 out of 5 ($M=4.5$, $SD=0.76$). In this session, there was a statistical difference between the control and treatment groups, as demonstrated here: $t(31) = -3.19$, $p = 0.00162$. Students who took notes were significantly more engaged within the class period than their peers.

In the final notetaking session, all students took notes and completed a survey. In this case, completing an independent samples one-tailed t-test was impossible because there was no control group. However, when asked to complete a Likert-style survey about their engagement, students indicated results that were relatively higher than their original engagement scores from the demographics survey. These results are indicated in Figure 5 below.

Figure 5.

Student Engagement during Session 5, Digital Notetaking



Student Engagement – Qualitative Data Analysis.

Data regarding engagement was also collected via interviews and open-ended survey questions. Students were honest about their overall impressions of notetaking and how it

impacted class engagement. Within these qualitative results, three themes emerged. First, students perceive engagement in class very differently. Secondly, student preference within notetaking impacts their perceived levels of engagement for the class period. Third, student engagement is impacted by the content of the lecture.

First, perception of classroom engagement is significantly different between students. For some, engagement in the class was not related to notetaking at all; notetaking was a distraction from the interaction and dialogue required within a class period. Student 18, for example, stated, “I wasn’t that engaged because I was busy taking notes” (Session 1). Student 10 recognized that he engaged with and processed information better when he didn’t write it down. On the other hand, several students indicated that taking notes was the only way they could keep engaged in the classroom, otherwise their minds would wander, and they would lose focus completely. Student 17 suggested that notetaking “kind of puts [on] my brain that I need to pay attention to what I need to write. Notetaking helps Student 16 feel “a lot more engaged, because otherwise my brain will start to wander.”

Student preferences when it comes to notetaking style or the difference between paper and pencil and digital notetaking formats impacted their perceived engagement within the classroom as well. Student 24 stated, “Paper notes help me to focus better. If it’s on the iPad, I like to doodle.” While Student 16 preferred the feel of paper and pencil notes, as well, Student 33 likes the “glidey” nature of the iPad and felt that doing things on the iPad helps both in terms of academics and engagement. Several students expressed an appreciation for the spell check feature on the iPads and said that they felt more engaged in digital notetaking because they didn’t have to worry about spelling and grammar as much.

The content and interest level of a lecture can impact student engagement. Throughout the lecture and notetaking sessions for this action research study, students learned about early Chinese dynasties, Chinese geography, the Great Wall of China, and Famous Places within Asia. In sessions two and three, there was very little quantitative difference between student engagement in the control and notetaking groups. On these two days, students in both groups indicated that the content was interesting and kept their attention. For example, Student 13 stated, “It was pretty cool to learn about new places,” and Student 23 said, “I was engaged because the lesson was interesting and shared many new things.”

Cognitive Data Analysis.

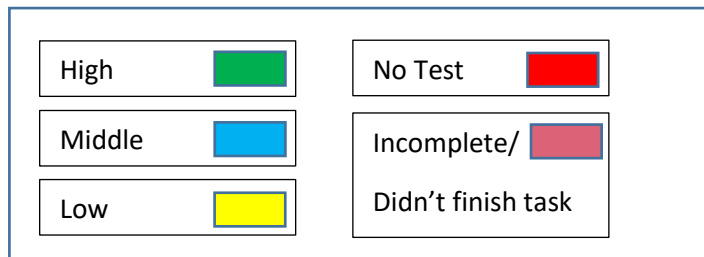
The correlation between cognitive tasks like handwriting speed, background knowledge, working memory, sustained attention, and language comprehension on notetaking was difficult to determine in this action research project. Figure 7 below shows where the students’ scores were compared to other students within their World History classes. Students were labeled with a Low, Average, High designation to show where they fit comparatively to their classmates. To determine the designations, I divided the range of student scores between the highest and lowest scores into thirds. All scores within the top third were labeled “High,” the second third were labeled “Average,” and the lowest third were labeled “Low.”

Figure 6.

Cognitive Task Scores and Comparison

Student #	Grade Point Average	Handwriting Speed	Language Comprehension Score	Background Knowledge Assessments	Working Memory Score	Sustained Attention Score	Notes
2	3.73	42	100%	55%	76.5	97.9	AVERAGE
Student #	Grade Point Average	Handwriting Speed	Language Comprehension Score	Background Knowledge Assessments	Working Memory Score	Sustained Attention Score	Notes
3	2.997	92	30%	30%	74.4	99.5	LOW

4	3.507	95	70%			98.7	AVERAGE
5	4.0	76	100%	20%	85.1	99.1	AV/ST
6	2.3	9	60%	20%	74.4	69.8	LOW/AV
7	3.243	78	50%	18.5%	78.7	97.5	STRONG
8	4.0	70	60%	30%	87.2	97.9	LOW/AV
9	4.0	116	100%	38.5%	97.8	92.5	STRONG
10	2.939	92	80%	53.5%	85.1		LOW
11	2.273	73	40%	75%	89.1	95	LOW
12	3.8	32		17%			LOW
13	3.6	22				90.1	AVERAGE
14	3.2	61	90%	36.5%	80.8		LOW
15	2.9	75	70%	80%	91.4	100	LOW
16	4.0	104	80%	46.5%	97.8	97.1	STRONG
17	3.884	104	80%	35%	93.6	99.5	AVERAGE
18	3.7	65	70%	38.5%	76.5	85.5	LOW/AV
19	2.8	52	70%	28.5%	36	99.5	AVERAGE
20	2.54	59	90%	30%	48.9	98.3	LOW
21	3.7	104		45%	82.9	99.5	STRONG
22	4.0	69	100%	40%	93.6	92.9	STRONG
23	4.0	85	70%	30%	80.6	74.7	STRONG
24	3.6	69	50%	40%	76.5	99.1	LOW/AV
25	3.9	108	100%	46.5%	82.9	88.4	STRONG
26	3.076	74	70%	36.5%	89	98.7	LOW
27	3.917	77	100%	38.5%	91.4	97.9	STRONG
28	3.697	77	50%	46.5%	95.7	97.9	LOW
29	3.826	76	90%	65%	72.3	99.5	STRONG
30	2.1	58	100%	35%	80.8	95.4	AVERAGE
31	2.696	77		30%	95.7	99.5	AVERAGE
32	3.81	107	80%	36.5%	100	93.3	AVERAGE
33	4.0	78	60%	45%	100	98.3	STRONG
34	2.517	129	60%	80%	97.8	94.2	AVERAGE
35	3.942	61	90%	18.5%	85.9	96.2	AVERAGE
36	2.818			26.5%		98.7	AVERAGE
37	3.0		40%	48.5%	82.9	100	STRONG



There are no clear correlations between cognitive skills and notetaking abilities except perhaps that students who are stronger academically tend to test higher in other forms of

assessment as well. Student 8 had a high GPA and relatively high scores on the cognitive tasks, but scored low in the notes assessment, which gauged how many points of information were recording throughout a lecture notetaking setting. It is possible that this student has developed skills appropriately to retain important information without needing to write everything down. Student 7 had low language comprehension and background scores but scored high on notetaking skills. This directly contradicts the work of Oefinger and Peverly (2020), who claim that these two cognitive tasks are the highest indicator of notetaking skills. Within this research study, those types of connections were difficult to assess.

Discussion

Findings.

Notetaking, as an academic practice, has been revealed through this action research study to be both highly individualized and highly dependent upon content, lecture style, and student preference. Students performed most highly when they were given autonomy in their notetaking style or were told exactly what to write down. The two most frequently chosen styles of notetaking during a 10-minute lecture were a bullet point / summary system or direct transcription of the lecture. These practices were consistent with the most common notetaking strategies outlined by Chen (2021). In analyzing these notes, it was clear that students were not organizing, processing, or interacting with the material in deep or meaningful ways; the goal seemed to be to get as much information down on paper as possible.

Students felt most engaged in notetaking when they were given a fill-in-the-blank notetaking form to fill in. This engagement comes with two possible explanations. First, students were able to focus more on the content of the lecture because their written and cognitive requirements within the lecture were minimal. Secondly, students felt most comfortable with

fill-in-the-blank notes because they had the most experience completing this style of notetaking in the past.

Impact on Teaching and Learning.

Based on the findings of this study, the four major conclusions were drawn. First, students need to be taught meaningful notetaking and organization strategies from a young age if information is delivered through lecture. In student interviews, it was clear that students who had participated in some previous notetaking practices, either taught by a teacher or a parent, felt more confident and capable in their notetaking skills. Several students indicated that middle school was the first time they were required to take notes, and as such felt lost, bored, or disengaged with the process. Although the Cornell notetaking style did not yield significant results within this study, various researchers have claimed its efficacy and importance within the classroom (Evans & Shively, 2019; Anca, 2016).

Second, teachers should use multiple strategies for delivering content. Students repeatedly stated that lectures were “too fast” and that they wrote what “was interesting to them” without a clear understanding of what information was necessary to include in their notes. By embedding pictures, key dates, names, and vocabulary into a presentation, slowing down the content delivery, and making space within a lecture for questions and discussion, a teacher can be sure that student engagement and understanding of the content will be strengthened. Additionally, incorporating engaging follow up lessons, review activities, and projects to supplement the notes and content learned in class will create a more robust and complete understanding of the material.

Third, students need to practice autonomy and ownership of their notetaking. While it is the educator’s job to provide information to the student, it is imperative that students view

notetaking as a personal responsibility and to recognize the benefits and methods of this practice that work best for their personal learning style, abilities, and needs. By holding students accountable for their notetaking practices or at the very least requiring students to summarize daily content if they choose not to participate in notetaking, students will be able to see their own academic progress. In this way, students can make personal adjustments to their notetaking style or frequency if necessary.

Fourth, classroom engagement is difficult to measure, but can be best supported by providing appropriate support when students face challenging tasks within the classroom. Shernoff et al. (2003) suggested that teachers need to find a way to balance challenge and skill in order to ensure classroom engagement. To do this effectively, teachers should provide a variety of options to students that will enable them to gather, organize, and study information when appropriate. Providing the presentation/lecture notes, a recording of the lecture, or a Guided notetaking sheet via a school management system, for example, are all ways that student engagement can be supported while allowing students to work through content at their own pace.

Alignment to Research.

The research regarding notetaking was fairly consistent with the results of this action research study, with two notable exceptions. It became clear throughout this study that notetaking, in certain forms, and with a high level of teacher instruction and student choice, can be beneficial to both the academic success of students and their engagement in class. Researchers Oefinger and Peverley (2020), Karabulut and Baran (2021), and İlter (2017) all discuss the necessity of active and effective notetaking instruction to make it a worthwhile practice in the classroom. İlter (2019) suggests that there is less of a cognitive impact on students when they are given completed or nearly completed notes. From a purely assessment-

based standpoint, this study disagrees with İlter because students performed better on the post-lecture assessment when they were given fill-in-the-blank notes. However, as most of the students stated that they preferred this notetaking method because it was “easier,” it is possible that the cognitive impact was minimized using that method.

There were two notable instances where the data from this action research study did not support other academic research. First, researchers Astra, Bui, and Evita (2019) suggest that guided notetaking led to increased student outcomes. In the instances of guided notetaking that students completed during this study, they performed only marginally better than their non-notetaking peers with little statistical significance. This is perhaps because guided notetaking requires specific training and modeling, which did not happen within the parameters of this study. Additionally, Oefinger and Peveryly (2020) suggest that the cognitive tasks of background knowledge and language comprehension are directly connected to notetaking abilities within the classroom. This research was not supported by the student data gleaned within this study.

Limitations of the Study.

Overall, this action research study provided data regarding the efficacy of notetaking on academic achievement and engagement within the classroom. Thirty-six students participated, however, numerous absences created discrepancies within the data and offered an incomplete picture on each notetaking style for each individual. Furthermore, all the students in my first and fourth period World History classes who participated in this action research study had a GPA over 2.0. Students with lower academic abilities may have approached notetaking differently or seen a stronger impact of notetaking practice. Finally, the cognitive tasks given to students were adjusted to make them work within the setting and digital capabilities that were available. A true

sustained attention task (SART), for example, would have measured both speed and accuracy, while our classroom modification was only able to measure accuracy.

Further Study

The findings from this study of notetaking within a 7th grade World History class create more questions than answers for this researcher. First, it would be appropriate to consider how learning style impacts notetaking. In this study, students indicated their learning preferences (visual, auditory, or kinesthetic), but all completed the same types of notetaking tasks. Both academic growth and engagement may be positively impacted if students participate in notetaking styles geared toward their specific strengths. Similarly, notes that are geared toward learning style may aid in student recall and retention of material, as students feel more personally connected to the content, its delivery, and their own interpretation and understanding.

Secondly, the impact of paper and pencil notetaking as compared to digital notetaking is worth considering. In a 1:1 iPad school, students are often required to take notes using their devices. However, throughout this action research study, several students specifically requested a paper option and recognized that they write more complete and visually pleasing notes when they do so on paper. Other students stated that their “bad handwriting” makes digital notetaking a more preferred option. Studying the impact of these different formats, especially on recall of information and frequency of student interaction with their notes after they write them, would be intriguing.

Finally, exploring the cognitive tasks impact on notetaking in more detail would provide further insight. Completing a test-retest option for handwriting speed or working memory, for example, might offer a more accurate picture of how these elements work to support strong notetaking. In the digital age, handwriting speed may not be as strong an indicator of notetaking

skills, but typing speed might make a difference. Furthermore, research on developing these cognitive skills in students could yield interesting results.

Conclusion

The purpose of this action research study was to determine if notetaking in a 7th grade World History supported student learning and increased engagement. A mixed-method study was used to determine if there was a significant impact of notetaking style and practice on grades and perceived engagement within the classroom. Both quantitative and qualitative data was collected, analyzed, and triangulated to determine how notetaking affected student performance during lecture-style classes. The findings drawn from this study will help with preparation and organization of World History course content in upcoming years. Incorporating and modeling strong notetaking skills early in the school year will help students develop their own personal habits and encourage active participation during lecture-based lessons.

Data analysis revealed that student academic achievement and engagement were positively impacted by notetaking when students engaged in “freestyle” notetaking, where they could write whatever they wanted, and in fill-in-the-blank notetaking, where they were asked to write single words in a prepared notes sheet. Other forms of guided notetaking, including Cornell-style notes and an outline format, revealed insignificant differences in academic performance and engagement. Additionally, there was little correlation, within this action research study, to support research that cognitive tasks like handwriting speed and language comprehension directly impacted a student’s notetaking abilities. This research provides direction for the notetaking skills I will address with my students each school year. While many students indicate that they prefer fill in the blank notes because they are “easier” than other more cognitively challenging formats, it would be appropriate to transition from this format to others

as students mature cognitively and in their notetaking skills. In high school and college level classes, students will most likely attend classes that require solid notetaking skills; by beginning notetaking instruction at the middle school level, I can support student learning, achievement, and engagement in the future.

Student interviews and survey comments indicated that students generally perceived notetaking as an important and beneficial exercise within the classroom experience. While several students indicated that notetaking was not helpful or important, their grades on assessments indicated that there was a correlation between notetaking and information retention. Furthermore, students who learned the skills of notetaking at a young age consistently completed more thorough notes and indicated a higher confidence level in their notetaking abilities. By encouraging targeted notetaking strategies and allowing student autonomy within their learning, teachers can support their students in classes where high amounts of information need to be taught and processed on a regular basis. In my World History classroom, developing a strong foundation of information allows students to think more critically about essential questions, develop more personalized and creative projects, and engage more deeply in discussions and debates. The information gathered on notetaking throughout this study will support the development of this strong knowledge base so that my classroom can be a vibrant space of scholarship and creativity.

Overall, notetaking is one pedagogical practice that can support student learning and engagement. Developing strong habits related to notetaking will serve students throughout their formative years and into their futures. However, notetaking as a method of information gathering should be supplemented by other engaging activities within the classroom. Collaborative, project-based, and inquiry-driven learning, combined with notetaking, may serve

to encourage the 21st century skills needed for students to thrive. This action research study has provided data to support cognitively rich, engaging, and meaningful notetaking practices at the middle school level.

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