

## **The Impact of the Cornell Note-Taking Method on Students' Performance in a High School Family and Consumer Sciences Class**

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*Note-taking is a difficult skill, but it is an important skill, especially considering the pervasiveness of lecture throughout middle-school, high school and college classes. This study set out to examine whether teaching high school students the Cornell note-taking method and requiring them to use it would affect their performance on unit tests. The research question guiding the study was "How does the use of the Cornell note-taking method impact student performance in a high school Family and Consumer Sciences class?" At the conclusion of the research, the data supports the null hypothesis – there is no difference in student-choice note-taking and Cornell note-taking on student performance in a high school Family and Consumer Sciences class.*

Lecture format is a common practice in high school classrooms for presentation of content material, and this is true in the Child Development classes at Northern High School (a pseudonym). As part of Family and Consumer Sciences, Child Development does have hands-on projects and units, but when covering the ages and stages of development (in particular from birth through the preschool years), lectures with PowerPoint visuals are an efficient way to communicate the subject matter. There are benefits to the lecture format with note-taking. While writing, students use three senses to process the material: sight, sound, and touch. Notes also give the students study materials for assessment preparation at a later time. However, there are several difficulties with this method: some students write quite slowly, and the instructor and other students must wait while those students write down the information; some students become so focused on writing what is projected on the screen that they cannot listen to the instructor; and some students may have trouble creating notes that are useful at a later time.

During the spring semester of 2011, two sections of Child Development class (taught by the same instructor) at Northern High School were used as the setting for an action research project with the aim of discovering the effectiveness of the Cornell note-taking method through comparison of the infant, toddler and preschool unit tests taken by both sections. The research question guiding the study was "How does the use of the Cornell note-taking method impact student performance in a high school Family and Consumer Sciences class?"

### **Theoretical Framework**

The theoretical framework for this article lies in the information processing perspective and schema theory. Theorists describe information processing as being comprised of three stages (Lieberman, 2000). First, information is received by the sensory memory, and through the

process of transduction converted to a usable format, resulting in a memory (Huitt, 2003). A sensory memory is very brief and, unless it is interesting to the individual or triggers a known pattern, it will not make it to the next stage, the short term memory.

During the second stage, the sensory memory may be transferred to the short term memory, also known as the working memory (Orey, 2001). Working memory, “is a kind of mental workbench where we assemble information and then work on this information” for particular purposes (Lieberman, 2000, p. 371). The working memory can only hold a limited number of items, 5-9, and typically only holds these items for about 20 seconds, but items can be held for up to 20 minutes through repeated use called rehearsal (Huitt, 2003). Then, if there is no interference, the memory may move into long term memory, the last of the three stages of information processing.

“Long-term memory is everything we know and know how to do” (Orey, 2001, para. 7). This information is combined with new information, organized in a way that makes sense, and then stored until it is needed (Eggen & Kauchak, 2013). Schema theory provides a framework for understanding how information is organized and stored (Ormrod, 2012). Schemata are “interconnected categories within the memory” (McKenna & Robinson, 2009, p. 17). As an individual takes in information, schemata are activated and this prior knowledge is used to make meaning. In order for new learning to be retained and retrievable for later use, the material must be stored in meaningful ways. Schemata influence how individuals process information and what they learn (Eggen & Kauchak, 2013). Because teachers have such a strong influence on how schemata are formed and the information with which students are presented, it is important to make thoughtful decisions not only about how information is presented to students, but also the ways in which they are asked to interact with the information (Huitt, 2003).

### **Review of Literature**

Traditional education is often based on effective listening and note-taking, and students of all ages and in all content areas are expected to be responsible for the knowledge shared through lectures (Boyle, 2010; Faber, Morris & Lieberman, 2000). Teachers place importance on the skills of note-taking and listening, and believe that students should have these skills to be successful in class (Boyle, 2010). A large proportion of middle- and high-school teachers use lecture to present important information, and content area teachers, in particular, often use the lecture format (Boyle, 2010; Peverly et al., 2007). General education teachers recognize that students must take notes and learn from lectures to do well in their classes, as lecture and note-taking are considered to be common ways of communicating material (Boyle, 2010; Titsworth, 2001). Teachers often require note-taking, and information relating to content and skills are frequently presented through lecture (Frey, 2006; Konrad, Joseph, & Eveleigh, 2009).

### **Purposes of Note-Taking**

One goal of education is retention of knowledge for life-long learning and for assessment, and note-taking can help students as they reach this goal. Notes “provide students with tools for identifying and understanding the most important aspects of what they are learning” (Marzano, Pickering, & Pollock, 2001, p. 48). Memory is fragile, and information can be forgotten very quickly if it is not transferred to long-term memory (Pauk, 2001). The information from a lecture must be remembered or recorded, or it is forgotten (Kiewra, 1991). This is where note-taking can help. Students who take notes typically retain more information than those who do not, which has a positive effect on learning (Titsworth, 2001). The actual process of note-taking

has value in promoting recall, with noted items recalled at a higher rate than non-noted items (Kiewra, 1985). Note-taking in classes has been shown to increase academic achievement (Boyle, 2007; Boyle, 2010; Kiewra, 1985; Kiewra & Benton, 1988). Notes can serve as a summary of the material gained through listening and observing during the lecture, and note-taking can also facilitate comprehension through internal connections made during the lecture (Faber et al., 2000; Kiewra et al., 1991; Piolat, Olive & Kellogg, 2004).

Taking notes can enhance learning due to the generative effect – students retain knowledge better when they generate materials themselves rather than having materials given to them (Piolat et al., 2004). Even though the information is given to students through lecture and visual aids, the act of writing notes creates a further learning opportunity. Notes that have the main concepts stated along with details are related to student recall and transfer of knowledge and to improved performance (Baker & Lombardi, 1985; Kiewra, 1985; Kiewra & Benton, 1988). Effective notes help students make connections to information that they already know (Faber et al., 2000). Note-taking supports information processing and serves as a means of external storage for later review (Kiewra, 1991; Piolat et al., 2004; Titsworth, 2001).

Since memory can be short-lived, and there is a span of time between hearing the information during a lecture and being assessed on that information, the external storage function of note-taking is crucial. Students who take the time to review their notes typically have higher achievement than those who do not (Kiewra, 1985; Kiewra, Benton, Kim, & Risch, 1995; Kiewra et al., 1991). Notes can serve as a permanent record of the information from the lecture, and complete notes are best for students to use in review (Boyle, 2010). The product of note-taking or the review materials is important, and so is the process of actually recording the notes (Kiewra et al., 1995; Piolat et al., 2004). The cognitive effort happening during the note-taking process adds to the learning effect.

Students who effectively record notes typically process the lecture information at a deeper level (Kiewra et al., 1995; Titsworth, 2001). This process of encoding, or making connections between the new material and past knowledge, facilitates comprehension (Cohn, Cohn, & Bradley, 1995; Faber et al., 2000; Kiewra, 1991). When the new material is incorporated with prior knowledge, the encoding process is successful (Faber et al., 2000; Kiewra et al., 1991; Piolat et al., 2004). Encoding leads to deeper meaning, better understanding, and better results on assessment (Baker & Lombardi, 1985; Kiewra, 1985). Successful note-takers end up with an effective set of notes that make connections to what they already know (Faber et al., 2000). The actual process of generating the notes is a learning aid, and students who add details to their notes during this process find the content more meaningful (Boyle, 2007; Boyle, 2010). When students are better able to identify the main points of the lecture, the encoding effect becomes as important as the external storage function (Faber et al., 2000). When comparing a group of students who wrote their own notes and used them for review (encoding and storage group) to a group who studied notes that were given to them (storage only group), the first group recalled more and performed better on assessments (Kiewra et al., 1991). In order to take advantage of the process of encoding notes, students need to have good working memory.

### **Difficulties of Note-Taking**

Note-taking is a complex activity that combines comprehension with production of notes, and this complicated process is dependent upon working memory (Piolat et al., 2004). As students listen to a lecture, the important information should be held in working memory long

enough to access it as they write it down (Cohn et al., 1995). Note-taking is dependent on working memory to “acquire, mentally represent, select and understand” (Makany, Kemp, & Dror, 2009, p. 620) the incoming information while making connections with previous knowledge. This intricate process may be difficult for students, which may be one reason students often are not successful at note-taking.

Other difficulties include balancing the effort of writing and listening at the same time, deciding which items are important to note, and writing fast enough (Boyle, 2010). It is difficult to listen, write and select important information all at once (Konrad et al., 2009). Students often assume that anything shown on the blackboard or screen is important and write everything (Baker & Lombardi, 1985). Other students will record verbatim everything that is said, which is ineffective and possibly detrimental to learning, as their focus on catching every word takes away from their focus on the information given in the lecture (Boyle, 2007; Kiewra & Benton, 1988). Just copying what is seen or heard does not lead to comprehension (Piolat et al., 2004). Unfortunately, few students are good at the skill of decoding what is important, and most just duplicate what is shown or said (Baker & Lombardi, 1985). The key to effective notes is to record the important material in an ordered manner, as comprehensively as possible (Boyle, 2007).

To better comprehend the material, students should have good notes with main points and added detail. Because of the difficulty of integrating information while taking notes, students sometimes limit their note-taking to improve comprehension, or limit their processing to improve transcription (Kiewra, 1985; Piolat et al., 2004). Neither solution leads to success; using either alone limits the encoding effect and the effect of external storage. Additionally, lectures often move at a fast pace, with many facts and vocabulary words (Boyle, 2010). The rate of speech is approximately two to three words per second, and the average handwriting speed is .2 to .3 words per second, which can lead to a problem in balancing the speed of writing against the speed of the lecture (Makany et al., 2009; Piolat et al., 2004).

Though most students do not receive any kind of instruction in note-taking, a good system or format of notes can make a big difference in dealing with these difficulties and can increase learning and achievement.

### **Organized Note-Taking: The Cornell Note-Taking Method**

Most students are not taught how to take notes, or are taught these skills at a relatively late point in the course of their education (Boyle, 2007; Faber et al., 2000). When students are shown a structure for note-taking, it often improves the quality of their notes (Gray & Madson, 2007). Students in science courses implementing the Cornell Note-taking method had a 10-12% higher average than students in the previous semester not using this method (Donohoo, 2010). When “Western” (a pseudonym) High School struggled with meeting AYP, they determined a course of action for improvements, including a plan to teach all students the Cornell note-taking system based on research showing that this system can increase comprehension and achievement (Fisher, Frey, & Lapp, 2009). Faber et al. (2000) showed that students who were taught the Cornell method had significantly better scores than the students who were not taught this method. AVID (Advancement Via Individual Determination) is a national program created to increase the number of students enrolling in four-year colleges, especially those from the academic middle, which are the second and third quartiles, who are neither academically advanced nor in special education (Gray & Herr, 2006). The AVID program, which is currently

in 4,800 schools in 48 states, includes the Cornell note-taking method as part of their successful curriculum (AVID, 2012).

The Cornell note-taking method is a two column system; the left column is one third of the page, and the right column is two thirds of the page (Faber et al., 2000). The right column is used to “capture the lecturer’s ideas and facts” (Pauk, 2001, p. 238), with students taking notes during the lecture in this column. The left column (the cue column) is filled in later with questions matching the main points (Pauk, 2001). After the note-taking session, students review their notes and write questions in the cue column to highlight main points, meanings, and relationships. The process of writing the questions in the cue column “helps clarify meanings, reveal relationships, establish continuity, and strengthen memory” (Pauk, 2001, p. 237). This column is also used in the review process when notes are studied (Pauk, 2001). At the bottom of the page, a two inch-space is left for summarizing the main point(s) of the page, which again clarifies meanings and also makes review easier (Pauk, 2001). When the note column, cue column and summary area are used for note-taking and for review, students have an organized system that can improve comprehension and achievement.

### **Summary**

Note-taking is a difficult but important skill, especially considering the pervasiveness of lecture throughout middle-school, high school and college. Much of the material that is presented in classes is given through lecture, and students are responsible for learning in this style. Students need to be able to listen and look while writing the main ideas and details from the lecture, all the while matching the new information to previous knowledge for comprehension. The synthesis of new material with old, or the encoding aspect of note-taking, is as valuable as the storage function, which is having the material available for later review. High quality notes contribute to better comprehension and better review, which can lead to higher achievement and better retention of knowledge. If students are taught an organized system like the Cornell note-taking method, many of the difficulties of lecture learning and note-taking might be overcome.

## **Methodology**

### **Overview**

Research took place in one researcher’s Child Development classes at Northern High School (a pseudonym) during the spring semester of 2011, with one section of 23 students and one section of 17 students. Each of the two sections met daily for 50 minutes. Section A had 19 females and four males, and the students included 13 sophomores, nine juniors, and one senior. Section B had 12 females and five males, with 12 sophomores, five juniors and no seniors. This is a typical enrollment in Child Development, as the Family and Consumer Sciences classes tend to have fewer males, and the Child Development classes tend to have a higher rate of sophomores.

Northern High School enrolls approximately 1,000 students each year, and has little ethnic or cultural diversity, with a high majority of students who are Caucasian and who speak English as a first language. The 2007-2008 data for free and reduced lunch show that out of total enrollment of 1,045, 62 students were part of the free lunch program and 51 were in the reduced-price lunch program. This is equal to 10.8% of the Northern High School population. The overall trends at Northern High School for ethnic and cultural background and socio-economic status follow through in the Child Development population.

The Child Development curriculum is based on the textbook, *Child Development: Early Stages Through Age 12* (Decker, 2011) by Goodheart-Willcox. Many of the units covered in Child Development have hands-on projects and learning opportunities, but the infancy, toddlers, and preschoolers units also have a lecture component, with information presented through PowerPoint slides and instructor lectures. The goal of this action research was to discover a more effective approach for classroom note-taking.

### **Data Collection**

The researcher read a recruitment script to each section of Child Development, explaining the research process to students. It was emphasized that all students would be involved in the regular classroom procedures (including lectures, note-taking, and unit tests) whether or not they volunteered to participate in the study, but only the test data from those who agreed to participate would be analyzed in the study. Their inclusion in the research data was strictly on a voluntary basis. At this time, a letter to parents explaining the research project and explaining implied consent was mailed home and students were given an assent form. No parents chose to opt out their child, but in Section A, seven students decided not to participate, and in Section B, one student missed much of the class due to other circumstances, so was not included in the research. The final population for the study was 16 students in each section. The Section A study sample had 14 females and two males, and the students included 11 sophomores, four juniors, and one senior. The Section B study sample had 12 females and four males, with 12 sophomores, four juniors and no seniors.

Section A of Child Development was randomly chosen through a coin flip to take notes in a student-choice manner. Section B was taught to use the Cornell note-taking method.

Student scores from a previously administered standardized test (ACT PLAN) were used to compare the academic level of the two sections of Child Development prior to intervention. The school district administers the ACT PLAN to all sophomores, so the scores for students involved in the research were available, except for one student in Section A, who was not at Northern High School in the fall semester. The ACT PLAN scores were used as a comparison between the Section A non-intervention group and the Section B intervention group to check that abilities and performances were similar between the two groups. The PLAN test includes multiple-choice tests in English, Math, Reading, and Science, and is a nationally-normed test that assesses academic progress in high school.

A PowerPoint explaining the Cornell note-taking method was used as an introduction to this system in section B of the class, along with examples of notes taken using the Cornell method from several different classes. Instruction in the Cornell note-taking method followed and students learned to create organized notes by dividing their paper into three sections. See Figure 1 for the example of Cornell notes used during this instruction. During initial instruction in this method there was an instructor demonstration, examples were made available, and there were opportunities for students to practice with feedback from the instructor.

Research began with the infancy unit, followed by the toddlers and preschoolers units. Students in both sections were required to take notes, with Section B using the Cornell note-taking method and Section A using student-choice. The students in both sections received two points for each day of notes, with the instructor visually checking notes each day for use of assigned method. Points were given for completion of notes, with total points for notes equaling 4% of the total semester grade. Students in both classes were cooperative in taking notes, and 100% of the students earned all of the points possible for taking notes. Students took unit tests

Figure 1.

Example of notes on child development used in instruction of Cornell method of taking notes.

Infancy Unit	
How long is infancy stage?	Infancy - 2 weeks to 1 year
difference between growth + dev?	Growth - Change in size Development - Change in skills
length + weight change - 1 <sup>st</sup> year?	length at 1 - 1 1/2 x birth length Weight At 1 - 3 x birth weight
what is more important than size?	Rate of growth - more important than size
possible reasons for failure to thrive?	Failure to thrive - slow rate of growth - to point of health problem disease, lack of nutrients, short/in frequent feedings, No attachment, Abuse, Neglect
<ul style="list-style-type: none"> <li>- growth + development important in infancy.</li> <li>- need steady rate of growth</li> <li>- Failure to thrive - can be problem</li> </ul>	

after each unit was completed. The unit tests were built using the Goodheart-Willcox curriculum for *Child Development: Early Stages Through Age 12* (Decker, 2011), and were based on lecture content throughout the unit. Test bank questions were chosen based on the four chapters in each unit to make an assessment consisting of true/false, matching, multiple choice, and essay questions. The length of the tests ranged from 67 questions and 75 points to 74 questions and 80 points.

### Results

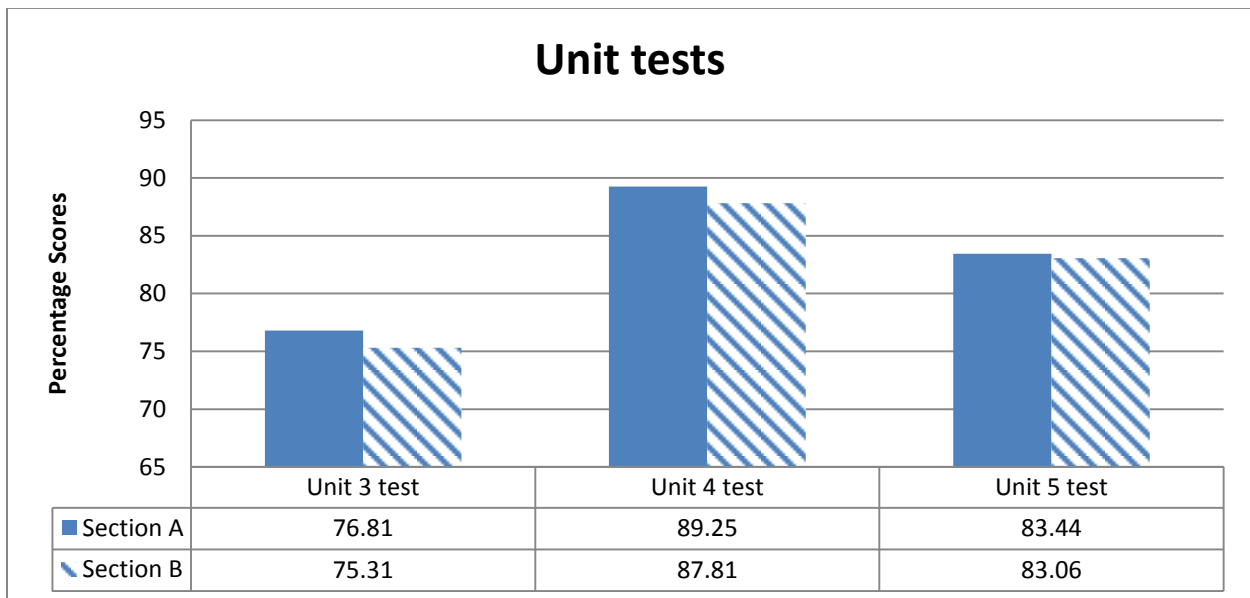
The scores from the previously-administered PLAN test were analyzed to compare the academic levels of the two sections of Child Development. An independent-samples t-test was conducted to compare the scores for Section A (M = 18.4, SD = 2.185) and Section B (M = 18.19, SD = 2.404);  $t(29) = .25, p = .80$ . As  $p > .05$ , the results showed no significant difference in the PLAN scores for the two sections which indicate that both sections were at a similar

academic level prior to the research beginning. Additionally, the average PLAN test scores for both classes were slightly below the average PLAN scores for all students in their grade levels at this school. The school-wide grade average PLAN test scores for those who were sophomores during this study was 19.2, and the school-wide grade average PLAN test score for those who were juniors during this study was 18.7.

Three unit tests were administered during the course of the action research consisting of true/false, matching, multiple choice, and essay questions. The first was the unit three test, which was administered after approximately three weeks of note-taking, with students in Section B using the Cornell note-taking method and students in Section A using any method they chose. The test included 67 questions and 79 points. An independent-samples t test was conducted to compare the scores between the two class sections. The results indicated that the mean for Section A non-intervention group ( $M = 76.81\%$ ,  $SD = 8.99$ ) was not significantly different than the mean for Section B intervention group ( $M = 75.31\%$ ,  $SD = 9.08$ ),  $t(30) = .47$ ,  $p = .64$ . Therefore, for the unit three test, there was no significant difference in scores (see Figure 2).

Figure 2.

*Comparison of unit test scores, using percentages. This figure illustrates the average test scores for units three, four, and five in Section A (non-intervention) and Section B (intervention).*



The unit four test, administered after approximately 5 total weeks of note-taking, included 61 questions and 75 points. The results indicated that the mean for Section A non-intervention group ( $M = 89.25\%$ ,  $SD = 6.03$ ) was not significantly different than the mean for Section B intervention group ( $M = 87.81\%$ ,  $SD = 5.78$ ),  $t(30) = .69$ ,  $p = .50$ . Therefore, for the unit four test, there was no significant difference in scores. (see Figure 2).

The last test, unit five, was administered after approximately seven total weeks of note-taking. This 80 point test, which had 74 questions, was the final test in the action research process. The results indicated that the mean for Section A non-intervention group ( $M = 83.44\%$ ,  $SD = 8.31$ ) was not significantly different than the mean for Section B intervention group (83.06,



SD = 5.40),  $t(30) = .15$ ,  $p = .88$ . Therefore, for the unit five test, there was no significant difference in scores (see Figure 2). The standard deviations were similar on all three tests to the standard deviations on tests on the same units from previous semesters.

### Conclusions

This action research was formulated around the question “How does the use of the Cornell note-taking method impact student performance in a high school Family and Consumer Sciences class?” At the conclusion of the research, the data supports the null hypothesis – there is no difference in student-choice note-taking and Cornell note-taking on student performance in a high school Family and Consumer Sciences class. The ACT PLAN scores show that both sections of Child Development were at a similar level in academics prior to the beginning of the research process. The comparison of scores between Section A (the non-intervention group) and Section B (the intervention group) for the three unit tests given during the research process shows no significant differences in scores for either group. Section A performed consistently (but not significantly) higher on the tests than Section B. Although there was no significant difference, examination of the scores shows that Section B (the intervention group) appears to have been slowly closing the gap between their scores and Section A’s scores.

Reflection upon the research study and the populations involved indicates that there may be several factors that had some bearing on the results, and thus, are acknowledged as possible limitations within this study, including: (a) Child Development is an elective class with mostly sophomores enrolled, (b) both sections were required to take notes, (c) there was no way to determine if notes were actually used for studying, (d) learning styles among students vary, and (e) there was some resistance to note-taking in both sections and to the Cornell method in Section B. Each of these will be explored more below.

Family and Consumer Sciences classes are electives, and some students seem predisposed to consider these classes as less important than and worth less of their time than required classes. Child Development students have shown this attitude in the past in this particular school, and depending on the student, this attitude can affect the amount of concentration and work that the student is willing to put into the class. In addition, Child Development has a high number of sophomores, which may also affect the effort given in the class. Northern High School includes grades 10 through 12, so sophomores are at a transitioning stage, and are adjusting to high school work. The combination of the elective class and the high number of sophomores may have led to less focus and less studying, which could have affected the results.

For the purpose of this study, both sections of Child Development were required to take notes, and the teacher checked the notes of each student daily. The non-intervention group in Section A took notes in whatever method they chose, but “true” student choice is often to take no notes at all. Not taking notes would potentially result in less processing of the information along with not having notes to study from. Because every student was taking notes in some form, and they did not have the option of not taking notes, this may have affected the test scores for both populations.

One of the objectives of the Cornell note-taking method is to provide organized notes for studying. Although all students in both sections of the class did take notes, there was no way to know if students were actually using the notes for study purposes. The assumption would be that some students in both sections did study, but that others did not. If students were not using the Cornell notes for studying, this could have affected the results.

Students do have different learning styles, and while note-taking is expected in class, it may be that many of the students would have preferred to learn in a different way. For example, students who were auditory learners may have been distracted by the visual requirement of note-taking. Those who were kinesthetic learners may not have gained much from either the audio or the visual portions of note-taking.

As stated earlier, note-taking is not easy, and it is certainly not an educational skill that is favored by many students. Throughout the length of the research study, there was resistance toward the idea of note-taking by both sections. Although students were cooperative and did take notes as required, some students protested this requirement to take notes and showed a negative attitude toward notes overall. Also, within the intervention group there were students who showed resistance to the Cornell note-taking method itself, with negative comments regarding the work, the format, and the overall strategy of the Cornell method. Some students had positive reactions to the method, but the more vocal students complained. This vocalized negative attitude could have affected the use of the Cornell notes, which could have affected the results.

One recommendation for future study would be to include a third section of the class. In this section, the students would not be required to take notes. This “true” student-choice method could then be compared with the other two methods. It may also be interesting to look at a class that has a more equal male/female population, as females tend to have higher literacy skills (Watson, Kehler, & Martino, 2010). Based on the comments of some students who appreciated learning a new way of taking notes that was helpful to them, it may also be beneficial to teach students a variety of note-taking methods, including image-based notes, and have each student choose which note-taking method works best for him or her. Marzano, Pickering, and Pollock (2001) state that each student may learn best from a different note-taking format and teachers should provide instruction on how to take notes in a variety of ways.

Note-taking continues to be an important part of many high school classes, and will remain part of the Child Development curriculum. Through the course of the action research, there were some students who commented positively on the instruction in note-taking, and some in the intervention section who commented that they found the Cornell note-taking method useful and helpful. In the future, it may be worth addressing the possible issues of attitude towards the class and attitude towards note-taking, and to look at use of the notes for studying, perhaps with time allowed in class for studying to take place. It might also be constructive to further investigate note-taking in general, and to research other formats of note-taking.

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