

# Conventional, Structured and “Camera-Captured” Note-taking Methods: A Comparative Analysis

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**Abstract** This study investigated which among conventional, structured and “camera-captured” notes, could enhance students’ conceptual understanding on direct circuits. The study employed a quasi-experimental approach with pretest-posttest design. The purposive sampling method was used to select 99 senior high school participants. These participants were categorized into three groups: conventional, structured, and “camera-captured” note-taking groups. Pretest and posttest were administered before and after the experiment. Furthermore, participants were tasked to create reflective journals to substantiate the results. One-way ANOVA results revealed that the posttest performance of the groups was non-significant, implying that the note-taking methods have comparable effect towards student performance. This indicates that no method is more effective over the other. Moreover, dependent t-test showed that all of the groups registered significant gains from pretest to posttest. This further indicates that note-taking, in whichever method utilized, could enhance conceptual understanding of students towards direct circuits.

**Keywords:** Cornell style, digital notes, lecture, notes, study habits

## **Introduction**

Delivering lessons in class often comes in a lecture whether it is in the collegiate level or in high school. According to Wilkinson (2012), high school education instructors do lectures for half of subject's period while tertiary learners listen for at most 80% of the class period. This tradition emphasizes that students have substantial time listening during classes. However, listening does not guarantee that the discussion could be easily recalled as most students are visual learners. Note-taking could help in recalling information that has been discussed during lecture (Blackenship, 2016).

Considered as vital for information-transmission, note-taking allows learners to obtain information from various sources, including lectures. Eventually, these notes could be utilized in preparation for examinations (Karimi, 2011). However, only 17% of students received training in doing note-taking which doubts the efficiency of the process (Jackson, 2015). Consequently, students are poor in note-taking, attaining only 25% of the lecture detail (Boyle, 2010). Despite absence of training, learners are expected to do complete and accurate notes while sitting for a lecture (Jackson, 2015). Students' lack of training also suggests that they create notes in a manner they deemed convenient and useful to them. Thus, note-taking comes in different styles as various learners do different notes for distinguished reasons in various lectures (Baharev, 2017). In response, a number of note-taking methods were developed to guide students in acquiring effective notes (Stacy & Cain, 2015). The presence of various note-taking methods imposes a knowledge gap on which note-taking technique is better in aiding students remember their lessons. Hence, this paper compared the general types of note-taking methods, namely conventional, structured and digital.

Conventional method is a free format of note-taking depending on what the learner deemed worth-noting (Graham & Hebert, 2012). These are notes created through traditional paper-pen method. Conventional notes lack heading and organizational style (Wilkinson, 2012). Despite being ill-organized, most students preferred doing conventional notes due to lack of training in doing formatted notes (Jackson, 2015). The presence of surrounding technologies did not override such method as students are comfortable with the traditional paper-pen notes (Boyle, 2011). Moreover, the temporal demand in note-taking leads students to develop practices that allow them to record leading to verbatim notes that emphasize completeness and similarity of notes from the discussion (Jackson, 2015). Verbatim notes are associated with external storage paradigm which expresses that reviewing notes is essential for learning (Jackson, 2015; Viani, 2011). Moreover, external storage paradigm implies that as much as possible notes must be accurate and complete to be available for review. As to comparison with other note-taking methods, conventional notes registered mixed results regarding its effect to student performance (Boyle, 2011; Gier, Kreiner, Hudnell, Montoya, & Herring, 2011; Igel, Clemons, Athorp, & Bachler, 2010; Peters, 2011; Wilkinson, 2012).

Structured method of note-taking, alternatively, is a method that utilizes graphical tools and format to organize information (Wilkinson, 2012). For clarity, structured notes in this paper are defined limitedly as formatted notes created without technological applications. Doing structured notes entails training to achieve its systematic process. Consequently, structured notes improve the quality of notes that may lead to positive performance (Donohoo, 2010). Structured note-taking is not merely recording of information, instead, it involves reviewing and reflecting on these information (Wilkinson, 2012). The process aligns structured note-taking to information processing theory which highlights mental

processes of receiving, processing, storing, and recovering data for future use (Viani, 2011). Furthermore, structured notes are associated with metacognition as students assess and reflect the incoming information (Caliskan & Sunbul, 2011). In effect, structured note-takers regulate incoming information instead of accommodating everything. In fact, various structured note-taking style were developed to achieve such systematic note-taking process. Some of these styles are graphic organizers, columnar notes, skeletal notes, outlines, and the popular Cornell style of note-taking (Wilkinson, 2012). Among the aforementioned styles, Cornell style of note-taking is most common due to its simplicity and efficiency in organizing notes which does not require rewriting (Jackson, 2015; Wilkinson, 2012). Hence, Cornell style of note-taking was utilized in this study for the structured note-taking. Developed by Walter Pauk of Cornell University, Cornell style allows learners to swiftly identify key ideas from their notes through its specific steps (Jackson, 2015). It includes the usual recording of information, but demands a meaningful process of reviewing and reflecting (Wilkinson, 2012). Despite its methodical approach, structured notes including Cornell style of notes generated varied results in terms of its effect to students' performance (Donohoo, 2010; Gardner, 2014; Wilkinson, 2012).

Digital note-taking is a method that utilizes technological devices such as cell phones and computers together with some applications in acquiring notes. It aims to promote efficiency and speed in note-taking (Stacy & Cain, 2015). Digital note-taking also allows learners to capture the interactive nature of lectures that utilize multimedia (Jackson, 2015). Multimedia provides words and graphics in which Mayer's Multimedia Principle believes to stimulate more learning (Clark & Mayer, 2011). Several digital note-taking applications, such as note-blogging, note-taking interfaces, online graphical organizers that involve typing,

copy-pasting, were developed as part of this digitalized note-taking. Additionally, students' digital literacy maximizes the use of digital notes (Brozana, 2011).

Despite being a promising method, most students nowadays do digital note-taking by capturing what is presented on the board or slides using smartphones or tablets. The resulting notes are referred as "camera-captured" notes (term coined in this research). A technique which simulates copy-paste strategy as it copies everything that is presented without processing (Jackson, 2015). "Camera-captured" notes, further advocate external storage paradigm by producing notes that are accurate copy of the discussion. Despite being ill-advised as it skips the actual process of note-taking, the practice of "camera-captured" notes is growing because of convenience in acquiring verbatim notes. Additionally, "camera-captured" notes are capable of providing words and pictures which is in accordance to the multimedia principle of learning. However, the simplistic process of "camera-captured" note-taking is often perceived to be a misapplication of what the digital method intends to convey, making it an interesting choice to compare with other note-taking methods. To add, Jackson (2015) suggests that mere reliance to digital literacy may not be enough to produce desirable students' performance as the actual process of note-taking is essential in digital notes. Moreover, the comparison of digital note-taking to other note-taking methods, in terms of effect to students' performance, is yet to be strongly established (Jackson, 2015; Rashid & Rigas, 2010).

In summary, the three general types of note-taking methods: conventional, structured and "camera-captured", ultimately have the same goal of recording information from a lecture to make it available on demand. As far as this paper limits the definition of these methods, conventional and structured notes were similar in applying the traditional paper-pen style. Alternatively, "camera-captured" notes utilize

gadgets such as cellphones or tablets. The main difference of the three methods is the process of how the notes were collated, hence, resulting to varying outputs. Conventional notes were taken without format and were based on what the learner deemed worth-noting. Conventional notes lead to ample information that were ill-organized. Structured notes, alternatively, followed a format. Consequently, learners assess and evaluate which ideas are to be written correspondingly on the certain part of the notes. Formatted organized output are formed through such process. Lastly, “camera-captured” notes are gathered by imaging what is presented on the board or slides. Exact copy of the texts and visuals presented during the lecture are created as notes. Despite of the similarities and differences of these note-taking methods, no method established an edge compared to the other in terms of its effect to students’ performance. Among the three note-taking methods, “camera-captured” notes is observed to be least liked by most instructors due to its convenient nature and copy-paste strategy. On the contrary, most learners belonging to the generation z who are technically savvy would likely embrace such practice. Hence, this paper aims to establish the equivalence of “camera-captured” notes to conventional and structured notes in terms of its effect to students’ performance.

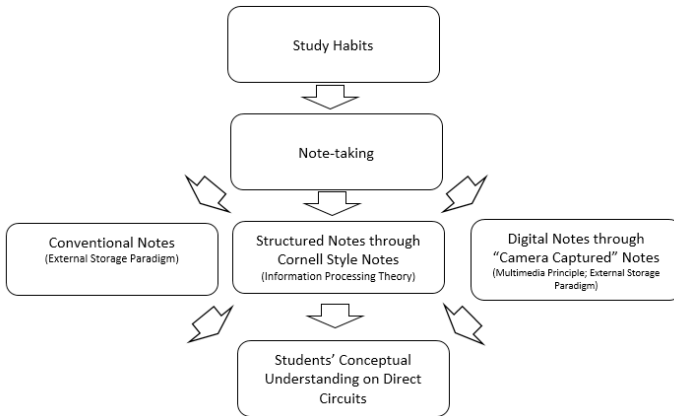
According to Buckenmeyer (2010), there is a positive relationship between student performance and appropriate study habits, which includes note-taking. It might follow that an appropriate note-taking technique could facilitate increased performance; hence, looking into the appropriateness of “camera-captured” notes is regarded pertinent. The aptness of “camera-captured” notes was anchored through assessing students’ conceptual understanding on direct circuits. Its effect was further compared to the effect of other note-taking methods. Electricity, including direct circuits, explains the functionality of many devices and understanding of these

concepts sustains their safety usage (Hewitt, 2015). Despite being essential, students were observed to use circuit terms erroneously together with wrong assumptions. Additionally, students have difficulty in identifying the types of circuits and distinguishing complete circuits from short circuits (Gaigher, 2011). Hence, this study investigated if “camera-captured” notes will be in phase with conventional and structured notes in improving the conceptual understanding of students towards direct circuits.

### **Framework of the Study**

Study habits help students to learn competently (Afful-Broni & Hogrey, 2010). It aids information retention and exam preparation (Wilkinson, 2012). Note-taking is on top of these study habits. Consequently, note-taking has various forms. Each form advocates varied model. External storage paradigm features storing a complete copy of notes to be made available during review. Conventional note-takers would likely advocate this paradigm as doing non-formatted notes would lead to accommodating almost all information from the discussion (Jackson, 2015; Viani, 2011). Conversely, information processing theory includes meaningful assessment and reflection of incoming ideas as mental process of receiving data. As a result, key concepts were identified (Viani, 2011). Structured notes apply this theory by providing a format in which note-takers review and reflect on which ideas are worthy to be accommodated as notes (Wilkinson, 2012). Lastly, multimedia principle suggests that texts and graphics could lead to more learning (Clark & Mayer, 2011). Doing “camera-captured” notes allow learners to store words and visuals through capturing what is presented on the board or slides. However, imaging everything that is seen during lecture also promotes the practice of external storage paradigm as it copies everything that was presented. Hence, this paper aimed to assess the potentials of “camera-captured”

notes in comparison with conventional and structured notes to students' conceptual understanding on direct circuits. Figure 1 diagrams the framework of the study.



*Figure 1.* Framework of the study.

### **Purposes of the Research**

The main purpose of this study is to equate the effects of conventional, structured, and “camera-captured” notes to students’ conceptual understanding on direct circuits. Specifically, the study sought to answer the following questions:

1. Is there a significant difference in the posttest performances of the three groups:
  - a. conventional notes
  - b. structured notes
  - c. “camera-captured” notes groups?
2. Is there a significant mean improvement from the pretest to the posttest of the three groups:
  - a. conventional notes group,
  - b. structured notes group, and
  - c. “camera-captured” notes group?



## **Methodology**

### **Research Design**

This research employed quasi-experimental approach with pretest-posttest design to detail the conceptual understanding of the senior high school participants on direct circuits. In addition, journaling provided the qualitative data for the study, which outlined the participants' experiences and impressions on the note-taking methods.

### **Participants**

The purposive sampling method was used in identifying 99 senior high school general physics students as participants. These students were from a premier university with multiple centers of excellence (COE) and development (COD) in the Philippines. Purposive sampling was used as the research needs participants who are currently enrolled in General Physics 2 course. However, to ensure that the research groups are comparable and that no group is initially performing better than the other, a pretest was administered. In addition, a professor with a Master's Degree in Science Education major in Physics (with 4 years of teaching experience) facilitated the classes of the participants.

### **Instruments Used**

#### ***Determining and Interpreting Resistive Electric Circuit Concepts Test (DIRECT)***

DIRECT is a 29-multiple choice instrument developed by Paula Vetter Engelhardt and Robert Beichner to assess conceptual understanding of students on direct circuit concepts. This is crafted through instructional and literature backgrounds and expert inputs. It is through Engelhardt and Beichner (2003) own research that DIRECT was tested to over a thousand of students in various universities for

reliability and validity test. DIRECT registered a reliability index of 0.71 through Kuder-Richardson 20 (KR-20) test indicating that it is reliable. The content validity of DIRECT was examined through presenting the test and its objectives to an external panel of experts. The process indicated that the questions were of high agreement with the objectives, hence, DIRECT is content valid. Moreover, DIRECT was established to be construct valid, through individual follow-up interviews where students replicated results of previous studies and showed understanding of the symbols used in the exam. Finally, DIRECT uncovers students' misconception as it incorporates distracters in every item related to these misconceptions (Engelhardt & Beichner, 2003).

### ***Reflective Journals***

Reflective journals are personal accounts of students' learning experiences. Participants in structured and "camera-captured" were asked to create a structured reflective journal (see Appendix A for the guide questions) to express their experiences and thoughts towards their assigned note-taking styles. This qualitative data further supported the participants' posttest performances.

### **Study Context**

The study was conducted in a premier university in Cebu City, Philippines. Classes were held twice a week for 2 hours by the facilitating professor. It is during this time that a lecture on direct circuits was delivered and the participants took down notes. Schedule for all exams, including pretest and posttest, were announced allowing the participants to review their notes. The experiment lasted for 3 weeks to be congruent with the required duration for the direct circuits discussion.

## **Data Collection**

Ninety-nine general physics students were chosen as participants of this quasi-experiment through purposive sampling. These students were assigned to three groups: conventional (control), structured, and “camera-captured” note-taking groups. All of these groups have the same physics teacher who exposes them to similar teaching approach that is predominantly lecture. The same learning materials and resources were also used in all of the groups. This is to eliminate as much as possible outside factors that could influence the comparison of the note-taking methods. However, different instructions on taking down notes were provided to the groups. Conventional notes group was told to take notes, in usual manner they took notes, using paper and pen without following a format. Structured notes group, alternatively, received intervention in doing Cornell style of note-taking. Structured notes were also regularly checked to ensure that Cornell style of note-taking guidelines were achieved. Finally, “camera-captured” notes group was directed to take a picture of what is seen on the board and slides to serve as notes. Furthermore, participants were already exposed to their assigned note-taking styles approximately a month before the discussion of direct circuits. The process was done to establish familiarity and comfortability of their respective methods. Participants were also reminded to rely heavily on their notes as their primary study material. Pretest and posttest through DIRECT instrument was administered in each group before and after the experiment. Results were used for performance comparison and gain assessment of the groups. Moreover, participants in the experimental groups, Cornell style and “camera-captured” notes, were asked to create reflective journal to elaborate their experiences with their assigned note-taking method. This was used for validation of the test results. A flow chart of

the research process is presented in Figure 2.

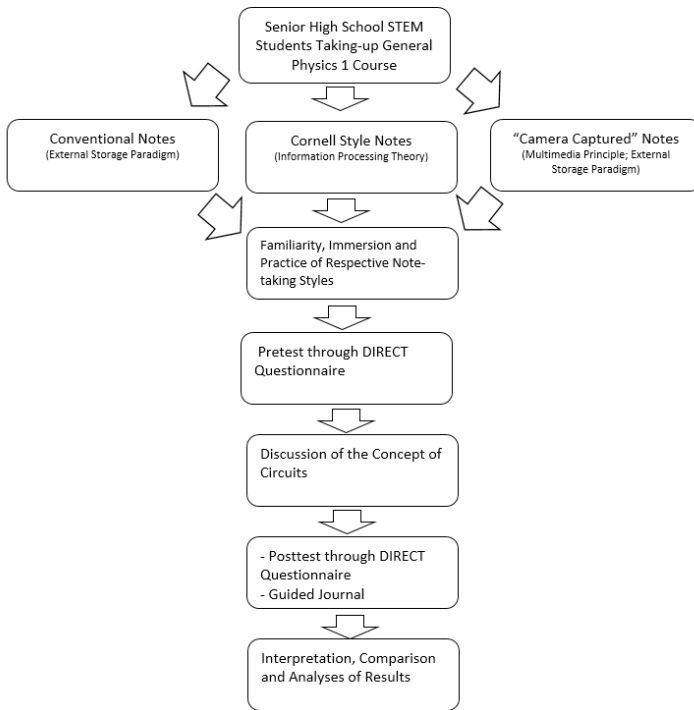


Figure 2. Flow chart of the research process.

### Data Analysis

Results obtained through the pretest and posttest were presented in tables. One-way analysis of variance (ANOVA) was used to compare the pretest and posttest means of the three groups. In case of a significant difference within groups, Tukey's multiple comparison test was further utilized. Post hoc was done to establish which group performed significantly better over the other groups. T-test for dependent sample was also applied to evaluate the mean gains in each group. The mean gain assessment verified if the posttest performance of the group has significantly improved. Finally, the results of this study were compared to the existing related literature.

## **Ethical Considerations**

Prior to the implementation of the study, the researcher requested the involvement of the participants through a written consent. The consent outlines the aims and processes involved in the study. It encompasses assurance of keeping the participants' identity confidential all throughout the process even during result dissemination. It also states that the participants' involvement in the study entails no cost for them and likewise, they will not be paid for their participation. Furthermore, the consent details that participating in the study is purely voluntary and involves no risk at any form. Finally, to avoid any researcher's influence, an external Physics instructor facilitated the participants' classes during the study implementation.

## **Results and Discussions**

### **Comparison of Students' Performance in Direct Circuits among Groups**

Table 1 presents the pretest and posttest students' performance mean comparison of the three note-taking groups: conventional, structured, and "camera-captured". The pretest mean comparison through one-way ANOVA in all of the groups, registered a p-value of .832 which

Table 1.

*Students' Performance Mean Comparison in the Three Groups (Conventional, Structured, and "Camera-captured" Notes).*

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	<b>Student's Performance Means (%)</b>			
	<b>Conventional</b>	<b>Structured</b>	<b>"Camera-</b>	<b>p-value<sup>a</sup></b>
	<b>Notes</b>	<b>Notes</b>	<b>Captured" Notes</b>	
<b>Pretest</b>	28.5266	27.7950	27.3770	0.832
<b>Posttest</b>	34.1693	35.0052	34.5872	0.933

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<sup>a</sup>significant if p-value<0.05

is not significant. It follows that the pre-assessment performances of the three groups do not significantly differ from one another. Thus, establishing that the three groups were comparable as they have same level of conceptual understanding on direct circuits prior to the experiment. It is also worth noting that the pretest performances of the groups are below the 60% (passing rate of Department of Education, Philippines) level which exemplifies the participants' little knowledge on direct circuits. This also depicts the difficulty students have in understanding direct circuits (Gaigher, 2011) which made them fit for the experiment.

It may also be inferred from Table 1 that the post-test mean comparison among the students' performance in the three groups, through one-way ANOVA registered a p-value of 0.933 which is not significant. The result indicates that despite the varied note-taking methods, the groups' posttest performances are not significantly different. This means that none among the three methods of note-taking resulted to a significantly higher students' performance posttest result. This result implies that the three varied ways of acquiring notes have the same effect towards students' conceptual understanding on direct circuits. This is in consonance with the previous studies that showed unestablished results in comparing of various note-taking in terms of effect to student's performance (Gier, et al., 2011; Rashid & Rigas, 2010; Wilkinson, 2012). Moreover, the result is an indication that "camera-captured" notes are not detrimental to students' performance. Instead, "camera-captured" notes produce the same students' performance with the other note-taking methods despite the method often being criticized due to its convenient nature and copy-paste strategy.

The non-significant results of the posttest comparison may be accounted to the different limitations

of each note-taking method. The limitations of each note-taking style could reduce the impact that the uniqueness of each style offers.

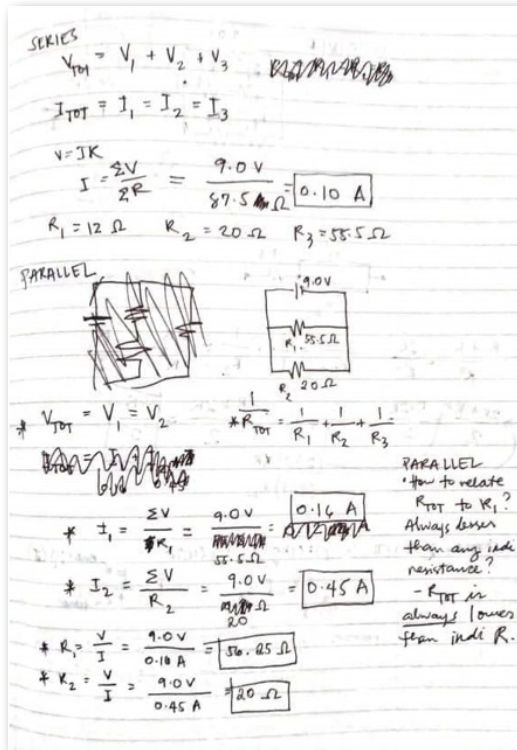


Figure 3. Sample of Conventional Notes.

Conventional notes through paper-pen may be very simple and easy to do but it lacks organization, see Figure 3, which leads to verbatim notes (Jackson, 2015; Wilkinson, 2012). Students create notes that are similar copy to what is presented during lecture which is in association with external storage paradigm (Jackson, 2015; Viani, 2011). Conventional notes lead to too much information that could cause difficulty in identifying the important ideas.

Questions	NOTES	09/02/19
electric potential energy of the system of charges?	$V_r = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$ $V_{AB} = \int_{r_B}^{r_A} \frac{1}{r^2} dr$	• EPE can be applied to a point charge in any electric field caused by static charge distribution.
NEGATIVE $(+)(+) = +$ $(+)(-) = -$ $(-)(-) = +$ $\Sigma = -$	$U = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r}$ EQUATION: EPE of 2 point charges value by a charges between the distance between the charges	• EPE of 2 point charges depends on the distance between the charges
	<ul style="list-style-type: none"> <li>equation is valid no matter the sign of charges</li> <li>EPE = zero when charges are infinitely far apart</li> <li>same sign (charges) = repulsive interaction EPE is positive               <ul style="list-style-type: none"> <li><math>r=0, u \rightarrow \infty</math></li> <li><math>r \rightarrow \infty, u \rightarrow 0</math></li> </ul> </li> <li>opposite sign (charges) = attractive interaction EPE is negative               <ul style="list-style-type: none"> <li><math>r=0, u \rightarrow -\infty</math></li> <li><math>r \rightarrow \infty, u \rightarrow 0</math></li> </ul> </li> </ul>	
$q_1 = +4\mu C$ $q_2 = -6\mu C$ $r_1 = 0.1m$ $r_2 = 0.2m$	$U = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r}$ $U = \frac{1}{9 \times 10^9} \frac{(4 \times 10^{-6})(-6 \times 10^{-6})}{0.1}$ $U = -0.262 \text{ Nm}$ $U = -0.262 \text{ Nm} \rightarrow 6.19 \times 10^{-2} \text{ J}$	
COMMENTS:	$S_1 = 0$ $S_2 = 0$ $S_3 = 6$ $S_4 = 7$ $S_5 = 1$ $S_6 = 5$ $S_7 = 4$ $S_8 = 3$	

Figure 4. Sample of Structured Notes.

Structured notes, through Cornell style of note-taking, offer efficient way of organizing and meaningful recognizing of the key ideas through following a format, see Figure 4 (Viani, 2011; Wilkinson, 2012). Hence, learners assess and reflect which ideas are essential to be accommodated in their notes (Viani, 2011) which is in accordance to information processing theory. However, such systematic process of note-taking requires ample training and immersion for proper execution (Donohoo, 2010). Some participants backed these ideas through their reflective journal entries as follows:

*“It is hassle because it is time consuming to write and at the same time understand what you are writing”;*



*“It is hassle, I find that some steps are irrelevant”;  
 “It’s hard for me to decide where to put the sample problems cause it may disrupt the flow of my notes”;  
 “It’s so hard to use this style of notes if the discussion is in faster pace.”*

The journal responses speak on the participants’ difficulty in applying Cornell style of note-taking under various circumstances. However, such difficulty could be addressed if the participants were already well-versed to using Cornell style through ample training and practice that in turn could maximize Cornell style’s effect to student performance.

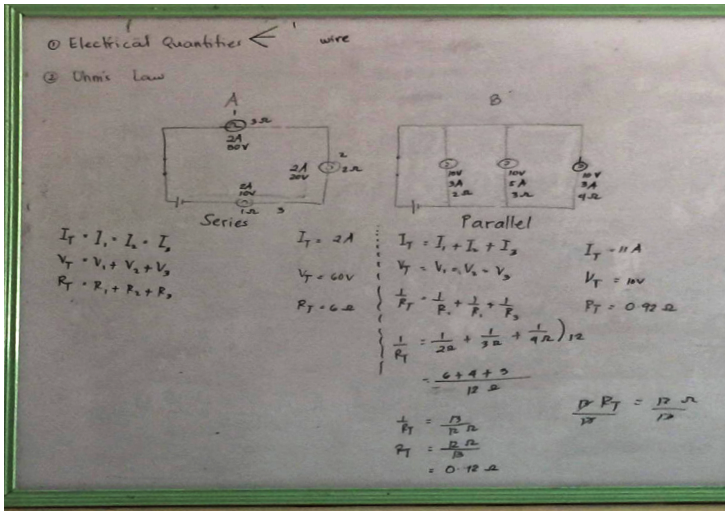


Figure 5. Sample of “Camera-captured” Notes.

“Camera-captured” notes promote speed in taking notes (Stacy & Cain, 2015). It allows students to contain words and images in their notes, see Figure 5, which multimedia principle believes to be an edge upon learning (Clark & Mayer, 2011). However, the convenient nature of just taking picture of everything presented during discussion skips the actual process of note-taking which may include

identification of key ideas (Jackson, 2015). Research participants backed this through the following journal entries:

*“Capturing notes may lead into forgetting important terminologies that you could when you write it”;*  
*“Studying through phone may invite distraction”;*  
*“In calculation, I still prefer taking down notes”;*  
*“I usually write side comments in my notes in the notebook and I couldn’t do that through phone.”*

Doing “camera-captured” notes have nearly no guidelines aside from imaging what is presented during discussion, hence, various issues on its utilization arouse as mentioned. However, it is important to note that despite these issues, “camera-captured” notes were able to produce statistically the same students’ performance with the other note-taking style. It may be inferred that the impact of these notes could be further highlighted if concrete guidelines on doing and reviewing “camera-captured” notes are created.

### **Mean Gain Assessment of the Students’ Performance in Direct Circuits of Each Group**

The pretest to posttest gains in each group showed significant increments. This means that all note-taking methods have significantly improved students’ performance on conceptual understanding on direct circuits from pretest to posttest. This further implies that the note-taking methods were effective in improving students’ performance. Moreover, the result entails that “camera-captured” notes significantly improve students’ performance like other note-taking methods do. Despite having handful of critics due to its simplistic process, “camera-captured” notes showed its positive impact of elevating students’ performance. Table 2 displays the mean gain in each of the groups.

Table 2.

*Comparing the Pre-test-Post-test Mean Gain of the Three Groups (Conventional, Structured, and “Camera-captured” Notes).*

Note-taking Style	Students’ Performance Mean (%)		Mean Gain (Pretest to Posttest)	p-value <sup>a</sup>
	Pretest	Posttest		
Conventional Notes	28.5266	34.1693	5.6426	.003
Structured Notes	27.7952	35.0052	7.2100	.000
“Camera-Captured” Notes	27.3772	34.5873	7.2100	.001

<sup>a</sup>significant if  $p\text{-value} < 0.05$

Based on Table 2, conventional, structured and “camera-captured” notes show significant gains from pretest to posttest, implying that study habits, which include note-taking, regardless of format, could improve students’ performance (Buckenmeyer, 2010). The result further entails that note-taking is vital in information-transmission and could be utilized prior to assessment for improved performance (Karimi, 2011).

It is worth noting that the raw mean gain of conventional notes is lesser than the raw mean gains of structured and “camera-captured” notes. The result may suggest that structured and “camera-captured” notes improved students’ performances more than conventional notes. However, the difference in raw mean gains is not high enough to produce a posttest performance that are significantly different among groups as shown in Table 1. Nevertheless, the slight edge of structured and “camera-captured” notes in terms of mean gain may be attributed to the enhancement of these methods from the conventional notes.

Structured notes, through Cornell style of note-taking, enhanced conventional notes by utilizing a format, see Figure 4, that entails the same process of recording notes but requires reviewing and reflecting which could lead to better understanding and internalizing of the lesson (Wilkinson, 2012). Furthermore, its format lead to swift identification of important ideas (Jackson, 2015; Wilkinson, 2012). The act of evaluating and reflecting the worth of the incoming information in accordance to information processing theory (Viani, 2011), shows to have a slight advantage over accommodating every information as per external storage paradigm (Jackson, 2015; Viani, 2011). Participants support the previous ideas as stated in their journal entries as follows:

*“The notes are arranged in a very orderly manner.”; “It made me easier to scan my notes.”; “The terms and questions on the left side of the notes which needs to be answered on the record helped me a lot in remembering and understanding the lesson.”; “I learned not to take down notes word by word but how you understood and processed it.”*

Indeed, structured notes format improved drastically the organization of notes that led to easier scanning and identifying of key ideas. Furthermore, structured notes helped learners assess which ideas are worth noting rather than creating a complete copy of what is presented.

“Camera-captured” notes enhanced conventional notes by simplifying and speeding up the process of note-taking through capturing pictures of what is presented during the discussion (Stacy & Cain, 2015). It could capture the interactive nature of the discussion and could provide a complete copy of what is presented, see Figure 5 (Jackson, 2015). The result shows that texts together with images, through multimedia principle (Clark & Mayer, 2011), are

better study materials compared to plain, complete, ill-organized texts alone, through external storage paradigm (Jackson, 2015; Viani, 2011). Participants reinforced the previous ideas through their journal entries as follows:

*“It increases attentiveness in class since they don’t have to multitask by taking notes.”; “It helps me focus on listening to the teacher”; “I can visualize the moment when the picture/slide was discussed helping me grasp the lesson easier.”; “It helps me get a clear and complete copy of graphs, charts and other visuals.”*

As stated, the graphs and diagrams in “camera-captured” notes aided the reviewing process of the learner. Moreover, the simplistic process of “camera-captured” notes allows learners to focus more on listening during class discussion while setting aside the task for writing notes. Despite ill-advised, the unique strategy of taking “camera-captured” notes proved to be capable in improving students’ performance.

## **Conclusion and Recommendations**

The primary aim of this study is to equate the effects of conventional, structured, and “camera-captured” notes to students’ conceptual understanding on direct circuits. It sought to know if one method is better over the other by means of comparing the groups’ performances doing each note-taking styles. The study further determined if the simplistic process of “camera-captured” notes is beneficial or detrimental to students’ performance in comparison to other note-taking methods.

The conventional, structured, and “camera-captured” notes had the same effect towards students’ conceptual understanding in direct circuits. This implied that no method is

better over the other. It further indicated that one note-taking style is as effective with the other styles. In addition, the three note-taking methods improved students' performance significantly from pretest to posttest. The results showed that note-taking, regardless of method, could nurture better study habits and augment students positive performance by re-emphasizing the value of note-taking. Unfortunately, fewer students practice these note-taking methods which prompted in the weakening of its essence. However, literature together with the results of this study reaffirm that notes are essential for information-transmission; as these can be used in preparation for examination to better students' performances. As the results re-emphasized the value of note-taking, instructors should encourage their learners to re-engage in note-taking. It is then recommended that they would discuss the advantages of having notes as a powerful tool come examination.

The results also highlighted the equivalence of the three note-taking methods. The outcomes which are anchored on the following theories on external storage paradigm, information processing theory, and multimedia principle all resulted to better student performances. Furthermore, the learners do notes in their preferred manner; a convenient way that they could take notes without jeopardizing the process of listening during discussion. Learners could also consider his/her own preference to which style provides better reviewing experience. There is no need to force learners to follow a particular note-taking style or belittle their simplistic note-taking process as all of the process led to better outcomes. However, structured and "camera-captured" notes exhibited promising outcomes of possibly outdoing the students' performance results of conventional notes. This hopefully spearheads the idea that enhancing the common conventional method of note-taking might produce much better marks. The aftermaths

underscored that using format for notes, indeed, allows students to assess and reflect incoming information. It eventually resulted to an organized notes in which key ideas can be easily identified. In contrary, it is barely practiced in schools that a systematic way of taking notes is discussed or given weight. Hence, the worth of these structured notes are set aside even if literature, including the result of this paper, speak of its potential. It would be best if educators, including administrators, provide substantial time and inputs to students on achieving these formatted notes. Some other states are actually having systematic note-taking as one of their subjects. Afterall, note-taking is a life long skill that learners can use even in their future workplace.

The use of “camera-captured” notes, is undeniably disliked by most instructors knowing that some schools implement “no gadgets policy”. In addition, the method’s unfavorable image comes from its very simplistic process of just imaging what has been discussed. Many consider this as an act of laziness, while others have major trust issues on gadgets. However, the output of this paper exemplify that “camera-captured” notes produced improved students’ performance statistically similar with the other note-taking methods. “Camera-captured” notes showed potential results higher than conventional notes. Accordingly, the findings showed that it would be best if such practice of note-taking will be generally accepted in classroom set-up. Afterall, the output of “camera-captured” notes were highly supported by Multimedia Principle which speaks for visuals and texts to elicit more learning. The process of “camera-captured” notes also hasten the discussion that most learners are from the generation z who are tech savvy, making the process suitable for them. In contrast, the study acknowledged that “camera-captured” note-taking provide very minimal guidelines in its application. The process is basically capture then done, this may lead to issues, such as distractions and unreviewed

notes, that would limit the output of “camera-captured” notes. Hence, it is best that the application of “camera-captured” notes comes with appropriate guidelines on how is it done and utilized for review to maximize its value.

Limitations in the process of applying the different note-taking methods may have been reduced if the participants were immersed and trained more in their respective note-taking styles. Further studies should focus in reducing such limitations. Moreover, notes would be only useful if utilized properly as study materials. This means that reviewing one’s notes could potentially affect the student’s performance. However, part of the limitation of this study is to assume that the participants will study their notes in their respective homes at least prior to any examination. Thus, additional recommendation is to control and monitor how the participants utilized their notes as an effective study material. It would also be interesting to know if there were changes in the students’ attitudes on learning and studying due to varied note-taking methods.



## References

- Afful-Broni, A., & Hogrey, M. (2010). Study habits as predictors of academic performance. A case study of students at Zion Girls Senior High School, Winneba, Ghana. *Global Journal of Education Research*, 9(1), 57-63.
- Baharev, Z. (2017). The effects of cornell note-taking and review strategies on recall and comprehension of lecture content for middle school students with and without disabilities. *ProQuest LLC*.
- Blackenship, M. W. (2016). Comparing note taking and test performance in methods and modes of note taking conditions. *ProQuest LLC*, 1.



- Boyle, J. (2010). Note-taking skills of middle school students with and without learning disabilities. *Journal of Learning Disabilities, (43)6*, 530-540.
- Boyle, J. (2011). Thinking strategically to record notes in content classes. *American Secondary Education, 51-66*.
- Brozana, A. L. (2011, February 14). Republican and Herald Online. Retrieved from <http://republicanherald.com/news/distracted-by-gadgets-cell-phones-other-devices-a-double-edged-sword-1.1105101>
- Buckenmeyer, J. (2010). Beyond computers in the classroom: Factors related to technology adoption to enhance teaching and learning. *Contemporary Issues in Education Research, 2-35*.
- Caliskan, M., & Sunbul, A. (2011). Kuram Ve Uygulamada Egitim Bilimleri. The effect of learning strategies instruction on metacognitive knowledge, using metacognitive skills and academic achievement (Primary education sixth grade Turkish course sample). Retrieved from <http://www.scimajor.com/journalsearch.php?q=19500157110&tip=sid>
- Clark, R. C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (3rd ed.). San Francisco, CA: John Wiley & Sons.
- Donohoo, J. (2010). Learning how to learn: Cornell notes as an example. *Journal of Adolescent and Adult Literacy, (54)3*, 224-227. doi:<http://dx.doi.org/doi:10.1598/JAAL.54.3.9>
- Engelhardt, P. V., & Beichner, R. J. (2003). Students' understanding of direct current resistive electrical circuits. *American Association of Physics Teachers, 98*.
- Gaigher, E. (2011). Teacher ' awareness of learners' misconceptions about simple circuits. ISTE International

Conference on Mathematics, Science and Technology Education. Kruger National Park, South Africa.

- Gardner, C. (2014). Utilizing Marzano's summarizing and note-taking strategies on seventh grade students' mathematics performance. *ProQuest LLC*.
- Gier, V., Kreiner, D., Hudnell, J., Montoya, J., & Herring, D. (2011). Using an electronic highlighter to eliminate the negative effects of pre-existing, inappropriate highlighting. *Journal of College Reading and Learning, (41)2*, 37-52.
- Graham, S., & Hebert, M. (2012). Writing to read: A meta-analysis of the impact of writing and writing instruction on reading. *Harvard Educational Review, (81)4*, 710-744.
- Hewitt, P. G. (2015). *Conceptual Physics* (12th ed.) United States of America: Pearson Education.
- Igel, C., Clemons, T., Apthorp, H., & Bachler, S. (2010). Summarizing and note taking. In A.D. Beesley & H.S. Apthorp (Eds). *Classroom instruction that works, 32*.
- Jackson, E. (2015). Comparing Analog and Digital Note-taking among Middle School Students. *ProQuest Dissertations & Theses Global, 35*.
- Karimi, L. (2011). Note-taking in the mirror of literature: Theory and Practice. *World Applied Sciences Journal, (15)6*, 806-820.
- Peters, J. (2011). *Effects of direct instruction of note-taking skills of students at a performing arts in middle school*. ProQuest Dissertations & Theses Global.
- Rashid, S., & Rigas, D. (2010). An empirical two-group study into electronic note-taking. *The Open Virtual Reality Journal, (2)1*, 1-7. doi:<http://dx.doi.org/10.2174/1875323X01002010001>

- Stacy, E. M., & Cain, J. (2015). Note-taking and handouts in the digital age. *American Journal of Pharmaceutical Education* , 79(7). 1-6.
- Viani, E. (2011). Student perceptions of note-taking in a ninth grade social studies class. Retrieved from [www.cehs.ohio.edu/gfx/media/pdf/viani.pdf](http://www.cehs.ohio.edu/gfx/media/pdf/viani.pdf)
- Wilkinson, G. A. (2012). The Impact of Structured Note Taking Strategies on Math Achievement of Middle School Students. ProQuest Dissertations & Theses Global, 66-67.

## Appendix A

Reflective Journals are personal records of students' learning experiences. A journal can be prompted by questions about students' own idea or students' thought processes about what happened in a particular time. There is an evidence that the art of reflection can help boost students' critical thinking skills, encourage students to think about their own thinking (meta-cognition), and help students prepare for assignments and examinations (Northern Illinois University Center for Innovative Teaching and Learning, 2012).

*Instruction:* This questionnaire is designed to assess or record your live experiences and insights on the use of \**“camera-captured”* notes and \*\**structured notes* (Cornell style). Employ the following questions as a guide in creating your reflective journals.

1. What are the challenges that you have encountered while using the usual paper and pen note-taking method?
2. How was your experience when you were assigned to do the \**“camera-captured”* note-taking? or \*\**structured note-taking*? What are the advantages and disadvantages of using the note-taking method?
3. Talk about your insights using your assigned note-taking method. Were these insights valuable in addressing the challenges that you have encountered while doing the usual paper and pen note-taking method? How?

*\*Questions specified for “camera-captured” note-taking group*

*\*\*Questions specified for structured note-taking group*