The Effects of ICT and Longhand Note-taking on Students' Comprehension

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Abstract - With the advent of technology nowadays, taking notes by hand seems old-fashioned to most students nowadays. Typing on ICT devices (such as laptops, smartphones, and tablets), on the other hand, is preferable since it is more practical and can record more information. Note-taking (either by hand or using gadgets) is a powerful and inevitable way of learning. However, each mode of note-taking will have a different effect on students' understanding of course materials. A study by Mueller & Oppenheimer (2014) found that students who took notes by hand performed better in their learning and retention compared to those who took notes using ICT devices. The purpose of the present study was to find out whether note-taking using ICT devices affect the students' comprehension of the lecture. This study used a quasi-experimental design, with 50 English department students of Bina Nusantara University as the participants. They were divided into two groups as the control and experimental group. Participants of both groups were shown various videos from TED talks, with topics related to their majors. While watching the videos, the control group was instructed to take notes by hand, while the other group took notes using their various devices. After that, participants had to do the test regarding their comprehension of the lecture videos. The results revealed that students who made notes using handwriting performed better in comprehension test than students who made notes using their ICT devices. The findings implied that the traditional pen and paper note-taking is more effective than ICT devices in improving learning and understanding.

Keywords: note-taking, ICT, gadgets, lecture videos, longhand, TED talks

1. INTRODUCTION

In an academic environment, note taking is a powerful and inevitable way of learning. Patterson et al. (1992) classify note taking as an organizing and focusing strategy. Notes help students to remember the important points of a lesson, and to be used for revision and reference purposes. According to Arslan (2006), note taking has three benefits. First, it increases attention to the lesson. Second, it aids memory for the lesson, and third, it produces a set of notes available for review.

There are two ways in which note taking can affect learning: encoding and external storage (Kiewra, 1989). The encoding hypothesis suggests that the processing that occurs during the act of note taking improves learning and retention. The external storage hypothesis pushes the benefits of the ability to review material (even from the notes taken by someone else). Quade (1996) also says that students take notes because of both the encoding and storage functions, to

maintain written records of what occurs in the text and later use this record to enhance review.

Note-taking can be done longhand, i.e. with traditional paper and a pen or by using gadgets (computers, laptops, or even cell phones). However, due to the advance of technology (and maybe students' idleness), more and more students do not bring their paper and pen to class. Instead, they use their gadgets to aid their learning in the classroom. While it is impossible to defy this trend, many experts still believe that computers (and the Internet) serve as distractions, detracting from class discussion and students' learning (Yamamoto, 2007).

Therefore, to incite students' awareness to 'go back to basic' of learning, the writer is conducting a quasi-experimental study to compare the comprehension results of students who take notes using pen and paper and those who takes notes using their gadgets. This study has two objectives. One objective is to compare taking notes by hand with taking notes using gadgets of their effects on comprehension test performance. The second objective is to find out which types of test items are better performed by each group.

Previous studies such as Mueller and Oppenheimer (2014) reported that participants who had taken notes with laptops performed worse on tests of both factual content and conceptual understanding, relative to participants who had taken notes longhand. Similarly, Steimle, Gurevych, and Mühlhäuser (2007) also stated that taking notes with a pen and paper is considered easier and faster. Therefore, the vast majority of students prefer longhand note-taking than using a laptop. Conversely, Bui et al. (2013) say that when people used a computer to take notes, they took more notes and recalled more of the lecture than when they took notes by hand.

2. METHODS

Research design: This is a quasi-experimental study using the posttest-only control group design (Creswell, 2009) in order to measure participants' performances in comprehension test after being instructed to take notes using longhand or gadgets.

Participants: The participants for this study were 50 English Department students of Bina Nusantara University. At the time of the study, they were in the sixth semester taking Research Method subject. They participated in this study as part of course requirements.

Material: The material for this study was one video from TED Talks (https://www.ted.com/talks) entitled "The Process of Writing Literary Review." The video duration was around 15 minutes. TED (Technology, Entertainment, Design) is a global set of conferences run by the private non-profit

Sapling Foundation, under the slogan "Ideas Worth Spreading." The emphasis is on the educational aspect.

Data Collection Procedure: Prior to the experimentation, the students were divided into two groups, longhand group, and ICT group. During the experiment, both groups were instructed to watch the same video twice. While they were watching the video, they were instructed to take notes according to their group assignment. The longhand group was assigned to make notes using pen and paper, while the other group was assigned to take notes using their ICT devices (cell phones, tablets, IPAD, or laptops). After watching the video and taking notes, they were given some time to review their notes. Finally, all the participants from the two groups were given the same test regarding the materials they had learned from the video. Students were allowed to consult their notes while doing their tests.

Data Analysis: The participants' test papers consisted of five parts, namely: completion, definition, summarizing, making a diagram and word listing. Each part contains five items, so the total is 25 items. Each participant's test paper was given a total score and scores for each part. All the participants' total scores were processed using SPSS program to obtain the mean score and significant value to determine which note-taking medium give the better result.

3. RESULTS AND DISCUSSION
3.1 Results of Longhand versus ICT devices note-taking

Table 1: Group Statistics

	group	N	Mean	Std. Deviation	Std. Error Mean
Value	Note	26	79.54	14.938	2.930
	Gadget	26	70.46	22.545	4.421

Independent sample t-test was used to test differences between the two groups: longhand versus gadget. The table shows that the longhand group performed better in comprehension test by attaining the mean score of 79.54 (SD = 14.938), while the gadget group only got a mean score 70.46 (SD = 22.545). There is a difference of 9.08, indicating that participants who took notes using pen and paper retain more information compared to those who took notes using their gadgets. These results provided evidence that using gadgets might not be too effective for academic performance. Participants using gadgets are more likely to type verbatim like notes. Mueller and Oppenheimer (2014) confirmed that even though taking more notes and having more information is beneficial for learning, mindless transcription will offset its benefit. The above findings are strengthened by the significance value obtained for the comparison of means.

Table 2: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
nilai	Equal variances assumed	7.635	.008	1.711	50	.093	9.077	5.304	-1.576	19.730
	Equal variances not assumed			1.711	43.404	.094	9.077	5.304	1.616	18.778

From the above SPSS results, the assumption that both variances are equal is fulfilled based on the hypothesis: *H0: 1 = 2* (in which 1 = variance of ALT group and 2= variance of VLT group). This is because the **p-value** = 0.008 which is smaller than = 0.05 for equal variance assumed, thus *H0: 1 = 2* is rejected. In other words, the equal variances assumed are not fulfilled, then we should use equal variances not assumed. Because the Levene's Test of equal variances is not assumed, the result of independent sample t-test for hypothesis *H0: μ1 = μ2* gives a t = 1.711 with the degree of freedom 43.404 and **p-value** (2-tailed) = 0.094. Because the test is done for the one-tailed hypothesis, then **p-value** should be divided by 2 become 0.094/2 = 0.047 which is smaller than = 0.05, then *H0: μ1 < μ2* is rejected. Then, it can be concluded that students who take notes with pen and paper perform better in comprehension test. The findings corroborate Kiewra's (1989) view that note-taking improves learning and retention, particularly if the note-taking is done using pen and paper.

3.2. The effects of note-taking medium on question types

Table 3: Results based on test type

Test type	Note taking with pen and paper	percentage	Note taking with gadgets	percentage
Completion	3.81	76.2 %	2.77	55.4 %
Definition	3.58	71.6 %	4.03	80.6 %
Summarize	3.31	66.2 %	3.00	60 %
Make diagram	4.69	93.8 %	4.54	90.8 %
List of words	4.50	90 %	3.23	64.6 %

Kiewra (1985) mentions that note taking can be generative (e.g. summarizing, paraphrasing, concept mapping) or non-generative (i.e. verbatim copying). Relating to the types of notes, the devices used for making notes will also influence the kinds of notes produced. For example, verbatim copying was easier done using computer, or laptop. Olive and Piolat (2002) mentioned that when people used a computer to take notes, they recalled more of the lecture. Brown (1988) also said that laptop use facilitates verbatim transcription of lecture content because most students can type significantly faster than they can write. However, other devices such as IPAD, tablet or cell phone do not give similar facility in typing a large amount of information. One student said that it is extremely difficult to type fast using a cell phone. On the other hand, when students make notes using pen and paper, they should select the most important information before putting it into notes. This is because they cannot write verbatim everything they hear. Using pen also enables them to draw concept mapping or

making diagram. Even in its simplest form, the diagram can be made faster on paper, rather than on a computer.

The above considerations are reflected in the results of their comprehension test. Only for one type of test, writing a definition, the gadget group excels over the longhand group. This may be due to their ability to record more words using their gadgets. On the contrary, for the other types of test, especially in completing and making a diagram, the pen and paper group performed better. The same goes for the other two types of test, summarizing and recalling lists of words. Students who make notes with their handwriting have previously summarized and selected the information in their notes.

4. CONCLUSION

ICT devices or gadgets are increasingly used in the classrooms as teaching learning aids. However, in a case of making notes for studying and reviewing, the traditional pen and paper seem irreplaceable with gadgets. This study has confirmed numerous other studies that taking notes with handwriting can give better results in students' comprehension of a lecture. Regarding the type of test, students who take notes with handwriting seem to excel in every type, except in giving definition.

This study, however, does not measure the retention or recall performance of the students, because the students were allowed to do the test by consulting their notes. For the next study, the participants should be allowed to review their notes, but not allowed to consult their notes during the test, to measure participants' retention of information.

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