ORIGINAL ARTICLE

Digital versus longhand note-taking effect on students' knowledge, satisfaction, and academic performance among medical students in Majmaah University

ABDULMALIK B ALBAKER[1]*
[1]*Assistant Professor, Orthopaedic department, college of medicine, Majmaah university, Al-Majmaah, 11952, Saudi Arabia
Email: a.albaker@mu.edu.sa*

ABSTRACT

Introduction: As technology changes, so do the types of note-taking methods used in the education system also changing. Note-taking can be done by hand, using ordinary paper and a pen, or using electronic devices so the aim of this study was to evaluate the Digital versus longhand note-taking effect on students' knowledge, satisfaction, and academic performance.

Materials and Methods: There were two between-subjects independent variables: participants took notes either longhand or electronically. The goal is to assess participants' performance in a comprehension test after they have been instructed to take notes using longhand or electronic devices. The hypothesis is that participants who take notes in longhand will perform better in the listening comprehension test than those who take notes in shorthand.

Results: With respect to effectiveness, electronic method (GPA 3.5-5.0= 69.1%) and longhand (GPA 3.5-5.0= 64.4%) groups were not differ significantly, 0.707. Overall, participants found the laptop note-taking method easier to use and more enjoyable than the longhand method.

Conclusion: The study showed that digitized note taking on mobile devices can be an effective approach to encouraging students to learn declarative, procedural and conditional knowledge and to improve student performance at various academic levels

Keywords: Digital device, Electronic device, Longhand note, note-taking methods

INTRODUCTION

Note taking method is traditionally defined as the process of capturing key ideas and concepts. These can be in the form of text outlines, guided notes, concept maps, and networks. Notes help students remember key points in a lesson and use them for review and reference purposes. According to Arslan (2006),[1] noting has three advantages. First, focus your attention on the lesson. Second, it aids the memory for the lesson, and third, it creates a series of notes that are available for review.

As technology changes, so do the types of note-taking methods used in the education system also changing. Note-taking can be done by hand, using ordinary paper and a pen, or using devices (computers, laptops, or even cell phones). With the advancement of technology (and possibly student inactivity), more and more students are not bringing pen and paper into class, but are using their devices to study in the classroom. While it is impossible to question this trend, many experts still believe that computers (and the internet) act as a distraction and interfere with class discussion and student learning. [2]

Modern mobile technology has expanded the modalities that students use to take notes. Traditionally, students have taken notes using a hand-held method (such as pencil paper), but the proliferation of laptops has allowed college students to write their notes during class.[3,4]

Recently, the use of technology in education is evolving and pedagogy is starting to change the learning style of educators and students. Significant evidence suggests that current technologies hold promise as they introduce better ways of teaching and acquiring knowledge. The technology offers special devices to improve the methods of education and learning through the development of various methods. System and applications to facilitate learning activity.[5] There is a worldwide improvement effort learning environments; therefore, the idea that most devices will be integrated with standard note-taking functions using pen-based technology is conceivable to replace traditional note-taking in the future. To replace panels; the slides are displayed on the computer instead of writing on the board, Microphone, digital pen, laser pointer, and web-based courses.[6] although we are in the digital age, taking notes as a teaching tool is still difficult. The lack of support for taking notes in digital format would widen the gap between traditional and digital learning tools in the coming decades as most of the information and knowledge is converted into digital representations.

The introduction of mobile computing devices in classrooms created new notation problems. Speed, legibility, and search ability are three positive attributes of digital noting.[7] Because of these advantages; some students prefer digital noting over traditional handwritten notes. The changes that result from these technological advances are not all positive. The digital document has also more advantages compared to paper documents, such as storability, transportability, computability, reproducibility, legibility, search ability, printability, and security. As digital learning materials offer new features to improve learning performance and encouraged both researchers and developers to facilitate advances in digital noting.

Previous research together with Mueller and Oppenheimer (2014)[8]said that members who had taken notes with laptops completed worse on checks of each real content material and conceptual information, relative to members who had taken notes longhand. Similarly, Steimle, Gurevych, and Mühlhäuser (2007)[9] additionally stated that taking notes with a pen and paper is taken into

consideration less complicated and faster. Therefore, the vast majority of students prefer longhand note-taking than using a laptop. Conversely, Bui et al. (2013)[10] 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.

The purpose of the present research was to evaluate the understanding of how digital versus longhand note-taking effect on students' knowledge, satisfaction, and academic performance.

MATERIALS AND METHODS

Study Population: The Study was conducted among 323 medical students of Majmaah University at Al Majma'ah, Saudi Arabia.

Research design: This is a quasi-experimental study was done using the posttest-only control group design (Creswell, 2009)[11] in order to measure participants' performances in comprehension test after being instructed to take notes using longhand or electronic devices. There were two between-subjects independent variables: participants took notes either longhand or electronically. The goal is to assess participants' performance in a comprehension test after they have been instructed to take notes using longhand or electronic devices. The hypothesis is that participants who take notes in longhand will perform better in the listening comprehension test than those who take notes in shorthand. The first few questions gathered general demographic information: age, gender, marital status, residence information, and father occupation. The second section contains three questions: 1) How do you take notes? 2) Electronic device type 3) Longhand device type. The other section (students' knowledge) included five statements focusing on the knowledge as low, average, and high. The other section focused on "process and satisfaction" and included statements related to several course evaluation aspects. Before the experimentation, the understudies were separated into two gatherings, longhand (pen and paper) bunch, and advanced gathering. During the examination, the two gatherings were told to watch a similar video twice. Video address was projected onto a screen at the front of the room. While they were watching the video, they were told to take notes as indicated by their gathering task. The longhand gathering was relegated to make notes utilizing pen and paper; while the other gathering was allotted to take notes utilizing their electronic gadgets (cell phones, tablets, IPAD or laptops). In the wake of watching the video and taking notes, they were given twenty minutes time to audit their notes by finishing missing words or data. At last, every one of the members from the two gatherings was given a similar test in regards to the materials they had gained from the video. The test comprises of five open-finished understanding inquiries which ought to be done quickly. Understudies were permitted to counsel their notes while doing their tests.

Data Analysis: 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.

RESULTS

A total of 323 students of the Majmaah University were evaluated in which 210 were males and 113 were females. Students belonging to the age group of <=20years were 22.3% (72), students between 21-23 were 57.9 %(187) and 19.8% (64) of patients and were >=24years. 69 (21.4%) students were in fifth year, 67(20.7%) students were in fourth year and second year, 50(15.5%) students from second year, and from second year there were 70(21.7%) students. 80(24.8%) students belongs to the Rural area and 243(75.2%) were belongs to the Urban (cities). Like these other Socio-demographic characteristics of study participants were shown in table 1. Method of taking notes were shown in table 2 in which 236(73.1) students were taken note by electronic methods and 87 (26.9%) students were taken notes by longhand method. In electronic method 12(5.1%) students were used computers and 224 (94.9%) were used smart devices. In longhand method 66(75.9%) students were used notebooks and 21 (24.1%) were used papers.

Table 3 provides the item statement and response on association between learning method and knowledge. Most of the student agreed that electronic method was more helpful to gain more knowledge (57.2%) compare to the longhand method (29.9%). T test reveled significant difference between the learning methods and to gain more knowledge (<0.001).

Higher level of agreement by student was noted through electronic method that student can write easily (61.4%) compare to the Longhand method (47.1%). In statement to follow the lecture and activity the electronic method achieved better result (70.3%) and statistically found significant (<0.001).

In retain and retrieve knowledge, participants using electronic method scored higher than those using longhand method and found Statistically significant (P<0.05).

Association between learning method and process were shown in table 4. Students using electronic method to take notes were more likely to agree that they were more engaged and thoughtful during process (58.5%). Students were higher agreement that they have better quality notes by electronic method (61.9%) compare to longhand method (26.4%) and this is found Statistically significant (<0.001). they were in more high agreement with the idea of electronic method of note taking being better and easy in Verbal and spatial (place) note taking and this association were found Statistically significant if (<0.001).

Participants give high agreement on Cognitive process during learning by electronic method (58.1%) and association were found statistically significant if (<0.001).Association between learning method and satisfaction were shown in table 5.

With respect to effectiveness, electronic method (GPA 3.5-5.0= 69.1%) and longhand (GPA 3.5-5.0= 64.4%) groups were not differ significantly, 0.707. Overall, participants found the laptop note-taking method easier to use and more enjoyable than the longhand method.

Table 1: Socio-demographic characteristics of study participants

Characteristics	Frequency	Percent
Age in years		
<=20	72	22.3
21-23	187	57.9
>=24	64	19.8
Gender:		
Female	113	35.0
Male	210	65.0
Level:		
Fifth	69	21.4
Fourth	67	20.7
Second year	67	20.7
Sixth	50	15.5
Third year	70	21.7
Residence:		
Rural	80	24.8
Urban (cities)	243	75.2
Father income SR/ month:		
Less than 5000	56	17.3
5,000-10,000	73	22.6
More than 10,000	194	60.1
Marital status:		
Single	299	92.6
Married	23	7.1
Divorced/widow	1	.3
Father occupation:		
Business	82	25.4
Salaried	152	47.1
Retired	43	13.3
Other	46	14.2

Table 2: Method of taking notes

Method	Frequency	Percentage
By which method do you take notes?		
Electronic	236	73.1
Longhand	87	26.9
If electronic, device type		
Computer	12	5.1
Smart devices.	224	94.9
If longhand, device type		
Notebooks	66	75.9
Papers	21	24.1

Table 3: Association between learning method and knowledge

Knowledge	Method	Agreement			Chi-Square	P-value
		Low	Average	High		
Gain more knowledge	Electronic	20 (8.5%)	81 (34.3%)	135 (57.2%)	19.068	<0.001
	Longhand	11 (12.6%)	50 (57.5%)	26 (29.9%)		
Write easily	Electronic	24 (10.2%)	67 (28.4%)	145 (61.4%)	5.443	0.066
	Longhand	11 (12.6%)	35 (40.2%)	41 (47.1%)		
Follow the lecture, activity	Electronic	15 (6.4%)	55 (23.3%)	166 (70.3%)	31.994	<0.001
	Longhand	17 (19.5%)	38 (43.7%)	32 (36.8%)		
Retain knowledge	Electronic	15 (6.4%)	84 (35.6%)	137 (58.1%)	11.806	0.003
	Longhand	10 (11.5%)	45 (51.7%)	32 (36.8%)		
Retrieve knowledge	Electronic	11 (4.7%)	87 (36.9%)	138 (58.5%)	21.912	<0.001
	Longhand	12 (13.8%)	48 (55.2%)	27 (31.0%)		

* Statistically significant if P<0.05

Table 4: Association between learning method and process

Process	Method	Agreement			Chi-Square	P-value
		Low	Average	High		
Achievements are boosted (activated)	Electronic	13 (5.5%)	95 (40.3%)	128 (54.2%)	23.033	<0.001
	Longhand	12 (13.8%)	53 (60.9%)	22 (25.3%)		
Generative process (add own ideas)	Electronic	15 (6.4%)	87 (36.9%)	134 (56.8%)	17.757	<0.001
	Longhand	12 (13.8%)	48 (55.2%)	27 (31.0%)		
Easy in Verbal and spatial (place) note taking	Electronic	9 (3.8%)	76 (32.2%)	151 (64.0%)	19.723	<0.001
	Longhand	10 (11.5%)	44 (50.6%)	33 (37.9%)		
Better quality notes	Electronic	19 (8.1%)	71 (30.1%)	146 (61.9%)	39.271	<0.001
	Longhand	25 (28.7%)	39 (44.8%)	23 (26.4%)		
More engaged and thoughtful during process	Electronic	16 (6.8%)	82 (34.7%)	138 (58.5%)	17.315	<0.001
	Longhand	15 (17.2%)	42 (48.3%)	30 (34.5%)		
Cognitive process during learning	Electronic	17 (7.2%)	82 (34.7%)	137 (58.1%)	9.261	0.010

	Longhand	10 (11.5%)	43 (49.4%)	34 (39.1%)		
Mechanical aspects of note taking	Electronic	18 (7.6%)	100 (42.4%)	118 (50.0%)	10.455	0.005
	Longhand	10 (11.5%)	51 (58.6%)	26 (29.9%)		

* Statistically significant if P<0.05

Table 5: Association between learning method and satisfaction

Satisfaction	Method	Agreement			Chi-Square	P-value
		Low	Average	High		
Easiness of work	Electronic	13 (5.5%)	86 (36.4%)	137 (58.1%)	13.994	0.001
	Longhand	14 (16.1%)	39 (44.8%)	34 (39.1%)		
Fastness	Electronic	23 (9.7%)	66 (28.0%)	147 (62.3%)	11.983	0.003
	Longhand	18 (20.7%)	32 (36.8%)	37 (42.5%)		
Clarity of writing	Electronic	26 (11.0%)	87 (36.9%)	123 (52.1%)	18.806	<0.001
	Longhand	22 (25.3%)	41 (47.1%)	24 (27.6%)		
More note recorded (ideas, notes)	Electronic	6 (2.5%)	82 (34.7%)	148 (62.7%)	29.878	<0.001
	Longhand	16 (18.4%)	36 (41.4%)	35 (40.2%)		
More visual notes recorded (signals, images)	Electronic	20 (8.5%)	63 (26.7%)	153 (64.8%)	66.041	<0.001
	Longhand	29 (33.3%)	44 (50.6%)	14 (16.1%)		
Better image related learning	Electronic	13 (5.5%)	65 (27.5%)	158 (66.9%)	79.098	<0.001
	Longhand	31 (35.6%)	41 (47.1%)	15 (17.2%)		
Better text-related learning	Electronic	16 (6.8%)	84 (35.6%)	136 (57.6%)	21.586	<0.001
	Longhand	12 (13.8%)	50 (57.5%)	25 (28.7%)		
General Satisfaction	Electronic	10 (4.2%)	76 (32.2%)	150 (63.6%)	29.449	<0.001
	Longhand	9 (10.3%)	52 (59.8%)	26 (29.9%)		

* Statistically significant if P<0.05

Table 6: Association between learning method and academic performance

Method	GPA			Chi-Square	P-value
	0.0 - 2.4	2.5 - 3.4	3.5 - 5.0		
Electronic	3 (1.3%)	70 (29.7%)	163 (69.1%)	0.692	0.707
Longhand	1 (1.1%)	30 (34.5%)	56 (64.4%)		

* Statistically significant if P<0.05

DISCUSSION

These days, the digital keyboard has become widespread in college classrooms, and there is a great variety in the way college students take notes and what devices they use. Therefore, studies arecurrently being carried out to determine which techniques can significantly improve information memory and how the students interpret the content. Given the increasing popularity of the use of laptops in classrooms (Fried 2008; Lauricella and Kay 2010) [12,13]it is important to examine the effectiveness of taking notes on laptops compared to traditional hand-heldnotes. However, research on this topic is still in its infancyas, to the bestofourknowledge, only three other published studies have examined note-taking onlaptops versus taking notes for classroom learning (Buiet al., 2013;Fiorella and Mayer, 2017) ; Mueller and Oppenheimer, 2014). [14-16]

There is no doubt that the students were enthusiastic about the use of digital technologies in their university educational setting, but they also found that the possibilities of chirographic writing and the use of paper have special properties that cannot be comparedto digital media. Vershinskaya, [17] comments, "The pace of [technological] change is very fast. Devices are getting smaller and lighter, reducing the weight of the bag you carry to college. This makes students under the age of 20 more computer-bound.Age matters. " (Vershinskaya, 2014, p. 4).[17] this raises new research questions about the effects of age on student preferences and theeffects of the pace of technological change. It is designed to meet some of the sentimental and practical reasons given for maintaining paper books and chirographic skills. Respondents in this study arehigh-volume users of digital technologies, but the use of pencil and paper for writing and reading incombination with digital technologies remains part of their normative practices. Motivations for using paper and pen are influenced by the haptic qualities of reading and writing – the feel and the smell of the paper and the grasp of the pen, the turn of the page, and extend also to the practical usefulness of note taking and writing in margins while reading.

Lalchandani and Healy (2016) [18] achieved a surprising result in which subjects who received handwritten notes performed worse on conceptual questions than subjects who received laptop notes. This result is similar to the results of the current experiment. These similar experimental results show a test performance advantage in receiving notes from the laptop. When it comes to digital notation for students with different academic achievement levels, there was an overall significant difference between excellent, intermediate, and underperforming students. Students, although there was an increase in the averages, the differences in test performance were not significant.

This finding could be tracedback tothe behaviorof students writing notes on their device in a classroom. Müller and Oppenheimer (2014) [8] found that students wrote the information received without processing, which prevented them from understanding the content during class, while VanWykand van Ryneveld (2018) [19] demonstrated the benefits of mobile devices and the process cognitively more challenging to take notes discussed. This affected the students' academic performance as they did not have enough time to process the information from the new conference and to process

the information from the various simultaneously available resources.

CONCLUSION

Overall, the study showed that digitized note taking on mobile devices can be an effective approach to encouraging students to learn declarative, procedural and conditional knowledge and to improve student performance at various academic levels (student's excellent, intermediate students, and underperforming students). Electronic devices or gadgets are increasingly used in classrooms as teaching and learning aids. However, if you are taking notes to study and review, then pencil and paper are irreplaceable. In addition, as technology evolves, additional digital methods could be introduced to encourage student learning. This research could help provide evidence-based recommendations to students and teachers as to which formats and techniques are best for learning.

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