The Compass

Volume 1
Issue 1 *The Compass, Issue 1*

Article 9

April 2014

Note Taking Effectiveness in the Modern Classroom

K.M. Beck
Rutgers University

Follow this and additional works at: https://scholarworks.arcadia.edu/thecompass

 Part of the Education Commons, and the Physical Sciences and Mathematics Commons

Recommended Citation

Beck, K.M. (2014) "Note Taking Effectiveness in the Modern Classroom," *The Compass*: Vol. 1: Iss. 1, Article 9.
Available at: https://scholarworks.arcadia.edu/thecompass/vol1/iss1/9

This Article is brought to you for free and open access by ScholarWorks@Arcadia. It has been accepted for inclusion in The Compass by an authorized editor of ScholarWorks@Arcadia. For more information, please contact hessa@arcadia.edu,correllm@arcadia.edu.

Note Taking Effectiveness in the Modern Classroom

By K.M. Beck, J.S. Hartley, S.L. Hustedde, and T.C. Felsberg
Rutgers University

The technological revolution has forever changed the way that people in many different environments work and learn. The modern classroom is no exception; it is rapidly changing due to the influx of technology such as laptops, tablets, smart boards, etc. This study will examine the effect that such technology has had on the modern day learning environment. Specifically, what effect does typing lecture notes on a laptop instead of writing them by hand have on test scores? Previous literature on this topic varies greatly, and covers a number of different facets of note-taking behavior. Early work in memory identifies three distinct processes involved in the memory process. These are Encoding, Storage, and Retrieval. Since retrieval, within the context of the learning environment, is the process of actually remembering the material during a test, most studies involving note-taking behavior, including the current study, focus on the encoding or external storage aspects of memory.

Encoding is the process of translating and organizing information and storing it for future use. The encoding process as it pertains to note taking has been researched extensively over the years. Fisher and Harris found that students who took their own notes and reviewed them performed better than students who did not take notes but instead studied the notes provided by the lecturer.[1] Einstein, Morris, & Smith found that students who took notes during a lecture, recalled more high-importance information than students who only listened to the lecture.[2]

The external storage function of note taking has also been well documented. For example Fisher and Harris found that students who studied their notes between the immediate test and the follow up test three weeks later, performed better on the follow up test than the students who did not study their notes. [3] Likewise, Einstein Morris, and Smith found that both more successful and less successful note takers benefitted from reviewing their notes.[4] Finally, Fisher and Harris found that students who took their own notes and reviewed them, performed better than students who merely reviewed the lecturer's notes, or took notes themselves but did not review them. [5] This suggests that the combination of taking your own notes and reviewing them takes full advantage of the encoding, and the external storage functions of note taking.

The influx of technology in the classroom is a more recent phenomenon, and thus studies examining the effects are a bit scarce and not as well distributed yet. There is, however, some evidence that the use of computers can be beneficial in the classroom. For example, Rogers & Case-Smith found that 6th graders with poor handwriting and note taking skills took notes in a more organized fashion on computers than they did by hand.[6] They also found that 75% of their subjects saw an increase in the speed by which they took notes while using a computer. This finding on the speed of note taking, links to the findings of Peverly et al. that transcription fluency (how fast

[1] Fisher, J. L., & Harris, M. B. (1973). Effect of note taking and review on recall. Journal of Educational Psychology, 65(3), 321-325. doi: 10.1037/h0035640

[2] Einstein, G. O., Morris, J., & Smith, S. (1985). Note-taking, individual differences, and memory for lecture information. Journal of Educational Psychology,77(5), 522-532. doi: 10.1037/0022-0663.77.5.522

[3] Fisher & Harris. Effect of note taking and review on recall.

[4] Einstein, Morris, & Smith. Note-taking, individual differences, and memory for lecture information.

[5] Fisher & Harris. Effect of note taking and review on recall.

[6] Rogers, J., & Case-Smith, J. (2002). Relationship between handwriting and keyboarding performance of sixth-grade students. American Journal of Occupational Therapy, 56, 34–39. doi:10.5014/ajot.56.1.34

one can take notes) is the greatest predictor of the quality of lecture notes.[7] In other words, the faster students can transcribe lecture notes, the better their notes will be, and this will have a positive effect on their test scores. Bui, Myerson, & Hale found that students who took notes on a computer, took more notes, and performed better on immediate free recall and short answer tests.[8]

The current study seeks to extend the findings of Bui, Myerson, & Hale.[9] The researchers want to replicate their short-term findings, but also to extend the study to include a delayed follow-up test for subjects taking handwritten notes. We hypothesize that computer note takers will perform better on the immediate test, and also that they will retain the information better and thus perform better on a delayed test one week later.

METHOD

Participants

Twenty-one subjects were recruited from three psychology classes. One class was from Rutgers at Atlantic Cape and two classes were from Atlantic Cape Community College (ACCC). The subjects from ACCC were members of Professor Beth Sanders-Rabinowitz's Child Psychology, and Social Psychology classes. Professor Sanders-Rabinowitz compensated her students with extra credit for their participation in the study.

The subjects from Rutgers at Atlantic Cape were members of Professor Kenneth Allendoerfer's Experimental Psychology class, and classmates of the research team. As compensation for their participation, the research team participated as subjects in the studies that the subjects themselves are conducting for the class. Of the participants from both schools 5 were male, 16 were female with their ages varying from eighteen to forty-nine and a mean age of twenty-five.

The data from two subjects were excluded due to the fact that the subjects failed to take notes during the video lecture. The data from a third subject was excluded because the subject failed to complete the entire quiz. This resulted in the data being more than two standard deviations from the mean.

Materials

A questionnaire was used during recruiting to acquire basic demographic information (see Appendix 1). An informed consent form was used to inform the subjects of the general purposes of the study, what was expected of them should they choose to participate, and to make them aware of the confidentiality, and anonymity measures in place to protect their privacy (see Appendix 2). Since there are two different types of compensation, a separate informed consent sheet was given to the subjects from Rutgers at Atlantic Cape (see Appendix 3). A nine-minute video was then shown to the subjects in a classroom via a projector screen. The video was a lecture by the Khan Academy featuring Drs. Steven Zucker & Beth Harris giving a lecture on an ancient artifact called the Standard of Ur.[10]

Lastly, a quiz was used to assess how much of the information presented in the video was retained by the subjects (see Appendix 4). The same quiz was randomly reorganized and used for the follow up test one week later (see Appendix 5). The order in which each subject received the two quizzes was randomized to control for order

[7] Peverly, S. T., Ramaswamy, V., Brown, C., Sumowsky, J., Alidoost, M., & Garner, J. (2007). What predicts skill in lecture note taking? Journal of Educational Psychology, 99, 167–180. doi:10.1037/0022-0663.99.1.167

[8] Bui, D. C., Myerson, J., & Hale, S. (2012, October 8). Note-Taking With Computers: Exploring Alternative Strategies for Improved Recall. Journal of Educational Psychology. Advance online publication. doi: 10.1037/a0030367

[9] Ibid.

[10] Zucker, S. (Performer), Harris, B. (Performer). (2012). Sumerian art: Standard of ur. [Web Video]. Retrieved from http://www.khanacademy.org/humanities/history/ancient-medieval/v/standard-of-ur–c–2600-2400-b-c-e.

effects. A laptop computer or college ruled notepaper was provided for the subjects to take their notes dependent on which condition they were randomly assigned to. The experiment took place in two separate classrooms provided by Rutgers at Atlantic Cape. They each had the same projector and screen. The subjects sat at the tables that the students normally sit at during regular class hours, to replicate an average classroom setting.

Procedures

When initially recruiting the subjects, the researchers distributed a questionnaire (see Appendix 1) to acquire demographic and basic information such as age, gender, computer competence, college grade point average, and the number of college credits completed. This information was used to ensure that there was no unintentional assignment bias to confound the results. After answering the questionnaire, the subjects were given a date, time, and place to report for the study. The information from the questionnaires was used to determine the demographics of the two groups.

The subjects were then randomly assigned to the computer or the handwritten conditions, and each subject's quiz order was randomized. The subjects were split into two separate rooms during the experiment to maintain experimental control. The computer group was instructed to take notes on the laptop computer provided for them, using a simple word processing program while the handwritten group took notes using a pen and paper provided for them. Both groups watched the nine-minute video on the projector screen and took notes using their assigned method. Subjects then took a 20-question immediate quiz on the content of the video. The subjects were thanked for their participation, and reminded of the follow-up appointment in one week's time. This entire process took approximately 30 minutes.

One week later, the subjects were administered their second quiz on the material presented in the video lecture. Once they finished the quiz, they were debriefed on the study, given the opportunity to ask questions, thanked for their participation, and dismissed.

Results

The immediate test scores were analyzed using an independent sample, two-tailed t-test with a .05 level of significance. The mean test score for the computer group was 15.1 (SD = 1.83) whereas the handwritten group scored an average of 15.4 on the test (SD = 2.37) as seen in Figure 1. The analysis of the data showed that there was no statistically significant difference between the test scores of students who take notes on a computer, and students who take notes by hand, $t(16.67) = -0.299$, $p = 0.769$. In other words, there was no statistically significant difference in the immediate test scores of students taking notes on a computer or students taking notes by hand.

The delayed test scores were also analyzed using an independent sample, two-tailed t-test with a .05 level of significance. The mean test score for the computer group was 14 (SD = 2.62) and the handwritten group scored an average of 14.33 on the test (SD = 2.6) as seen in Figure 1. The analysis of the data showed that there was no statistically significant difference between the test scores of students who take notes on a computer, and students who take notes by hand, $t(14.74) = -2.63$, $p = .796$. In other words, there was no statistically significant difference in the delayed test scores of students taking notes on a computer or students taking notes by hand.

Lastly, the word counts of the lecture notes taken by both groups were analyzed, using an independent sample, two-tailed t-test with a .05 level of significance. The mean word count for the computer group was 153.3 (SD = 62.6) while the average of the handwritten group was 96.7 (SD = 45.1) as seen in Figure 2. The analysis of the data showed that there was a statistically significant difference between the amount of notes taken by students taking notes on a computer, and students taking notes by hand, $t(17) = 2.24$, $p = .041$. In other words, students

taking notes on a computer took significantly more notes than students taking notes by hand.

Discussion

Our data did not support our hypotheses in that the computer group did not perform better on the immediate or the delayed test. The current data are contrary previous research by Bui, Myerson, & Hale who found that computer note takers performed better than handwritten note takers.[11] Not only did both groups perform equally well on the immediate and delayed tests, but the test scores of both groups decayed at the same rate from the immediate to the delayed tests. These results suggest that the encoding functions of both digital and handwritten note taking have comparable effects on short-term and long-term memory.

The current study isolated the encoding function of memory by not allowing the subjects to review their notes. This allowed the researchers to examine the differences in the effectiveness of encoding between the two groups. The data show that the encoding function of taking notes on either a laptop or by hand does not, in and of itself, produce significant changes in test scores. This may not be true if the subjects were allowed to utilize the external storage function of the notes.

A possible limitation of the current study was the small subject pool. One reason for this could be that subjects had to travel to our campus to participate in the study. Another limitation is that all our subjects were college students; in future research we would like to see groups that are representative of the larger population. Future research could also look at middle and high school populations to see if the effect is the same.

A good direction for future research would be to allow the subjects to review their notes; this may produce a significant effect between the digital and handwritten groups. Future research could examine the effect of tests that vary in difficulty. It is possible that a more difficult test could increase the drop-off in test scores between the immediate and the delayed test. Furthermore, the current study only examined laptops versus handwriting for notes.

As technology advances, other forms of digital note taking will become more prevalent. Future research may want to examine the effect of tablet note taking, dictated notes, voice recognition software, and other forms of digital note taking on test scores. Research in this field is important because technology is becoming more and more prevalent in today's classrooms. Thus, research on the effect that technology has on the learning process can help shape the way that students learn in the modern classroom. If future studies can provide evidence on how to better make use of technology in the classroom, students can harness the educational benefits that can be achieved through its use.

[11] Bui, Myerson, & Hale. Note-Taking With Computers: Exploring Alternative Strategies for Improved Recall.

Bibliography

Bui, D. C., Myerson, J., & Hale, S. (2012, October 8). Note-Taking With Computers: Exploring Alternative Strategies for Improved Recall. Journal of Educational Psychology. Advance online publication. doi: 10.1037/a0030367

Einstein, G. O., Morris, J., & Smith, S. (1985). Note-taking, individual differences, and memory for lecture information. Journal of Educational Psychology,77(5), 522-532. doi: 10.1037/0022-0663.77.5.522

Fisher, J. L., & Harris, M. B. (1973). Effect of note taking and review on recall. Journal of Educational Psychology, 65(3), 321-325. doi: 10.1037/h0035640

Peverly, S. T., Ramaswamy, V., Brown, C., Sumowsky, J., Alidoost, M., & Garner, J. (2007). What predicts skill in lecture note taking? Journal of Educational Psychology, 99, 167–180. doi:10.1037/0022-0663.99.1.167

Rogers, J., & Case-Smith, J. (2002). Relationship between handwriting and keyboarding performance of sixth-grade students. American Journal of Occupational Therapy, 56, 34–39. doi:10.5014/ajot.56.1.34

Zucker , S. (Performer), Harris, B. (Performer). (2012). Sumerian art: Standard of ur. [Web Video]. Retrieved from http://www.khanacademy.org/humanities/history/ancient-medieval/v/standard-of-ur–c–2600-2400-b-c-e

Appendix 1

Basic Information

Subject Number_____

Name:_____

Gender: A.) Male B.) Female

How old are you? _____

How many College credits have you completed? _____

How do you usually take notes during class?

A.) Handwritten b.) Typed/Electronic c.) Both

How confident are you in your ability to use a computer?

Low confidence 1 — 2 — 3 — 4 — 5 High confidence

What is your cumulative GPA? _____

Appendix 2

Informed Consent

Subject Number _____

Subjects will watch a nine-minute video and take notes on the content that is presented. There will then be a short quiz to measure how much information from the video was retained. This whole process should take roughly 30 minutes. One week later, subjects will be asked to come back for a brief follow up study that will take about fifteen minutes. All data will be kept confidential and the data will be kept separate from the participant's personal information. In order to protect subject anonymity all personal information will be destroyed after the study is completed. Subjects participate at their own discretion and may drop out of the study at any point, without penalty. For any concerns or to report an issue with your experience participating in the study, please contact professor Kenneth Allendoerfer via e-mail at kenneth.allendoerfer@rutgers.edu.

We foresee no possible risks of participation. Possible benefits of participation: you may find it interesting, and you can contribute to science. Compensation for participating: for your participation in the study, Professor Sanders has agreed a reward of extra credit. Subjects will receive partial credit for partial participation, and full credit for full participation.

Name: _____ Date: _____

Signature: _____

Witness: _____

Appendix 3

Informed Consent 2

Subject Number_____

Subjects will watch a nine-minute video and take notes on the content that is presented. There will then be a short quiz to measure how much information from the video was retained. This whole process should take roughly 30 minutes. One week later, subjects will be asked to come back for a brief follow up study that will take about fifteen minutes. All data will be kept confidential and the data will be kept separate from the participant's personal information. In order to protect subject anonymity all personal information will be destroyed after the study is completed. Subjects participate at their own discretion and may drop out of the study at any point, without penalty. For any concerns or to report an issue with your experience participating in the study, please contact professor Kenneth Allendoerfer via e-mail at kenneth.allendoerfer@rutgers.edu.

We foresee no possible risks of participation. Possible benefits of participation: you may find it interesting, and you can contribute to science. Compensation for participating: For your participation in the study, the researchers will volunteer to be subjects in your Experimental Psychology final experimental study.

Name: _____ Date: _____

Signature: _____

Witness: _____

Appendix 4

Quiz 1

1. The top registers of the standard of Ur feature:
    a. A King being brought prisoners of war
    b. Merchants leading animals to market
    c. A King seated among his court
    d. Both a and c

2. Only four people were killed in the battle depicted on the Standard of Ur.
    a. True
    b. False

3. The figures on the Standard of Ur are depicted in three dimensions rather than in two-dimensional profile.
    a. True
    b. False

4. The two sides of the Standard focus on the themes of:
    a. Rich, and poor
    b. Male, and Female
    c. War, and Peace
    d. All of the Above

5. How many registers are on each side of the Standard of Ur?
    a. 1
    b. 2
    c. 3
    d. 4

6. The style used on the Standard of Ur is similar to the style of:
    a. Babylon
    b. Assyria
    c. Egypt
    d. Rome

7. The soldier's helmets depicted on the Standard of Ur have never been proven to have actually existed.
    a. True
    b. False

8. How old is the Standard of Ur?
    a. 3500 years
    b. 2500 years
    c. 4500 years
    d. 1500 years

9. The bottom register is composed of the lowest class workers in the society.
    a. True
    b. False

10. One of the reasons the Standard of Ur was made from so many different materials is because Ur was a society made up solely of farmers.
    a. True
    b. False

11. The king is distinguished from the rest of the figures because:
    a. He is dressed better than everyone else
    b. He has more jewelry
    c. He has lots of concubines
    d. He is much larger than the rest of the people.

12. The standard of Ur was discovered in the 1800's.
    a. True
    b. False

13. The society depicted in the Standard of Ur has nothing in common with today's society.
    a. True
    b. False

14. What are the two things the eagle on the back of a US dollar bill clutches in its talons?
    a. Arrows, and a fig branch
    b. Arrows, and a Scroll
    c. Olive branch, and a Scroll
    d. Olive branch, and Arrows

15. The city-state of Ur is located in what modern day country?
    a. Iran
    b. Iraq
    c. Turkey
    d. Pakistan

16. The figures on the Standard of Ur depict:
    a. People, and Animals
    b. People, and Gods
    c. Animals, and Gods
    d. All of the above

17. Some have proposed that the Standard of Ur was a box for a musical instrument.
    a. True
    b. False

18. The way experts determined that the king was being brought prisoners is because the prisoners are depicted smaller than anyone else.
    a. True
    b. False

19. The middle register on the second side of the Standard of Ur depicts:
    a. Chariots riding over enemies.
    b. A king seated among his court.
    c. Farmers and manual laborers.
    d. Ranks of soldiers marching toward a battle.

20. The Standard of Ur was discovered by Leonard Woolley.
    a. True
    b. False

Appendix 5

Quiz 2

1. How old is the Standard of Ur?
    a. 3500 years
    b. 2500 years
    c. 4500 years
    d. 1500 years

2. One of the reasons the Standard of Ur was made from so many different materials is because Ur was a society made up solely of farmers.
    a. True
    b. False

3. The figures on the Standard of Ur depict:
    a. People, and Animals
    b. People, and Gods
    c. Animals, and Gods
    d. All of the above

4. The style used on the Standard of Ur is similar to the style of:
    a. Babylon
    b. Assyria
    c. Egypt
    d. Rome

5. The way experts determined that the king was being brought prisoners is because the prisoners are depicted smaller than anyone else.
    a. True
    b. False

6. How many registers are on each side of the Standard of Ur?
    a. 1
    b. 2
    c. 3
    d. 4

7. The bottom register is composed of the lowest class workers in the society.
    a. True
    b. False

8. The top registers of the standard of Ur feature:
    a. A King being brought prisoners of war
    b. Merchants leading animals to market
    c. A King seated among his court
    d. Both a and c

9. The Standard of Ur was discovered by Leonard Woolley.
    a. True
    b. False

10. What are the two things the eagle on the back of a US dollar bill clutches in its talons?
    a. Arrows, and a fig branch
    b. Arrows, and a Scroll
    c. Olive branch, and a Scroll
    d. Olive branch, and Arrows

11. The figures on the Standard of Ur are depicted in three dimensions rather than in two-dimensional profile.
    a. True
    b. False

12. The standard of Ur was discovered in the 1800's.
    a. True
    b. False

13. The middle register on the second side of the Standard of Ur depicts:
    a. Chariots riding over enemies.
    b. A king seated among his court.
    c. Farmers and manual laborers.
    d. Ranks of soldiers marching toward a battle.

14. The society depicted in the Standard of Ur has nothing in common with today's society.
    a. True
    b. False

15. Only four people were killed in the battle depicted on the Standard of Ur.
    a. True
    b. False

16. The city-state of Ur is located in what modern day country?
    a. Iran
    b. Iraq
    c. Turkey
    d. Pakistan

17. The soldier's helmets depicted on the Standard of Ur have never been proven to have actually existed.
    a. True
    b. False

18. The king is distinguished from the rest of the figures because:
    a. He is dressed better than everyone else
    b. He has more jewelry
    c. He has lots of concubines
    d. He is much larger than the rest of the people.

19. Some have proposed that the Standard of Ur was a box for a musical instrument.
    a. True
    b. False

20. The two sides of the Standard focus on the themes of:
    a. Rich, and poor
    b. Male, and Female
    c. War, and Peace
    d. All of the Above