

Notes and Learning from Lectures

by

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Abstract

College students spend many hours sitting in class listening to lectures and taking notes with hopes to pass an exam and to furthermore pass a class. To what extent does the quality and nature of these notes affect their performance on a quiz? Students of an Undergraduate Educational Psychology course were instructed to take notes on a videotaped lecture in preparation for an in class, weekly quiz of the material. They were also instructed to complete a questionnaire about their study and note-taking habits. There was a significant positive correlation between the total quality of notes and performance on quiz. However, there was not a significant relationship between self-reported study habits and performance on the quiz. The results suggest there is a variation between note taking skill among college students and students are not necessarily good judges of their quality of note-taking and study habits.

Keywords: note-taking, lecture, learning, quality

Notes and Learning from Lectures

Every year there are new students making the transition from high school to college. While there are the same expectations of going to class, learning, and taking exams to pass the course, the learning process is different. Students are now in large lectures where they are not afforded the one-on-one attention as in high school. Students must adapt to this new style of learning. It is their responsibility to go to class and make sure they understand the material. It is possible the instructor may cover multiple chapters in one hour; students remain anonymous/instructor unless they reach out on their own, and there is limited time, if any, for questions. In high school, students were tested fairly soon after learning the material, now months may lie between learning and testing. It is for these reasons that it is essential for students to understand the importance of note taking.

Relevance of note taking for learning

The process of taking notes in itself is beneficial for learning because it serves two purposes: a) Encoding of content, which is potentially enhanced by taking notes, and b) storage of information for which is helpful at a later point when a student reviews the material. In the encoding phase, note-taking structures the way students pay attention to what is said in class. During lecture, students must decide which information to integrate into their working memory and which information to store into their long-term memory to be retrieved in the future. This information is what should be recorded in student's notes—the main points and enough supporting details so that the idea is clear when one goes to review notes in the future. Knowing what to write down and remembering what to write down is also an acquired skill. VanderStoep and Pintrich (2008) discuss how attention is limited, which can complicate the process for students to decide what to note and how to phrase it and, at the same time, keep up with the flow

of the lecture which is particularly challenging if the teacher presents material at a fast pace. According to Kiewra (1989), “One must select information, maintain it while integrating it with new and old ideas and transcribe representative notes.” Information that only makes it into the sensory memory is lost unless it is transferred to the working memory and eventually long-term memory, which is facilitated by the process of taking notes (VanderStoep & Pintrich, 2008).

While encoding alone can be helpful for remembering information. Kiewra, Dubois, Christian, McShane, Meyerhoffer, and Roskelley (1991) conducted a study investigating new note-taking functions: encoding (take notes/no review), encoding plus storage (take notes/review notes) and external storage (absent self from lecture/review borrowed notes) relative to note-taking techniques (conventional, linear, matrix). They found that taking notes and reviewing them (encoding plus storage) is superior to taking notes with no review and borrowing notes. They found that taking notes and not reviewing them is as effective as listening to a lecture without taking notes or reviewing. They also found that matrix notes were superior to conventional notes, as a result of their completeness and or their formation of internal connections. When reviewing notes, students form connections between prior knowledge and new knowledge and through this process are able to identify ideas that are more important which help with the process of committing them to long-term memory (Kiewra, 1989).

Students are also able to make more internal connections if they take notes in a non-linear format such as an outline (Kiewra, 1989). With this strategy, memory is more effective and it is easier to retain self-generated information (Piolat, Olive, & Kellogg, 2005). VanderStoep and Pintrich (2008) suggest that notes are clear and neat which usually means one has a clear understanding of material. When organizing notes they say blank space should be utilized and inserted between concepts and major section headings. This technique coincides with their idea

that clear organization is related to clear understanding of the material and is easier to form internal connections. In a study directed by Kiewra and Fletcher (1984) as cited in Kiewera, et al., 1991, it was found that many students were unable to record generative notes but this does not mean there is no room for students to improve notes. To improve both quantity and quality requires some effort from the instructor. Cueing during lecture such (i.e. asking questions, repeating important information, explicitly stating what is important) is helpful along with writing on the board, using power point slides and recording the lecture so students can re-watch it (Kiewra, 1989). It was found that low ability students achieved higher when questions were embedded throughout the lecture (Berliner, 1969, 1971; Kiewra, 1989). So assistance with deciding what is important to write down can impact the quality of students' notes and alleviate some of the cognitive processes they must go through.

Though students know the importance of taking notes, their theories of taking notes are derived from their perceptions of the purpose of notes (Meter, Yokoi, & Pressley, 1994). Most people take notes with a specific goal in mind. Notes can serve the purpose of being a study tool, to help with focusing attention, to better understand the structure of content, to prevent from dozing off, and more. The reasons for taking notes could also affect the way students take notes. If a student is taking notes with the goal of remaining focused in class, they may not take the time to express the lecture content in their own words. Where as if a student is taking notes to use later in preparation for an exam they may be more subject to write down thoughts and questions they may have. They may review notes they took from the assigned reading(s) so that they are able to make connections between information from the reading and examples given by the instructor, an approach that would encourage more generative notes and allow for deeper

thinking. These two very different goals would obviously produce a different level of quality in notes.

So how does the quality of student notes and student's report on their reasons for taking notes affect performance on a quiz? This study analyzes student notes from a large Psychology lecture class and relates the nature and quality of student notes to performance on quiz students took on the material in the lecture. The first prediction is that students who report good study and note-taking habits will perform well on the quiz. This hypothesis is based on research that taking notes improves performance and good study habits do as well. The second prediction is that students who take good notes will perform better on the quiz. In the event that the second prediction is supported, there should also be a positive correlation between quality of notes on individual question item material and performance for that specific item. This leads to a third prediction that the quality of notes would be more likely to predict performance for more difficult items.

Method

Participants

In the undergraduate Educational Psychology course at the University of Michigan of approximately 180 students, (n = 79) consented to participate in the study. Data used for the study was part of the students' normal course requirements and neither participation in nor results from the study had an effect on their grade. Students from this course were selected to be studied because the material used in the course essentially emphasizes the psychological approaches to teaching, learning, motivation, and assessment that are grounded in theory and research. Students enrolled in this course may want to work in fields related to education or are considering graduate study or research in education. For these reasons, results from this study

would be of interest to them for both personal and educational benefits. Year of schooling, gender nor ethnicity were specified for this study.

Procedure

To test the hypotheses, data was collected in an undergraduate course at the University of Michigan. In place of a scheduled in-class lecture, students were instructed to view an hour-long pre-recorded lecture given by their instructor. The recording jointly displays the instructor and lecture slides to simulate an actual lecture. Students were instructed to watch this lecture in a quiet location with no distractions and to take notes on the content as they would in lecture. Copies of students' notes were collected the following week and they were asked to complete a voluntary questionnaire and consent form to participate in the study. The questionnaire asked about general note-taking habits, why students take notes, how they take notes, and general questions about their viewing of the lecture. As with each lecture in this course, students were given a 10-question quiz on the material in the lecture 1 week after watching the video. There was no tangible compensation for participation in the study but the entire class was able to hear a report on the early statistics found.

Measures

Note-Taking Questionnaire. The aim of distributing a questionnaire was to gather qualitative data on the students' study habits and perceptions of notes. A four-item Likert scale: 1 = every class, 2 = most classes, 3 = some classes, 4 = never, was used to assess how often students engage in listed behaviors. A different four-item Likert scale was also used for questions related to viewing of the video, and why and how students take notes to gauge whether students 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree. Questions related to the frequency of behaviors included taking notes, printing power point slides prior to lecture, re-

reading notes after class, reviewing notes before class, etc. Items to assess the extent to which students agree or disagree about reasons for taking notes include: to stay focused, to understand structure of content, as a reminder of what was discussed in class, etc. Items to assess the extent to which students agree or disagree about how they take notes include: writing down own thoughts and questions, by writing down titles/headers/subheaders from slides, adding comments to printed slides, etc. A bivariate correlation analysis was conducted with the students' reported study habits and their performance on the quiz.

Quality of Notes. The actual notes were also assessed for quality. After viewing notes, a scale was created to accurately analyze the specific notes from this study. Notes were coded on a 4-point scale to gauge whether information in notes is sufficient for success on the quiz. 0 = provides misleading information regarding the answer to the question, 1 = does not mention the information required to answer the question, 2 = provides some, but not enough information to correctly answer the question, 3 = provides enough information to correctly answer or easily infer the answer to the question. A score of "3" represents better notes and a score of "0" represents worse notes. See Appendix A for complete coding scale. A bivariate correlation analysis was conducted between the total score of quality of notes and the quiz response total. Quiz response items were coded: 0 = incorrect and 1 = correct. Next, a correlation was taken of the quality of notes for each individual quiz item and response to the individual quiz item.

Results

Questionnaire x Performance

In the first hypothesis, it was predicted that students' self-report from questionnaire on their study habits would correlate with performance on the quiz. Most students report taking notes in class ($M = 1.53$, $SD = 0.70$). On average, students report looking at notes before going

to class ($M = 3.11$, $SD = 0.85$) and re-reading notes after class ($M = 3.15$, $SD = 0.70$) less frequently. Generally, students agreed that they take notes to stay focused in class ($M = 1.43$, $SD = 0.55$), to understand the structure or the content ($M = 1.56$, $SD = 0.55$), and to prepare for tests/quizzes ($M = 1.19$, $SD = 0.56$). Students did not perceive the material in the lecture to be difficult ($M = 3.03$, $SD = 0.53$). After running a bivariate correlation between the questionnaire responses and students' performance on quiz, the hypothesis was not supported. There were no significant correlations between students' self-reports of study habits and their performance on the quiz.

Quality of Notes x Performance

The results supported the second hypothesis that students who take good notes will perform better on the exam. There was a positive correlation between the total quality of notes and the total responses on quiz items ($r(77) = 0.28$, $p < .05$). The total quality of notes was derived from adding the quality score given to notes on each specific question. Adding the number of questions a student answered correctly derived the total response. Thus, the higher the quality of notes, the higher the response total, performance on the quiz.

The results of a bivariate correlation analysis of the individual quiz items and performance, however, showed variation with questions. The questions with the least percentage of correct answers include questions 3 (56%), 6 (54%), 7 (62%), and 8 (61%). However, the analysis shows significant positive correlations in questions 4 ($r(77) = 0.27$, $p < .05$), 5 ($r(77) = 0.21$, $p < .1$), 7 ($r(77) = 0.34$, $p < .05$) and 10 ($r(77) = 0.24$, $p < .05$). Hence, the third hypothesis was not supported. The percentage of correct answers for questions 4 (85%), 5 (85%), and 10 (77%) were fairly high, suggesting a lower level of difficulty. This suggests that there is something specific to the individual questions causing these correlations.

Discussion

After analyzing the notes and relating their quality to the quiz performance, results supported the claim that students with better notes, meaning there was relatively enough information in their notes to answer the quiz questions correctly, will perform better on the quiz. This can be explained by a suggestion given by VanderStoep & Pintrich (2008) that to determine whether someone's notes are good by having someone else determine whether they can pick out the main points and if they can study from them. When analyzing the student notes for this study, one could conclude that if the information in the students' notes is sufficient for them to answer questions correctly, then it should be the same if someone borrowed the notes.

The quality of notes was assessed using the 4 codes mentioned in the method section. These codes however do not take into account the fact that people may only include in their notes information that they feel is important or new. Students have different prior knowledge and therefore may make different internal connections with the new material. Even though Kiewra and Fletcher (1984) found that most students were unable to record generative notes, notes in own words with the cognitive process requiring more thinking (VanderStoep & Pintrich, 2008), there are still students who are able to do so which could account for some notes recorded as lower quality. The coding of quality of notes also fails to account for the fact that some information is learned and retained through the process of listening to the lecture. While listening to a lecture does not guarantee the student will remember the information, it may be possible to recall information when reviewing incomplete notes.

The prediction that the same results found for total quality of notes and performance of the quiz would hold true for the individual questions was not supported. The results showed a correlation between quality and response for four of the ten questions. It was predicted that a

positive correlation would exist for questions that were more difficult meaning quality notes would yield a higher probability of answering the question correctly. For notes on number 7, students recorded notes very differently, 19 students were missing data about this information, 26 students did not have enough information and 31 students had enough to infer or answer correctly. Students are less likely to take notes on information they feel is easy to remember. The notes related to this question were regarding the college drop out rate in the United States being over 50%. While this may seem intuitive and easy to remember, when a student goes to study the material, this information will be missing and will not be at the forefront of their mind.

The hypothesis that student self-reports of study habits would correlate with performance on quiz was not supported. This result was not expected because good study habits are typically associated with high achievement. Nisbett and Wilson (1977) conducted research that provides a possible explanation for these results. In their research they explore the idea that people are not able to report on their cognitive processes. When questioning people about the reasoning of their behavior, people are able to readily respond because they are able to draw from the stimulus of knowing the social norm related to that behavior and or what response is expected for the question. Because subjects are sometimes unaware of the existence of a stimulus that influenced a response when they attempt to report on the cognitive process behind their behavior they do not do so based on true introspection (Nisbett & Wilson, 1977). Because the questions are so subjective, it may be beneficial to ask more specific questions related to study habits and note-taking for the specific course and or for the specific lecture being studied. Asking more specific questions would strengthen internal validity because it would eliminate perception biases.

Overall, while the quality of notes did influence performance on the quiz. The results from the questionnaire responses suggest that there is something more to factor in for good

performance on the quiz. As Kiewra, et al. (1991) found, it is not enough to only take notes, encode data. For maximized performance, one must take notes and review them. Because data on study habits was self-reported, it may not be as accurate as it would if study habits are a controlled variable in the experiment.

Because the lecture used for this study was videotaped and students were allowed to watch the recording on their own time, students may not have taken assignment as serious because they were not sitting in a classroom. If data was based off of an actual lecture, notes may have differed in quality. With a video, students have the ability to pause to finish writing down complete thought or to rewind if a concept was unclear, which would lead to better notes. Whereas, if students were in a lecture hall and a concept was unclear they would need to make note of it and it would be their responsibility to ask for clarity.

The course used in this study is not what an average course would look like. In that it has a quiz every week on lecture material. Because of technology, it is becoming more common for instructors to provide recordings of lectures online but if they do, this is in a consistent manner. However, because the specific course used for the study does not generally have recorded lectures online, this was a new experience within this class for all of the students. Therefore, the results cannot be generalized. Instead, notes from an actual lecture should be used so that students are able to get the effects of being in their normal condition.

In spite of its limitations, this study shows the importance of quality of note-taking on performance. It also shows that taking notes is not enough. Students must also have good study habits when it comes to maximizing their achievement and understanding of presented information. Because people take notes in multiple ways, future research needs to be done for a

better understanding of what good notes and bad notes look like. Is there a such thing as good notes, does it depend on the subject matter, or is it subjective and can vary by person.

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Author Note

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Table 1

Correlations Between Quality of the Notes for Individual Questions and Question Responses

Variable 1	Variable 2	Correlation
Q1	R1	-.05
Q2	R2	-.05
Q3	R3	-.04
Q4	R4	.27**
Q5	R5	.21*
Q6	R6	.18
Q7	R7	.34**
Q8	R8	.09
Q9	R9	.03
Q10	R10	.24**

* $p < .1$.

** $p < .05$.

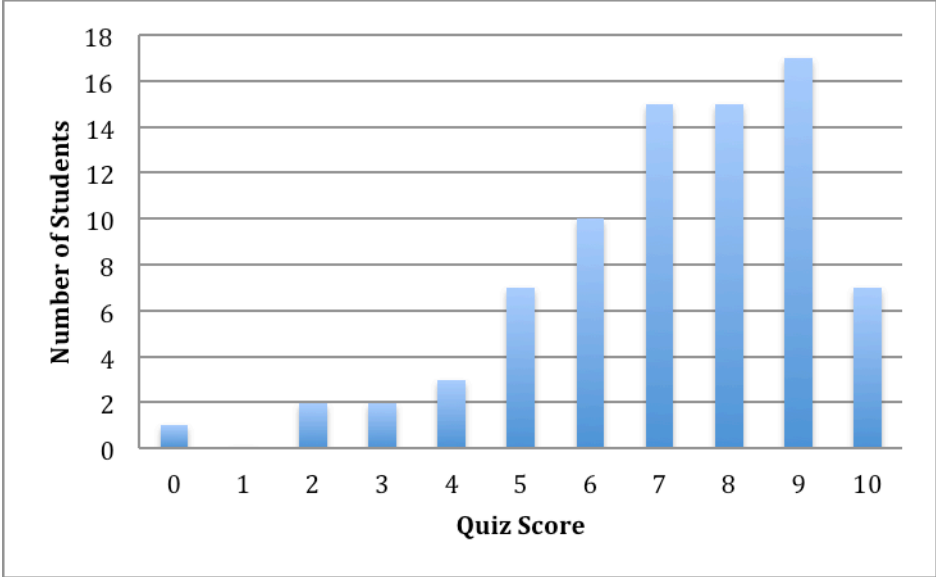


Figure 1. The frequencies of individual quiz scores.

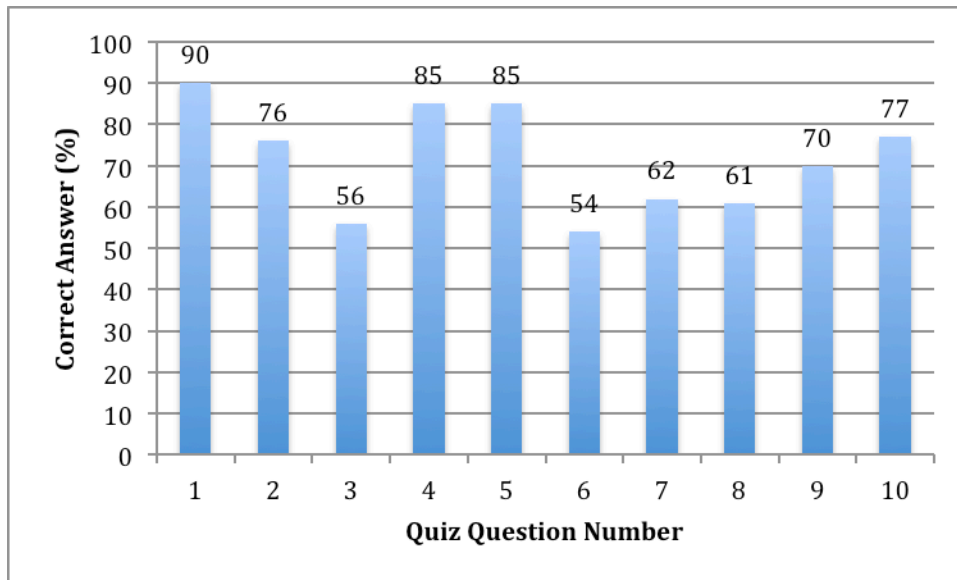


Figure 2. Percentage of correct answers for individual quiz questions.

Appendix

Coding Chart for Quality of Notes

<p><u>(0) Misleading information regarding answer to the question</u></p> <p>There are notes related to the question but content could potentially be misleading.</p> <p><i>Example Quiz Question:</i> While it is true that in the Western countries educational degrees and credentials are very predictive of later income, this is not true for former communist and developing countries. True or False?</p> <p><i>Example Notes:</i> “Maybe not always but it does pay off.”</p> <p>“Absolutely yes! (But maybe not <u>always</u>)”</p>
<p><u>[1] Does not mention the information required to answer the question</u></p> <p>There are no notes regarding information being asked.</p>
<p><u>[2] Provides some, but not enough information required to correctly answer the question</u></p> <p>There are notes related to the question but content does not necessarily lead to correct answer.</p> <p><i>Example Quiz Question:</i> While it is true that in the Western countries educational degrees and credentials are very predictive of later income, this is not true for former communist and developing countries. True or False?</p> <p><i>Example Notes:</i> “Graphs indicate that education (especially tertiary education) pays off later in life.”</p> <p>“Does education always pay off later in life? Yes it does”</p>
<p><u>[3] Provides enough information to correctly answer or easily infer the answer to the question</u></p> <p>There are notes related to the question and notes are clear enough to guide to correct answer.</p> <p><i>Example Quiz Question:</i> While it is true that in the Western countries educational degrees and credentials are very predictive of later income, this is not true for former communist and developing countries. True or False?</p> <p><i>Example Notes:</i> “Does education always pay off later in life? YES! In ALLLLL nations.”</p> <p>“Later-life benefits to education? YES, in all countries on average relative earnings é ALL over the world. Invest in higher education!”</p>

Note-Taking Questionnaire

College students differ in the study habits and the way they learn in and out of the classroom. One aspect of learning in classes is the practice of taking notes. With the following questions, we want to learn more about your habits of taking notes in large lecture classes (like Psych 356 or Psych 250) and how you watched the online lecture.

Note: This is not a test. There are not right or wrong answers. The purpose of this questionnaire is to learn more about difference in note taking of students. Completing this questionnaire is voluntary. It is not graded and will not in any way used to assess your performance in class.

Thank you for your participation!

In general, how often to you do the following?

	Every class	Most classes	Some classes	Never
I take notes in class				
I bring notes from my textbook reading to class				
I look at my notes before going to class				
I print the power point slides prior to lecture				
I re-read my notes after class				
I file my notes together with other course material				
I type up my notes after class				

Why do you take notes?

	Strongly agree	Agree	Disagree	Strongly disagree
Taking notes in class keeps me focused				
Taking notes helps me understand the structure of the content				
I takes notes to prevent me from dozing off				
I write down notes to show the instructor that I am paying attention				
I take notes as a general reminder of what was discussed in class				
I use notes to discuss the class in my study group				
I don't take notes in class because they tend to distract me from lecture				
I use notes to prepare for tests/quizzes				

How do you take notes?

	Strongly agree	Agree	Disagree	Strongly disagree
I write down my own thoughts and questions				
I take notes only when I realize that the content is not covered in the textbook/readings				
I write down titles/headers/subheaders from the slides				
I add comments to the slides that I printed prior to class				
I try to express lecture content in my own words				

Additional questions regarding the viewing of the lecture on c-tools

	Strongly agree	Agree	Disagree	Strongly disagree
I was in a quiet room when I watched the lecture				
Other people distracted me while I was watching				
The lecture content was very challenging				
While watching I was very focused				
I did other things while I was watching the lecture				
I watched the lecture in one sitting				
The online lecture was similar to a regular class				
I took notes the same way as in a regular class				