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Do Instructor-Provided Online Notes Facilitate Student Learning?

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Abstract

Previous research has shown that providing students an outline or some form of notes prior to lectures and for later review facilitates learning. Recent advances in technology make this practice practical and inexpensive. To test the efficacy of instructor provided notes, students studied lecture material under one of four conditions. Some students listened and took notes without instructor assistance. Others listened and took notes using an instructor-provided outline with spaces for students in fill in important information. A third group listened with a complete set of notes that includes virtually every idea in the lecture (in outline form). Finally, a control group studied the complete set of instructor notes without hearing the lecture. The lecture was 35 minutes and covered the structure and functions of the brain. Memory was tested in Experiment 1, while memory and transfer were measured in Experiment 2. In both studies, the group taking their own notes and the group with the instructor-provided skeletal notes performed better than the groups with full set of notes (regardless of whether they heard the lecture). However, instructor-provided skeletal notes did not increase test performance beyond what students achieved simply by taking their own notes.

This research investigates a practical issue: making course notes available to students online. Lecturing remains the most popular college teaching method (Benjamin, 2002), and taking notes while listening is an almost universal study activity (Armbruster, 2000). Instructors can assist students by making outlines and class notes available electronically via course Web sites. This paper describes two experimental studies designed to answer three questions: Should instructors provide students with lecture notes? If so, what kind of notes should be provided? And, if instructors provide elaborate notes to students, do students still need to attend class?

Only one study was located that directly measured the benefits of providing notes online. Grabe (2002) made all course notes available to his students in a large general psychology class. Student surveys and the monitoring of online “hits” to the notes pages revealed that students frequently downloaded copies of the class notes prior to coming to class, just before tests as a guide for review, and as a substitute when absent from class. Accessing class notes was correlated with course achievement, even when reading ability was controlled.

While not directly connected with technology, there is a rich body of empirical research on note taking and learning. DiVesta and Gray (1972) distinguished the encoding and external storage functions of note taking. The encoding function occurs when taking notes alters the learner's cognitive processes. Taking notes helps make attention more selective, forces the listener to organize ideas, and helps students relate material to existing knowledge, thus facilitating learning (Peper & Mayer, 1986). The external storage function occurs when students use their notes for later review. Both functions have been shown to facilitate learning across a wide range of conditions, but the effect size for the external storage function is generally stronger (Kiewra, 1985; Kiewra et al., 1991).

To serve an external storage function, notes must be complete and accurate. Unfortunately, student notes are often limited (containing 35% of the presented material) and sometimes incorrect (Kiewra, 1985). Knight and McKalvie (1986) found that students reviewing a good set of notes (but never attending the lecture) outperformed a group who attended the lecture, took their own notes, and then reviewed their own notes. Given these problems with student note taking, researchers have searched for ways to facilitate better note taking. Providing students with a skeleton outline of the lecture improved both the quality of notes taken (Kiewra, Benton, Christensen, Kim, & Risch, 1989) and test performance after review (Kiewra, DuBois, Christian, & McShane, 1988). Based upon these results, it seems obvious that if notes are used primarily for review purposes, instructors should provide assistance in taking notes, or complete set of notes, to students.

The research described here was mainly concerned with the encoding function, or providing students with notes as an aid to listening. Should instructors provide notes prior to class? Based upon the studies by Kiewra and colleagues (1989), the answer is yes. Taking notes from a college lecture can be mentally taxing, requiring most of the listener's cognitive capacity to get the information and to record good notes. Armbruster (2000) supports this view, arguing that "taking notes is such a cognitively demanding task, there is limited opportunity for generative processing at the time of encoding" (p. 179). A skeletal outline (or partial notes) should relieve some of the cognitive load experienced during listening to a lecture (finding the main ideas, copying terms from the board or overhead, deciding how lecture ideas fit together), allowing for more focus on understanding and encoding (Armbruster, 2000; Kiewra et al, 1988; Kiewra et al., 1991). By allowing more focus on relating ideas within the presentation (internal connections), learning and recall should be enhanced. By allowing students to relate lecture ideas to prior knowledge (external connections), understanding and transfer should be enhanced (Mayer, 1984; Peper & Mayer, 1986).

A second question addressed in this study is what kind of notes should be provided? Should notes be in skeleton form (with just the key points) or should a detailed set of notes be provided? If providing notes makes the task of note taking easier and leaves students more capacity for meaning making, then why not provide complete notes and allow students to follow along? However, if the activity of note taking encourages deep processing (writing notes in their own words and placing them into the framework where they belong), skeletal notes should be better.

The third and final question is if students can study a good copy of notes, why attend the lecture at all? To test these speculations, four conditions were compared. In one condition, students listened to the lecture without any notes from the instructor but were encouraged to take notes (the "take-notes" group). In a second condition, students were provided a skeleton outline (covering one side of one page) listing key phrases (the "skeletal-notes" group). In the "full-notes" condition, students were provided with an elaborate outline (approximately three pages, single spaced). In the fourth condition, students were given the detailed outline but did not see the video (the control group).

To insure some level of ecological validity, a videotape of a college lecture was used in the study. This instructor used PowerPoint slides to organize the lecture. Skeleton notes were constructed by combining the key points off the PowerPoint slides onto one page (these notes are normally made available to all students prior to the lecture). The detailed notes were the instructor's own notes, which she uses to keep herself organized (as she teaches multiple sections throughout the school year). These detailed notes are made available for students who have extended, excused absences from class.

Experiment 1

Method

Participants. Seventy-four students from undergraduate educational psychology classes at a Midwestern university participated in the study. The mostly female sample were sophomores and juniors, majoring in education, and taking their first psychology class.

Materials. All students watched a 35-min video on the brain, taken from a 50-min general psychology class. The topic was chosen because it would be of interest to the experimental sample, but not typically covered in educational psychology. Fifteen minutes were cut from the original tape by omitting class announcements, some questions and responses that were difficult to hear and that went off-topic, and an end-of-class summary.

The test consisted of 14 fill-in-the-blank or short-answer questions. The questions were factual, covering material explicitly presented in the videotape. Alpha reliability was .74.

Procedures. Students were randomly assigned to one of four experimental conditions. The take-notes students were given blank sheets of paper and instructions to take notes "as they normally do." In the skeletal-notes condition, students were given a one-page outline with 16 key terms and main ideas. The full-notes group received a three-page outline with about 80 terms and concepts. The control group received the three-page outline, but was not allowed to view the video.

To begin the study, all participants were given a general description of the study. After signing consent forms, students were randomly assigned to groups and moved to one of four rooms, given instructions and materials appropriate to their experimental conditions, and the video began (except for the control, who was instructed to study the outline). At the end of the video, the experimenter removed all materials and distributed the test. Students participated in small groups of 4 or 5, and the entire experiment took just under one hour.

Results

Descriptive statistics are presented in Table 1. There was a significant treatment effect, $F(3, 70) = 3.28$, $p = .026$. Using the LSD procedure, a series of t tests found that the skeletal notes produced the highest scores, but those scores were not significantly higher than the take-notes group. The mean for the skeletal-notes group was significantly higher than the full-notes and the no-lecture control groups. The take-notes group did not differ significantly from the skeletal-notes or the no-lecture control, but they did score significantly higher than the full-notes group. The no-lecture control group was significantly lower than the skeletal-notes group, but not different from the other two. Finally, the full-notes group scored significantly lower than the skeletal-notes and the take-notes groups, but not from the no-notes control group.

Table 1

Descriptive Statistics From Experiments 1 and 2

	Memory (Exp. 1)		Memory (Exp. 2)		Memory (Exp. 3)	
Condition	*M*	*SD*	*M*	*SD*	*M*	*SD*
Control	5.61	3.63	2.90	1.29	3.10	1.10
Take notes	6.89	2.81	5.60	2.59	5.20	2.04
Skeletal notes	7.61	2.25	4.10	0.99	4.30	1.25
Full notes	4.79	3.17	3.50	2.07	2.90	2.28

To examine the quality of notes taken, two analyses were undertaken. First, the notes taken by the 19 participants in the take-notes group were examined to determine how many of the 16 key ideas in the skeletal notes were recorded. Two individuals, working independently, scored the notes and had 100% agreement. Of the 16 key ideas, 14 of the 19 participants had all 16 key ideas, 4 had 15, and 1 set of notes contained 14 of the 16.

A second analysis compared the notes of the skeletal- and take-notes groups. The notes of the 19 students in the take-notes group and the 18 students in the skeletal-notes group were compared. Two individuals scored the notes to determine how many lecture ideas were actually recorded. Student notes were compared to the 80 ideas contained in the instructor’s complete notes. Agreement occurred in 94.5% of the scores. The discrepancies were settled by the paper’s author. The skeletal-notes group recorded an average of 44.79 (SD = 10.34), while the take-notes group had a mean of 51.56 (SD = 11.96). This difference was not significant, $t(35) = 1.84$, $p = .07$.

In summary, the students in the two note-taking groups were very active, recording almost all of the key ideas and many of the supporting details and examples. The number of ideas recorded did not change by giving students skeletal outlines.

Experiment 2

A replication experiment was conducted. The test was altered by cutting the number of factual items from 14 to 10, but adding a transfer test with 4 items. These transfer items required students to apply their knowledge about the brain to answer questions not discussed in the lecture.

Method

Forty students from the same population as Experiment 1 participated in this study. All details were identical except the test. The factual test was shortened from 14 to 10 items. By choosing the best questions of the original 14 items, the reliability was virtually unchanged (a = .72). The transfer test gave students four problems, such as "We know the brain develops with age. Comparing children and adults, which part of the brain probably develops the most? Why?" Other items asked about comparative anatomy, robotics, and evolution. The key was that there was no information presented in the lecture on these topics, but students could speculate intelligently based upon the information presented. Items were scored on a scale of 0, 1, or 2, where 2 represented an appropriate use of lecture information and a 1 was partial credit for being on the right track. All responses were scored by two individuals working independently. They agreed on 96% of all scores.

Results

The first analysis compared the performance on memory items across the four groups. There was a significant effect, F (3, 36) = 3.94, p = .016. Descriptive statistics can be found in Table 1. Follow-up tests revealed that the take-notes group was significantly higher than the control group and the full-notes group, but not the skeletal-notes group. The skeletal group was not significantly different from any other groups. The control group was significantly lower than the take-notes group, but not different from the two other groups. The pattern for the full-notes group was the same, in that they were significantly lower than the take-notes group, but equal to the other groups.

A second ANOVA tested differences among the groups on the transfer test. Once again, there were significant differences, F(3, 36) = 3.82, p = .018. Follow-up tests revealed the exact same pattern as with the memory tests. The take-notes group did not differ significantly from the skeletal-notes group, but did significantly outperform the other two groups.

General Discussion

Do instructor-provided notes assist learners in taking better notes or learning from lectures? Given the conditions of this study (no opportunity to review notes, one 35-minute lecture delivered via videotape, only college sophomores tested), the answer is no. This failure to find a significant difference between the take-notes and skeletal-notes groups is surprising given the general superiority of providing partial notes in previous studies (Armbruster, 2000; Kiewra et al., 1989, 1991). Providing students with notes is hypothesized to reduce the cognitive load required to listen and record information. Since we have no independent measure of cognitive load, no clear conclusions can be drawn. The failure to find benefits of provided notes could be due to specific details in this study. The instructor taped for this study made excellent use of a series of PowerPoint slides, making this lecture easy to understand and to take good notes. The notes taken by students closely resembled the skeletal notes, and both groups recorded elaborate, accurate notes. A less organized, more difficult to follow lecture might prove a better test of the benefits of skeletal notes.

Providing students with the instructor's detailed notes prior to the lecture resulted in poor performance. One possible explanation is that the notes are just too much. Following along with the detailed notes, especially for students not used to having them available, may be too distracting. Another possibility is that these notes make the listener too passive, since they just follow along. It is important to note that this study did not involve an opportunity to review, when a complete set of instructor's notes might prove helpful. The control group with the notes but no lecture also performed poorly, confirming what instructors have tried to tell students: it is important to get good notes when you miss class, but it is not the same as attending class. Lectures cannot be reduced to a set of notes.

These studies have several limitations, which can be described by briefly discussing some things that are missing from this paper. One is individual differences. A recent paper by Ryan (2001) presents an interesting analysis of note-taking styles, arguing that students vary in their beliefs about the purpose of note taking and in their note-taking habits. The notes taken in the present studies were remarkably homogeneous, closely resembling the instructor's own outline and the PowerPoint slides, and showed no evidence of differing styles. This could be due to the highly structured, detail-oriented lecture that was employed. Further, this was a one-shot experience for students. Sustained experience in a course with an instructor might yield more variability in note-taking and study behaviors, as students learned what information was needed for tests or class assignments.

Also missing from this paper is any reference to self-regulated learning. Van Meter and Pressley (Pressley, Van Etten, Yokoi, Freebern, & Van Meter, 1998; Van Meter, Yokoi, & Pressley, 1994) described student note taking as flexible and adaptive. They found students alter their note taking based upon the pace and density of the lecture, the type and difficulty of test expected, and the level of assistance from the instructor. One way to interpret the present studies is that these students quickly recognized the situation and adapted to it: the instructor provides a highly structured lecture with main points on the overhead and lectures on details that elaborate the key points. Studying how students use their notes for exam preparation, and how the availability of online materials influences studying are important topics for further investigation.

The final missing ingredient in this research is that no student actually downloaded any notes or completed any task online. The two experiments presented here were traditional research, controlling variables in experimental fashion. Classroom research, such as that by Grabe (2002), and qualitative work, such as those described in the Van Meter and Pressley papers, are necessary complements to the experimental studies presented here.

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