RESEARCH ON STUDENT NOTETAKING: IMPLICATIONS FOR FACULTY AND GRADUATE STUDENT INSTRUCTORS

Deborah DeZure
Matthew Kaplan
Martha A. Deerman

CRLT Occasional Papers

Center for Research on Learning and Teaching

University of Michigan

No. 16

Introduction

Notetaking has been a staple activity of academic life, particularly in lecture courses, for decades. Despite its widespread use, notetaking has generally been taken for granted by both instructors and students. However, in the past few years, changes in the landscape of higher education, such as the proliferation of commercial notetaking services, have led instructors to ask questions about the efficacy of notetaking in promoting learning and their own role in the process. These questions reflect instructor concerns not only about notetaking services, but also the apparent decrease in student notetaking abilities, the introduction of active modes of learning within lectures, and the ease with which instructors can post their lecture notes online for campus-based courses or distance learning.

The purpose of this *Occasional Paper* is to review what research tells us about the impact of notetaking and how the review of notes affects student learning. The paper also explores the role that instructors can play, suggesting several specific strategies to support students.

What Research Tells Us About Notetaking and Review of Notes

Research on notetaking indicates that taking notes in class and reviewing those notes (either in class or afterward) have a positive impact on student learning. Not surprisingly, the preponderance of studies confirms that students recall more lecture material if they record it in their notes (Bligh, 2000). Students who take notes score higher on both immediate and delayed tests of recall and synthesis than students who do not take notes (Kiewra et al., 1991). Moreover, the more students record, the more they remember and the better they perform on exams (Johnstone & Su, 1994). In summary, notetaking facilitates both recall of factual material and the synthesis and application of new knowledge, particularly when notes are reviewed prior to exams.

Deborah DeZure is Coordinator of Faculty Programs at the Center for Research on Learning and Teaching at the University of Michigan.

Matthew Kaplan is Associate Director at the Center for Research on Learning and Teaching at the University of Michigan.

Martha A. Deerman is a graduate student research assistant at CRLT.

Many studies of notetaking find that review of notes (one's own, borrowed notes, or notes provided by the instructor) significantly improves recall of lecture material. Kiewra et al. (1991) found that students who take notes but do not review, earn lower exam scores than students who review notes prior to the exam. Additionally, students not present at the lecture but given notes to review (either the instructors' notes or notes taken by other students) did almost as well as the students who reviewed their own notes and significantly better than students who did not review.

Student Notetaking Abilities. Given the importance of notetaking and review to student learning, it is especially problematic that student notes are often incomplete and/or inadequate. Research indicates that students fail to record 40% of the important points in a typical lecture (Hartley & Cameron, 1967; Howe, 1970), with first-year students recording, on average, only 11% (Locke, 1977). Material written on the blackboard makes it into students' notes at a higher rate than material communicated verbally: students record most of the blackboard information (Locke, 1977), but only about 10% of information delivered orally (Johnstone & Su, 1994). However, students are selective about which lecture material to record, so that while overall recording may be low, recording of main ideas may be quite high. Kiewra, Benton, and Lewis (1987) found that students record 90% of the main ideas, but not more than 11% of the supporting ideas.

In summary, notetaking facilitates both recall of factual material and the synthesis and application of new knowledge, particularly when notes are reviewed prior to exams.

Unfortunately, students' notes are often inaccurate. Johnstone and Su (1994) report that inaccuracies in student notes occur most frequently when students are copying diagrams, numerical figures, equations, and items on transparencies—much of which is essential material. Further, corrections to notes that are identified during class are seldom incorporated into notes once they are written. All of these challenges are compounded for international students who may have difficulty with oral and/or written communications in English.

How can faculty support student notetaking?

The poor quality of student notes may reflect not only a lack of skills necessary to take accurate and complete notes but also the complexity of the task. Notetaking involves listening to new and often unfamiliar information, transcribing that information quickly enough to keep pace with the lecture, and deciding how to organize the material to reflect the relationships stated by the speaker. Several studies indicate that students have difficulty organizing lecture material and identifying main points (Davies, 1976; Jackson & Bilton, 1990a, 1990b). Furthermore, students say they experience the most difficulty with lecturers who speak too quickly or inaudibly, fail to present a clear outline at the beginning of the lecture, or fail to signal important information (Johnstone & Su, 1994). Consequently, how faculty lecture (organization, pace, affect, inflection) and what faculty do during lecture (give handouts, write on the board, emphasize and/or repeat important material, summarize complex information), strongly affect students' ability to take notes. Faculty can improve their students' notetaking ability by focusing on three areas: lecture strategies, the use of handouts, and strategies for engaging students.

Lecture strategies to support notetaking

While the topic of effective lecturing is multifaceted, there are two factors that have a particularly strong impact on students' ability to take notes: 1) pacing, which includes both speed of delivery and the amount and difficulty of information delivered; and 2) "cueing," which involves verbal and visual signals of emphasis, structure, and relationships.

Pacing. The pace with which an instructor delivers a lecture has obvious implications for students' ability to keep up with the presentation and maintain attention. But how fast is too fast? Research indicates that a moderate speed of delivery, around 135 words per minute, best supports student notetaking (Peters, 1972). Faculty can evaluate their pace by asking a colleague to sit in on a lecture or by distributing a short survey to students, including items such as "The pace of today's lecture was a) Too slow, b) About right, c) Too fast." CRLT consultants can also observe or videotape instructors' classes to assist them in assessing the pace of their lectures.

Appropriate pacing is also affected by the complexity and familiarity of the material. When lectures contain complex or unfamiliar material (or a lot of technical information

and terminology), instructors should move more slowly to allow students to record the relevant information. Instructors may also want to balance the amount of new vs. familiar and simple vs. complex material when possible. Conversely, when lecture material is easy to understand or reviews familiar ground, instructors can pick up the pace and expect that students will easily keep up.

Pausing. The simplest way to engage students and improve their notes is to build in short pauses (two to three minutes) a few times during the lecture when students can review and rework their notes. At the end of the lecture, instructors can ask students to take three minutes to do a "free recall," that is, write down everything they remember from lecture. Pausing uses relatively little class time and requires minimal effort from instructors. Pausing also significantly improves student comprehension and retention of material (Bonwell & Eison, 1991).

Verbal and Visual Cues. Students' ability to discern the structure of a lecture will also play a role in the quality of their notes. Although the problem-centered, chronological, or cause-and-effect organization of a lecture may be self-evident to faculty, students may not be able to identify this structure. To help students, faculty can signal lecture structure and hierarchical relationships (e.g., key points versus detail, context versus cause) by verbal and visual cueing. Verbal cues provide clarity and emphasis as well as signal relationships (cause-and-effect, hierarchical, sequential, comparative, etc.) (Bligh, 2000). Verbal cues include phrases such as "The four main arguments are...," "A major development was...," "Applying that concept...," "This story was an example of..."

Instructors can use visual cues to emphasize specific concepts and/or relationships among concepts. Visual cues include writing information or simple diagrams on the board, presenting graphs or complex charts on transparencies, or presenting a running outline of the lecture on slides. The most commonly used visual cue is a topic outline on the board, slide, or overhead at the beginning of class to signal what will be addressed in class that day. Instructors can refer back to the topic outline throughout the class to signal transitions from one topic to the next, to reinforce the relations among topics and to summarize what has been discussed at the close of class. Written cues are particularly important in light of students' tendency to record material from the blackboard. However, students often record complex information (such as long definitions, formulas, or labeled figures and diagrams) incorrectly. When it is important to record exact wording or an accurate diagram, student learning is better supported with a handout containing the complete information (Johnstone & Su, 1994). While visual cues and handouts are particularly helpful to non-native speakers and students with several types of disabilities, they benefit most students and are well worth the time and effort to use them.

Handouts

Faculty can support student notetaking by distributing handouts for students to use while taking notes or while reviewing their lecture notes. Students take better notes and review material more effectively if faculty provide a "scaffold," such as an outline, an overview, or other advance organizer for students to use while taking notes. The research on notetaking focuses on three kinds of handouts: outlines, graphic organizers, and copies (full or partial) of the instructor's lecture notes. Students benefit from outlines during lecture because outlines provide a framework for notetaking. Students benefit from graphic organizers during review because graphic organizers facilitate understanding of lecture material. Copies of the instructor's notes help students as supplements to their own notes during review.

Students benefit from outlines during lecture because outlines provide a scaffold for notetaking. Students benefit from graphic organizers during review because graphic organizers facilitate understanding of lecture material. Copies of the instructor's notes help students as supplements to their own notes during review.

Outlines. Outlines provide students with headings and subheadings (identifying major and minor topics of lecture material) and include space to fill in the relevant information in the order it will be delivered during the lecture. The advantage of providing outlines is that they pre-organize lecture material and (through headings and subheadings) make clear the distinction between main and supporting ideas. Studies comparing test performance of students taking notes on outlines provided by the instructor prior to lecture with students taking notes in their usual manner find

that students given outlines take more complete notes and perform better on exams (Kiewra, DuBois, Christensen, Kim, & Lindberg, 1989; Cohn, Cohn, & Bradley, 1995). This research suggests that outlines work best when used during lecture to record the material in the order it is presented. Additionally, an outline can enable students to identify gaps in their notes that can be corrected later through consultation with the instructor or peers.

Graphic Organizers. Graphic organizers show relations across categories, concepts, or ideas by organizing information in a two-dimensional format. A common graphic organizer is the matrix, which shows relations by using rows and columns to represent a concept, its subordinate concepts, and corresponding information (see Fig. 1: Model of a Matrix). The advantage of graphic organizers is that they offer students a meaningful way to think through the information in their notes. As students enter information into the cells of the matrix, they construct a visual representation of the relationships between ideas or concepts presented in a given lecture. Research suggests that providing students with a matrix to complete during review facilitates learning, particularly the ability to transfer the material to new applications and/or synthesize the material (Kiewra, DuBois, Christian, & McShane, 1988; Kiewra et al., 1991).

Distributing Instructor Notes. Instructors might also consider handing out partial to full copies of their own lecture notes. As Kiewra argues (1985a), instructor notes can effectively supplement students' notes by ensuring their accuracy and comprehensiveness. One study found that students who reviewed instructor notes (and did not take their own) performed better on recall tests than students who took and reviewed their own notes (Kiewra, 1985b). However, most researchers suggest that instructor notes should be used only as a supplement to students' own notes, since the act of notetaking itself helps students learn lecture material and because students claim that their own notes are personally meaningful and represent their personal selection of important points (Bligh, 2000).

Important Caveats: Attendance and Dependence. Handing out the instructors' notes raises concerns about student attendance and students' potential dependence on external aids that may hinder mastery of listening and notetaking skills. Instructors concerned about attendance have several options: 1) make handouts skeletal enough that students need to be present in class for the notes to be useful; 2) use class time for activities and interactions that will enhance learning and cannot be reflected in simple written summary or outline form; 3) document the impact of attendance on exam performance and convey that information to students; and 4) require attendance. When students receive instructor notes, in the short-run, students may perform better on tests of mastery of factual material, but in the long-run, students may not learn to organize ideas because of a dependence on external aids (Kiewra 1985b, 385).

Additional strategies to support student notetaking

Faculty might also consider supporting students' active engagement with their notes through short focused activities during lecture or in office hours. These instructional strategies engage students actively and can help them remember and understand more of the lecture material. In this section, we describe five activities.

Fig. 1: Model of a Matrix Diagram Schizophrenia

Type	***Simple***	***Paranoid***	***Catatonic***	***Hebephrenic***
% of Americans	0.1	1	0.1	0.75
Definition	gradual withdrawal and disinterest in the world	feeling of being persecuted	peculiar motor behavior alternating between stupor and frenzy	regressive behavior and total disregard for personal hygiene
Severity	most likely to fend for themselves	may live in a marginal way	series of sudden short attacks over many years	most severe

(Robinson and Kiewra, 1991, p. 456)

Instruction on Notetaking and Tips Sheets. Instructors, particularly those who teach first- and second-year students, can take time in class to talk about how to take notes for their courses. Instructors can also distribute or post online tips sheets like the one provided at the end of this paper (see p.7, below), adding their own suggestions that reflect the discipline they teach and their priorities for the types of materials they expect students to retain and master.

Providing models. Another option is to show students a sample of complete and correct notes, either provided by the instructor or borrowed from students in the class. By examining exemplary notes, students can see what they can do to improve their own notes. Instructors can point out that good notes:

1. are correct (or have been corrected)
2. identify all main points and selectively include subsidiary points or support
3. connect supporting materials to the appropriate main point
4. connect examples or stories to the concepts they demonstrate
5. summarize the main points of class discussions
6. describe interactive experiences in the classroom
7. include student comments
8. use abbreviations

Peer learning. Faculty can go a step further and allow time for students to compare their notes with those of a peer in the class, offering each other corrections or missing information. After three to four minutes of comparison, students can ask the instructor for clarification and elaboration. The process of peer discussion can also help students identify and articulate questions about the material.

Writing summaries and questions. Asking students to summarize their notes or write discussion questions engages students in the active use of lecture material. Both activities are easily integrated into lecture and significantly improve student comprehension and retention of material (King, 1989, 1992). Instructors can collect summaries and select some common problems and particularly good examples to discuss with the class. King suggests that faculty can help students formulate questions by offering "question stems" that lead students to ask the kinds of questions that generate improved comprehension (e.g., How is ... related to ...? What is the difference between ... and ... ? In your opinion, what is the best way to...?). Additionally, student summaries and discussion questions provide evidence of how well students understand the lecture material. To further motivate students, instructors can include several questions designed by students on their tests and examinations.

Office hours. During office hours faculty can suggest to students ways to improve their notes and help students identify gaps in notetaking that did (or will) impact test performance and learning. The importance of review can also be demonstrated to students when the correct information needed for a specific exam question is found in their own notes.

Supporting Students with Disabilities

Students with disabilities often experience difficulty taking notes in lectures. Students overcome these unique challenges by using various support technologies, such as tape recorders, or relying on sign language interpreters. The UM Office of Services for Students with Disabilities (SSD) also offers support services for students, ranging from providing notetakers who attend lecture with the student and record lecture notes to captioning videos shown in the course. Faculty can learn more by contacting SSD directly at (734) 763-3300 or TDD 763-3000.

Notetaking Services for Students with Disabilities. Notetaking services are often used by students with disabilities, particularly when a sign interpreter is used, a student cannot see the lecturer or visual aids (the blackboard, transparencies or PowerPoint slides), or a student cannot keep up with the pace of the lecture. Faculty can help students who have trouble with notetaking by: 1) providing complete notes as a supplement, 2) providing study guides for exams, 3) giving assignments in written and oral form, and 4) encouraging students and their notetakers to sit together, close to the instructor.

SSD suggests that faculty begin each new course with a variant of the following comment: "Any student who feels that he/she may need an accommodation for any sort of disability, please make an appointment to see me during office hours." This approach preserves students' privacy and also indicates the willingness of the faculty member to provide assistance as needed. (See *SSD Faculty Handbook* at http://www.umich.edu/~sswd/ssd/fhb.html for additional suggestions.)

Interpreters. Interpreters make it possible for hearing-impaired students to learn from lectures. However, classroom interactions and discussions can be fast-paced. Faculty can help hearing-impaired students by repeating questions raised by students before replying to the question, identifying speakers so that the student knows who is

speaking, and by regulating cross-talk among students (e.g., students can be asked to raise their hands so that the hearing-impaired student can identify the speaker).

Classroom Management to Support Students with Disabilities. Communicating with disabled students requires sensitivity and flexibility, particularly with seating arrangements. For example, lip reading depends upon a clear view of the speaker. Hard-of-hearing or learning disabled students who use a tape recorder may need to sit close to the instructor. Sight-impaired students may need larger type and an uncluttered format to be able to read handouts. Faculty can prepare and share handouts of the material they will present on the board. Sight-impaired students can then take the handouts to *SSD* to be enlarged or read onto tape.

Conclusion

The process of notetaking involves a complex set of skills and interactions between instructors and their students. Current concerns and questions about notetaking offer both a challenge and an opportunity to re-examine our assumptions about the efficacy of notes and notetaking. They also offer a chance to re-conceptualize the role of instructors in an educational landscape that may require new approaches to time-honored practices.

References

Bligh, D. (2000). *What's the use of lectures?* San Francisco: Jossey-Bass.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom.* Washington, D.C.: George Washington University.

Cohn, E., Cohn, S., & Bradley, J. J. (1995). Notetaking, working memory, and learning in principles of economics. *Research in Economic Education, 26* (4), 291-307.

Davies, B. (1976). Physics lectures and student notes. *Physics Education, 11* (1), 33-36.

Fahmy, J. J., & Bilton, L. (1990a). Lecture comprehension and notetaking for L2 students. (Unpublished.) (ERIC Document Reproduction No. 323785)

Fahmy, J. J., & Bilton, L. (1990b). Listening and notetaking in higher education. (Unpublished.) (ERIC Document Reproduction No. 366189)

Hartley, J., & Cameron, A. (1967). Some observations on the efficiency of lecturing. *Educational Review, 20* (1), 30-37.

Howe, M. J. (1970). Notetaking strategy, review and long-term retention of verbal information. *Journal of Educational Research, 63* (6), 285.

Johnstone, A. H., & Su, W. Y. (1994). Lectures— a learning experience? *Education in Chemistry, 31* (1), 75-76, 79.

Kiewra, K. A. (1985a). Providing the instructor's notes: An effective addition to student notetaking. *Educational Psychologist, 20* (1), 33-39.

Kiewra, K. A. (1985b). Students' notetaking behaviors and the efficacy of providing the instructors' notes for review. *Contemporary Educational Psychology, 10* (4), 378-386.

Kiewra, K. A., Benton, S. L., & Lewis, L. B. (1987). The qualitative aspects of information-processing ability and academic achievement. *Journal of Instructional Psychology, 14* (3), 110-117.

Kiewra, K. A., DuBois, N., Christensen, M., Kim, S.I., & Lindberg, N. (1989). A more equitable account of the notetaking functions in learning from lecture and from text. *Instructional Science, 18* (3), 217-232.

Kiewra, K. A., DuBois, N., Christian, D., & McShane, A. (1988). Providing study notes: Comparison of three types of notes for review. *Journal of Educational Psychology, 80* (4), 595-597.

Kiewra, K. A., DuBois, N., Christian, D., McShane, A., Meyerhoffer, M., & Roskelley, D. (1991). Note-taking functions and techniques. *Journal of Educational Psychology, 83* (2), 240-245.

King, A. (1989). Effects of self-questioning training on college students' comprehension of lectures. *Contemporary Educational Psychology, 14* (4), 366-381.

King, A. (1992). Comparison of self-questioning, summarizing, and notetaking-review as strategies for learning from lectures. *American Educational Research Journal, 29* (2), 303-323.

Locke, E. A. (1977). An empirical study of lecture notetaking among college students. The *Journal of Educational Research, 77,* 93-99.

Palkovitz, R. J., & Lore, R. K. (1980). Notetaking and note review: Why students fail questions based on lecture material. *Teaching of Psychology, 7* (3), 159-161.

Peters, D. L. (1972). Effect of notetaking and rate of presentation on short-term objective test performance. *Journal of Educational Psychology, 63* (3), 276-280.

Robinson, D.H., & Kiewra, K.A. (1995). Visual argument: Graphic organizers are superior to outlines in improving learning from text. *Journal of Educational Psychology, 87* (3), 455-467.

Student Guide to Effective Notetaking and Review

Good notetaking is much more than fast writing. Good notetakers listen actively while they write, think while they listen, and make conscious choices about what to record. In general, they capture as much of the lecture content as possible. They take notes they can use for effective learning, and then, most importantly, they *review* those notes regularly and with focused attention.

Before Class

Do assigned readings.

- Check your syllabus.
- Reading before class will help you identify, understand, and organize main points and content in the lecture and class discussion.

Organize.

- Keep one notebook per course.
- Loose-leaf binders with pockets give more flexibility in organizing your notes and allow you to add handouts and other material in a useful order.

Engage fully.

- Be positive about learning.
- Plan to start listening as soon as the instructor starts talking: tune in, have your pen and paper ready, do not let others distract you.

During Class

Listen for structure.

- Listen for introductory and concluding phrases and transitions indicating how the lecture is organized ("Today's topics will include...").
- If the instructor begins lecture with questions, write them down, then listen for the answers.
- Listen for repetition.
- Listen as closely to the end of the lecture as to the beginning. The instructor may summarize the most important points ("Today we discussed...").

Be complete and accurate.

- Write down key points, theories, facts, theorems, definitions, etc.
- Write down examples and indicate the point(s) they demonstrate.
- Write down anything given in list form ("Three causes were...").
- Write down what is written on the board or projected on screen.
- Pay attention to the instructor's body language and tone of voice. Note when she or he uses the most emphasis or enthusiasm.
- Listen for main points, but generally, writing more is better.

Keep up.

- Abbreviate! Every subject has words that can be shortened. For example, use **S.** for *Shakespeare*, **b/c** for *because*, **w/** for *with*, or **re:** for *regarding*).
- To save time, use a system of symbols. For example, use ➜ for *resulted in*, = for *is equal to*, > for *is greater than*, ∴ for *therefore*. Develop your own symbols too.
- Leave space if you fall behind or get confused. Circle terms you do not understand. Write question marks next to places you want to clarify later, but do not stop taking notes.

After Class

Review within 24 hours.

- Compare notes with classmates to supplement or clarify what you wrote down.
- Locate gaps or confusion. Ask peers, GSIs, or the instructor for help in class or during office hours.
- Check for accuracy of material (especially formulas, definitions, spelling of terms.).
- Identify connections with what you already know and with material from previous class meetings. How does the material extend or clarify your knowledge? What is the "big picture" that is starting to emerge?

Reorganize and rehearse.

- Reorganize your notes visually. Create an outline, diagram, or chart to show relationships among concepts.
- Use different pen colors or highlighters for different types of material, or to distinguish your ideas from the instructor's.
- Try writing brief summaries of the information in your own words.
- Review your notes regularly to improve your understanding and to prevent cramming at test time.
- Make up and answer possible test questions.

Evaluate your method.

- Are you finding a lot of gaps and errors?
- Do your notes help you study? Did they help you on your exams? If not, what can you do to improve your notes?
- If you feel that your notes are not helping you learn, and you do not feel that you know how to improve them, seek the assistance of your instructor or GSI.

Prepared by Jennifer Lutman, Center for Research on Learning and Teaching (CRLT), 2001.

The *CRLT Occasional Papers* series is published on a variable schedule by the Center for Research on Learning and Teaching at the University of Michigan. Information about extra copies or back issues can be obtained by writing to: Publications, CRLT, 3300 School of Education Building, Ann Arbor, MI 48109-1259.

CRLT Occasional Paper No. 16

Center for Research
on Learning and Teaching

University of Michigan
3300 School of Education Bldg.
Ann Arbor, MI 48109-1259