

**How University Students Use Online Lecture Notes
In a First-Year Introduction Course**

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Abstract

The purpose of this study was to investigate the efficacy of providing students with access to formatted copies of lecture notes based on the PowerPoint slides used by the instructor. The research question was as follows: “Can first-year students taking the ARTS 1110 Introduction to University course be taught how to make better use of online lecture notes?” Data was gathered using a combination of pre- and posttest quantitative surveys and pre- and posttest qualitative focus groups. The results indicated that students, in both the control group and the experimental group, did not use the online notes as they had been intended by the researchers. Most students, in each group, did not use the online notes in class but they did indicate that they used the online notes as a study aid or if they had missed class. The students in the experimental group, who had been taught the parallel note-taking system, did show significance in two areas: (1) adding their own notes to the online notes; and, (2) summarizing the main points of the lecture.

How University Students Use Online Lecture Notes

In a First-Year Introduction Course

Introduction

Effective note-taking has long been regarded as an important skill in colleges and universities (Dunkel, Mishra & Berliner, 1989; Weiland & Kingsbury, 1979; Williams & Eggert, 2002) and most college/university students rate note-taking as an important part of their strategy for acquiring content in a lecture (Dunkel, Mishra & Berliner, 1989; Locke, 1977; Peverly, Ramaswamy, Brown, Sumowski, & Alidoost, 2007). Hughes and Suritsky (1994) found that there was a positive correlation between the volume of information recorded in students' notes and student performance on tests. Because lecturing continues to be the primary method of delivering information in the classroom, with "the major educational goal of student understanding of content and application of skills [being] commonly pursued via lecture in classroom settings" (Konrad, Joseph, & Eveleigh, 2009, p. 421), effective note-taking in university classes is necessary (Hughes & Suritsky, 1994; Konrad, Joseph, and Eveleigh, 2009; Ward & Taksukawa, 2003).

Note-taking Practices

Peverly, Ramaswamy, Brown, Sumowski, and Alidoost (2007) found that 98% of the university students they surveyed took notes of some kind in their courses. The authors suggest that taking notes in class is a:

difficult and cognitive demanding skill – students must hold lecture information in verbal working memory; select, construct, and/or transform important thematic units before the information in working memory is forgotten; quickly transcribe (via writing or typing) the information held in working memory, again before the information is forgotten; and

maintain the continuity of the lecture (which also consumes working memory resources). Thus, expertise in note-taking may be related to three variables: transcription fluency, working memory, and the higher level processes needed to identify important information in lecture. (p. 167-168)

Peverly et al., further reported that two important skills related to successful note-taking involved the ability to understand the difference between unimportant information and the identification of the main ideas.

Locke (1977) found that “virtually all books on how to study in college emphasize the importance of taking good lecture notes and may even give specific advice on what types of errors to avoid (e.g., taking too many notes)” (p. 93). Though Locke found that studies on note-taking at that time were usually limited to controlled laboratory experiments, he did note a few studies that had been carried out in classroom settings. The laboratory studies indicated that students who recorded notes while listening to lectures generally retained information better than those who did not. He also reported that more complete notes led to better overall retention of content than did less complete notes. In the classroom settings, the studies consistently revealed that “note taking facilitates recall and that better notes lead to better course performance than poorer notes” (p. 94). Similarly, Fisher and Harris (1973) found that students with notes of good quality generally recalled more information than those with poor quality notes.

Locke’s (1977) study was designed to answer several questions about note-taking:

- What extent are the typical student’s lecture notes complete?
- To what extent are the notes accurate?

- Do students who take better lecture notes receive higher grades than those who take poorer notes?
- To what extent does writing information on a chalk or white board increase the likelihood of that information appearing in the students' notes?

Locke (1977) found that the quality of lecture notes correlated closely to course grades. He also found that the students with higher grade point averages made fewer errors in their notes and were less likely to record incorrect information. However, Locke reported that, in general, students did not take thorough notes, with the notes of the average student in his study containing only 60% of the relevant lecture material. Interestingly, Locke's study revealed that "writing material on the blackboard dramatically increased its probability of appearing in students' notes" (p. 98). Locke's work seems to suggest that the use of visual cues may improve the quality of students' notes.

Benefits of Note-taking

Weiland and Kingsbury (1979) conducted a study to investigate the short and long term effects of note-taking in a classroom setting. Students from an advanced undergraduate/graduate level course served as the participants in the study. During one of the classes, a guest speaker gave a 50 minute lecture. One half of the class was instructed to take regular notes during the lecture and the other half of the class was asked to refrain from taking notes during the lecture. At the completion of the lecture, all notes from the note-taking group were collected. A ten-item multiple-choice quiz of the material covered in the lecture was given to all students in the class. The test items each required recall of specific factual material presented in the lecture. A second ten-item quiz was administered to the class ten days (three class sessions) after the administration

of the first quiz. No questions for the first quiz were repeated on the second quiz and no students had access to class notes on the lecture material during the period between the two quizzes.

The results indicated that the note takers did significantly better on the first quiz ($p < .001$) and on the second quiz ($p < .05$). However, information retention on the second quiz was lower than on the first quiz for both groups of students. An analysis of the retention in both the no-notes group and the note-taking group showed that each suffered a significant decline between the first and second quiz ($p < .03$ and $p < .001$ respectively). However, Weiland and Kingsbury (1979) concluded that the act of taking notes improved the immediate and delayed recall of the students who had taken class notes during the lecture.

Williams and Eggert (2002) found that note-taking aids a student's ability to recall noted information and do well on examinations that are related to that information. The research of Einstein et al., 1985 (as cited in Williams and Eggert 2002) showed that the subjects in their study recalled 44% of the ideas that had been recorded in their notes but only 6% of ideas that had not been recorded. Similarly, Kiewra (1984) found that students were more than twice as likely to recall information that they had recorded in their notes as non-recorded material. He noted that the value of detailed notes increased as the span of time between note-taking and the examination increased. In a later study, Kiewra (1985) reported that it was not enough for students to simply record notes. He suggested that note-taking is not a particularly effective strategy unless the notes are also reviewed, observing that students who reviewed their notes were found to remember the main points of the lecture much better than students who recorded notes but did not review them. Kiewra also reported that students typically record only 30% of the ideas that were embedded in the instructor's notes and suggested that the advantage of reviewing notes would depend on the accuracy, completeness, and organization of the notes.

Provision of guided notes

Disappointing performance in tests and examinations can often be attributed, in part at least, to the inability to take clear, concise notes in class (Ward & Tatsukawa, 2003). Ward and Tatsukawa (2003) found that there are several factors that account for problems in note-taking: (1) students who are taking notes during lectures attempt to record all the material being presented rather than noting key phrases; (2) students are challenged by a certain degree of urgency as they attempt to write down the main ideas of the topic before the instructor moves on to a new topic; (3) students are faced with memory overload as they try to manage the acquisition of large volumes of new content in each lecture; and (4) students study from class notes that are, for the most part, linear (i.e., arranged in the same order as the information was received). Ward and Tatsukawa stated that students often do not take the time to organize their notes in a pattern that will facilitate studying.

Frey and Birnbaum (2002) investigated the value of providing students with access to the PowerPoint slides they see in their lectures. They surveyed 160 undergraduate students at a university in the United States to determine whether students perceived an advantage to having access to class slides. In Frey and Birnbaum's study, the PowerPoint presentations were posted on the course website prior to class and students were advised to bring print-outs of the slides to class to guide their own note-taking. The authors found that the majority of the students reported positive perceptions of the practice. According to Konrad, Joseph, & Eveleigh (2009), the use of guided notes generally enhances the ability of students to take accurate, complete notes during a lecture. Similarly, Barnett (2003) found that "providing students with a skeleton outline of the lecture improves both the quality of notes taken and test performance after review" (p. 2). It may be necessary to provide students with a note of caution, however. The use of guided notes is

meant to enhance learning. It cannot serve as a substitute for attending the lecture. As Barnett (2003) observed, “lectures cannot be reduced to a set of notes” (p. 6). In order to derive the greatest benefit from prepared notes, students must actively interact with the notes by carefully attending to the lecture content and adding their own interpretations to the pre-printed notes.

Pardini, Domizi, Forbes, and Pettis (2005) developed a note-taking strategy called *parallel note-taking* which was designed to encourage first-year university students to make better use of online lecture notes or ‘Webnotes’. The authors were instructors who conducted seminars in specific disciplines (e.g., Geography, Biology, and Philosophy) in their institution’s “Learning to Learn” program. These pass/fail seminars met once a week to discuss strategies for academic reading, studying, writing, exam taking, and time management. As the term progressed, Pardini et al., observed that their students were having difficulties using the Webnotes effectively. They devised the parallel note-taking strategy in response to that perceived need, creating a model that was based on “research-tested note-taking and text marking strategies” (Pardini, Domizi, Forbes & Pettis, 2005, p. 41).

Students were taught the parallel note-taking strategy and encouraged to print the Webnotes to bring to class. They were further taught to take their own notes on the back of the Webnotes page. The students were instructed to draw a vertical line approximately two inches from the left edge of the page. On the wider side of the page, they were instructed to write notes that “paralleled” the text of the Webnotes and, on the narrower side, they were asked to add to, or elaborate upon, the notes, recording process notes, summaries, predicted test questions, and other annotations. Pardini et al., (2005) reasoned “that this strategy would address student difficulties with Webnotes because it requires the student to perform the same encoding tasks that take place in conventional note-taking and text annotation” (p. 43). In addition, because the

strategy required students to listen to the lectures and to supplement the supplied Webnotes, it facilitated the creation of more personal and idiomatic notes. These were expected to render the content of the lecture more meaningful because the students were obliged to interact with the content rather than merely transcribing it.

A survey was conducted after the students had been taught the parallel note-taking strategy and had had the opportunity to use it in class. The survey was meant to investigate student attitudes regarding the strategy. Sixty-two surveys were completed, with each recording the students' individual responses to three open-ended questions: (1) How do you use Webnotes; (2) What do you like about your professor's Webnotes; and, (3) What do you find problematic about your professor's Webnotes? The results indicated that students used Webnotes for a variety of reasons: (1) the notes helped them to focus during class; (2) the notes helped to guide them in studying for exams; (3) the notes allowed students to listen more and write less; (4) the notes provided access to information that had been missed in class; and (5) the notes drew attention to important information and helped identify the information that the instructor regarded as important.

The present study emerged from reflections on the note-taking study of Pardini et al.,(2005). Although Pardini et al.,'s model of the parallel note-taking strategy differs from the one employed for this study, there are similarities. Those similarities must be acknowledged as the inspiration for this study.

Purpose of the Study

This study was undertaken with students who were enrolled in the University of Manitoba's Introduction to University course, a three-credit course designed to help students make the transition to university. The course is interdisciplinary in nature, offering instruction in

academic writing, research, critical thinking, and educational psychology. Our research was guided by the following question: “Can first-year students taking the ARTS 1110 Introduction to University course be taught to make better use of online lecture notes?”

The purpose of this study was to investigate the effect of providing students with access to formatted copies of the instructor’s PowerPoint lecture slides. In the experimental group, the instructor explicitly taught the students to use these slides to guide their note-taking (a strategy that we identify as *parallel note-taking*. For the purposes of this study, parallel note-taking was defined as a note-taking method in which students used formatted PowerPoint handouts (three slides per page, with blank lines provided on the right hand side of page for students to note key concepts and examples from the lesson). Students were encouraged to print out the posted PowerPoint slides from the course web site and bring them to class as a way of organizing their own notes. In the course of the instruction on the note-taking method, students were advised that the posted notes were not intended to replace the students’ own class notes but rather to facilitate note-taking and to prepare students for class discussions.

Methodology

Subjects/Participants

In January 2012, students from two sections of the University of Manitoba’s *Introduction to University* course were invited to participate in the study. Participants were assigned to one of two groups based on their membership in intact classrooms. One of the researchers (O’Brien Moran) served as instructor for both lecture sections. The two classrooms were randomly assigned to serve either as the control group (those who did not receive the intervention) or the experimental group (those who did receive the intervention). In the initial pre-study survey, there

were 59 participants in the control section and 62 in the experimental section. In the post-study survey, the numbers were 22 for the control section and 25 for the experimental section.

The students who participated in the quantitative phase of the study were also recruited for the qualitative phase. Students self-selected to participate in two focus groups, one at the beginning of term and one at the end of term. All participants were made aware of the parameters of the study and were asked to sign permission forms before they took part in the study. In the pre-focus group, there were no participants in the control group and seven participants in the experimental group. In the post-focus group, there were four participants in the control group and three in the experimental group.

Procedure

The study involved six separate phases:

- (1) In January, 2012, at the beginning of term, the students in the two groups (i.e., the control and experimental) were informed that online notes were available for the course;
- (2) In January 2012, a pre-study survey was administered to both the control and the experimental groups;
- (3) In January 2012, the first focus group was held to explore students' awareness of online notes and to ascertain the way in which the students intended to use the online notes in class;
- (4) During regular class lectures in January 2012, students in the experimental class were instructed in the use of the parallel note-taking strategy, with the course instructor modelling the use of the formatted handouts for taking notes in class. Only the experimental class had access to the *formatted* online notes;

(5) At the end of March 2012, a post-study survey was administered to both the control and experimental sections; and,

(6) At the end of March 2012, the second focus group was held to explore the students' use of the online notes in class.

Research Instruments

The research instruments, appended as Appendices A, B, and C, were paper and pencil surveys that were analyzed quantitatively. The surveys took approximately 10 minutes to complete. The surveys asked first-year students to give their perceptions of the online notes used in ARTS 1110 Introduction to University. The pre-study survey (Appendix A) consisted of 10 questions designed to measure students' awareness of the online notes used in ARTS 1110 and to discover how, if at all, the students planned to use the online notes in class. There were two post-study surveys utilized, one for the control section and one for the experimental section, due to the nature of the questions that were to be asked. The first 15 statements on the post-study survey were the same for both the control and experimental sections. These statements pertained to general queries concerning students' use of online notes. The last six statements on the post-study survey for the experimental section asked specifically about the parallel note-taking strategy that was taught in class.

Data Analysis

The quantitative data obtained in this investigation were processed using SPSS (Statistical Package for the Social Sciences). The surveys employed a five point Likert scale with respondents using the scale to indicate their level of agreement to each of the respective statements. The choices ranged from strongly agree to strongly disagree for each statement. Each item was analyzed separately using a measure of frequency distribution. The use of frequency

distribution charts allowed us to determine which score occurred the most frequently for each statement. In addition, there were three preliminary questions that asked students: (1) whether they were aware that there were online lecture notes available for the course; (2) whether the course instructor had informed them of the availability of the online lecture notes; and, (3) whether they had accessed the online notes. Each of these three questions had yes/no answers.

The quantitative data was also analyzed using paired t-tests to compare the control group to the experimental group. The use of independent t-tests was employed for the questions that did not have a pre-study equivalent.

The focus group transcripts were analyzed qualitatively and coded for themes by the three researchers. Before beginning the process of coding for themes, the researchers each read through the transcripts to get an overview of the emerging themes. When coding was complete, the researchers met to validate codes. The themes were confirmed, modified, or discarded on the basis of discussion and evidence from the data. In this way, the researchers sought to establish inter-coder reliability, consensus, and verification of the emerging themes.

Results

The quantitative data and the qualitative data were both broken down according to major themes. In the final analysis, the themes from the quantitative data and qualitative data were collapsed and are discussed together. Under each theme, and subtheme, discussion of the data is organized in the following manner: (1) review of the existing literature; (2) reporting of the quantitative survey data for the present study; (3) incorporation of qualitative data with the quantitative data where applicable; and, (4) analysis of data, taking into account both the current literature and the results of the present study.

Four major themes were identified. Within those major themes, a number of subthemes were identified, some taken from the survey, and some emerging from the focus groups. These will be discussed in the following order:

Theme 1: Note-Taking

Sub-theme 1: Students' perception that they had not been taught to take notes in high school

Sub-theme 2: Students' discussion of note-taking experiences at university

Sub-theme 3: Students' perception that online notes are beneficial

Theme 2: Note-taking strategies employed

Sub-theme 1: Summarization

Sub-theme 2: Reviewing of notes

Sub-theme 3: Use of notes for exam preparation

Theme 3: Difficulties with the Use of Online Notes

Sub-theme 1: Students' perception that online notes are expensive to print.

Sub-theme 2: Students' perception that online notes are not always user-friendly

Theme 4: Problems with Instructors and Note-Taking

Sub-theme 1: Challenge of taking notes while attempting to listen to lecture

Data Analysis – Quantitative

The first question asked the students to indicate whether they were aware of the availability of online notes for the course. On the pre-study survey, 90% of the control group and 92% of the experimental group indicated that they were aware of the online notes. In the post-study survey, 100% of the students in the control group and 99% of the students in the experimental group said that they were aware there were online notes. This was relatively

consistent with the finding of focus groups. In the pre and post focus groups for both the control and the experimental groups, all participants indicated that they were aware that there were online notes available for the course. The second question asked students to indicate whether their course instructor had informed them of the availability of online lecture notes. On the pre-study survey, 92% of the students in each group indicated that their instructor had informed them about the online notes. In the post-study survey, 100% of the students in each group reported that their instructor had informed that there were online notes available. In the pre and post focus groups, all participants in both the control and experimental groups reported that their instructor had told them that there were online notes available on the course website. When asked on the pre-study survey whether they had accessed the online notes for the course, 69% of the students in the control group and 69% of the students in the experimental group indicated that they had accessed the notes. In the post-study survey, 100% of the students in the control group and 100% of the students in the experimental group reported that they had accessed the online notes. In the focus groups, only two students from the experimental group indicated that they had not been on the course website to look at the notes (these two students said that they planned on accessing the notes before the final exam). In the control group, 100% of the students reported that they had looked at the online notes though some acknowledged that they had not used them in class.

On the pre-study survey, students were asked if they intended to use the online notes that were posted for the course. Eighty percent of the control group and 79% of the experimental group said that they intended to use the online notes in class. On the post-study survey, 72% of the control group and 88% of the experimental group reported that they had made use of the online notes in class. That is, in the experimental group, there was a marked increase from the

number of students who had initially indicated that they intended to use the notes to the number of students in the same group who reported in the post-study survey that they *had* used the notes. By contrast, in the control group, the number of students who used the online notes was lower than the number of students who had predicted they would use the notes.

On the post-study survey, five additional questions were added to those that had been used on the pre-study survey. These questions were added, in part, to investigate the nature of the difference, if any, between students' intentions for online notes and their practice. Students were asked, for instance, whether they had used the online notes as a substitute for attending class. Eighteen percent of the students from the control group and 12% of the students from the experimental class indicated that they did use the online notes as a substitute for attending class. When asked whether they perceived that the notes were an adequate substitute for attending class, 23% of the control group and 12% of the experimental group indicated that they believed that the online notes were an adequate substitute for attending class. The discussion of the other three additional questions is incorporated under Theme 2 (Summarization) as those questions pertain to the way students take notes in class.

On the post-survey, the students in the experimental group were also asked six additional questions to investigate their experience with the parallel note-taking strategy that had been taught during their course. When asked whether they used the parallel note-taking strategy in class, 24% reported that they had. When asked if they thought that using the parallel note-taking strategy had proved useful in assisting them to remember the content of the course, 28% agreed that the strategy was useful. A similar percentage of the students (24%) reported that they found the parallel note-taking strategy was useful in helping them prepare for exams. Only 16% of the students reported that the parallel note-taking strategy was easy to use. It is not entirely

surprising, therefore, that only 12% reported that they would continue to use the strategy in future courses. It is more surprising, in fact, that, while only 12% thought they would use the strategy in the future, a greater number (20%) reported that they had already used it in some of their other courses.

Data Analysis – Qualitative

In the first focus groups, conducted in January 2012, no students from the control group volunteered to participate and seven participants from the experimental group agreed to participate (the questions posed to the students in the focus group are attached as Appendix D and Appendix E). In the second round of focus groups, conducted in March 2012, there were four participants from the control group and three returning participants from the experimental group. The absence of control group participants for the first focus group renders any meaningful comparison between groups of attitudinal changes over the course of the term difficult. Nevertheless, the students' discussions produced a rich picture of their respective degrees of tutelage in note-taking strategies, awareness of note-taking strategies, use of note-taking strategies in general, and use of parallel note-taking strategies in particular. These data provided an unexpected insight into the students' understandings of the note-taking process.

Four major themes and several sub-themes were identified from the focus groups. These will be discussed incorporating both the quantitative survey results and the qualitative focus group interviews.

Theme 1: Note Taking

Suritsky and Hughes (1991) suggested that the act of note-taking involves four independent skills: listening, cognitive processing (metacognition), recording lecture content in written form, and reviewing noted information. The first three skills usually occur at the same

time for most students, with reviewing of information delayed until students are studying for an exam. According to Suritsky and Hughes, the challenge in note-taking is to strike a balance between listening, processing of information, and note-taking. In deciding what information is most profitably captured in notes, students have to distinguish between important ideas and concepts, on the one hand, and unnecessary information on the other. Students often have difficulty making these judgments and, consequently, fail to note important lecture points while they are recording less important information. Suritsky and Hughes found that the percentage of instructor ideas recorded by freshman (first-year students) was 11%. This pattern suggested that most first-year students are not particularly strategic in their note-taking.

Suritsky and Hughes (1991) carried out an informal analysis of students' listening patterns and found that the percentage of students who were able to recall the information their instructors had just discussed ranged from a low of 10% to a high of 98%. Suritsky and Hughes suggested that, because the cognitive processing of lecture content involves two stages (i.e, first, the understanding of each lecture point or idea, and, second, the connection of that understanding to prior knowledge), students may fail to attend to lecture content without realizing that they have done so. They found that some students were able to listen to an instructor's lecture, repeat what had been said, and yet not understand the content. They recommended, therefore, that students record paraphrases of the instructor's comments, rather than trying to record the instructor's exact words, because the first is more likely to lead to comprehension while the second generally results in rote memorization. They also noted that students who exhibit a clear pattern of organization in their note-taking are the most successful in establishing a relationship between the course content and their own understanding.

The findings of this study are, at times, consistent with the findings of Suritsky and Hughes (1991) and other times complementary. That is, the failure of students to take notes in an intentional and strategic way that was noted in the work of Suritsky and Hughes might be explained, in part at least, by the challenges to note-taking that the students reported in this study. A discussion of the findings related to the first theme follows below.

Sub-theme 1: Students' perception that they were not taught how to take notes in high school

In the present study, all seven of the focus group participants from the experimental group indicated that they had never been taught to take notes in high school. Gord said, "We were just expected to [take notes]". Gail agreed, saying:

One of our teachers would give us fill in the blanks like her notes. She would have some spaces with blanks and that is how we would take notes. We weren't taught step-by-step or how to take the most important information out so I just tended to write everything out.

Jason commented that:

I think the expectation in high school for notes is that your teacher will have just the overhead with notes and then everyone just copies it word for word, or like a PowerPoint of something, whereas in university lots of times the prof will have like the main points and then he will speak about what he wants you to take notes about, or what's important and then you have to filter it through and find out what is important.

Similarly, Brad reported:

In high school I had a couple of teachers who would always say you have to make sure that you're not copying it down word for word, you're just taking the most important

stuff, and then at the same time they would put up the slide and then wait 5 minutes for everyone to copy it down word for word, so there was no enforcement, they just told you that you should learn [how to take notes] but never gave any direction.

Sub-Theme 2: Students' discussion of note-taking experiences at university

Most university instructors use a lecture format in their courses and this necessitates the taking of notes (Hughes & Suritsky, 1994). As was the case in this study, students often report that they receive no explicit instruction in note-taking while in high school. Once they begin university, they are required to record large volumes of information that are being delivered at a rapid pace without the benefit of effective note-taking strategies.

The students in this study were asked if they thought they would use the online notes in class and add to them during the lecture. On the pre-study survey, 41% of the control group and 40% of the experimental group thought they would make use of the online notes in class. On the post-study survey, students were asked if they had made use of the online notes in class. Twenty-three percent of the control group and 40% of the experimental class said that they had made use of the online notes in class. The number of students from the control class who stated at the beginning of term that they thought they would use the online notes was higher than the number of students in the same group who reported at the end of the term that they had, in fact, used the online notes. By contrast, the number of students in the experimental group *who predicted that they would use the online notes* was the same as the number of students *who reported that they had used the online notes*.

The students were also asked if they would use the online notes to clarify their understanding of a point that had been raised in class. On the pre-study survey, 80% of the control group and 84% of the experimental group indicated that they would use the online notes

if they did not understand something. On the post-study survey 77% of the control group and 80% of the experimental group reported that they had made use of the online notes if they did not understand something from class.

In the focus group with the experimental group, Brad indicated that he believed it was important to paraphrase concepts in his own words when taking notes in class. He suggested that one ought to avoid “just copying it [lecture] word for word”. He added that:

...you have to put it in your own words and make sure that you understand it as you're going through. Like I mean in my calculus class last semester there were days where I was copying everything out and I have no idea what happened that day. Like I have all the notes, I have all of them, and I do not remember writing them cause it was just in one ear and then on the paper.

Two other members of the focus group expressed similar sentiments. Gail and Rachel reported that they were often so busy writing notes that they did not remember what was said in class.

Gord found that “the reading, the writing, and then the re-reading, sort of that repetition sometimes helps. I find I write more about what the teacher says than what he is actually writing on the board”. Gail agreed, saying that “if you go through your notes once or twice, that's the key for it to become long term [be]cause it kind of goes in there because you've seen those words so many times even though it's repetitive”.

Post-Study Focus Groups: Taking notes in university

The following are representative of the comments made by the students in the experimental group focus group. Jason said, “I haven't really taken many notes. I just feel like a lot of the examples he uses kind of stick in my memory so when I come to review the notes, I can say, okay I remember”. Brad noted that the parallel note-taking strategy had been taught to

his class. He reported that he “didn’t use it but [could] see why it would be really effective”.

Similarly, Brad indicated that he had been taught the method but did not use it. He said:

... generally, I probably just parallel them [online lecture notes] to my notes. I don’t print them out, but I do use a sort of parallel note-taking. For the final I plan on having the online notes, my notes, and just seeing where they match up.

Jason said:

I didn’t use it [the parallel note-taking strategy] in this class but I had a class last semester and that’s actually how he gave us all the slides. That was the only option to get them was in the parallel structure. So I did it in that class and every so often a slide wouldn’t have all the information so then it would be like an incentive to come to class instead of just having all the notes, just reviewing them and not coming to class.

When speaking of their note-taking strategies, the students in the control group made similar comments to the students in the experimental group. Clara said:

I just make notes of what’s most important. I don’t write down all of it [be]cause sometimes he has a lot but I just write down what’s most important during class. I find that I often write down more what he says in his own words rather than write down what he has written up [on the online notes] cause sometimes the way he words it is kind of confusing. Kind of complicated. He does explain it very well so I will write down more what he says than what are on the notes . . . I like to add in my own words.

Julia said “[I take notes of] what he told us would be on the exam. I usually just write down the main points like he told us would be on the exam like metacognition, SQ3R, and like the Cornell Note-Taking system”.

Sub-theme 3: Students' perception that online notes are beneficial

Students were asked on the survey if they thought that the online notes would be helpful to them in class. On the pre-study survey 73% of the control group and 74% of the experimental group indicated that they believed the online notes would be helpful. On the post-study survey, when students were asked if they found the online notes helpful, 82% of the control group and 88% of the experimental group reported that they found the online notes helpful. This is a large increase, from the pre-study survey to the post-study survey, of the number of students from both groups who indicated that they believed the use of online notes in class was beneficial.

In the focus groups, all students reported that they found the availability of online notes beneficial. They also indicated that they found the lecture easier to follow if they had read the online notes before going to class. It was their perception that having online notes available in class helped them take better notes during the lecture. The students also indicated that having online notes available reduced their stress level in class. They reported that they were not afraid of missing information in class because they could go online and find it. Conversely, they said, they felt high anxiety in classes that did not have online notes available because they could not record all the information they felt they needed to do well in the course during the lecture.

Brad, a member of the experimental focus group, said, "even if you don't use them [online notes], they're a safety blanket that you know it's there, it's definitely useful". He also said, "Me, I don't even have to have the notes on me, just knowing that I have access to them at home or in the library reduces the anxiety. Gail agreed, saying "I just feel like you are less likely to freak out that you missed something [if there are online notes available]. If there are no online notes you have this feeling that everything coming out of his mouth is like going to be on the

exam and you're just so afraid of missing something". Gail spoke, in particular, of the advantage of supplementing online notes with class notes. She said:

online notes are really good, but for me personally, I like the class notes cause, if you could just read the online notes and you could still pass, I would never come. So I just come for that extra push cause I know, even if I have online notes, I really have to push myself to go and read them. But, when I go to class, its double read. So I know, if I don't get a chance to read the online notes, at least I get to go to class and actually get to see and hear it and be taught about it so at least you get one round [of listening to the notes].

For Gail, one of the benefits of attending class was that she could augment the online notes with details she acquired in the lecture. She did not perceive online notes as being an acceptable substitute for attending class. The results from the quantitative survey indicated that 18% of the students from the control group and 12% of the students from the experimental group used the online notes as a substitute for attending class.

Post-Study Focus Groups: Online notes are beneficial

In the post-study focus group, Gail, a student from the experimental class, said:

It's useful having the slides on line, especially if you miss something in class or you can't attend class. Because, in one of my other classes, [the instructor] doesn't put anything on line, nothing, so if we don't come to class, then you don't know what happened unless you ask another student. And like she [the instructor] won't give you any information about what happened in class or anything, and she talks really fast so it's kind of hard to get everything down. But, yeah, I found the online notes helpful.

The students from the control class also found the online notes helpful. Clara said:

I have courses where there are no online notes and that sucks. Even though I don't particularly use them for this class, just knowing that I do have them is kind of nice. Like I have some classes where she [the instructor] doesn't post anything so just in case you miss class then you're emailing the whole class asking if anyone can send the notes. It is nice that they're there even if I don't use them.

While generally expressing her support for the use of online notes, Clara also added this caveat: "they're [online notes] helpful if you've already listened to the lecture [and you] know what he was talking about . . . But, if you just read the notes without going to class, then you would not understand it".

Lloyd, an engineering student, suggested that online notes would be particularly useful in his area of study. He said:

I would like for my engineering courses, most of them don't have it [online notes] but it would be a lot better if they did have them, [be]cause there's lots of rules and stuff that you have to remember, and if there are no online notes it's hard because you have to remember everything from class.

Barry captured the general sentiment of the group when he said, "the online notes are a safety net".

Theme 2: Note-taking strategies employed

The students from the experimental class discussed a number of different strategies that they used when taking class notes. Gord said, "[when taking notes] I always use two colours, sort of basic points, important points, things to remember". Jason reported that, when the instructor lectures in an organized fashion, he generally follows that pattern: "in my physics class

. . . he [the professor] gives you the header and then he will give you a point by point where he is going through his notes”. Gail made a similar observation, saying that:

I find the really good teachers have a tendency to talk in almost a note-taking way. They say something and then they give you points, and after awhile you realize, hey, he’s not just talking, he’s actually telling me what to write down. In a strange sense, that way you just cut out the words that are not important and just write.

When discussing the way in which he takes notes in class, Jason said:

Especially in the Intro to University [ARTS 1110] course, like the [class] notes are just the supplementary stuff that he writes on the board that he says this is the important part.

Because we have all the notes online already. So, after class then, when I am studying, I just kind of put those two together. So I don’t have to write some of that stuff twice when he is already saying it and if it is already written down.

Gordon said, “I always write down the title of the slide so that, no matter where you are writing what he is saying, [it is] like so this is slide AB so this information that I wrote goes with this slide even though it’s not on here”.

Sub-theme 1: Summarization

Williams and Eggert (2002) discovered that students who summarize notes in their own words were better able to recall the content than students who did not. On the quantitative post-study survey, the following three questions were added to explore this aspect of note-taking.

Students were asked whether they tried to transcribe exactly what their professor was saying in class when taking notes. Thirty-two percent of the students from the control group and 32% of the students from the experimental group reported that they tried to transcribe the lecture when taking notes. Students were also asked whether they summarized the main points of the lecture

when taking notes in class. Forty-five percent of the control group and 80% of the experimental group said that they summarized the main points of the lecture in their notes. The last question asked students whether they added their own examples to the online lecture notes. Twenty-three percent of the control group and 52% of the experimental group reported that they added their own examples to the lecture notes.

With regard to summarization, Hank, from the experimental focus group, reported that: most of the time, I try to get down the important stuff. There is not always everything on the online notes. Sometimes he is teaching something he is talking about so I write down what he says. Then I look at the notes and then I write down my own notes, try to summarize.

Jason reported that “I almost always try to summarize and try to get it as short as physically possible. Sometimes my teacher will talk for twenty minutes and I’ll get two lines down and I have a general gist of the entire twenty minute lecture”.

For her part, Gail spoke to some of the difficulties she found in attempting to summarize in class:

I find that . . . sometimes when you try to summarize, it’s almost like you’re not writing properly. It’s awful because it’s an English class. But you’re trying to write so fast that you’re not even writing in proper English. It’s horrible. It’s nice when everyone just has online notes.

Post-Study Focus Groups: Summarizing Class Notes

In the experimental group, Brad found that “he [the instructor] switches the slides as he goes through the lecture so I try to take down the slide title and then sort of summarize what he is saying and then put in examples that he uses”. Gail said “I just try to write down the key points that the professor talks about. [I do not transcribe] because there is so much information. I’m

just like trying to remember everything and try to get the main points so I don't miss anything. So, basically, summarize the main points".

When the data was analyzed using an independent samples t-test, the difference between the students in the control group and the students in the experimental group in the use of summarization was found to be statistically significant ($p=.016$). Students in both the control group and the experimental group reported on the post-study survey that they added their own examples to the online notes. However, when the data was analyzed using an independent samples t-test, the prevalence of the practice was significantly higher amongst students in the experimental group ($p = .022$).

Sub-theme 2: Reviewing Notes

Reviewing notes is an important step in facilitating effective memory retrieval. Dunkel et al., (1989) reported that "note-taking without review may not facilitate effective English lecture encoding" (p. 545). That is, the primary encoding benefit of note-taking occurs from the act of reviewing notes rather than from the act of taking notes. Dunkel et al., found that students who were provided the opportunity to review their notes outperformed the students who were not given the opportunity. They concluded that there is a need for students to rehearse information in their notes rather than just take notes on information from a lecture. Similarly, Barnett et al., (1981) suggested that notes are a form of external storage that are available for review at a later time. They found that students who reviewed their notes prior to the exam performed better than students who did not review their notes. They concluded that, unless the student reviews their notes, the usefulness of the notes is limited.

The students from the experimental group spoke about the way in which they review their notes between classes. Gord described the process he uses this way:

I usually try to do a quick 5 to 10 minute review after class. Like, even if you don't have time right after class, right after you get home. If you have the notes online you can be, like, I remember this and this, and I'll try to remember for next class. And, even if you don't read everything, just to be able to scan through it, like, oh, I missed this word entirely.

Brad reported that he also conducted a quick review of his notes between classes but followed a schedule that was different than Gord's. Brad said, "I usually scan. I scan last week's notes right before the next class. That's usually what I do. I'm not big on reading notes right after class cause I'm either running to another class or I'm doing homework for something". For her part, Rachel reported that:

I tend to sit down a couple of times during the week, a couple of times on the weekend and I try to review notes and whatever I am sitting down to read in the textbook. I try to do a review, just a scan through the last chapter, [looking for] key points. Review the notes, and then start the next chapter, and I usually do that two or three times a week.

Jason commented that:

Lots of time what I'll do is, when I take notes in class, I won't worry too much about spelling or about being neat or anything. And then that night I will re-write the notes, formatting it nicely so that it's easier to read when you're trying to study. I add in material that I can remember from the lecture.

Sub-theme 3: Use of Notes for Exam Preparation

Ward and Tatsukawa (2003) found that the:

most common use of class notes is for review by the person who created them. As such, notes do not have to be stand alone documents; rather they are good enough if they serve to help retrieve memories of what the instructor was saying or writing. (p. 5)

Ward and Tatsukawa also found that class notes are typically reviewed before exams, with some students also choosing to review their notes in the evening after class or on the weekends.

Barnett (2003) suggested that “taking notes helps make attention more selective, forces the listener to organize ideas, and helps students relate material to existing knowledge, thus facilitating learning” (p. 2). He refers to this as an external storage function that occurs when students use their notes for later review. However, he stresses that, in order for notes to serve a storage function, they must be complete and accurate. He found that students’ notes are often limited and incorrect. Barnett argued that if notes are used primarily for review purposes, then instructors should provide assistance in taking notes.

When students in this study were asked on the pre-study survey whether they thought that the online notes would make studying for an exam easier, the majority of students (i.e., 86% of the control group and 76% of the experimental class) indicated that they thought making use of the online notes would help them when they studied for the exams. For both groups, those percentages increased in the post-study survey. On the post-study survey, 95% of the control group and 88% of the experimental group reported that they made use of the online notes to study for their exams.

When discussing the way in which they use the online notes in class, all of the students who participated in the focus groups, both control and experimental, indicated that they used the

online notes to prepare for the exam. Holly, from the experimental group, said “Just before the exam, I go through all the things we learned by going through the notes”. Interestingly, Brad, Gord, and Holly each reported that they followed a similar practice prior to examinations. Right before an examination, each would make an individual short list of the facts they thought were important. In essence, each would create a cheat sheet, recording the most important points on crib notes as if those notes were going to be taken into the exam. This development of individual study strategies will be discussed in greater detail below.

Post-Study Focus Groups: Use of notes for exam preparation

The students from the experimental group who participated in the first focus group said that they would use the online notes to study for their exams. In the post-study focus group, they reported that they had, in fact, used the online notes to study for the exams.

For example, Brad said “I’ve used them [online notes] in passing, like if I want to double-check something and I plan on using them a lot for studying”. He also reported that:

I have only even been signed on JUMP [online system] twice, but I’ll sign up and I’ll look [at the online notes] and see how it’s arranged. And I’m probably going to spend a couple of hours on there looking at all the lecture notes for the final. During the course I didn’t look at them at all . . . I didn’t use them for the midterm because I had most of my notes already pretty much arranged and I figured I could probably make do with that. And I did pretty well on the midterm. But for the final, I ended up missing one class and a couple of my notes are a bit haphazard since the midterm. So I am going to go through and re-do all of my notes based on the slides.

Similarly, Jason reported that he had not used the online notes but intended to do so. He said, “I haven’t used them yet but I will use them a lot for studying . . . Yeah, I pretty much just used them [online notes] for the midterm”.

Likewise, Gail said, “For the mid-term I used them online and took notes from that and studied the material from there . . . I guess kind of a review more”.

One of the questions on the survey asked the students to indicate whether they thought the online notes would be useful when they were writing their essays. On the pre-study survey, 64% of the control group and 61% of the experimental group indicated that they thought the online notes would assist them in writing their class essays. On the post-study survey, only 41% of the students from the control group and 40% of the experimental group reported that the online notes helped them with writing their essays.

It should be noted that the purpose of the lecture was not to provide explicit step-by-step writing instruction to the students on how to write their essays. The ARTS 1110 course includes a writing seminar of 75 minutes per week in which students learn to write argumentative essays. Since the students obtained the majority of their essay-writing instruction in the writing seminars, they may have regarded the lecture notes on that subject to be less important.

Theme 3: Difficulties with Using Online Notes

Sub-theme 1: Students’ perception that online notes are expensive to print

One of the questions on the survey asked students whether they expected that they would print the online notes and bring them to class. On the pre-study survey, 27% of the control group and 26% of the experimental group indicated that they would do so. On the post-study survey, students were asked whether they had printed out the notes and taken them to class. Eighteen percent of the control group and 36% of the experimental group reported that they had printed

out the notes and taken them to class. It is worth noting that the number of students in the experimental class who stated that they printed out the online notes for class was higher than the number of students who thought they would print out the notes. It is also noteworthy that the number of students in the control group who actually printed out the online notes decreased from the pre-study survey to the post-study survey.

Five out of the seven participants in the pre-study focus group cited cost as one of the reasons for not printing the online notes. Jason said that “the problem with slides is that there is a lot of wasted space. So you can throw six [slides] on a page. But, when there are so many of them, it can end up being pretty expensive to print ”.

Post-Study Focus Groups: Online notes are expensive to print

The students from the post-study control focus group all cited cost as one of the reasons they did not print the notes to take to class. Julie also said that she thought it was “a waste of paper [to print out the online notes]”. Barry commented that “he [the instructor] uses the online lecture notes in class so there’s no point printing them off when we’re seeing them in the class”. Similarly, in the experimental post-study focus group, all of the participants said that cost was one of the reasons they did not print the online notes to take to class.

Sub-theme 2: Students’ perception that online notes are not always user-friendly

In this study, the notes provided to the students in the experimental group through the university online system were formatted in accordance with the parallel note-taking strategy they were encouraged to use in the class lecture. The students in the focus groups (both control and experimental) often spoke about the use of online notes in general. That is, they did not limit their comments on online notes to those provided in ARTS 1110 but instead discussed all of their classes that provided online notes.

Students in the experimental focus group expressed frustration with some of the online notes that were made available by their instructors. Gail found that:

In some courses, the teacher has a box, and then a little note section [the parallel note-taking format] but in other classes it's just slide after slide. So you feel it's kind of strange when it's super small. How do you add in extra information? So it's nice [in the parallel note-taking format] when they actually give you space to make notes.

Jason found that his instructor "just made up PDF's so there would be three slides and then a bunch of lines so you could make extra notes". He went on to say:

I find it's really rare where you get any handout in class. In my calculus class, he [the instructor] hands out a sheet with diagrams on it and, when he is going over the notes and is lecturing, then he references specific diagram numbers and so we can reference that.

Gord agreed with Jason:

I also find PDF's to be so much better than PowerPoints. [Be]cause with PDF's you can alter them, you can change them, and you can add spaces so you can put in your own notes. But with PowerPoints, it's just messy. In the PowerPoint slides, if you try to add in one word, it will jump off the page and then everything will move".

Brad added that "another thing about PDF's . . . [is that they] are universal and much easier to work with". However, Jason found "PowerPoints are a lot better for presentation. Cause no one would want to sit in class and just see a PDF up on the screen". Brad agreed that "It's a lot easier to see [PowerPoints] but when you are studying on your own you don't want to see pretty fonts".

The comments concerning the slide format (i.e., PDF's versus PowerPoint) is an interesting one. The students suggested that they felt that PDF's were easier to manipulate and

to amend. It is not clear that the students understood the terminology they were using since PDF's are often locked into their format and not easily altered. In addition, the purpose of providing the online lecture notes that had been formatted in accordance with the parallel note-taking strategy was to ensure that the students would not have to manipulate the document before printing it for use in class.

Post-Study Focus Groups: Online notes are not always user-friendly

Students from the control class made the following comments regarding the online notes. Clara said “[the reason I did not use the online lecture notes] I guess [is] because he veers off of them a lot. He’s on topic. He just tries to make the connections to stuff he knows. So, he just kind of veers off a lot”. Barry also found that “he [the instructor] applies [the content] to a personal experience that he had so that helps but otherwise no [I do not use the online notes]. The online lecture notes are only half way useful”.

Theme 4: Problems with Instructors and Note-Taking

In their study of the way in which university students used online notes, Pardini et al., (2005) found that some students experienced difficulties with the online notes that were posted for their courses. The students perceived that there was an overwhelming volume of information posted online. The students reported that the notes were often not well organized, were not reader-friendly, did not flow evenly, and did not clearly indicate which information was the most important.

The students in this study made similar observations. The students in the experimental group mentioned that some of their professors make it difficult to take good class notes. Jason found:

[In one of my classes] our prof has all the notes on line but he talks so fast and he goes off on these tangents so I never know, like, what to actually write down. If it's relevant. And it's hard too cause he talks so fast, and half-way through his tangent, I realize this isn't even on the slide, so why is he talking about it.

Gord reported "I've had a few teachers with nearly impossible accents . . . I couldn't understand a thing he said and his hand writing was even worse".

Brad stated that "I have a teacher right now, his accent isn't that bad, but sometimes it's almost like he only knows how the word is on paper. Like, he could write it down a thousand times but he has minor pronunciation problems".

Gail also found that "sometimes it's the level of voice they use. [Be]cause sometimes you have a professor who whispers, and you don't know what to say. Like, hey, could you speak up [be]cause we can't really hear you".

Brad talked about the difficulties he had with one of his instructors:

My teacher is pretty quiet so he tried setting up a microphone. But I don't know . . . [be]cause he tried a couple of times but there's no volume control that he could find. One of the speakers is broken and doesn't work and there are 200 kids in the classroom and a 150 of them have no idea what he's saying but it's not his fault.

Not all of the problems have to do with the speaking volume or the accent of the instructor. Jason reported that some of the difficulties arose from the spatial orientation of the instructor in the classroom:

I have one prof, he talks really well so it's not a big deal. But lots of times, he'll be looking at the slides when he's talking to the class. So he'll be looking at the slide and doing his

lecture while looking at the slides. So his back is facing the whole class. It's not a problem because he has a loud voice and he does project but he just watches the slides the whole time.

Gord reported that he has a different problem with one instructor when he is attempting to take notes:

I have a wandering professor. He just doesn't walk back and forth in front, but he walks up and down the aisles and so you're trying to listen and write like this [*he swivels his head and body around*] because he still has the clicker going.

Brad said:

One problem I had last semester . . . was when my teacher would be talking about something and there's this proof, [and he would say] if you want to write this one down you can. And he would scribble it down and then on the final exam it would be a good 20% of the final exam grade was based on knowing that proof . . . Some teachers don't stress what's important or they'll just sort of nonchalantly mention something on the side and then it happens to be a really main selling point.

Gail had a similar difficulty with one of her professors:

One of the problems I have is, if you are just taking freestyle notes, is sometimes he says something really important. So you're trying to catch up but then you don't get the most important part. So you have all of this stuff but the little part you need you don't remember. That's what gets me. Cause all you wrote is irrelevant because you needed that one little thing.

Sub-theme 1: Challenges of taking notes while attempting to listen to the lecture

Three of the students in the experimental group (i.e., Brad, Holly, and Rachel) indicated that they find it difficult to listen and take notes at the same time. This is consistent with much of the current literature. Konrad, Joseph, and Eveleigh (2009) found that students' records of the lectures they attend are often incomplete and/or inaccurate due to the challenge of attempting to simultaneously listen to a lecture and record information.

One of the students in this study resolved this difficulty by choosing to abandon note-taking altogether. Brad said:

... usually what I'll do is I'll forgo the notes in favour of listening. Cause I'm relatively good at remembering what I hear. But, sometimes, if I'm writing down what he just finished talking about, and he's just going to jump to the next topic, I know I'm going to miss something important so I'll hold off on the notes. I also write down the slide number so I can check it online later.

Rachel reported a similar strategy: "I'll do the same thing or I'll just write down the key words. Because I know a lot of it is going to be in the text or online. And, then, I'll just connect, put a mark beside it. Cause then I know I missed it".

Gord said that he used the same strategy but added that he included 'tagging' information that allowed him to re-locate the source of the information later: "I try to write down the slide number, the page number, the title and then I try to write down what he just said".

Holly found that "sometimes you try to write out what he said and it's not on the slide. And you are just writing down some key words and I try to connect them. I write down some piece of the word but I can't always get what he said".

Brad offered a suggestion to help facilitate note-taking in the classroom: “Something that I think would be really handy is if there were page numbers on all the slides. Like, if there was a number in the bottom right corner, just a little number, so you could write down ‘slide 42’ [for example]”.

Rachel voiced observations about the use of online notes based on previous experiences in other courses:

I took a course through Continuing Ed here at the U of M and, what I found, what the instructors did, is they gave the handouts. They did some lectures, some interaction stuff. We wrote on the handouts. So we weren’t sitting there writing for the whole class. It was a three hour class. But you were learning because you weren’t writing through it. You were using the slides. You had the space beside to write notes about the things that weren’t on the slide, the key points that were important, and taking time to interact through the course. I found that probably more helpful.

It is interesting to note that this was, in fact, the method that the students were being taught to use in this study.

In the post-study focus groups, the students from the control group also spoke of the challenges they experienced when trying to take notes and listen to a lecture simultaneously. Like many of the students in the experimental group, Lloyd reported that he generally did not attempt to record notes during his lectures. He said “I actually don’t write down anything, I just listen”. Barry reported that he followed a similar practice: “I just listen . . . I can either listen to the teacher or take notes. But if I take notes, then I can’t pay attention. So I just sit there and listen”.

Discussion

Online Note-taking

A number of observations offered by the students in this study were consistent with conclusions in the existing note-taking literature. Some of these included the following: (a) most students take notes in their classes (Dunkel, et al., 1989; Locke, 1977; Peverly et al., 2007); (b) note-taking increases student understanding and recall of lecture content (Kiewra, 1984, 1985); (c) note-taking increased students' ability to remember information for exams (Kiewra, 1984; Weiland & Kingsbury, 1979; Williams & Eggert, 2002); (d) students retain more information if they review their class notes (Kiewra, 1984, 1985; Williams & Eggert, 2002); and, (e) students found the online notes beneficial (Frey & Birnbaum, 2002).

The students in this study did not, for the most part, use the online notes as they were intended by the researchers. The study was set up, and the notes formatted, to facilitate students' note-taking during the class. Students did not print off the online notes to take to class even though they had been encouraged to do so by their instructor. Students cited cost as the main reason why they did not print the notes to take to class. Students did report that they made use of the online notes when reviewing for the exams. They admitted that the online notes were beneficial and that the online notes provided a safety net for them in case they missed class or were confused about something in their own notes.

We can conclude from this study that despite students being aware of the availability of online notes they did not use them when they took their own notes in class. Only 24% of the students said that they used the parallel note-taking strategy in class even though the notes had been formatted for them online and were posted before class. The students, in this study, did not appear to see the benefits of using the online notes as a method of taking their own class notes.

Note-taking in General

In addition to the findings that emerged in reference to the initial research questions, the study also produced rich data in regard to students' perceptions of the note-taking process in general. Though this data was not specifically anticipated in the initial stages of the project, it proved to be an unexpected benefit of the study. The qualitative research uncovered that university students have a number of areas of concern in their preparation for, and practice of, note-taking at the college or university level. These include:

1. The students' perceptions that they had never been taught to take notes in high school.
2. The students' perceptions that note-taking at university was complicated by new challenges.
3. The students' perceptions that note-taking interfered with listening in lectures.

The students' perceptions that they had never been taught to take notes in high school.

In general, the students reported that they had never been taught note-taking strategies in high school but rather were simply expected to do so. Some teachers provided fill-in-the-blank sheets (i.e., incomplete note sets into which students supplied the missing information), some teachers provided power-points or overhead notes from which the students were asked to recopy information verbatim, and some teachers provided notes from which the students were expected to identify main points without being given direction. Many of the students reported that they developed a default strategy of recording all information indiscriminately. This is the strategy used by most as they began their university studies.

The students' perceptions that note-taking at university was complicated by new challenges.

The students identified a number of challenges when taking notes in university classes. The sheer volume of information is over-whelming and, in the absence of note-taking strategies, decisions about the pertinence or relevance of specific points are often haphazard. Though some instructors lecture in ways that facilitate note-taking, with well-defined patterns of organization and cues to the importance of particular ideas, others are less clear. Students were particularly critical of unexplained tangents. Students also reported that the university learning environment made note-taking more difficult. They were exposed to a greater number of instructors who spoke with unfamiliar accents, spoke too quietly, spoke too quickly, or roamed the room too much. The large classrooms made interaction between faculty and students problematic, and clarification of ideas challenging. The size of the lecture halls necessitated the increased use of unreliable microphones and other faulty audio technology. Finally, some students noted that the use of new educational technologies like the i-Clicker occasionally interfered with the process of note-taking.

The students' perceptions that note-taking interfered with listening in lectures.

Some students indicated that they found note-taking to be an impediment to understanding in university lectures. As Konrad, Joseph, and Eveleigh (2009) found, students' accuracy and comprehensiveness in note-taking is often compromised by the challenges of simultaneously reflecting upon and recording new information. Many of the students in this study reported that, because they could not listen and record notes at the same time, they opted to attend to the lecture closely and take fewer or less extensive notes. Interestingly, some students developed their own strategies for managing the cognitive load. Some recorded power point slide

numbers, intending to return to the point at a later time when they could explore and explain it more fully. Some developed hybrid short-hand systems, using combinations of keywords and power point slide numbers as references. For many students, however, the advantage of good notes did not appear to be worth the risk of failing to understand new course material. They simply chose to forgo note-taking altogether in favour of concentrating on the lecture.

The data also revealed some of the strategies students report for taking and using notes.

These included:

1. Summarization
2. Reviewing of Notes
3. Use of Notes for Exam Preparation

The data seemed to suggest that the students developed ad hoc strategies to cope with the challenges of note-taking. Interestingly, the ad hoc strategies appear to correspond with the strategies that have been identified in the literature as being effective. While there is not enough evidence to make the claim conclusively, it seems as if the students independently devised solutions to note-taking problems that resemble the suggested strategies in a number of important ways.

Summarization

Summarization of notes has been identified as a useful strategy for retention of information (Williams & Eggert, 2002). In this study, 45% percent of the control group and 80% of the experimental group reported that they attempted to summarize the main points of the lecture in their notes. It appears that some students use summarizing as a strategy for managing the volume of information being delivered in a lecture while others use summarizing more strategically. Some students reported that they attempted to recode lecture content thematically

to facilitate memory and retrieval. In some cases, summarization was described as a single stage process (i.e., occurring in class as notes were being recorded) while other students described summarization as a two stage, with notes being transcribed in class and summarized at a later time.

Reviewing of notes

Researchers have noted that it is the review of notes, rather than the transcription, that generally facilitates effective memory retrieval (Barnett, Di Vesta, & Rogozinski, 1981; Dunkel et al., 1989). That is, the encoding benefit of note-taking actually occurs in the review of notes and not from the act of note-taking itself. Many of the students in this study reported that they reviewed their notes after class, in the evening, or on weekends. Of the students who reported reviewing notes, most indicated that they did so on a number of different occasions

Interestingly, it also appeared that the students had a number of purposes for their review, using strategies that they had developed on their own. Some suggested that their purpose was to edit notes for clarity or accuracy, others said that they reviewed the notes to consolidate their memory of the lecture, while others reported that they used the review to create links between ideas. Many of the students reported that they used the review to augment the notes they had taken with additional information. A number of the students suggested that they reviewed notes to create a context for new information and the next class.

Use of notes for exam preparation

Not surprisingly, the majority of students (95% of the control group and 88% of the experimental group) reported that they made use of online notes for exam preparation. It is, however, the ways in which the students use the online notes that is most interesting. In a number of the focus groups, students reported that they were very active in their engagement

with the notes. While some indicated that they that would use the notes primarily to review the content, others said that they mined the material for short lists of important themes or to create interrelated tables of important information. A number of students spoke of their intention to use online notes to confirm or recode details. The confidence the students invested in the online notes supports an observation that Barnett (2003) made in reference to students' preparation and uses of notes. According to Barnett, if notes are to serve students as 'external storage' devices, they must be complete and accurate. Because students' notes are often limited and incorrect, instructors should provide assistance in preparing authoritative notes (Barnett, 2003). In the present study, the strategies used by the students for exam preparation appear to have been predicated, in some part, on their faith in the authority of the online notes.

Limitations and Conclusions

One of the limitations of the study was the high degree of attrition in both the control group and the experimental group. There were a number of students who did not complete the post-study survey due to course withdrawals and absences on the day on which the survey was administered. This attrition made the comparison between groups difficult. The low number of participants in the focus groups was also a limitation. Given the number of students who indicated that they did not print the formatted online notes because of the related cost, it is also difficult to determine whether the low number of students who adopted the strategy reflected a rejection of the strategy or a rejection of the expense. Perhaps, if the students had been provided with handouts of the online notes in the first class (i.e., the day on which the strategy was taught, more students would have seen the benefits of using the parallel note-taking strategy).

It is also possible that any adjustment of note taking strategy that is introduced during the challenging period of transition to college or university will be resisted. There is, after all, an

efficiency to the known strategies even when those strategies, in and of themselves, are less efficient than new strategies. In general, new academic strategies require some degree of practice before their respective benefits will reveal themselves. First-year students, whose executive functioning is already overtaxed by the adjustment to their new learning environment, may not have the luxury of investing time and energy in novel learning practices.

It is interesting to note the number of ad hoc strategies for note-taking that were revealed by the students during the focus groups. These seem to suggest that the students in this study were far more aware of their note-taking processes than might have been expected. Many of the students appeared to have considered the purpose and function of their note-taking strategies and to have made idiomatic adjustments to meet their specific goals. However, given the evidence that students' memory of lecture content is often more limited than the students themselves might believe (Konrad, Joseph, & Eveleigh, 2009) and the evidence that student notes are often incomplete or inaccurate (Suritsky and Hughes, 1991), it may yet be necessary to continue to encourage students to adopt more systematic note-taking strategies.

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Appendix A Pre-Study Survey



UNIVERSITY
OF MANITOBA

1. Are you aware that there are online lecture notes available for this course?

Yes No

2. Did your course instructor inform you of the availability of online lecture notes?

Yes No

3. Did you go and check out the online lecture notes?

Yes No

4. I intend to make use of the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. I anticipate that the online lecture notes will be very helpful in this class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. I will print out the online lecture notes and take them to class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. I will use the online lecture notes in class and add to them during the lecture.

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. I anticipate that the online lecture notes will make studying for exams easier.

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. I anticipate that the online lecture notes will make writing my essays easier.

Strongly Agree Agree Neutral Disagree Strongly Disagree

10. If I don't understand something, I will go and look at the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

Appendix B: Post-Study Survey for the Control Group

UNIVERSITY
OF MANITOBA

1. Are you aware that there are online lecture notes available for this course?

Yes No

2. Did your course instructor inform you of the availability of online lecture notes?

Yes No

3. Did you go and check out the online lecture notes?

Yes No

4. I made use of the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. I found the online lecture notes to be very helpful.

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. I printed out the online lecture notes and took them to class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. I used the online lecture notes in class and added to them during the lecture.

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. The online lecture notes made studying for exams easier.

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. The online lecture notes made writing my essays easier.

Strongly Agree Agree Neutral Disagree Strongly Disagree

10. When I didn't understand something, I went and looked at the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

11. I used the online lecture notes as a substitute for attending class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

12. The online lecture notes were an adequate substitute for attending class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

13. When taking notes, I try to transcribe exactly what the instructor is saying.

Strongly Agree Agree Neutral Disagree Strongly Disagree

14. When taking notes, I summarize the main points of the lecture.

Strongly Agree Agree Neutral Disagree Strongly Disagree

15. When taking notes, I add in my own examples to the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

Appendix C: Post-Study Survey for the Experimental Group



UNIVERSITY
OF MANITOBA

1. Are you aware that there are online lecture notes available for this course?

Yes No

2. Did your course instructor inform you of the availability of online lecture notes?

Yes No

3. Did you go and check out the online lecture notes?

Yes No

4. I made use of the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. I found the online lecture notes to be very helpful.

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. I printed out the online lecture notes and took them to class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. I used the online lecture notes in class and added to them during the lecture.

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. The online lecture notes made studying for exams easier.

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. The online lecture notes made writing my essays easier.

Strongly Agree Agree Neutral Disagree Strongly Disagree

10. When I didn't understand something, I went and looked at the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

11. I used the online lecture notes as a substitute for attending class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

12. The online lecture notes were an adequate substitute for attending class.

Strongly Agree Agree Neutral Disagree Strongly Disagree

13. When taking notes, I try to transcribe exactly what the instructor is saying.

Strongly Agree Agree Neutral Disagree Strongly Disagree

14. When taking notes, I summarize the main points of the lecture.

Strongly Agree Agree Neutral Disagree Strongly Disagree

15. When taking notes, I add in my own examples to the online lecture notes.

Strongly Agree Agree Neutral Disagree Strongly Disagree

16. I used the parallel note-taking strategy that we were taught in ARTS 1110.

Strongly Agree Agree Neutral Disagree Strongly Disagree

17. The parallel note-taking strategy that was taught in ARTS 1110 proved to be useful in learning and remembering content.

Strongly Agree Agree Neutral Disagree Strongly Disagree

18. The parallel note-taking strategy that was taught in ARTS 1110 proved to be useful in preparing for exams.

Strongly Agree Agree Neutral Disagree Strongly Disagree

19. I found the parallel note-taking strategy easy to use.

Strongly Agree Agree Neutral Disagree Strongly Disagree

20. I used the parallel note-taking strategy in other courses.

Strongly Agree Agree Neutral Disagree Strongly Disagree

21. I will continue to use the parallel note-taking strategy in my future courses.

Strongly Agree Agree Neutral Disagree Strongly Disagree

Appendix D: Pre/Post Focus Group Questions

1. Are you aware that there are online lecture notes for this course, ARTS 1110 Introduction to University?
2. Have you made use of the online lecture notes for this course? Why or why not?
3. How often did you use the online lecture notes for this course?
4. If you used the online notes, how did you use them?
 - a) Did you print them out?
 - b) Did you look at them before class?
 - c) Did you take them to class with you?
 - d) Did you add your own notes to the online lecture notes?
 - e) Did you use them to follow the lecture without adding your own notes?
 - f) Did you use them to review for the exams?
 - g) Did you use them to complete your assignments?
 - h) Did you use them as a substitute for attending class?
5. If you did not make use of the online notes, why not?
 - a) Did you know that there were online notes available for this course?
 - b) Did you ever look at the online notes for this course? If so, why did you decide not to use them?
 - c) What would have made the notes easier to use?
6. How do you take notes in your classes? Do you try to transcribe what the instructor is saying word for word? Do you summarize? Do you add in your own examples?
7. If you used the online notes, did you add to the notes during the lecture? Why or why not?
8. Is there anything else that you would like to explain about taking notes in class?

Appendix E: Additional Post-Focus Group Questions for the Experimental Group

1. Do you remember learning about parallel note-taking in your ARTS 1110 class?
 - a) Did you use the parallel note-taking strategy? Why or why not?
 - b) Did you have any difficulties implementing the parallel note-taking strategy? Please explain.
 - c) Have you found the parallel note-taking strategy useful? How?
 - d) Have you used it in other classes? Why or why not?
2. Did you feel like you had other problems taking notes in ARTS 1110? Please explain.

Appendix F: Table of Answers to the Survey Questions

Question/Statement	Control	Experimental
Are you aware that there are online lecture notes available for this course?	Yes Pre: 90% Yes Post: 100%	Yes Pre: 92% Yes Post: 99%
Did your course instructor inform you of the availability of online lecture notes?	Yes Pre: 92% Yes Post: 100%	Yes Pre: 92% Yes Post: 100%
Did you go and check out the online lecture notes?	Yes Pre: 69% Yes Post: 100%	Yes Pre: 69% Yes Post: 100%
Pre: I intend to make use of the online lecture notes. Post: I did make use of the online lecture notes.	Pre: 80% Post: 72%	Pre: 79% Post: 88%
Pre: I anticipate that the online lecture notes will be very helpful in this class. Post: I found the online notes to be very helpful in class.	Pre: 73% Post: 82%	Pre: 74% Post: 88%
Pre: I will print out the online lecture notes and take them to class. Post: I printed out the online lecture notes and took them to	Pre: 27% Post: 18%	Pre: 26% Post: 36%

class.		
<p>Pre: I will use the online lecture notes in class and add to them during the lecture.</p> <p>Post: I used the online lecture notes and added to them during the lecture.</p>	<p>Pre: 41%</p> <p>Post: 23%</p>	<p>Pre: 40%</p> <p>Post: 40%</p>
<p>Pre: I anticipate that the online lecture notes will make studying for exams easier.</p> <p>Post: The online lecture notes made studying for exams easier.</p>	<p>Pre: 86%</p> <p>Post: 95%</p>	<p>Pre: 76%</p> <p>Post: 88%</p>
<p>Pre: I anticipate that the online lecture notes will make writing my essays easier.</p> <p>Post: The online lecture notes made writing my essays easier.</p>	<p>Pre: 64%</p> <p>Post: 41%</p>	<p>Pre: 61%</p> <p>Post: 40%</p>
<p>Pre: If I don't understand something, I will go and look at the online lecture notes.</p> <p>Post: When I didn't understand something, I went and looked at the online lecture notes.</p>	<p>Pre: 80%</p> <p>Post: 77%</p>	<p>Pre: 84%</p> <p>Post: 80%</p>

I used the online lecture notes as a substitute for attending class.	Strongly Agree/Agree: 18%	Strongly Agree/Agree 12%
The online notes were an adequate substitute for attending class.	Strongly Agree/Agree: 23%	Strongly Agree/Agree: 12%
When taking notes, I try to transcribe exactly what the instructor is saying.	Strongly Agree/Agree: 32%	Strongly Agree/Agree: 32%
When taking notes, I summarize the main points of the lecture.	Strongly Agree/Agree: 45%	Strongly Agree/Agree: 80%
When taking notes, I add my own examples to the online lecture notes.	Strongly Agree/Agree: 23%	Strongly Agree/Agree: 52%
I used the parallel note-taking strategy that we were taught in ARTS 1110.	N/A	Strongly Agree/Agree: 24%
The parallel note-taking strategy that was taught in ARTS 1110 proved to be useful in learning and remembering the content.	N/A	Strongly Agree/Agree: 28%
The parallel note-taking strategy that was taught in ARTS 1110 proved to be	N/A	Strongly Agree/Agree: 24%

useful in preparing for exams.		
I found the parallel note-taking strategy easy to use.	N/A	Strongly Agree/Agree: 16%
I used the parallel note-taking strategy in other courses.	N/A	Strongly Agree/Agree: 20%
I will continue to use the parallel note-taking strategy in future courses.	N/A	Strongly Agree/Agree: 12%