NOTE-TAKING HABITS OF ONLINE STUDENTS
Value, Quality, and Support

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Do online students take notes when reading lecture content or watching video lectures? Can they benefit from note-taking supports, such as graphic organizers, to improve their study skills? These are among the questions explored in a pilot study with student participants enrolled in a 100% online graduate program. Students were provided academic content in video or text lecture format, and some students were also provided a graphic organizer on which they could take notes. All participants were then assessed for recall of the content immediately after the lecture. Results suggested online students will use a graphic organizer when provided one, and that self-assessed learning preference might play a role in the use of note-taking as a study strategy. Recommendations for further research based on this pilot study are offered.

INTRODUCTION

In this study, the note-taking habits of fully online students in a graduate-level program were documented and analyzed. Some students were shown a video of the academic content, and others were provided an online text transcript of the academic content. In addition, some students were provided with a note-taking template (graphic organizer) on which to take notes. Students were quizzed on the academic material after viewing the video or reading the text. All the study tasks were performed online with students enrolled in a fully online course, which is part of a degree they can earn completely online. Results support some of the current research findings about note-taking for face-to-face students and demonstrate a requirement for more research on note-taking in online education.

REVIEW OF THE LITERATURE

Whether online students spontaneously take notes in the same way face-to-face students do, whether they take high quality notes, or whether they can benefit from note-taking supports (which can offset cognitive demand in note-taking), are interesting research questions. This is particularly true as online learn-
ing grows in use and as developing the study skills of online learners has become increasingly important to both student success and retention (Watkins & Corry, 2014). In face-to-face classes, note-taking is among the most common classroom activities (DiVesta & Gray, 1972; Kiewra, 1987; Kobayashi, 2005; Palmatier & Bennett, 1974), but despite the fact that students take plenty of notes, the notes vary widely in quality, which can affect outcomes (Baker & Lombardi, 1985; Crawford, 1925; Fisher & Harris, 1973; Frank, 1984; Jairam & Kiewra, 2009; Kiewra, 1987; Kiewra & Benton, 1988; Palmatier, 1971). Researchers are not yet certain whether quality note-taking as a self-regulatory skill can transfer easily to online education (Jairam & Kiewra, 2009; Kauffman, 2004; Kauffman, Zhao, & Yang, 2011; Nakayama, Mutsuura, & Yamamoto, 2012). After all, online education is not simply education placed on the Internet; it is a completely different teaching and administrative paradigm (Archambault & Crippen, 2009; Black, DiPietro, Ferdig, & Polling, 2009; Cavanaugh, Barbour, & Clark, 2009; DiPietro, Ferdig, Black, & Preston, 2008; Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2009; Oliver, Osbourne, & Brady, 2009; Rice, 2006; Tucker, 2007; Vedanthem & Breeden, 1995). Note-taking, as a specific study strategy and skill, is hoped to have similar positive influences for online students as it has had for their face-to-face peers.

**Taking Notes—A Spontaneous Choice**

Whether an online student makes a spontaneous choice (not cued or required) to take lecture notes can indicate that the student values note-taking as a self-regulatory skill. In face-to-face classes, students have traditionally valued note-taking; in fact, 99% of students in face-to-face classes take some sort of notes, and 96% of college students feel that taking notes is essential for success in higher education (Palmatier & Bennett, 1974). However, as one might imagine, whether a student spontaneously chooses to take notes in an online course is a difficult behavior to examine. Indeed, much of online learning takes place outside the eye of the instructor, so visual cues about a student’s self-regulatory skills are unavailable (Huang, Lin, & Huang, 2012; Nakayama et al., 2012). In addition, instructors have little power over uncontrolled use of notes, text lectures, or video lectures during assessment, so it can be difficult for an instructor to recommend better quality note-taking as an intervention for struggling students. The solutions to these problems might seem as easy as exerting more supervision over note-taking in the online classroom, but research studies about power and control in the classroom have demonstrated that, although changes in the authoritative balance in a classroom may support some student achievement, productive relationships between student autonomy and student motivation may suffer (Bandura, 1989; Deci & Ryan, 1985, 2000; Drexler, 2010; Reeve & Tseng, 2011; Skinner & Pitzer, 2012; Skinner, Kinderman, & Furrer, 2009; Skinner, Kindermann, Connell, & Wellborn, 2009).

One important factor in online education that may affect whether a student spontaneously takes notes is on-demand access. With on-demand access, students can use all learning materials for a course without time constraints and can return to materials multiple times if they choose. Indeed, on-demand access is often cited as unique advantage of online education (Archambault et al., 2010; Barbour & Reeves, 2009; Smith, Clark, & Blomeyer, 2005). This lack of constraints, however, may make students feel they no longer have to take notes. After all, their academic information is easily at hand in online files, videos, and other multimedia resources (Hsu, Ching, Mathews, & Carr-Chellman, 2009).

Unfortunately, students who do not engage in note-taking miss out somewhat on encoding the lecture material, which is the process by which a student personalizes the notes (DiVesta & Gray, 1972; Fisher & Harris, 1973; Kiewra, Benton, Kim, & Christensen, 1995; Suritsky & Hughes, 1991) and one of the main reasons note-taking leads to successful
retrieval. Indeed, research studies have found that an efficient encoding process leads to good quality notes for storage of information and for later retrieval (Howe, 1970, Kiewra, 1989). Clearly, whether students in online courses spontaneously choose to take notes could have a profound impact on their academic outcomes.

**Taking Notes—Quality of Notes**

According to many research studies, students who do take notes find that their outcomes are related to the quality of their notes. In other words, quality notes produce quality outcomes. Of course, the quality of student notes varies widely, and there are many models of neurological and physical differences to account for this variance. What is common among these models is that most researchers agree working memory capacity plays an influential part in the quality of notes taken (Cohn, Cohn, & Bradley, 1995; Eggert, 2000; Kiewra, 1987; Kiewra & Benton, 1988; Piolat, Olive, & Kellogg, 2005; Sweller & Chandler, 1991).

Working memory capacity is unique to each individual. It is also fixed, meaning it cannot be increased. In the case of note-taking, however, it can be optimized using external supports that help organize the material so a student can take quality notes. According to cognitive load theory (Sweller & Chandler, 1991), processing lecture material and taking notes creates a demand for cognitive resources, such as working memory. Since working memory has a fixed capacity, it can be overwhelmed by cognitive demand.

Academic input creates intrinsic and extraneous demand for cognitive resources (Gerjets & Scheiter, 2003). Intrinsic demand quantifies the amount of neural effort required to understand and process information. It can be overwhelmed when a student attempts to process exceedingly difficult material. Extrinsic demand quantifies the neural effort required to successfully operate in a learning environment. It can be overwhelmed when a student attempts to process academic content with unclear organization. If the cognitive demand for absorbing academic content is high, the neural network has little processing power left for contextualizing knowledge and situating it among other previously learned ideas and facts, which is essential for learning (DiVesta & Gray, 1972; Kiewra, 1987; Jairam & Kiewra, 2009; Sweller & Chandler, 1991; Wittrock, 2010). As may be expected, exceedingly high cognitive demand may result in poor quality notes.

Research findings in note-taking studies where student outcomes in text lectures and video lectures are compared suggest surprisingly conflicting evidence about cognitive load theory, especially where the results were unexpected. For example, results from a 1989 (Kiewra, Dubois, Christensen, Kim, & Lindberg) comparison of outcomes comparing a text lecture group to a video lecture group favored the control group, where the participants were able to read the text twice and took no notes. Similar results were found in a 1979 study by Riley and Dyer, where some participants listened to a presentation of a 2,000-word text, while others read the text. Some took notes, while others did not. In general, participants who took notes on the text outperformed the other students, but the most successful students read the text twice and took no notes. A similar result was found in one of the Crawford (1925) experiments, but only for true/false questions on an assessment taken directly after reading. These curious results could be due to the complexity of the questions on the assessment (Bohay, Blakely, Tamplin, & Radvansky, 2011; Crawford, 1925) or, as suggested by Kiewra et al. (1989), text note-taking and video note-taking differ too much for comparison because lecture note-taking requires simultaneous processing while text note-taking requires sequential processing. On the other hand, working memory in combination with the additional cognitive factors of prior experience (Kiewra, 1988; Shaughnessy & Evans, 1986; Wetzels, Kester, van Merriënboer, & Broers, 2011) and learner field independence/dependence could have affected the
quality of notes (DiVesta & Gray, 1972; Frank, 1984; Kiewra, 1989; Rickards, Fajen, Sullivan, & Gillespie, 1997). Also, it should be noted that Ganske (1981) reported that several researchers characterize the large number of variables in note-taking comparisons a significant hindrance in validating prior research (Hartley, 1972; Hartley & Marshall, 1974; Howe, 1974).

**Taking Notes—**

**Supports and Interventions**

Regardless of how working memory capacity was overloaded, students in both face-to-face and online courses have successfully optimized working memory using graphic organizers (a history of the use and development of graphic organizers in education is available from Culbert, Flood, Windler, & Work, 1997); however, more research is required to find its optimal form among variations such as outlines, partially completed outlines, matrix, instructor completed notes, whether the notes were hand-written or typed, and more (Collingwood & Hughes, 1978; Culbert et al., 1997; Katayama & Robinson, 2000; Kiewra, 1987; Kiewra, Benton, Kim, Risch, & Christensen, 1995; Kiewra, Mayer, Dubois, Christensen, Kim, & Risch, 1997; Palmatier, 1971; Robinson, Katayama, Dubois, & Devaney, 1998). Students in online courses have an additional way to support quality note-taking. Online learners can use their on-demand access to course materials as an opportunity to alleviate one of the most difficult hurdles in note-taking—that of time pressure (Piolat et al., 2005). They can reread the lectures, watch the videos again, and add depth/breadth to their notes while drawing important connections among other knowledge. Online learners may also have access to technologically based interventions for note-taking in online apps and learning management systems of online courses where embedded cues, tools, and prompts help students take notes and encourage other self-regulatory skills (Chang, Sung, & Chiou, 2002; Kauffman, 2004; Kauffman et al., 2011; Reid & Morrison, 2014). The cues can be especially helpful for field-dependent learners, as research studies have suggested that cuing, graphic organizers, and other supports can bring field-dependent learners to their full potential if they have a less-developed propensity for online learning (Akdemir & Koszalka, 2008; Cao, 2006; Chang et al., 2002; Cook, 2005; Howles, 2009; Kauffman, 2004; Kauffman et al., 2011; Luk, 1998; Reid & Morrison, 2014; Rickards et al., 1997).

**Summary**

Student academic note-taking in general continues to interest researchers because it has consistently been shown to optimize student academic outcomes (Baker & Lombardi, 1985; Bohay et al., 2011; Crawford, 1925; DiVesta & Gray, 1972; Einstein, Morris, & Smith, 1985; Fisher & Harris, 1973; Kiewra, 1987; Kiewra & Benton, 1988; Kiewra, Benton, & Lewis, 1987; Peper & Mayer, 1986). The importance of quality in student notes is widely recognized, and research studies attempting to examine how quality notes are produced have dissected its attributes, cognitive processes, and best practices seeking to find the optimal note-taking tools, techniques, and training for the most students to get the best results from the practice (Boch & Piolat, 2005; Fisher & Harris, 1973; Kiewra, 1987; Kiewra et al., 1991; Kiewra et al., 1995; Makany, Kemp, & Dror, 2008; Palmatier, 1971; Piolat et al., 2005; Robinson et al., 1998). Research in student note-taking in online courses could support the growth of online content, which is quickly changing the look of education—for both online students as well as on-campus students. Indeed, it is becoming difficult today to differentiate students based on the use of technologies in their courses. The popular “flipped classroom” approach, for example, uses online videos to provide content lectures and then uses face-to-face classroom time for engaging learners in activities. Similarly, online students can now
use various web-based video programs to meet “live” with their instructors around the globe.

Taking notes during traditional classroom lectures has been researched for decades and the results consistently illustrate positive learning outcomes. While cognitive load must be managed in any learning environment, its role in moderating the ability of students to take high quality notes is noteworthy and offers an important context for understanding how the benefits of note-taking may or may not translate over into the online classroom. The use graphic organizers (i.e., note-taking templates) may, for example, be one tool for reducing cognitive load and helping online learners get the most out of their text-only and/or video lectures. Online courses have many unique opportunities for supporting students by aligning the learning platforms with research that supports learning outcomes. With a strong research foundation, mostly from the traditional classroom, the following study expands these research inquiries into online education.

**METHODOLOGY**

**Participants**

Online graduate students were offered the opportunity to participate in this pilot research study during their 2014 fall-semester online orientation. Some of the students had completed one or more online courses either as part of their current program of study or as part of a previous degree or other educational opportunity. Others were new to online learning. Participation was voluntary, and the students were awarded extra credit in the course in exchange for their participation. For this pilot study the $N = 44$ subjects.

**Materials**

There were no face-to-face interactions in this study. All information was delivered via online digital documents. Survey responses were collected through online forms, and participant consent was collected digitally.

**Procedure**

Students were asked to participate in the study via an orientation e-mail sent to all students. Students agreed to participate by clicking on a link in the e-mail, which brought them to an outside website for the materials and survey. No identifying information was collected from students. Students who agreed to participate were randomly assigned to one of four online orientation groups. As indicated in Table 1 below, groups received one form of treatment, a posttreatment survey, and a post-treatment recall assessment.

Instructional content for each pair of treatment groups was the same. In other words, the text instruction is a direct transcript of the video. Students who were given the note-taking template were neither required nor advised to take notes.

Data about student experience with online courses were collected using a Likert scale (1932). Other data were collected with multiple-choice or true/false forced-choice answers, though participants were allowed to skip any of the questions. It should be noted that the assessment questions in the survey involved only direct recall of exact information from the lecture. Detecting deeper cognitive processes through questions that paraphrased the lecture or required inference/application of the material is outside of the scope of this investigation (Bohay et al., 2011; Kintsch & Van Dijk, 1978). Chi-square ($\chi^2$) test and contingency tables were used to investigate note-taking behavior. Fisher exact test was used to calculate more precise probabilities in situations where the sample size yields less than 5 expected values per cell.

**Analysis**

Survey data were recorded using Qualtrics and analyzed using SPSS. A series of chi-square test of independence were computed to
examine the relation between note-taking behavior and: template, video, type of learner. Follow-up contingency tables were also computed when appropriate.

RESULTS

The interaction between note-taking behavior and template was significant, $\chi^2 (1, N = 44) = 13.67, p < .001$. Participants who were provided with a template were more likely to take notes than those who did not receive a template. The interaction between note-taking behavior and video was not significant. The Fisher’s exact test was used as a follow up test to determine significance amongst the 4 groups in the video/template conditions and note-taking. Fisher’s exact test was significant $(3, N = 44), p < .001$.

The interaction between note-taking behavior and type of learner was not significant for, $\chi^2 (1, N = 44) = 3.792, p < .052$, however for the one tailed Fisher’s exact test with significant, $p = .050$. Table 2 through Table 5 present the cross tabulated frequencies for the analyses conducted between note-taking behavior respectively with: template, video, group, type of learner.

DISCUSSION

Applications

This initial pilot study explored for differences among how online graduate students take, or do not take, notes while studying online materials. In this case, subjects received either a text lecture or a video lecture and some subjects received note-taking templates. The results of the study, even with its small sample size, highlighted that there are likely several issues worth further exploration with larger studies. To begin, the introduction of a note-taking template did increase the likelihood of students taking notes while studying the lecture. This difference was greater for those reading the text transcript of the lecture, but still noteworthy for those watching the video lecture. Given the substantial research literature supporting the value of note-taking as a tool for improving student performance, using a note-taking template to further encourage learners to take notes could be worth the low
investment of time and effort by faculty to create such templates for their lectures. In addition, future research might examine the type of template online students prefer, or whether different templates result in different outcomes, which has been explored in some studies of face-to-face students (Collingwood & Hughes, 1978; Katayama & Robinson, 2000; Kiewra, 1987; Kiewra et al., 1995; Kiewra et al., 1997; Palmatier, 1971; Robinson et al., 1998). It should be noted that the pilot study template most closely resembled an outline, but other template forms, such as free-form, outline, and matrix may produce different findings.

The results of this study also suggest that note-taking as a self-regulatory skill may be worth further exploration. Whereas this study found that few online students were likely to take notes when not provided with a note-taking template, other results indicate that 99% of face-to-face students spontaneously take notes during an academic lecture (Palmatier & Bennett, 1974). Given the difference between online and face-to-face learning, this may not be surprising; however, more research studies involving these variables could be pursued. One of these might consider whether the low skill-transfer rate of note-taking is true for other self-regulatory skills, such as time management and self-efficacy. Whether students tend to consider their on-demand access to course materials a replacement for note-taking, and whether it is a successful replacement, could be examined as well.

### TABLE 3
**Cross Tabulation of Note-Taking by Video**

<table>
<thead>
<tr>
<th>Video</th>
<th>No</th>
<th>Yes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note-taking Yes</td>
<td>7</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>24</td>
<td>44</td>
</tr>
</tbody>
</table>

### TABLE 4
**Cross Tabulation of Note-Taking by Group**

<table>
<thead>
<tr>
<th>Group</th>
<th>1.0</th>
<th>3.0</th>
<th>2.0</th>
<th>4.0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note-taking Yes</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>No</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>14</td>
<td>9</td>
<td>11</td>
<td>44</td>
</tr>
</tbody>
</table>

*Note: Group 1 video and no template; Group 2 video and template; Group 3 text and no template; Group 4 text and template.*

### TABLE 5
**Cross Tabulation of Note-Taking by Learner Type**

<table>
<thead>
<tr>
<th>Learner Type</th>
<th>Nonvisual</th>
<th>Visual</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note-taking Yes</td>
<td>12</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>24</td>
<td>43</td>
</tr>
</tbody>
</table>
A second finding from the pilot that likely warrants additional study is that those online graduate students who self-identified as preferring visual learning formats were less likely to take notes than those who self-identified with audio or text as a preferred learning format. Given the increasing popularity of video formats for online education (e.g., the flipped classroom and massive open online courses), noting the role of student preferences in media formats and its relation to their study skill habits could better inform instructor decisions about how to best support the online learners in their classes.

Analysis of findings about the quality of participant notes is inconclusive. While prior empirical research suggests that good quality notes contribute to successful encoding, the relationship to student outcomes may not be statistically causal. In this study, note-takers did not score substantially higher on the assessment than non-note-takers, and analyzing the quality of the notes taken by the participants was outside of the scope of the pilot study. Therefore, it is not possible to say whether the quality of the notes and the assessment outcomes are related.

Linking data about format preferences, note-taking habits, and the format of online content to the short-term (e.g., end of lecture quiz) and longer term (e.g., end of course assessment) performance of students will be important for drawing further implications from this line of research. Analysis of the pilot data indicated, however, problems with the short-term performance assessment.

**Limitations**

Limitations from sample size and questionnaire construction constrain the generalizability of these results. The primary concern of small sample size is the interpretation of results. Results on the cusp of a significant result such as note-taking behavior and type of learner may be a false-positive result, while other non-significant effects such as those possible interactions among learning preference (listening, watching, or reading) and participant group membership (text, video, graphic organizer, no graphic organizer) could be also be attributed to a small sample. The data suggest that significant patterns might be found with an increase in the number of participants. Therefore, inferences drawn from the data to the conclusion of noteworthy effect or lack thereof should be understood as being conditional on small sample size and its interactions with effect size, power, and random fluctuation.

The recall questionnaire may have limited the results of this study because the assessment questions, though consistent in level, represented only shallow cognitive processing and not application of the material (Bohay et al., 2011; Crawford, 1925; DiVesta & Gray, 1973). As well, the questionnaire was self-report, so it was limited by participant self-knowledge and accuracy. In addition, it should be noted that future research of note-taking in online education could be limited because the physical separation of the teacher and student might constrain the researcher’s ability to control experimental variables, such as the review of academic material before assessment (how often, how long, how soon after the lecture).

**Future Research**

If substantial evidence suggests that note-taking skills transfer fairly easily to online education, other self-regulatory skills should continue to be studied. Based on this initial pilot we believe that there is ample evidence to warrant further investigation. Future research on topic will require however a validated assessment of recall to overcome the challenges we had with the current inquiry. In future studies we also recommend that larger sample sizes be used to identify important patterns in the data, and that participants be given both an immediate assessment of recall and an assessment of recall 2 or 3 days later.

Given that students may have varying note-taking preferences, future research should investigate possible differences between hand-
written versus typed notes on the recall of learners. Similarly, free-form, outline, and matrix notes-taking templates could be investigated for possible advantages as tools for supporting online learners.

CONCLUSION

As online learning continues to grow in usage and acceptance, it is more likely than ever that students will encounter online learning throughout their education and into the workplace. Therefore, the importance of understanding the habits and skills in a successful online learning experience is an educational imperative for all students. Research suggests that positive academic outcomes for learners may be affected variously by note-taking. The objective of this preliminary study was to explore how the media format of online lectures (video and text) influenced note-taking of online graduate students. In the exploratory pilot additional variables, including format preference and experience with online courses, were also examined. While the small sample size of the pilot limits interpretations of the results, there was ample evidence in the data to suggest that further research is warranted. With this a foundation, the researchers will continue to pursue questions related to the role of study skills in supporting students as they make the transition to online learning.

REFERENCES


