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Differences in the note-taking skills of students with high achievement, average achievement, and learning disabilities

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ABSTRACT

Students with learning disabilities (LD) experience problems recording notes from lectures, yet, lectures serve as one of the major avenues of learning content in secondary classes. Despite the importance of note-taking skills for students with LD, few if any studies have examined the differences in note-taking between students with LD and students with high and average achievement. In this study, the note-taking skills of middle school students with LD were compared to peers with average and high achievement. The results indicate differences in the number and type of notes recorded between students with LD and their peers and differences in test performance of lecture content.

1. Introduction

Note-taking is a critical skill for students in middle and high school, and eventually becomes the primary means of learning content in post-secondary settings, such as colleges and universities (Buttrill, Niizawa, Biemer, Takahashi, & Hearn, 1989). Approximately one-third to one-half of the time students spend in general education or inclusive content classes is spent on teacher-led lectures with note-taking (Johnson, 2008; Moin, Magiera, & Zigmond, 2009; Putnam, Deshler, & Schumaker, 1993). During lectures, teachers also expect students to discern important from unimportant information, record notes in sync with the lecture, and use notes as a method of learning content (Badger, White, Sutherland, & Haggis, 2001; Bakunas & Holley, 2001; Suritsky & Hughes, 1996). Finally, because teachers frequently construct tests using information found in their lectures (Putnam et al., 1993), recording notes allows students multiple exposures to lecture content through reviewing and elaboration.

Notetaking provides students an opportunity to engage in higher-order cognitive activities. Students become actively engaged in the lecture; they need to track the teacher's speech, select important information in the lecture, and paraphrase this information into their own words before recording it in notes (Steimle, Brdiczka, & Mühlhäuser, 2009). Kiewra (1985) noted that this paraphrasing serves as a *reconstruction* function; students encode factual information from lecture content and integrate it into external storage (Shrager & Mayer, 1989). It is as a generative activity (Stefanou, Hoffman, & Vielee, 2008), whereby students continuously encode and update their existing knowledge on a topic (Armbruster, 2000). In addition, according to Kobayashi (2005), among younger and less skilled students, recording notes serves as a scaffold to assist them with processing content that is presented in lectures. In turn, the more efficient processing of lecture information leads to subsequent gains on recall and comprehension measures.

These tasks require students to utilize metacognitive and executive skills, including, but are not limited to: metacognitive and strategy use, regulation of attention, and memory mechanisms, such as working memory (Anderson, 2002; Eslinger, 1996). From this perspective, executive processes are primarily responsible for directing and regulating attention during learning tasks. Once directed, students utilize metacognitive monitoring and regulation to select, monitor, and evaluate strategy use during note-taking. Students with good metacognitive self-regulatory skills tend to change their strategies based upon their success or failure on the task.

Studies have indicated that certain aspects of lectures better facilitate the use of these skills. Cued lecture points, or pieces of information that are highlighted through *organizational* or *emphasis* verbal cues, alert students to key lecture content. Emphasis cues have a verbal cue to stress its importance (e.g., "Please write this in your notes: A plasma engine uses only one tenth of the fuel that a chemical rocket engine would use."). Organizational cues help organize chunks of related information (e.g., "There are three kinds of plasma engine rockets: ion drive, Hall thruster, and MPD thruster."). Conversely, non-cued lecture points are pieces of information that did not have a prompt or cue before their presentation. Titsworth (2001) and Titsworth and Kiewra (2004)

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revealed that college students who recorded more organizational cued lecture points in their notes demonstrated superior performance on comprehension measures. Recorded lecture points also aids later retrieval of information. Einstein, Morris, and Smith (1985) found information recorded in notes also aided retrieval of lecture information, with college students remembering 40% of the lecture points found in their notes and only 7% of the lecture points that were not in their notes. Finally, vocabulary knowledge positively influences both language and broader academic achievement (Beck, McKeown, & Kucan, 2002; Marzano, 2003), where it has demonstrated clear links to comprehension, fluency, and achievement (Ehri & Rosenthal, 2007). Despite the importance of vocabulary during science lectures (Flowerdew, 1992), there is little evidence about the role that vocabulary plays in note-taking and lecture comprehension.

Efficiency of notes recorded has been suggested as an indicator of performance good note-taking skill. Howe (1970) reported that efficient notes have the maximum number of lecture points recorded using the minimum number of words and found that college students recorded an average of 32.11 words and 10.88 lecture points per lecture, resulting in an average lecture point being 3.02 words in length. Furthermore, Howe (1970) reported that note-taking efficiency was moderately positively correlated with recall (i.e., .53). Conversely, Kiewra (1984) demonstrated that among college students, the note-taking efficiency was inversely related to performance ($r = -.38$); students who recorded short, terse notes performed poorly on measures of lecture comprehension. Of interest in the current study is the question of whether the length of lecture points varies among middle school students who perform at different achievement levels.

Recording notes is a cognitively demanding task that requires students to recognize and utilize strategies. Students without disabilities report strategy use with varying effectiveness, where recording main ideas is more effective than writing every word from a lecture down (Sutherland, Badger, & White, 2002). In fact, when students use typical note-taking skills, studies have shown that they generally record less than 45% of the information from a lecture, even among high achieving college students (Kiewra, Benton, Kim, Risch, & Christensen, 1995; Kiewra et al., 1991). For example, Einstein et al. (1985) examined the difference in ability between successful and less successful college students, based on GPA derived from introductory courses to learn and record notes during a lecture. These researchers reported that successful students recorded more notes and recalled more information than less successful college students; however, these successful college students only recorded between 25 and 33% of the total ideas presented in the lecture. Notwithstanding, this study did illustrate that successful college students differ from less successful students in terms of the organization and structure of lecture information found in their notes. No studies have examined differences between high achievers and other groups of students (e.g., students with average achievement or LD) among the middle school population in terms of notes recorded during lectures and subsequent test performance on lecture content.

Unfortunately, students with disabilities have difficulties naturally deploying and using strategies during learning tasks (Evers & Spencer, 2007). Mortimore and Crozier (2006) found that college students with disabilities have reported numerous problems at recording notes during lectures; a large percentage of them report problems with note-taking in secondary (59%) and postsecondary settings (78%). Furthermore, Suritsky (1992) found that college students with LD had self-reported difficulties in: writing fast enough to keep up with the pace of the lecture, paying attention during the lecture, making sense out of their notes after class (i.e., notes were not legible), and deciding what was important to record during the lecture.

Many of these note-taking difficulties often result in notes with either partial or incomplete lecture points. Among college students, Hughes and Suritsky (1994) revealed that students with disabilities recorded fewer total lecture points (36% for students with LD versus 56% for students without LD) and fewer cued lecture points (46% for students with LD versus 77% for students without disabilities). Likewise, Boyle (2010) found that both general education middle school students recorded fewer notes during lectures (i.e., 25%), with middle school students with LD performing much worse, recording only about 13% of the total lecture points (Boyle, 2010). Similarly, this study also reported that students with LD only recorded 18% of cued lecture points compared to their peers without disabilities who recorded 42%.

Overall, note-taking has clear advantages to increase students' learning. Students who can record quality notes demonstrate increased comprehension of material and later recall of information. However, it requires higher cognitive abilities, such as utilizing metacognitive and executive skill to continually update new information. Students with disabilities are at a clear disadvantage to utilizing these skills and demonstrate poorer performance. Furthermore, there is limited research on the note-taking performance of middle school students with LD to peers without disabilities (Boyle, 2010). As such, there are a number of unanswered questions about the nature and quality of secondary students' notes when examined from different achievement levels.

This study, therefore, seeks to address the following questions: First, how do middle school students with LD perform on cued lecture points and total lecture points compared to average and high achieving students? Second, how do these students compare on the average length of total lecture points and cued lecture points that are recorded in their notes? Third, how do middle school students with LD perform on the amount of key vocabulary words found in their notes compared to average and high achieving students? Fourth, what is the relationship between information (e.g., vocabulary, cued lecture points, total lecture points, and total words) recorded in notes and performance on a test without the benefit of studying?

2. Method

2.1. Participants

After University level Institutional Review Board (IRB) approval, recruitment of participants was drawn from several science inclusive classes in an urban middle school of approximately 900 students, located near a large metropolitan city in the Mid-Atlantic region of the country. The principal from the target school was contacted and agreed to allow research to take place in his school. The primary investigator worked with the school's science curriculum director to solicit interest among the school's science teachers. Science teachers were then provided with parental consent and student assent forms that were sent home with students. After two weeks, only students who returned both signed forms were permitted to participate in the study.

Figures in Table 1 reports a breakdown of various dimensions by group. Ninety-three middle school students in sixth, seventh, or eighth grade participated in this study. This sample reflects the actual student

Table 1
Student demographics.

	High ach. ($N = 31$)	Avg. ach. ($N = 32$)	LD ($N = 30$)
Gender:			
Male	12	11	17
Female	19	21	13
Ethnicity:			
African–American	21	18	17
Hispanic–American	2	5	5
European–American	7	9	8
Asian–American	1	0	0
Grade:			
Sixth	13	13	12
Seventh	11	12	12
Eighth	7	7	6