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Note-Taking Interventions to Assist Students With Disabilities in Content Area Classes

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As high-stakes testing, Common Core, and state standards become the new norms in schools, teachers are tasked with helping all students meet specific benchmarks. In conjunction with the influx of more students with disabilities being included in inclusive and general education classrooms where lectures with note-taking comprise a majority of instruction, teachers must find ways to assist all students in their classes, especially students with disabilities. For these students to learn efficiently, note-taking becomes a critical skill for their success. This article addresses the demands placed on students during class lectures, difficulties they experience with note-taking, specific accommodations for students with disabilities, and practical ways in which teachers can help students successfully record notes in content area classes.

Keywords: learning disabilities, note-taking, study skills, writing

As more secondary students with high-incidence disabilities are asked to meet higher standards in schools, often in the form of Common Core or state standards (Bulgren, Sampson, & Deshler, 2013; Scruggs, Brigham, & Mastropieri, 2013), teachers are faced with the challenge of helping these students learn from the general education curriculum. In particular, the alignment of No Child Left Behind with the 2004 Individuals With Disabilities Education Act requires schools to allow students with disabilities access to and participation in the general education curriculum so that they become proficient at levels similar to peers without disabilities (Brigham, Scruggs, & Mastropieri, 2011; Mastropieri et al., 2006). Even more critical is that, at present, 26 states require students to pass exit exams to move on to the next course/grade level or to graduate from high school (Center on Education Policy, 2012; Deshler, Schumaker, Bui, & Vernon, 2006). As more students with disabilities enroll in advanced content-area courses, the expectation is that they will have the necessary skills to meet the same standards as peers without disabilities (Olson, 2004). Once in these classes, students will learn much of the content information through listening, reading, and writing (Weisman & Hansen, 2007). Specifically when learning verbally presented information, through lectures or discussions, students must rely heavily on listening and note-taking to efficiently comprehend and retain oral information (Suritsky & Hughes, 1996).

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What's Happening in Content-Area Classes?

For students in classes such as science and social studies, daily learning consists of teacher-led lectures, class discussions, hands-on activities, worksheet problems, and textbook/web readings (Fulp, 2002; Scruggs, Mastropieri, & Okolo, 2008). For example, Marshall (2008) surveyed experienced and exemplary secondary science teachers and found that the three most popular methods used by these groups of teachers were hands-on labs, whole-class lecture/discussions, and small-group activities. Similarly, Moin, Magiera, and Zigmond (2009) observed the lessons of 10 pairs of co-teachers in high school science and found that these teachers used whole-class instruction involving lectures 45% of the time, small-group work (e.g., labs, readings, diagrams, games) 34% of the time, and individual work 21% of the time.

Teaching methods in secondary social studies classes reflect similar trends. Bolinger and Warren (2007) reported that secondary social studies teachers listed lectures as the most effective method for teaching their discipline, followed by discussions, projects, and cooperative learning. Furthermore, these same teachers reported that lectures took up the majority of class time (i.e., 22% of class time), followed by class projects (17%), other activities (14%) and worksheets (12.6%). Leming, Ellington, and Schug (2006) also conducted a national survey of middle school social studies teachers that found that problem-solving/critical thinking activities were used by the majority of teachers in their most recent lesson, with whole-class teacher presentations as the next most popular activity used in their most recent lesson.

As shown, while a mix of teaching methods are used in secondary content-area classrooms, lectures (with note-taking) are used as much as—if not more often than—other methods. Because of the diversity of students in today's secondary

classrooms, many teachers feel that lectures are one way to help students compensate for reading and written language disabilities by presenting critical content through explicit instruction (Stringfellow & Miller, 2005). For example, teachers may use a guided lecture-demonstration method that combines verbal explanation with a modeling/demonstration of a skill to communicate processes, concepts, and facts to students (Sola & Ojo, 2007). According to McDaniel (2010), lectures (i.e., particularly short lectures) provide a straightforward method of helping students understand complex concepts. It also provides a context within which they can generate interpretations of difficult content and a foundation from which to build their own ideas and interpretations of lecture content. Similarly, Issacs (1994) believed that lectures provide students with the most critical information about the topic and can help them to think critically about the subject.

Note-taking is an activity that facilitates learning during lectures. According to Castello and Monereo (2005), note-taking serves as a mediator during learning between the content being taught by teachers and students' construction of that knowledge. The benefits using this method (i.e., lectures with note-taking) have been used to explain why teachers favor lectures one third of the time in secondary content-area classes such as science and social studies (Bolinger & Warren, 2007; Marshall, 2008).

In addition to notes serving as an aid to learn content during lectures, the lecture content from notes is also tied to test performance. For example, teachers have reported that they use their lecture notes to construct classroom tests. According to Putnam, Deshler, and Schumaker, (1993), teachers told researchers that their class lectures were the major source for developing secondary science and social studies tests. Moreover, a separate study found that students' test scores account for about half of the course grade (Putnam, 1992). It is not surprising that some studies (Boyle, 2010a, 2010b, 2013) have also shown that students' lecture notes have a moderate positive correlation (about .53) to student performance on tests. This evidence serves to reinforce the point that not only do notes help students learn during lectures, but having complete and accurate notes can provide ample material with which students can effectively prepare for class tests.

Cognitive Demands of Learning During Lectures

Unfortunately for students with disabilities, recording notes during fast-paced lectures can be a daunting task. Students must listen for incoming lecture content, discern important points from less important points, process verbal information, and record/write down information in note form; in many cases these processes occur almost simultaneously (Boyle, 2013). According to Piolat, Olive, and Kellogg (2005), multiple cognitive processes must be coordinated in rapid succession for note-taking to be successful. If students experience executive function difficulties, complex, multitasking activities such as note-taking can be particularly challenging. Meltzer and Krishnan (2007) found that these executive function difficulties prevent students from using efficient strategies, using them in a flexible manner during problem solving tasks, and might explain why these students struggle with self-regulation and monitoring of strategies during complex learning tasks. Considering that most students typically write about about 17 to 20 words per minute and teachers present at approximately 110 words per minute (Boyle, 2013), it is not surprising that note-taking is such a cognitively demanding task. Moreover, because of the temporal nature of note-taking, without the aid of a recording device, if students miss a lecture point during the lecture, more than likely the information will be lost.

Note-Taking Problems Reported by Students

Because of the complex nature of note-taking, students with disabilities have reported difficulties while recording notes during lectures. In findings from Boyle, Forchelli, and Cariss (2013), researchers found that eighth-grade students with high-incidence disabilities had note-taking difficulties during lectures in a number of different areas. When these students ($N = 37$) (i.e., who were in inclusive science classes) were asked to rate ten categories of potential note-taking difficulties, students rated the five most difficult areas as follows: writing fast enough, studying notes, deciding what is important to record, making sense out of notes after the lecture, and understanding what the teacher is talking about during the lecture. These survey results concur with an earlier a study by Suritsky (1992) who asked college students with learning disabilities ($N = 31$) to report areas of note-taking difficulty during lectures and found that students reported the top five as follows: writing fast enough, paying attention, making sense of notes, deciding important information to note, and understanding the professor. These difficulties often result in poor performance of recording notes and, subsequently, poor test performance.

When compared with peers without disabilities, students with disabilities seem to have concerns that reflect deficits in listening and note-taking skills. For example, Ward-Lonergan, Liles, and Anderson (1998, 1999) conducted two studies among middle school students with learning disabilities and found that when these students viewed short (e.g., 5.5 min), videotaped lectures they performed poorly on comprehension and recall measures. In particular, when students with learning disabilities were asked to retell the lecture, on average, they recalled fewer linguistic units (also called *t-units*) compared to peers without disabilities and when answering comprehension questions about the lectures, answered fewer correct literal and inferential questions compared to peers.

Previous research that has compared the note-taking performance of students with learning disabilities and students with no learning disabilities (i.e., general education peers) has found that the former group recorded fewer notes and performed worse on a test of the lecture than did the latter group (Boyle, 2010a). In particular, students with learning disabilities recorded about half as many total notes, less than half as many important lecture points, and about half of the total words when compared with students with no learning disabilities. In this same study, students' poor note-taking skills

appeared to be reflected in their poor performance on a test of lecture comprehension, as students with learning disabilities scored 20% lower than did students with no learning disabilities (i.e., 47% vs. 67%).

Note-Taking Accommodations and Shortcomings

In many schools, students with disabilities often receive accommodations, such as having another student take notes (i.e., scribe), being provided with teacher-constructed guided notes, or being allowed to tape record the lecture. Although these accommodations might seem useful, they can inhibit learning for students with disabilities. First, having a scribe record notes for a student with disabilities allows the student to assume a passive learning mode during the lecture (i.e., because another student is recording notes for him or her), thereby missing the benefits of active participation in the lecture (Ruhl, Hughes, & Gajar, 1990). Moreover, students who assume a passive mode have been reported to ask fewer questions about confusing information (Ruhl et al., 1990) and encode less information to long-term memory because they are not actively processing information in working memory (Armbruster, 2000; Kobayashi, 2006).

A second common accommodation for students with disabilities is that teachers can provide students with teacher-constructed guided notes. Although this may be feasible for some teachers, Lazarus (1993, 1996) has reported that teacher-made guided notes may reach lengths of up to 25 pages per chapter and teachers have reported that it takes 1.5 to 2 hr to construct guided notes from one chapter, making it very time consuming for most teachers. While guided notes are designed to increase active listening and participation for students who use them, researchers (Haydon, Mancil, Kroegor, McLeskey, & Lin, 2011; Lazarus, 1991) have pointed out that the main drawback of guided notes is that it is questionable whether students who use guided notes actually learn independent note-taking skills. With most guided-note formats, students simply learn to follow along with the teacher and use the guided notes (i.e., outline) to fill in the rest of the notes during the lecture. In some cases, guided notes were constructed using a Cloze procedure (Sweeney et al., 1999) which only require students to fill in the blank space (i.e., with one to three words) as the teacher progressed through the lecture. Another drawback of guided notes is that not all teachers provide notes or handouts to students in their classes (Maydosz & Raver, 2010).

The third accommodation used by students with disabilities is to electronically record the lecture. Although this may be useful to help students fill in gaps in their notes after the lecture, the main drawback with this accommodation is that it might be time consuming to listen to the entire lecture again while recording notes a second time. Another possible hindrance is that some teachers may not allow students to record lectures (Fuller, Healey, Bradley, & Hall, 2004). Although the aforementioned note-taking accommodations can serve as temporary solutions, teachers should consider teaching students with disabilities note-taking skills that they can practice and use in their classes.

What Exactly Is a "Good Note-Taker"?

While no studies exist on the specific characteristics that make secondary students proficient note-takers, there have been a few studies on college students' note-taking ability (Einstein, Morris, & Smith, 1985; Hartley & Marshall, 1974). This research, along with recommendations from other note-taking researchers, provide a larger picture of the characteristics of a successful note-taker.

Self-Regulation

Self-regulation in note-taking allows students to assess and monitor their note-taking strategies before, during, and after note-taking (Bonner & Holliday, 2006). This takes efficient metacognitive skills as well as appropriate regulation of attention. Students are required to listen to a lecture, make decisions about what is to be written, and physically write at the same time (Quintus, Borr, Duffield, Napoleon, & Welch, 2012). In addition, while engaging in the lesson and making note-taking decisions, good note-takers will relate the information to what they already know and let that inform what is written down. This deeper processing of the material enhances comprehension (Cohn, Cohn, & Bradley, 1995), but takes sufficient self-monitoring and reflection.

Accuracy

Recording material from a lecture is only useful if the information is accurate. Later review of inaccurate notes will hinder, rather than help a student succeed on tests. A proficient note-taker will be conscious of recording accurate information and ask for clarification when they are confused or unsure. Working memory, the ability to temporarily store, manipulate, and transform incoming auditory and visual information (Baddeley, 2000), is an integral part of this process. The working memory demands of note-taking are large, requiring a student to remember chunks of information, manipulate the information to best fit their notes and personal knowledge, and make split second decisions on what will be included. This process can lead to errors and gaps in information if not consciously monitored by the student, as well as the teacher.

Organization

Organizational decisions are also important for a note-taker. For notes to be useful as later study aides, the student must organize their thoughts and ideas in a logical and understandable sequence. From a macro viewpoint, Bonner and Holiday (2006) found that students mentioned organization of notes (e.g., headings, subheadings, logical sequence of topics) as a hallmark of good notes. Teachers who use guided notes with their students have for some time known about the advantages of applying structure in their notes, as supported by research on guided notes. In a research synthesis of note-taking interventions, Boyle and Rivera (2012) reported that among students with disabilities, guided notes were effective

at increasing accuracy of notes, as well as test scores. It appears that providing an organization (i.e., structure) via guided notes seems be useful at helping students learn lecture content.

On the micro level, researchers have found that when organizational lecture cues are used in lectures, students record more lecture cues and details, and students perform better on tests of lecture content (Titsworth, 2001; Titsworth, 2004; Titsworth & Kiewra, 2004). According to Titsworth (2001), organizational lecture points (e.g., the four main types of electric energy used in plasma engines are laser, microwave, nuclear, and solar) are natural chunks of information that can be used efficiently by working memory and facilitate schema development in students. Similarly, researchers have demonstrated positive correlations between recorded cued lecture points in notes (i.e., both organization and emphasis cued lecture points) and test performance in middle school students identified with learning disabilities, lending support to Titsworth's research on organizational aspects of notes (Boyle, 2010a, 2013).

Recognition/Discrimination of Teacher Cues

Recording important and relevant lecture points rather than the teacher's words verbatim allows students to capture the most helpful information in an efficient and accurate way. Bonner and Holliday's (2006) study found that college students reported needing to interpret their instructor's nonverbal and verbal cues in order to recognize the most important lecture points. Studies have demonstrated that students with less experience and background knowledge have a difficult time recognizing and discriminating these teacher cues during lectures. For example, Einstein and colleagues (1985) found that proficient note-takers recorded and recalled more highly important lecture points than poor note-takers, thus demonstrating their ability to recognize important lecture points during lectures, and subsequently record them in notes. Boyle (2010a) found that students with learning disabilities had a more difficult time recognizing cued lecture points than did peers without learning disabilities, given that fewer cued lecture points were found in the notes of students with learning disabilities.

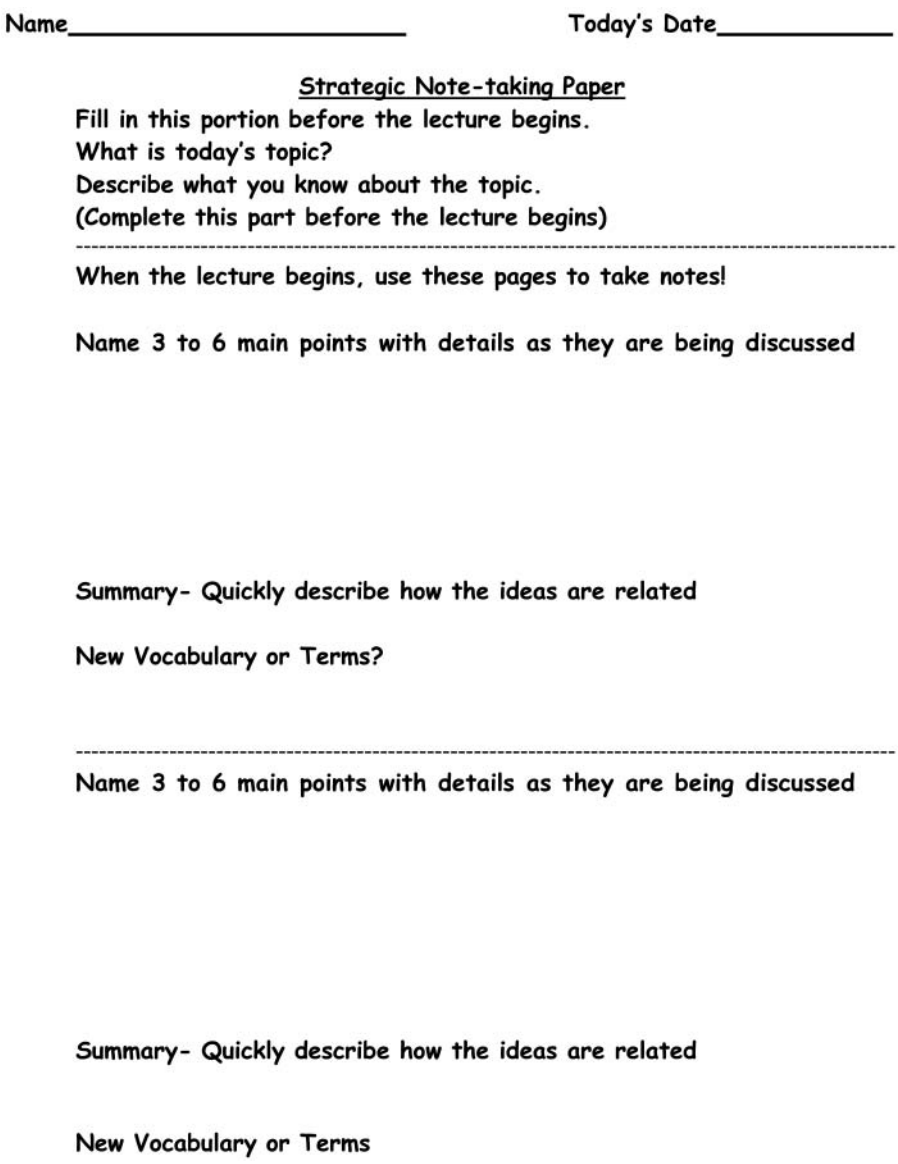
Review of Notes

Although there has been debate over whether the benefits of note-taking come from the immediate act of writing down notes or having students study and review from previously taken notes (Bonner & Holliday, 2006), many teachers encourage the latter. Successful students use lecture notes to supplement information from their textbook when reviewing for tests and checking for their own comprehension. Likewise, students who review notes can benefit by performing better on quizzes and tests. For example, Lazarus (1991, 1993) reported that when students with disabilities used a 10-min review after recording notes (through guided notes), their performance on quizzes was on average 24% higher compared with sessions with no review. These studies corroborate the results of other studies that found large effect sizes (0.75 and 0.77; Kobayashi, 2005) for "note-taking plus review" sessions on measures of lecture comprehension among students without disabilities.

How Can We Help Students Become Better Note-Takers?

As discussed, accommodations for note-taking (e.g., guided notes, recorded notes) may not be the best avenue to support students' note-taking abilities, as it may reinforce students' passive model of learning. Instead, students should learn how to use note-taking skills or a strategy to help them engage in the lecture and become active note-takers. One such strategy, the strategic note-taking intervention, has shown to improve note-taking skills and increase comprehension of lecture information for both students with and without disabilities (Boyle, 2010a, 2013; Boyle & Weishaar, 2001; Lee, Lan, Hamman, & Hendricks, 2008). The strategic note-taking intervention uses both the CUES+ strategy and strategic note-taking paper to provide structure to the note-taking process and assist students in retaining more information during lectures. The structure aims to focus students' attention on teacher cues and vocabulary in the lecture, as well as help students organize lecture content through clustering similar lecture ideas and categorizing summarized lecture points. The CUES+ strategy is a mnemonic device representing five steps that prompt students to perform different actions using the strategic note-taking paper. The "C" stands for *Cluster*, where students are reminded to group lecture information into manageable units of three to six semantically similar ideas and record the chunked ideas on the strategic note-taking paper. The "U" stands for the *Use* step, which signals students to attend and listen for teacher cues (i.e., number cues and importance cues) during the lecture and, when they hear these cues, record the lecture points that are associated with them. Next, "E" stands for *Enter*, where students listen for and record vocabulary words from the lecture in the appropriate area on the strategic note-taking paper. In the "S" or *Summarize* step, students are to write a word or words that would categorize the three to six lecture points they have already listed (i.e., clustered together) on the strategic note-taking paper. Last, the "+" indicates that the student should attempt to use symbols or abbreviations whenever possible (see Figure 1 for an abbreviated version of a strategic note-taking paper).

Results from the Boyle (2013) investigation best exemplify the effectiveness of strategic note-taking for middle school students with and without disabilities. Boyle reported that both students with and without learning disabilities who used the intervention scored better than did peers who used conventional note-taking on measures of the cued lecture points recorded (e.g., emphasis and organization cued lecture points), total lecture points recorded, number of vocabulary recorded, and total words in notes. In addition, students with learning disabilities in the strategic note-taking group scored as well as or better than students without disabilities in the control group. Results from other studies (Boyle, 2010b;


Name_____ Today's Date_____

Strategic Note-taking Paper

Fill in this portion before the lecture begins.
What is today's topic?
Describe what you know about the topic.
(Complete this part before the lecture begins)

When the lecture begins, use these pages to take notes!

Name 3 to 6 main points with details as they are being discussed

Summary- Quickly describe how the ideas are related

New Vocabulary or Terms?

Name 3 to 6 main points with details as they are being discussed

Summary- Quickly describe how the ideas are related

New Vocabulary or Terms

Fig. 1. Strategic note-taking paper (abbreviated version).

Boyle & Weishaar, 2001) also demonstrate that students with disabilities who were taught strategic note-taking outperformed peers with disabilities who used traditional note-taking to record notes during lectures.

Moreover, a study in progress by Boyle and colleagues, funded by a federal Institute of Education Sciences grant, involves collaboration with teachers and students to improve the strategic note-taking strategy. During implementation of the strategic note-taking strategy, the research team realized that the "CUES+" mnemonic did not include a step to remind or direct students of the importance of revisiting material from the lecture. Therefore, the "S" of the "CUES," was changed from "Summarize" to "Study." The "Study" step directed students to look over their notes three times. The strategic note-taking paper was also changed to facilitate the review/study of notes by students. In addition, using feedback from teachers that their students were missing some lecture material in their notes, the "Study" step was later changed to "Share." The "Share" step aimed to engage students in dialogue about key points in the lecture. This had a dual purpose: to help students record any missed lecture notes and to engage students in academic discussion about their notes. During the "Share" step, students were paired up and spent two minutes each explaining their notes to their partner.

Enhancing Lectures to Help Students Record Better/More Notes

Suritsky and Hughes (1996) suggested a number of ways to improve students' note-taking ability. An important first step involves teaching students how to listen to verbal information. In most classes, students do not normally receive instruction on how to listen to acquire information during a lectures or discussions. According to Suritsky and Hughes,

this can be do through a three-stage process. First, there are discussions surrounding prelistening skills in which students are asked to frame their listening to acquire information from the lecture; second, in listening skills, students work to improve processing of verbal information presented in lecture; and third, in follow-up, students can practice these skills through role-play. The goal of these three phases is to improve the listening skills of students.

Other researchers have suggested that teachers should write key lecture ideas or vocabulary words on the board (Boch & Piolat, 2005; Haydon et al., 2011; Maydosz & Raver, 2010). Information written on the board provides a visual cue to students directing them towards important information and is more likely to be recorded in students' notes (Locke, 1977). It also provides a permanent product that students can revisit if they miss information that was verbally presented, which can be particularly helpful for children who process information at a slower rate. In addition, these visual cues also provide a frame of reference for students before the lecture. For example, writing the objectives for a science lecture, such as "Define why gravity is important" and "Understand how speed is impacted by gravity," will help frame and focus students' attention to specific information provided in a lecture.

Likewise, providing an advanced organizer can also help students frame lecture information (Marzano, 1993). An advanced organizer can provide verbal and/or written information that allows students to form a framework of the lecture before presenting the actual lecture (Ivie, 1998). When presenting an advanced organizer, teachers should try to link information to students' background knowledge to make more meaningful relationships with the lecture content. Throughout the lecture, the teacher can refer back to the advance organizer to make links between the organizer and current lecture points. Related to this, teachers can also pose questions in a lecture to cue students to test their own knowledge of lecture information and create new connections with presented information (Marzano, 1993). This can work by encouraging students to use metacognitive skills—by making them think about the knowledge they just acquired and assess their mastery of the information. In addition, incorporating questions into lectures might assist students with slower-processing skills and allow them to catch up with the lecture.

The strategic note-taking strategy also addresses the balancing act of pace in a lecture. One aspect of lecture pace that can be moderated by teachers is their rate of speech and interjection of pauses. Slowing down the pace of a lecture will allow students to process information and record more points from the lecture (Maydosz & Raver, 2010). Likewise the pause procedure allows for the lecture to be broken up with periodic 2-min pauses (Ruhl et al., 1990; Ruhl & Suritsky, 1995). Using the pause procedure, during each 2-min pause paired students shared lecture information with each other using their notes. The pause procedure has been shown to assist students at recording more ideas in notes and recalling more lecture content (Ruhl & Suritsky, 1995). Another aspect of pace is finishing a lecture early enough to allow students time to review lecture information. Allowing students time to review their notes either independently or in a group has been shown to boost lecture recall and comprehension (Kiewra et al., 1991; Lazarus, 1993).

Haydon and colleagues (2011) recommended that note-taking interventions be used in combination with other instructional strategies (e.g., response cards with teacher feedback) or other modalities of instruction (e.g., PowerPoint presentations, digital pens, or iPads with note-taking apps) to maximize learning opportunities and increase engagement for students with disabilities during lectures. Likewise, these authors suggest that note-taking interventions be used with students in preservice teaching programs so that future teachers acquire a firsthand understanding of how these techniques work and might be more inclined to use them in the classes that they will teach in the future.

As previously reported, standard note-taking accommodations are also available for students (Suritsky & Hughes, 1996). These include providing copies of notes to the student before the lecture is presented or providing incomplete or guided notes that allow the student to focus on filling in key details. Teachers can also allow students to audio-record lectures to provide students to follow-up on missed information after class. While this might increase the amount of time that students spend with their notes, some students might be reluctant to spend the extra time reviewing their notes.

Generalizing Note-Taking to Other Classes

While the strategic note-taking studies have been used in science classrooms with science curricula, these skills can be generalized to other subject areas. Social studies classes are the most easily transferable for strategic note-taking. Similar types of lecture structure are used to convey important facts and information, whereby students need to pick and choose the most important points. In English classes, note-taking strategies should also work well for lectures on literary terms, historical information, or vocabulary words. Likewise, note-taking techniques can be used in conjunction with discussions about plots, themes, or characters from a book or story.

It is important to note however that students often need explicit instruction to generalize strategies across academic domains (Ellis & Lenz, 1987). This has been found especially true for students with learning disabilities, as spontaneous generalization of learned skills often does not occur naturally (Deshler, Warner, Shumaker, & Alley, 1983). In addition, Suritsky (1992) found that although generalization of a note-taking strategy did occur for many college students, the notes were of a lower quality, indicating that teachers should monitor students' notes in generalized classes. When students use a strategy in multiple academic areas, they should be provided with specific feedback to increase the chances that they will generalize the skills to new settings (Ellis, Lenz, & Sabornie, 1987). Equally important, teachers should teach students to use their metacognitive skills to recognize of the task demands (e.g., "The class is discussing George Washington; I should probably record some notes.") and incorporate the appropriate note-taking strategies.

Promising Technology for Note-Taking

There is an increasing amount of support for technology in the classroom to aid students' learning (Kagohara, 2011; Schepman, Rodway, Beattie, & Lambert, 2012). Two promising technological developments that can aid students' note-taking ability are digital pens and handheld tablet applications.

The first promising technological innovation that may help students compensate with poor note-taking skills is the digital pen or Smartpen pen (Hannon, 2008; Stachowiak, 2010). A smartpen is an electronic pen that contains a micro-camera that records information. There are two categories of pens, including a freeform pen can be used on any paper and a pen that uses special dot paper to track note-taking and audio of the lecture (VanSchaack, 2012). The freeform pen uses wireless positioning technology to track note-taking on a page and uploads notes as digital images and pictures. The other form requires a specialized dot paper for the pen's camera to monitor movement on the paper (e.g., recording notes).

More recently, smartpens now use audio recording during a lecture to enhance the note-taking experience (VanSchaack, 2012). In addition, smartpens use a special dot paper that contains *microdots* that tell the location of the pen on the paper via the pen's micro-camera. This facilitates coordination between written and audio material for students during lectures. For example, if the student was only able to record a partial lecture point (e.g., "plasma") on the dot paper, after the lecture ends, the student can go back and tap the written word *plasma* (i.e., a partial lecture point) and that particular audio portion of the lecture will be played (e.g., "Plasma is the fourth state of matter. It is an ionized gas."), enabling the student to amend their lecture notes of any missing/incorrect information. Any training should involve the teacher modeling how to use the smartpen, guided practice to allow students opportunities to use it fluently, and then independent practice to assess student's independent use of the pen.

Another technology is the use of handheld tablets (e.g., iPads). Handheld tablets aid a student's ability to take in information in an increasingly mobile and tech-savvy manner (Schepman, Rodway, Beattie, & Lambert, 2012). For students with disabilities, these apps can be particularly helpful for helping them organize and store information in one place. Similar to smartpens, some tablet apps allow both audio and written information to be recorded simultaneously for students to revisit missed information after a lecture. However, unlike the smartpen, some tablet and computerized note-taking apps can transform students' handwriting to type-font. This may be a particular advantage for students with handwriting difficulties. Some of the technologies also force students to use more higher-order thinking strategies to organize and disseminate information. Many apps are marketed for use on computers and tablet technologies; we subsequently highlight a few.

Penultimate (Evernote, 2013) is an app that attempts to mirror the natural note-taking process, whereby a student records notes and pictures using a stylus that transforms information into a document on the tablet screen. The document will show the student's handwritten notes and can be saved or exported to an e-mail account for later review. Students can record notes on documents of varying types (plain, lined, or graphed), varying pen thicknesses, and colors of ink. More information is located at https://itunes.apple.com/us/app/penultimate/id354098826?mt=8.

Another app, NotesPlus (Viet Train, 2012), attempts to blend audio-recording of notes with typed or handwritten notes. This allows students to either use a stylus or a keyboard attachment to take notes. This application also has additional benefits for students with disabilities in that it has shape recognition technology to that helps with drawing shapes and symbols and it also has a blow-out window to allow students to write larger than what is allotted on the lined document. It also has a folder system to allow organization of multiple types of notes. More information on this app is available at http://notesplusapp.com.

A very similar app, AudioNote (Luminant Software, 2013) also allows students to record notes and audio of the lecture simultaneously. In addition, this app synchronizes the audio and written notes in real time, allowing information to be kept organized and easily referenced. More information is available at http://luminantsoftware.com/iphone/audionote.html.

Summary

Learning verbally presented information, via lectures or discussions, requires students to rely heavily on listening and note-taking skills to efficiently comprehend and retain oral information (Suritsky & Hughes, 1996). Student performance in content area classrooms is particularly dependent on the quality of information obtained from lectures. Good note-taking skills are encompassed by multiple skill sets used simultaneously. A student must have the ability to accurately record and organize notes, self-regulate to assess and monitor the use of note-taking strategies, and revisit them to amend any misheard or inaccurate information.

Students with learning disabilities are at a distinct disadvantage for accessing verbally presented information via lectures because of the need to simultaneously access and use cognitive and motor skills.

Despite the note-taking difficulties encountered by students with disabilities during lectures, teachers can take a number of steps to ensure that all students are active participants in the lecture. First, to help students record accurate and more notes, they can modify the way they lecture to include more cued information. For example teachers can write vocabulary (or difficult-to-spell) words on the board ahead of time to help students with spelling difficulties and to alert them to important vocabulary that they will see in the lecture. Likewise, they can write an outline on the board ahead of time or preview relevant components of the lecture to help students organize their notes and to prime students to listen for important lecture content.

Second, teachers can teach all students note-taking skills such as recognizing cues that the teacher will be using during the year, modeling a simplified heading/subheading system for recording notes, discussing how to use abbreviations (i.e., think *texting*) to simplify terms or vocabulary, and teaching students to review notes afterwards to fill in gaps in notes.

Teachers can either teach these skills separately or through a strategy such the strategic note-taking intervention.

Third, teachers can incorporate technology for those students with weak note-taking skills. Technologies such as iPads and smartpens have the potential to help students compensate for poor note-taking skills, however, as with any new technique, teachers should use modeling and guided practice to help students learn how to use the technology properly and accurately. In some cases, teachers can develop a strategy to help students learn the steps to properly use the new technology to record notes during lectures. As in other areas of the untaught curriculum (e.g., test-taking and study skills), note-taking skills represent one type of hidden skill that is often overlooked by teachers, but in the end, is a critical skill for all secondary students to learn, especially for students with disabilities.

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