Speech Recognition, Disability, and College Composition

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Abstract

This study examined the composing processes of five postsecondary students who used or were learning to use speech recognition software (SR) for college-level writing. The study analyzed their composing processes through observation, interviews, and analysis of written products over a series of composing sessions. This investigation was prompted by a perceived lack of published research on SR and the writing processes of college students with learning disabilities (LD) as well as a dearth of research in the area of assistive technology (AT), specifically in college writing courses. While some students dropped out of the study before its completion, results confirmed earlier, limited research that found SR to be an effective writing technology for some college students with chronic spelling difficulties but indicated that college writers with attentional challenges and/or physical difficulties keyboarding may benefit from using SR, too. Findings also suggested that a subset of successful SR users may demonstrate a strong aversion to formal planning but that some planning does occur because SR requires users to formulate sentences silently and then express them clearly and continuously, further indicating that writing processes during dictation may be more internally focused than the general processes of writers while keyboarding. Finally, the study noted that SR is not yet suitable for general use in the college composition classroom; thus, SR will likely remain an AT rather than a new media technology adopted for broader use. Therefore, it is incumbent on disability service providers to identify students who may benefit from SR and offer access and training on their campuses.

Keywords: Speech recognition, assistive technology, learning disability, composition

In public universities in the United States the number of students considered marginalized for any reason continues to grow. The need to increase and maintain enrollment and the democratic value of equal access to education guarantee that the borders of college composition courses will continually expand to include more diverse student populations. Of the students in college writing classes who may be on the boundaries in one way or another, students with disabilities remain among the more marginalized. The Conference on College Composition and Communication's (CCCC) 2011 position paper, "A Policy on Disability in CCCC," recognizes the presence of these students and makes clear that "people with disabilities have been oppressed and continue to be relegated to the margins" (para. 3). While definition and measurement issues surrounding the concept of disabilities remain complex, students with reported disabilities make up almost 11% of all postsecondary students in the U.S. (Government Accountability Office [GAO], 2009). It is important to note that disclosure of disability at the postsecondary level is voluntary, so there are likely many more college students who have disabilities than are reported. Current estimates show that just over half of college students who received disability-based services in secondary school no longer considered themselves to have a disability at the postsecondary level and, even among those who did think of themselves as having one or more disabilities, about 10% did not report it (Wagner, Newman, Cameto, Garza, & Levine, 2005). Because of progress in special education, as well as improved access for students with disabilities to higher education effected by federal legislation, composition instructors are

increasingly likely to encounter students who have learning disabilities (LD). This rise in students with LD and other disabilities creates a growing need to embrace a range of approaches to teaching college writing effectively to a diverse student population.

This study examined the composing processes of five postsecondary students who used or were learning to use speech recognition technology (SR) for college writing over a series of composing sessions. The investigation was prompted by a perceived lack of research on the writing processes of college students with LD, as well as a perceived lack of research in the area of assistive technology (AT) in college composition. This study asked if students, particularly those with disabilities, might benefit from the use of SR as a composing tool, how they might benefit from SR, and if college-level writing instructors should add SR to their courses as a new media tool, an AT, or at all. This project explored the commonalities in the composing processes of college students who used SR in one or more composing session through observation, informal interviews, and analysis of written products.

Literature Review

Disability in the College Writing Classroom

The number of faculty members outraged by the mere presence of those with LD in their composition classes – for an example, see Dunn's account of "Somnolent Samantha" (Brueggemann, White, Dunn, Heifferon, & Cheu, 2001, p. 375-82) – seems to be declining. Yet some in the field continue to question the legitimacy of LD and to believe that people with LD do not belong in college. Despite the intentions of most writing faculty to support the success of an increasingly diverse student population, many educators at the college level do not have the time or expertise to understand and help students who have disabilities. Faculty members' attitudes about students with disabilities and accommodations can vary significantly even across a single campus, and relatively few institutions offer training for faculty. Because of these reasons, a student with one or more LD entering a composition classroom can expect anything from welcoming support to outright hostility, from ready availability of AT to minimal and obligatory granting of accommodations, from celebration of the diversity of learners to illegal discrimination. Amendments broadening the definition of disability under the 1990 Americans with Disabilities Act (ADA) took effect in 2009, and new federal rules prescribing web accessibility standards in higher education are currently being finalized (Cummings, 2011). Yet despite recent fortifications to legal protections, the relationship between composition studies and LD remains troubled and largely unexplored.

Generally, a disability is "a physical or mental condition that causes functional limitations that substantially limit one or more major life activities, including mobility, communication (seeing, hearing, speaking), and learning" (Raue and Lewis, 2011, p. 1). This broad definition provides a framework for understanding the difference between impairment, something most people will experience at some points in life, and disability, a life-altering condition that seriously restricts vital activities needed to live. The classification is a social construct defined by the intent to protect vulnerable people and strengthen equality. While any number of disabilities can affect the manner in which students learn and communicate, the presence of invisible, language-based specific LD frequently complicates success for college students in composition classes. The range of language-based LD spans labels that include reading disorders and disorders of written expression. The National Joint Committee on Learning Disability defines specific LD, in part, as "a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical skills" (as cited in Cortiella, 2011, p. 3). People with LD are a heterogeneous group with regard to how they learn and process information. Heterogeneity not only reigns within the group but also within a single individual, whose abilities in some areas may be outstanding while very weak in others.

One example of a disorder of written expression is dysgraphia, a processing disorder that causes extreme difficulty with writing and organizing. Unfortunately, few educators at any level recognize this extreme inability to organize thoughts on paper, often chalking it up to laziness or poor handwriting, yet dysgraphia need not automatically prevent students from becoming able writers if they have access to remedial educational interventions and AT. For instance, Barbetta and Spears-Bunton (2007) found that SR could be an effective tool for those with dysgraphia. In addition, about one-third of those who have LD also experience Attention-Deficit/Hyperactivity Disorder (ADHD), a neurobiological difficulty in regulating attention (Cortiella, 2011). The cognitive inability to regulate attention can negatively impact writing in many ways, making organization especially difficult. Learning disabilities are subject to some degree of remediation through education, and AT provide some amelioration in many cases.

AT and SR in College Composition

Assistive technology is "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities." ("What Is Assistive," 2013, para. 1). Assistive Technology gives people with disabilities a mechanism to do what they need to do to learn, work, and live. For example, text-to-speech reading software that speaks text aloud provides a means for some students with print or visual disabilities to do what they could not otherwise do, functioning in the capacity of a "cognitive prosthesis" (Holmes & Sylvestri, 2012, p. 82-83). For students who have trouble keyboarding, AT for writing has also become more widely available. An especially effective AT for many students is SR that is often built into operating systems and is available as stand-alone programs. With this technology, the user speaks and the program transcribes. Using SR requires a fairly quiet environment, a stand-alone microphone or headset with a microphone, and individual program training for each user. As with text-to-speech technology, SR can be used both as an AT by those who need it and as an extension of everyday technology by those who do not.

Research on the writing difficulties of college students with one or more LD is rare, as is research on the use of AT by college students. Occasional articles on the intersection of LD and postsecondary composition can be found in major journals in the field that address developmental students (Dunn, 1995, p. 56); however, flagship journals remain almost entirely devoid of similar literature (Barber-Fendley & Hamel, 2004, p. 506). Among the top AT devices used in postsecondary education for language issues in the U.S., SR ranks fifth after audio books, portable word processors, word prediction software, and text-to-speech technology (Sharpe, Johnson, Izzo, & Murray, 2005, p. 9). Although advances in SR are "making a difference in the performance of postsecondary students with writing difficulties" (Martinez-Marrero & Estrada-Hernández, 2008, p. 60), it is still unusual to find references to SR in the literature. The paucity of research on the effectiveness of AT for college writing is remarkable, according to Holmes and Sylvestri (2012): "as far as can be discerned from attempting to find peer-reviewed articles, AT use to circumvent writing deficits has not been studied" (p. 90).

In articles that do address disability in college writing, scholars continue to insist upon increased attention to all disabilities in the composition classroom. Brueggemann et al. (2001) call for increased visibility of disabilities in the college writing classroom. These authors asked writing teachers to "learn to 'compose' without words—visually, graphically, orally, using new strategies that perhaps seriously challenge all our traditional pedagogical practices and our strongly held beliefs about literacy and writing as empowerment" (p. 392). The skills needed to produce a text-based essay or research paper differ from those needed to produce a multimedia presentation, yet this call for composing via different modes in order to broaden the definition of literacy intersects decisively with the shifting understanding of literacy brought about by digital technologies. This intersection presents an opportunity for all scholars and instructors of composition to consider students with disabilities as they interrogate their working definitions of literacy. The ongoing explosion of technologies commonly available for reading and writing magnifies this opportunity.

One significant study of SR use by college students from a vocational rehabilitation stance was undertaken by Roberts and Stodden (2005). They trained or offered to train 15 college students with LD in the use of SR. These researchers were specifically interested in the use of SR by college students with LD as a compensatory strategy for writing difficulties and whether this AT use would be continued by students. They found some evidence that writing improved through the use of SR but that the benefits of SR for writing were highly variable and depended on many factors. One meaningful result of the study was the generation of a list of characteristics for the ideal SR user that include the abilities to speak Standard English and tolerate a high degree of frustration (Roberts & Stodden, 2005, p. 61). As a result of the variability of results, those authors strongly cautioned against the notion of SR as a panacea for students with LD, a warning echoed more recently by Holmes and Sylvestri (2012). It was expected that similar characteristics would be important for the participants in this study and that results might vary significantly due to individual difference.

Li and Hamel (2003) reviewed the literature on the writing issues of college students with LD through 2000 and found that the writing difficulties of college students with LD included mechanical aspects such as "spelling, punctuation, and capitalization" and content aspects including "organization and coherence issues" (p. 29). Though SR may not benefit all college students with LD, it may help those who "possess oral communication skills superior to their writing abilities" (Li & Hamel, 2003, p. 34). A major reason for superior oral communication skills relative to writing skills is the neurologically based inability to spell

often seen in students with dyslexia. Higgins and Raskind (1995) described this problem in their report on a quantitative study of college students using SR, which found that writing quality was improved for students with intractable spelling issues when they used SR. In comparing the written products of students using no assistance, a human transcriber, and SR, they found that writing composed with SR received higher holistic scoring because of "big words," or words with seven letters or more (Higgins & Raskind, 1995, p. 167). The researchers postulated that SR allowed students to use "their more extensively developed oral vocabularies" in writing and "confirmed that a typical writing strategy for them was to substitute a 'baby' word for the word they really wanted to use to avoid the embarrassment of spelling it incorrectly" (Higgins & Raskind, 1995, p. 167). Students were freed from the "mental distraction of constantly having to check and recheck spelling" and cited this freedom as "one of the most positive features of the equipment" (Higgins & Raskind, 1995, p. 167). One college student interviewed in another study described the impact of SR on her spelling challenges:

> It's so cool because of the fact that I can say anything, [even] words that I have a hard time spelling. Words I hadn't dreamed of writing could be said. The program matched my vocabulary with my writing. Using words like imaginary, legend, big words that can really capture my thoughts and what I want to say. (Roberts & Stodden, 2005, p. 56)

The ubiquitous presence of spell-checkers may appear to obviate the need for AT for poor spellers, but one still has to be able to spell well enough to elicit the correctly-spelled word. SR provides a clear advantage to writers with severe spelling problems if their spoken vocabularies exceed those used in writing, and this advantage was an expected outcome of the current study.

Honeycutt (2003) reviewed the literature on general use of SR, much of it focused on dictation in business, and recommended further study of SR, especially as "a technology supremely fit for freewriting and drafting" (p. 83). On one hand, according to Honeycutt (2003), the speed with which SR can capture and display emerging speech makes it a remarkable tool for writing while, on the other hand, SR's persistent problem with transcription errors deters some users. Honeycutt (2003) cited word recognition errors and the need they create for users both to enunciate assiduously and to "speak in continuous phrases" as perennial SR challenges (p. 78). He also noted the greater efficiency of using the mouse and keyboard for editing compared with using voice commands to cut and paste text. In a comparative study between SR and keyboard transcriptions, Millar, McNaughton, and Light (2005) confirmed the inefficiency of voice editing and also found that the types of errors prevalent in the use of SR may be harder to detect because they are often correctly spelled words that are the result of transcription errors as opposed to incorrect words. These fundamental assumptions about speed, errors, style of speaking, and editing were expected to emerge as themes in this study.

Honeycutt's (2003) review of SR did not exclude the consideration of SR for use by people with disabilities, but it was concerned primarily with the potential for broader use of SR for composition. He raised interesting questions about how an individual's writing process may be affected by SR, citing Gardner's belief that writers may be auditory thinkers who "write from an inner voice" or visual thinkers "seeing whole paragraphs at a time" (Honeycutt, 2003, p. 86). By extension, it might be supposed that SR would be highly beneficial for those with a more auditory approach and less appropriate for visual thinkers. Though this project did not explore cognitive processes or learning styles, its results were expected to implicate the presence of these differences and their interplay with dictation.

Also important to Honeycutt (2003) was the consideration of planning relative to dictation, based on a "plethora of advice" that came from cognitivists during the 1980s recommending formal planning before writing or dictating (p. 90). Many composition instructors continue to maintain that prewriting heuristics and outlines are critical for effective academic writing. Simultaneously, many students resist the use of formal planning and some are able to produce high-quality work without any tangible form of planning. These students may be incurable procrastinators or, as Pollack (2009) observed, some may be "holistic" thinkers and writers "who need to see the big picture" (p. 74), which only arrives after "standing back from the information and letting it reconfigure" in their minds, allowing them to "'see' it in a new and meaningful way" (p. 83). According to Pollack (2009), dyslexics are often such holistic thinkers (p. 83). Honeycutt (2003) asked the question of planning relative to dictation: Does the speed of SR with its "external representation of evolving text … obviate the need for the elaborate, formal planning" suggested by earlier literature, or "does the need to enunciate clearly and speak in whole, well-formed phrases and sentences" require detailed planning be-

fore beginning to dictate? (p. 92). If Pollack (2009) is correct that many dyslexics think holistically and may resist planning, this could mean that a large subset of SR users may not need or may be strongly averse to using formal planning for dictation. This possibility was a consideration of the current study.

Students who must rely on AT to write often receive no training at all. When such training is provided, it usually begins and ends with a focus on minimal technical proficiency. Sharpe et al. (2005) found that 74% of graduates who used AT in college indicated that "they had taught themselves" to use it (p. 8). Pollack (2009) noted that AT training "is often an entirely technical affair: a crash course in technical ability that takes little account of their course, or learning needs and strengths" (p. 81). The financial cost associated with providing AT tools and training can be prohibitive for many postsecondary institutions. Mull and Sitlington (2003) list lack of funding, abandonment of AT devices by students, and lack of training for university faculty as major impediments to wider availability of AT in postsecondary settings (p. 30). Indeed, as Fichten, Suncion, Nguyen, Budd, and Amsel (2010) note, while students generally report that their information and communication technology needs are met on college campuses, students with disabilities report that their technological needs "were met least well" (p.150). The current study was unusual, then, in providing free access to SR and including training that specifically proceeded from the learning needs, interests, and strengths of its participants, with individualized training for new users of SR.

Looking for the link between research on SR in college writing and research on college students with disabilities makes sense. If the field of composition and rhetoric seems to have largely neglected the practical realities of disabilities in its scholarship, its scholars and instructors have risen to the occasion regarding the rhetoric of disability. The CCCC (2011) position paper on disability formally recognized the contribution of disability studies to college composition:

> Disability studies as it intersects with composition, rhetoric, and literacy studies has enlarged knowledge in our field. The critical lens of disability studies scholarship has produced new knowledge, for example, about variations in composing processes, alternative ways of working with students in the composition classroom or writing center, histories of oppression in education and literacy practices, theoretical explorations of queer and disabled subjectivity, and critiques of the exclusionary power of normate pedagogy. (para. 11)

Expanding inclusivity has become a fundamental principle that defines the work of the field of composition and rhetoric. This statement recognized the value of exploring different technologies for composing and of understanding new ways of teaching, learning, and defining writing in college composition. The current project found its place among research in composition at this precise point of entry. Specifically, this project seeks to answer the following research questions about SR as a composing technology:

- Is SR an effective tool for writers with disabilities to facilitate the production of quality written texts?
- What is the impact of SR on the composing processes used to create traditional, written texts?
- Is SR suitable for general use in the composition classroom or will it remain an AT to accommodate students with disabilities?

Method

Participants

Potential volunteers were selected with the help of the Disabilities Support Office at a community college and all five students who were invited to participate did so. Motivation for participation ranged from wanting to further the research about college students with disabilities to wanting to learn to use SR. Before beginning the study, researchers explained the purpose of the study, the collection and storage of data, and the resulting products of the research, and participants signed informed consent forms to indicate their willingness to participate. No reward beyond training in SR was offered in exchange for participation.

Participants ranged in age from 18 to 30 years and included three men and two women, all American, native speakers of English. Four of the five students attended a public community college and were engaged in composing tasks related to their coursework. The fifth study participant had recently graduated from a private junior college and was in the process of applying for admission to a four-year university. Four of the five participants were curriculum students with experience writing college papers and one was a developmental student who was just beginning a sequence of pre-curriculum classes. Three of the five subjects had completed the required semesters of first-year composition and were engaged in writing papers in other disciplines.

Despite complaints about their writing histories, the participants demonstrated little actual discomfort with writing, ostensibly due to past experience or pleasure through self-expression and hope for their development as writers through continued writing. Each had a distinctive approach to writing, developed through academic and personal practice. Together, these five students showed a range of composing and writing skills, grammar and mechanics skills, and proofreading and editing skills, with a tendency toward the higher end of the grading scale (A's and B's) on formal papers. All of the participants also demonstrated linguistic interest and ability. Specifically, each was capable or highly capable of effective oral communication, used a good-to-outstanding spoken vocabulary, and had a desire to improve written self-expression.

The participants varied in their experience with SR. Three had no previous experience, while two had used SR for multiple years. All five students had access to SR as a result of having formally declared disabilities, which ranged from the visible, physical inability to type using a traditional keyboard to invisible differences in brain structure (such as dyslexia, which causes a lifelong inability to decode text and spell adequately) and brain chemistry (such as ADHD, which causes a lifelong inability to regulate attention). The Disabilities Support Office verified these disabilities and recommended students for the study who were interested in SR. The researchers did not access the specific records and medical labels of participants; however, through interviews and observation, some participants disclosed their disabilities and the researchers noted others as they became evident through observation.

Pseudonyms were assigned to each participant. Table 1 provides an overview of the demographic descriptions for the subjects of this study.

Richard. Richard was a first-year community college student taking developmental reading and writing courses. His attentional challenges made sustained focus on writing difficult, yet he enjoyed creative writing. Richard's goal was to become a writer, so he was highly motivated to learn to use SR as an aid to his writing process. He was learning the basics of sentence grammar in his courses and his writing showed self-correction based on these new skills. Richard expressed hope that using SR would help him "become a writer," a career on which he had his heart set.

Ariel. Ariel was a first-year community college student who was taking courses with the hope of transferring to a university. Ariel was a very bright, energetic, and verbal student who could easily generate speech and communicate orally. Her writing was often stymied at the outset because of so many ideas pouring into her mind at once, making it difficult for her to control her thinking well enough to sort thoughts and sequence sentences. Her attentional difficulties increased the cognitive load of writing, stressing working memory enough to make composition a frustrating and often unsuccessful enterprise for Ariel.

Phoebe. Phoebe was a second-year community college student. Her educational goal was to complete her community college degree and then transfer to a university. Phoebe was a very fluent reader. Phoebe's challenges regulating her attention made it difficult for her to compose, yet she had completed her first-year college writing courses with A's. Her writing process consisted of having lengthy discussions on the topic with her grandmother and then writing out her entire paper by hand. She then typed her paper from the handwritten text. Going directly from silent thinking to typing did not work for Phoebe. She had learned to skip formal planning approaches such as outlining, moving directly from discussion to drafting. She was comfortable talking and could generate speech easily and quickly. She was excited about the possibility of using SR, especially because of spelling difficulties, but she exhibited apprehension because of her tendency to be, as she described it, "a little obsessive" about correctness, needing to have each sentence perfect before moving on to the next. Her need for discussion in order to clarify and develop her ideas prior to writing was not often met in her classes. Phoebe hoped SR would enhance her independence and speed in composing papers.

Ian. Ian was a second-year community college student. His goal was to become a rehabilitation counselor and he was moving along successfully in his educational program. Ian had completed the required sequence of first-year writing courses and he was composing a paper for a psychology course at the time of this study. He reported that he typically utilized the support of a learning specialist when writing papers, particularly for proofreading assistance. Ian was an experienced and capable user of SR, having begun using it in middle school due to physical disability and LD. He used SR on his laptop and carried a high-quality headset for dictation. He did all of his academic writing with SR and had learned many shortcuts to speed up his drafting processes. Ian was a student for whom SR was a well-honed AT that enabled writing. His individual writing process had developed around the use of the technology. He

Table 1

Demographic Descriptions

	Participants				
Characteristics	Richard	Ariel	Phoebe	Ian	Jonathan
Sex	Male	Female	Female	Male	Male
Age	18	19	21	20	30
Race	African American	Caucasian	Caucasian	Caucasian	Caucasian
Writing level	Developmental	First-Year	Upper-Level	Upper-Level	Upper-Level
Previous experience with SR	None	None	None	Extensive	Moderate
Identified disability/ies	Language-based LD	ADHD	ADHD & Psychological Condition	Cerebral Palsy & ADHD	Dyslexia

Note. Writing level in this study referred to the current placement of students in their writing courses. Richard was enrolled in a pre-curriculum, developmental writing course; Ariel was enrolled in a traditional first-year writing course; and, Phoebe, Ian, and Jonathan had completed the first-year writing sequence and were writing in upper-level courses. Identified disability/ies referred to those conditions disclosed voluntarily by participants and/or observed by the researchers during the study. The researchers did not approach this study on the basis of particular disabilities and did not want to make the students feel that they were involved because of disability. Instead, counselors who knew the details of their challenges suggested participants, and the researchers worked on the project with the purpose of understanding them as composers.

procrastinated more than the other participants, yet his writing process was efficient and effective once he got started. According to Ian, he had learned to "stay six-to-ten sentences ahead" as he dictated. He knew what glitches and inaccuracies to expect from the program and he could deal with them quickly.

Jonathan. Jonathan, the only nontraditional study participant in terms of age, returned to college at 28 after an earlier attempt that had been unsatisfying. Jonathan used alternate format texts ("books on tape") and had received remedial phonics tutoring in high school. He underwent a psychoeducational evaluation prior to entering a private junior college and learned the details of his dyslexia and his particular learning strengths and needs. By attending to and persisting with effective reading, writing, and learning strategies, Jonathan successfully completed a two-year program in business and was applying to a public university. He had learned to use SR his first semester in college. His experiences helped prepare him for some reading tasks, such as training the SR software, but reading complex college texts remained tiring and difficult. Jonathan explained that when he learned to use SR he "started over" with writing, paying less attention to spelling and mechanical errors in early drafts. By focusing first on composing, aided by SR that reduced spelling errors and effectively increased his written vocabulary to match his spoken vocabulary, Jonathan had learned to design written composition based on rhetorical situation and purpose first and to edit and proofread later as part of a multistep process. Proficient use of SR provided Jonathan the means to revise his initial drafts and to perform global editing, including moving chunks of text around and developing weak areas of his compositions. He had been an exceptional student in his college composition courses.

Materials and Procedures

Conditions and tasks. All of the students used Dragon Naturally Speaking software professional version 11 by Nuance Corporation for the study.

Although other SR products are available, including Windows Speech Recognition, TalkingDesktop, Express Dictate from NCH Software, and e-Speaking, Nuance currently dominates the field in speech-to-text technology with its Dragon Naturally Speaking and MacSpeech Dictate programs (Williams, 2010, para. 4). Students used desktop computers with Windows-based operating systems and high-quality headsets with microphones. Composing with SR requires a quiet setting to prevent the microphone from picking up random background noise that the software may attempt to interpret, so the observed SR sessions took place in specially-designed computer labs on two college campuses. All participants worked individually with a composition instructor who had training as a learning specialist.

Because participants were at different levels with their use of SR, their training was individualized to their needs. No generalized training protocol was used. The procedures for this study were constrained by time, lab availability, and differing degrees of proficiency among participants so that one predetermined training protocol was impractical. The tasks and procedures of this study were built upon the learning and writing needs, interests, and strengths of the participants.

New users underwent introductory training with SR that included a demonstration of the dictation process. Although the SR software was advanced enough to use right out of the box without setup, the manufacturers recommended that users complete a training process to create an individual profile. During the introductory sessions, participants trained the SR program to recognize their particular speech patterns to increase the accuracy of transcription. This process consisted of participants reading a selected passage aloud to the program. Students also learned basic commands such as starting and stopping the "listening" function, moving the cursor to new lines or paragraphs, and inserting punctuation. All participants were operating at a basic level and composing within the first session.

In the initial meeting, participants shared their previous experiences with writing, disabilities, and AT, responding to questions from the learning specialist. These questions were meant to be open-ended to elicit a broad range of responses. These are the general questions asked of each student:

1. What do you like/dislike about college writing?
2. What are your strengths and challenges as a writer?
3. How would you describe your writing process, from the time you get an assignment until the time you turn in the paper?
4. What is your experience with disability services, assistive technologies, and speech-recognition software?

Additionally, following each composing session, the participants were asked to share their thoughts on the experience of composing with SR and to reflect on their general feelings about writing in relation to SR.

Students who remained in the study met for additional composing sessions during which additional observation and informal interviews took place. The researchers scheduled five composing sessions for each participant over the course of a five-week summer session during which the students were enrolled in courses and would be on campus. Two participants attended all five sessions, one completed three sessions, and two completed only the introductory session. The writing tasks varied based on student needs and interests in order to enhance and support initial success with SR. Being allowed to experiment with authentic writing tasks while beginning dictation enhanced motivation. Writing tasks for beginners included drafting an email, writing a résumé, and writing a response to a prompt about personal interests. More competent writers composed formal, academic papers. The learning specialist interviewed participants before and after these additional sessions and observed them as they used SR to compose.

Data analysis. Through informal interviews, observations of participants while they composed with SR, and examinations of the documents they produced, this project investigated the methods and strategies they employed to create traditional, written texts using SR. The interviews enabled the researchers to gather information about the participants' past experiences with and evolving attitudes about college-level writing, their own writing processes (planning, drafting, and revising), and composing with SR, as well as their oral communication skills. Observations by the learning specialist during composing sessions allowed researchers to gather data about the speed, ease of use, and actual participant interaction with the technology while composing with SR. These observations also provided additional information about the participants' composing processes while using SR. Careful examination of the texts produced using SR provided evidence of the quality of the compositions holistically as well as with regard to specific issues of vocabulary, spelling, and errors. Researchers kept notes during all interviews and composing sessions and added a summative statement to those notes fol-

lowing each session. These notes were kept with copies of the texts composed during the SR sessions and these documents were reviewed for themes connected to previous SR research detailed in the Literature Review, including the following:

- The speed and ease of use of SR (Honeycutt, 2003) and the necessary ability needed to tolerate a high degree of frustration in relation to errors (Honeycutt, 2003; Roberts & Stodden, 2005);
- The importance of the ability to speak Standard English (Roberts & Stodden, 2005) and for strong, clear enunciation (Honeycutt, 2003);
- The benefit of SR for composers whose oral skills are stronger than their writing skills (Li & Hamel, 2003), particularly for spelling (Higgins & Raskind, 1995) and vocabulary (Higgins & Raskind, 1995; Li & Hamel, 2003);
- The impact of SR on composing processes, particularly planning (Honeycutt, 2003) and editing (Higgins & Raskind, 1995; Honeycutt, 2003; Millar, McNaughton, & Light 2005); and
- The results of composing with SR on the products as traditional, written documents and shifting notions of literacy (Brueggemann et al., 2001).

These themes emerged often quite differently for the participants depending on their level of proficiency with SR as a composing technology. Therefore, the users were classified as beginning, intermediate, and competent users of SR. Beginning users were those with no previous experience using SR. Within one session, these users were able to train the program and begin testing it after only a brief demonstration and limited instruction. The beginning users were able to compose simple documents with the guidance of the learning specialist but were not yet able to use SR independently or to compose documents that required extensive formatting. Intermediate users were those with some experience composing with SR who were able to produce a variety of documents independently, but who were still not entirely comfortable and confident in their ability to use SR as their primary composing tool. Competent users were so comfortable and confident in their abilities to compose with SR through sustained use that it was their preferred mode of composition.

Results

Findings and Discussion

Interviews with study participants revealed several commonalities related to SR and writing. All students who participated in this project were dealing with disabilities that made college writing particularly challenging in one way or another, yet all were strongly dedicated to academic success. All five participants also described how tiring writing was for them. All students complained about the focus on grammar and mechanics at the expense of content and idea development by both instructors and tutors. The idea expressed by Jonathan of being "shut down" by spelling before having the chance to "say anything" emerged as a consistent, powerful theme for these students. Despite these concerns, all participants reported seeking help with writing whenever possible from instructors, learning specialists, tutors, other students, and family members. These students demonstrated a remarkably high degree of motivation to improve their writing, especially in the face of learning differences, attentional challenges, and physical disabilities that often impeded their success. Many differences related to experience with SR and writing seemed related to level of proficiency.

Beginning users: Richard, Ariel, and Phoebe. Several important themes surfaced for new users. As expected (Honeycutt, 2003), new users began dictating very quickly and with little difficulty. Once the program was trained, all new users began testing it after only a brief demonstration and the introduction of a few basic spoken commands.

The literature (Honeycutt, 2003; Roberts & Stodden, 2005) suggested that several technical aspects of SR are crucial to the success or failure of students learning to use dictation. For new SR users, this study found that participants could begin dictation fairly easily, as all three were able to compose documents in their first session. Inserting punctuation into sentences orally also proved to be less difficult than anticipated: participants generally knew where to put periods, question marks, and, to a lesser extent, commas. Two particular issues predicted from the literature (Honeycutt, 2003; Roberts & Stodden, 2005) were confirmed for the new users: the need to speak clearly and forcefully in phrases that flowed and the need to ignore mistakes and keep speaking in order to maintain momentum. New users had various experiences with errors. Errors became an issue right away for two participants. These difficulties were handled in different ways in order to make progress with training. While learning to use the software,

students were persuaded to shift focus from watching text appear and apprehending possible errors to discussing topics of interest during dictation and only checking the screen after composing. In other words, participants used a conversational strategy for initial training. Once these students started talking about something engaging rather than watching for errors to appear, composing became much easier for them.

One new user, Phoebe, expressed specific apprehension regarding the emergence of dictated text and its "correctness." This was a concern transferred from her linear writing process in which she wrote every word out by hand and then typed the paper using a word processing program, a process requiring rigid and painstaking effort. She had composed that way to try to remember everything she wanted to say, to avoid general mistakes, and to try to avoid spelling errors. Her process was not only time-consuming but, as she lamented, it was also "not too good" at preventing spelling issues. Phoebe dictated the following before she had completed the reading to train the software. It followed from the question, "What are your career goals?" The verbatim text below shows errors typical of the unconscious use of SR, yet it also shows that almost anyone without much effort can use SR to generate text:

> Hello my name is Phoebe once some random woman came up to me she heard me talking to some friends and she told me a helical wonderful voice and told me I should go into radio. I'll know I welcome advice from different people just met to understand things than my own family yeah they want to put me in my different boxes that they see but that's not really cool so it's really hard.

Words came easily for Phoebe as long as she did not watch the screen for transcription errors, such as those captured above. With a little coaching and practice during the same session, Phoebe was dictating coherent sentences and enunciating clearly and forcefully enough to reduce transcription errors. Throughout the session, however, she continued to express anxiety over departing from her usual linear process of writing out everything by hand and completely editing one sentence before moving on to the next.

Richard, the other student for whom significant errors emerged, immediately faced the obstacle of clear enunciation. The program did not recognize his pronunciation of some words, and this impeded accurate transcription. During the reading required for training, Richard's reading dysfluency proved to be an obstacle as well. The sample text is Richard's first dictation after training the program. He was asked, "Do you have any emails you need to send?" This approach provided a practical use of SR. He opened his email account and dictated the following:

> Dear Johnny
>
> How you doing today, and I'm coming to see you this afternoon. Also my mom is going to come to your birthday party, I hope you get this message. Next time you will have a birthday party should invite some family members.
>
> We are going to have a bang up time. Uncle Charlie say he was going to have the apple eating contest and if you want to say anything else give me a call as soon as you get this letter.

Richard learned to add commas and periods during this initial dictation. He used the command "scratch that" a few times during this dictation because the program did not recognize words he was speaking. For Richard, continued use of SR would require practice speaking clearly and pronouncing words correctly. It is possible that dictation could limit his lexicon as much as typing does; in the first case, he might be restricted to only words the program can transcribe correctly and, in the second, only words he can spell. Although pronunciation of some words presented a barrier and limited his writing lexicon, Richard was able to use SR to further his creative self-expression. Dictation has the potential to capture Richard's ability to quickly generate engaging, wide-ranging narratives but only if he can put in the time needed to train the program effectively and develop the "disposition to tolerate high degrees of ambiguity and frustration" (Roberts & Stodden, 2005, p. 61). It was clear through this study that beginners can start basic dictation and even use SR for more advanced writing very quickly, though observations confirmed the need for strong, clear enunciation and for speaking in continuous phrases.

The third beginner, Ariel, completed the training smoothly and was dictating soon after. Ariel loved using SR right away because it let her speak, an enjoyable activity for her. Prompted to describe her athletic experience, she composed four paragraphs with ease during her first training session. Included here is a sample paragraph of that draft composition:

> My day is going pretty well. I'm really sleepy and I can't wait to go home and take a nap. This

> Dragon program is pretty awesome. I don't want to go to track practice later on today. I have practice at four o'clock. I have a sprinters workout today. I have to run a bunch of 100s and 200s and 400s today which I'm really not looking forward to. After that I have to go to weightlifting. Then after that I have to go on the two mile cool down. Then I go home, eat, take a shower, and go to sleep.

After dictating, Ariel formatted the paragraphs without prompting after learning the command, "New paragraph." She began adding periods and commas fairly reliably after three reminders. She independently performed minor editing at the end of dictation; for example, she removed several instances of the word "awesome." Ariel expressed interest in using SR in the future because she said that it helped her "get all the words out." This example suggested that SR could provide a workable solution to writing a rough draft for an articulate student who enunciates clearly, speaks in phrases, and has many words at the ready. Ariel completed only one SR session for this study, but she expressed motivation to continue working with the technology because it "made writing more fun." In this way, SR proved to be very advantageous as AT for highly verbal students.

All three new users quickly recognized that physically manipulating the mouse and keyboard was the most practical solution for editing text. This is because moving the cursor around, highlighting text, cutting, and pasting solely by voice command can be tediously intricate. This preference for editing with the mouse affirmed research expectations (Higgins & Raskind, 1995; Honeycutt, 2003) and demonstrated typical SR usage by those physically capable of doing so.

As expected from the literature (Higgins & Raskind, 1995), all beginners cited improvement in spelling as a potential benefit of SR because spelling had remained an intractable problem throughout their writing experiences. They liked the possibility of being able to write with words that they knew and used comfortably while speaking but might avoid while writing because of the impossibility of spelling them correctly. This potential for increasing the working vocabulary of these writers confirms previous research (Higgins & Raskind, 1995; Li & Hamel, 2003). Interestingly, the mechanical concern of punctuation did not appear to be as much of a problem as expected, at least not the simple insertion of periods to finalize sentences. With a few reminders from the trainer, students learned to insert periods quickly. In this case, students seemed able to transfer previous knowledge of mechanics readily to dictation.

Finally, these three new users also expressed interest in the possibility that writing longer papers would become easier for two reasons. First, the speed of dictated transcription compared with typing offered hope that writing would become less exhausting, a problem every student in the study mentioned. For instance, during her composing session, Ariel said it would have taken her a long time to type so much and she would not have wanted to start because of all the spelling errors that would have appeared. Dictating allowed her to get the ideas down quickly enough to keep moving without being overwhelmed. Second, two participants (Richard and Ariel) expressed interest in dictation so that they could orally release from their minds and then capture on screen the mass of swirling thoughts that came and went for them while writing. As Ariel explained, she often got stuck writing first drafts because of "too many words" that "try to come out at the same time." This cognitive overload could shut down her writing process altogether. Many writing instructors who are unaware of the effects of problems with attention such as those caused by traumatic brain injury (TBI) or ADHD may believe that everyone can learn to organize thoughts before writing, yet the study found this to be untrue. Capturing thoughts quickly on paper before they disappear from their minds had proven difficult in the past for these two students when keyboarding. In previous writing, the interplay of composing internally and composing externally by typing had not proven entirely satisfactory as a means to organize their thoughts, even with the use of an outline.

Intermediate proficiency: Phoebe. Taking the time to become a proficient user may require a pressing need or desire to do so. Unfortunately, the new SR users did not complete the offered training. Phoebe was the only new user who attended enough sessions to begin progressing toward intermediate proficiency, defined as the independent ability to produce documents of different types. For instance, she used a template from Microsoft Word to create a basic résumé. Before using dictation to create a one-page résumé, Phoebe discussed its contents and made notes by hand about what she wanted to include. The primary benefit of using SR for this project according to Phoebe was that spelling impediments were significantly reduced compared with typical word processing. Phoebe reported that spelling had limited her vocabulary and been a significant issue when keyboarding but that SR seemed to "know what [she] wanted to say" so that she was able to use

vocabulary that she would not have otherwise used. This affirmed earlier research on SR as it affects spelling and vocabulary (Higgins & Raskind, 1995; Li & Hamel, 2003). Some keyboarding was needed for the document, but the majority of the content was dictated. This project provided motivation for Phoebe, both in writing with SR and in furthering her career goals. She saw that her inability to spell need not prevent her from creating important documents.

Technological competency: Ian and Jonathan. Becoming comfortable with the technology takes desire and practice. Ian had started using SR in middle school and considered himself an expert at the time of the study. He explained his process of learning to use dictation as a challenge through which his father and teachers in middle school supported him. He was taught a conversational approach to SR, which he explained was to "make believe your paper is a person." As Ian was first learning to use dictation as a youngster, he claimed it was "hard to look at the computer as a person when you are really talking to an inanimate object." Over time, Ian became accustomed to this approach, though learning to use third person pronouns in dictation for academic writing posed special difficulties for him. His "conversations" with the computer, as he called them, went better in first and second person. He turned to SR for all his college writing and used the dictation application on his smartphone for "almost everything" else.

For editing, Ian used the mouse and keyboard because he claimed it was "much faster" than voice commands for making changes to the text. Ian's preference for manual editing reaffirmed earlier findings that SR users would rely on a mix of dictation, mouse, and keyboard for composition. Homophones remained one of Ian's error-based challenges in writing college papers, and he reported that he read his papers very carefully to find them, as speech recognition cannot distinguish between words that sound the same but are spelled differently. He lamented having problems with common homophones like "to, too, and two" and "there, their, and they're" among others. To maintain momentum in writing, Ian preferred to locate those errors after a draft was written rather than stopping frequently to make corrections. Ian preferred to avoid prewriting and outlines, reporting that he stayed "six to ten lines ahead in [his] head." He also shared that he had used thinking maps in high school and "hated" them.

A paper for a survey psychology class illustrated various types of errors, including dictation errors and problems with organization and grammar. Nonetheless, Ian's writing was good enough to earn a B on this paper. The errors he failed to catch and correct during proofreading did not prevent Ian's psychology instructor from judging his paper's form and content as satisfactory. This paragraph from his essay provides examples of a transcription error caused by SR, a typical word-choice mistake that could be made either typing or dictating, and other errors that may or may not have resulted from the use of SR:

> I noticed that the children, especially the younger ones were being constantly supervised by their parent, and there were no further then 3 feet away from their child at all times. Personally, I think that is a little too close. With a parent that is being so close to the child, the child will not have a good sense of adventure and will make it difficult in the social world later on in life. One of the good things about being so close is that when the child crosses a milestone such as climbing up the jungle gym without the aid of the parent. The parent is right there to give them to warn them in a positive manner. This positive feedback ranged from a verbal feedback, such as: "good job", "way to go", "You did it all by yourself". Of course, this gave the child, the confidence to do the activity that they will be praised for again and again.

For the SR error, Ian dictated "they were," and the program transcribed "there." Substituting "then" for "than" in the comparative adverbial phrase "then 3 feet away" represented a mistake that many students make in writing, one that was not caused by using SR. The later error of including two infinitive phrases "to give them to warn them" could be a result of the flow of dictation, but such an error could also occur in texts that are traditionally composed. Worth noting, as well, were the lack of spelling errors and the use of "big" words, affirming earlier studies that found SR beneficial for those with better-spoken vocabularies than written due to spelling issues. If anything, this document demonstrated the need for revision and careful proofreading faced by all writers, suggesting that the range of errors in SR-created documents may not differ substantially from word-processed college writing.

As a masterful user of SR, Ian was eager to offer advice to new users. He called the following his most important message: "Just don't worry about mistakes!" Regarding the interest instructors have shown in Ian's use of AT for composition, he reported that none of his instructors had ever asked him about it. This apparent indifference could result from many possible factors, including the similarity between Ian's papers and those written by students using word processing.

While Ian had years of experience using dictation, Jonathan had been using SR for only about two years. Jonathan reported that he became "comfortable" with dictation quickly and SR had become his choice for composing. He found that he completed his writing assignments faster and with higher quality. Spelling and keyboarding had presented serious obstacles for him, and, according to Jonathan, dictation bypassed the "major portion" of both impediments. Like Ian, Jonathan used the mouse and keyboard for formatting but dictated punctuation. He explained that he had to restrain the perfectionist in himself while creating drafts to avoid interrupting his dictation. While Jonathan described his tendency to "fix, sentence-by-sentence," he said that he learned to make corrections later in order to "protect his train of thought." For essay exams, Jonathan had the accommodation of using SR. Because the technology was physically situated in a quiet setting, separate from the classroom, this also provided an aid to his focus. According to Jonathan, this option was "better than sitting in a classroom" because his thoughts were "more congruent" and he felt "more confident."

Both of the study's competent SR users also composed papers in their heads, rarely creating any tangible planning documents. In contrast to Ian's contingent, six-sentence head start, Jonathan's prewriting stage could last weeks. Jonathan reported that he wrote "the paper in [his] head" before beginning the process of writing. Jonathan frontloaded the paper through what he called his "Zen process" of absorbing information and formulating the paper in his head. The early stages of his process, he explained, consisted of "idea churning" and "inner dialog." His methods for writing also included as much discussion as possible, for Jonathan viewed discussion as "rehearsal for the paper" and necessary to the "free flow of thoughts." For the most part, Jonathan used the same grammatical constructions in writing he used in speaking, and, because he was an accomplished speaker, this correlation was effective for him. Thinking about the college writing he had completed, Jonathan asserted, "I never wrote my papers. I spoke them." Jonathan used the process of composing mentally before physically even when he was keyboarding his writing in high school, but this process had become "more elaborate" with SR. He described this process as "speaking in [his] head," and reflected that he "could see the paper being written in [his] head." A short essay written by Jonathan for his first-year composition course demonstrated his ability to create a unified, engaging essay with syntactic and lexical variety. Included here is his introductory paragraph:

> It was so hot I could see the heat rising off the asphalt as I sat in traffic on the Beltline on my way home from Louisburg. As I sat in frustration, I began to look at all the vehicles lines up around me. I wondered where they were headed: Home? The shopping mall? The grocery store? They were all headed somewhere. Ever since the first Model T rolled off Henry Ford's production line, cars have always had the same purpose. No matter how old, how expensive, or how basic they are, cars must get us from point A to point B.

Because of the largely intractable inability to spell that comes with dyslexia, Jonathan's writing lexicon was greatly enhanced by the use of SR. The range of words he used in this short essay would have been diminished had he composed it using the keyboard. Dictation allowed him to utilize more of his spoken vocabulary for writing and this improved his academic success and confidence.

Jonathan expressed the most compelling description of the change in his writing sensibility once he discovered SR. He described his K-12 writing as suffering from "poor imagination" and as having been under attack from all sides because of spelling and grammar. After learning to use SR, Jonathan found that his "brain was not exhausted from writing the paper, so it was not as tasking to read for proofing right away." He asserted that learning dictation could "open up good writers" and that many writers like him have "special ability but "we just don't know it yet." Jonathan's ability to write came as a revelation to him only after he became proficient with SR.

Limitations

The present study faced several limitations, including the small number of participants, completers, and written documents. This study was primarily limited by a small sample size. The number of potential participants was greatly reduced by the fact that the research took place during the summer. Over the summer, there were relatively few students on campus and many had limited schedules due to off-campus work. In practical terms, the study was also limited by a lack of resources; simply put, using SR required expensive equipment and an isolated space. Researchers were dependent upon the availability of existing equipment in a shared lab. The low number of completers was a direct result of the low number of participants; beginning with only five participants meant that having two drop out significantly affected the study. Likewise, stronger conclusions would have been possible had more participants produced more

writing over more sessions. Finally, a more structured protocol for interviewing and textual analysis would have likely provided more generalizable data.

Areas for Future Research

This project suggested a number of interesting themes that should be confirmed through a larger study. Ideally, such a study would include a range of participants with different disabilities or a relatively large group with one verified diagnosis to determine more precisely how SR might work as AT for users differently depending on the disability with which they live. Having all students work in response to the same writing prompts and questionnaires would also likely provide more useful results.

Such research might specifically address some of the findings of the current study. For instance, a study might compare SR user perceptions of spelling and ease of composing in comparison with textual analysis of previous, traditionally written texts as well as texts composed using SR. Research might also focus on processes to reduce hypercorrection while composing (e.g., composing with the screen turned off) and ways to improve training of the program for students with reading disabilities.

Finally, for the experienced users of SR in this study, planning was a part of the writing process that had nothing to do with writing, outlining, or even drawing diagrams. Planning for these experienced SR users constituted an internal process of formulating sentences and even complete documents. It was also easy to pause the microphone and take short breaks from dictation to mentally prepare as needed. Dictation seemed to require a different kind of thinking in which sentences sprang from the lips of their creators more fully formed. This different process for sentence formation as dictated by the technology is reminiscent of Haas's (1996) claim that "different writing technologies can support very different mental processes" (p. xiv). These findings regarding planning and composing processes deserve further investigation to identify possible connections with specific technologies, specific disabilities, and/or specific cognitive styles.

Implications

Though this study could not precisely tease out the full impact SR has upon composition, the findings do suggest three general conclusions.

First, several of the technical aspects of using SR referenced in the literature were affirmed:

- Composing with SR seems both easier and faster than keyboarding (Honeycutt, 2003);
- Persistence with SR requires the ability to tolerate a high degree of frustration in relation to errors (Honeycutt, 2003; Roberts & Stodden, 2005);
- Success with dictation relies on the ability to speak Standard English (Roberts & Stodden, 2005) and to enunciate clearly (Honeycutt, 2003);
- SR is particularly beneficial for composers whose oral skills are stronger than their writing skills (Li & Hamel, 2003), particularly for spelling (Higgins & Raskind, 1995) and vocabulary (Higgins & Raskind, 1995; Li & Hamel, 2003); and,
- Users prefer to utilize the mouse and keyboard for editing (Higgins & Raskind, 1995; Honeycutt, 2003; Millar, McNaughton, & Light 2005).

Second, planning for dictation represented a critical issue for college writers who used SR. Except for Phoebe, all of the participants expressed very powerful aversions to outlining or even to making informal lists or notes to prepare for writing. Instead, they found discussion to be a highly desirable prewriting activity. All five agreed on the importance of talking out ideas and getting oral feedback from experienced guides, as well as the pleasure of exchanging and nurturing knowledge through conversation. Therefore, planning was a major issue in the use of SR but not necessarily for the reasons Honeycutt (2003) framed. Instead, it is probable that a major subset of successful SR users can and do write without formal planning such as prewriting heuristics and outlining. Indeed, the two competent users in the study strongly expressed rejection of outlining and other formal planning, suggesting potentially different writing processes due to SR and/or disability.

Third, the final significant implication of this project addresses SR specifically within the context of college composition. For three of the five students in this project, SR was clearly a superior mode for composition. Its speed allowed them to complete writing tasks more quickly and with less cognitive exhaustion. Dictating rather than keyboarding was a physical necessity for Ian, and the others in the group for whom SR was a good choice had an affinity for speaking. Yet this affinity was not necessarily related to an auditory cognitive style, as Jonathan was more of a visual thinker in terms of writing. He explained that he could "see the essay being written in [his] mind," which was representative of Pollack's

(2009) observation about dyslexics. From this study, it appeared that the interplay of cognitive style and writing method was specific, individual, and largely unpredictable. Both students experienced with SR affirmed that the process of dictation allowed them to produce higher quality academic prose than they would have been able to create by keyboarding. Yet SR clearly does not necessarily offer benefits for all writers. Even in this study that included students who had interest in using the technology, SR may not have been appropriate for two of the five participants, who experienced challenges with speaking/reading fluency and an inability to compose without correcting. SR is no panacea for students with disabilities and, while the field of composition has recognized the work of disability studies scholars, the impact of SR on composition is likely to be limited to discussions of SR as an AT due to practical issues of usability.

Although the functionality of SR may make it more efficient for many users, it requires special conditions that make general use of SR impractical. Dictation cannot be done in the classroom because of background noise and special software, hardware, and training are likely cost-prohibitive for many institutions. With the professional muddle surrounding AT in general, postsecondary writing faculty can be exonerated from a general state of ignorance regarding SR as an important and growing alternative method for composing. Still, writing instructors who want to experiment personally or introduce their classes to SR as a method of generating ideas or drafting will likely find the technology full of potential as a writing tool. Consequently, the option of using readily available technology should be explored. For now, it seems likely that SR will continue to be an AT that will be provided only by the relatively few institutions that can afford it and be made available only to students with certain documented disabilities. Therefore, it is incumbent on disability service providers to identify students who may benefit from SR and offer access and training on their campuses.

These professionals need training and experience in a variety of AT including SR so they can make informed recommendations based on empirical evidence and thorough evaluations of individuals. Indeed, Holmes and Sylvestri (2012) go so far as to chastise psychoeducational professionals who evaluate students for LD of being critically uninformed about AT and making recommendations unsupported by research (p. 92). These trained disability service providers will be better able to match students with AT like SR that will be appropriate and beneficial to the student. In addition, they will be better prepared to provide the necessary training to assist students toward the successful use of such AT. Because service providers may not have much experience with students' writing, these professionals might do well to share potential AT with writing faculty in brief professional development sessions about disability services in general. Such meetings can facilitate students in finding the support they need through referrals from their writing instructors: those who understand their writing issues the best. Such interdisciplinary work might lead to further discussion and research about the various relationships between college composition, AT, and writers with disabilities.

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