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The Online and Blended Learning Experience: Differences for Students With and Without Learning Disabilities and Attention Deficit/Hyperactivity Disorder

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Abstract

As colleges and universities offer more classes in both online and technology blended formats, students with learning disabilities (LD) and attention-deficit/hyperactivity disorder (ADHD) will face new learning demands. Compared to traditional face-to-face courses, online and blended courses require increased self-management and executive functioning skills, which research indicates can underlie many common learning challenges for students with LD and ADHD. This article presents the outcomes of interviews with postsecondary students with LD and/or ADHD who were enrolled in online and blended courses and compares these experiences to a sample of students without disabilities. Barriers and opportunities to enhance learning are discussed from the students' perspective, as are suggestions to enhance the planning and development of online and technology blended courses.

As the number of online and blended courses offered on college campuses across the nation continues to exponentially increase, it is important to consider the impact of such courses on all learners, including those with learning disabilities (LD) and attention-deficit/hyperactivity disorder (ADHD). The growth trend of both online instruction and students with LD and ADHD in postsecondary education is clear. For example, a recent study by Allen and Seaman (2011) reported that the percentage of students taking online courses increased from 9.6% of all students in 2002 to 31.3% of all students in 2010, representing an increase of almost five million students. For the same time period, enrollment at institutions of higher education increased by approximately 3 million students. Over half a million more students enrolled in at least one online course in fall 2010 versus fall 2009, representing a year-to-year growth rate of 10.1%. This number greatly outpaced the 0.6% growth in total student enrollment for the same period (Allen & Seaman). These numbers are likely to continue to increase, particularly at four-year public institutions, as 65% of the institutional respondents in the Allen and Seaman survey reported that online courses are a critical part of their long-term growth strategy. EDUCAUSE (2008) reported on over 27,000

undergraduates (freshmen and seniors) from 98 institutions and found that students spend nearly 20 hours per week using the Internet for school, work, or recreation. In addition, almost 83% of undergraduates, more often seniors than freshmen, reported using a course management system (CMS) "several times a week or more often" (p. 12).

During this time period, the number of students with disabilities attending postsecondary education also increased, growing from 9.3% in 2000 to 10.8% of all students in 2008 (U.S. Government Accountability Office (GAO), 2009). Additionally, between 1983 and 2008, the number of college students with LD increased from .05% to 3.3% of all college freshmen (Pryor et al., 2008), while the number of college students with ADHD rose from 6.7% in 2000 to 19.1% in 2008 (U.S. GAO, 2009). Clearly, given these statistics, it is likely that college students with LD and ADHD will enroll in at least one completely online course, and even more likely that they will be expected to use a Course Management System (CMS).

Given that one of the hallmarks of students with LD or ADHD is weaknesses in executive functioning skills, the self-management demands of such courses are likely to create new learning challenges (Dukes, Koorland, & Scott, 2009). However, the access needs of these students are largely overlooked in the literature related to online learning. Additionally, the experiences of students with LD and ADHD versus students without disabilities in online and blended courses have not been explored in the professional literature. This study examined the experiences of students with LD and ADHD in online and technology blended courses at two postsecondary institutions in the northeast, and compared these to the experiences of students without disabilities. In order to frame the need for such an investigation, the access needs of students with LD and ADHD in online learning will be examined.

Access needs of students with LD and ADHD. There is growing literature on online and technology blended learning, however, there is a paucity of research on the specific needs of learners with disabilities in these courses (Erickson, Terise, Van Looy, Lee, & Bruyere, 2009; Moisey, 2004; Shayo, 2008; Veal, Bray, & Flowers, 2005). Likewise, despite the access standards set forth by Section 508 of the Rehabilitation Act and the World Wide Web Consortium (W3C; 2012), the general web accessibility needs of people with LD and ADHD have received little attention. Multiple authors have noted that although people with cognitive disabilities are the largest single group of people with disabilities worldwide, their access needs tend to be overlooked by web designers (Bohman, 2004; Bohman & Anderson, 2005; Crow, 2008), often because of a focus on physical and sensory disabilities, and a lack of understanding of the functional limitations caused by cognitive disabilities. Keeler and Horney (2007) also explained that there is a misconception that assistive technology can successfully remove barriers to access for students with cognitive disabilities, such as LD and ADHD. They summarized: "The online education literature related to disabilities is robust with guidelines relating to accommodation indications with physical impairments, including low vision, and blindness, hearing difficulties, and mobility impairments, but is lacking regarding individuals with cognitive impairments" (p. 62).

Several articles outlined the needs of students with disabilities in online and blended courses and proposed guidelines for course developers and instructors to incorporate the principles of universal design for learning (UDL) or universal design for instruction (UDI) (Bissonette, n.d.; Burgsthaler, n.d.; Crow, 2008; Dukes et al., 2009). UDL is defined as a method to provide "a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone" (CAST, n.d.). UDI is described as "an approach to teaching that consists of the proactive design and use of inclusive instructional strategies that benefit a broad range of learners including students with disabilities" (Scott, McGuire, & Embry, 2002). This construct includes nine principles to guide instructors with the planning, delivery, and assessment of student learning in postsecondary courses.

Another example of guidelines for course developers and instructors is *Quality Matters* (Maryland Online, 2011), which provides a set of eight standards to assess online and hybrid (or technology blended) courses. One of these standards relates to course accessibility, and includes statements that the course "employs accessible technologies and provides guidance on how to obtain accommodation," that the "course contain equivalent alternatives to auditory and visual content", and that "course design facilitates readability and minimizes distractions" (p.1). These standards may indirectly address many of the needs of students with LD or ADHD, but more details about the access needs of these students are needed.

Students with LD and ADHD in online courses. To date, few studies have been published that examine the experiences of students with LD and ADHD in online courses. Badge, Dawson, Cann and Scott (2008) conducted a pilot study of how students with and without disabilities (including LD/ADHD) employed tools that allowed the students to control (start, stop, pause) an audio narration that was embedded into a PowerPoint presentation in a college course in Great Britain. The results indicated that the students with disabilities used the tools more often than students without disabilities, and that the total time needed to complete the reading did not differ between the two groups. The authors noted that the students with disabilities were deliberate in their use of the tools, and speculated that they were taking control of the learning situation.

Simoncelli and Hinson (2008) conducted a qualitative investigation of 5 students (2 of whom had LD) enrolled in an online summer course. Their findings included that students with LD did not know what was expected of them on course discussion boards, and spent less time on course discussions or other activities than students without LD. Neither the students with nor those without LD found audio enhanced lectures to be helpful, as some had technical issues downloading the files, while others reported that the audio was distracting. The students with LD reported having difficulty with the computer-based test, which consisted of 50 questions in 50 minutes.

Barnard-Brak and Sulak (2010) examined the accommodation requests and use by students with disabilities in online courses. The results indicated that students with visible

disabilities were more positive about requesting accommodations in these courses than students with hidden disabilities, such as LD and ADHD. The authors concluded that this reluctance to disclose could be related to wishing to avoid "stigma or negative peer interaction" (p. 87). Parker and Banerjee (2007) studied undergraduate students with and without LD or ADHD in regard to overall technology skills. While all students studied reported being either fluent or moderately fluent with basic computer skills, students with disabilities were less comfortable using e-mail, multitasking on a computer, and conducting online literature searches. Noting that online and blended learning requires the ability to work independently and self-regulated learning, and that other research has demonstrated that students with LD and ADHD are less proficient in these areas, Parker and Banerjee (2007) observed that the increase in technology use has significant implications for learners with LD and ADHD.

In a review of the demands placed on learners in online courses, Dukes et al. (2009) described that typically, higher education courses focus on content, or the meaning of the message being taught. However, online courses add a new element, namely that of process demands, or "the methods and actions that a student must engage to access course matter" (p. 39). According to Dukes et al., students must acclimate themselves to these new demands, which include: 1) technology skills; 2) self-motivation, which includes time management and autonomy; and 3) self-regulation, including organization and study strategies. Dukes et al. also observed that the communication requirements among course participants can require new demands for quantity and quality of written language, and fluency of reading. These requirements can impact performance on course discussion boards and synchronous chats.

An additional demand on students in online courses is overcoming feelings of isolation, both from the instructor and from fellow students (McInnerney & Roberts, 2004). Facilitating a sense of community for students can be important to enhance retention (Perrucci, Balboni, & Cacciamani, 2008). Perrucci et al. noted that this may be particularly important for students with disabilities who may experience feelings of disconnectedness from their learning community, even in face-to-face situations.

Clearly, the literature related to online and technology blended courses demonstrates that such learning environments place new and significant demands on students with LD and ADHD, many of which tap directly into areas of common weakness in the LD/ADHD profile. However, the literature currently lacks studies that examine the experiences of students with LD and/or ADHD in such courses, and in particular, the direct perspectives of students. The intent of this study was to examine the experiences of a group of post secondary students with LD and/or ADHD in online and blended courses, and to compare these experiences to a cohort of students without disabilities. A portion of this study that focused on students with LD/ADHD from one postsecondary institution was reported elsewhere (Madaus, Banerjee, McKeown, & Gelbar, 2011). As noted, the present study compares the experiences of students with and without LD and/or ADHD at two institutions.

Method

Sample recruitment. Working with a project liaison on each campus, the appropriate office (Institute for Teaching and Learning, Instructional Design teams, Information Technology) provided a list of faculty who taught courses using a web-based platform (e.g., Blackboard, Moodle). The purpose of the study was explained in an e-mail, and 16 instructors of online courses were requested to forward an invitation to participate in the study to their students. Concurrently, the project liaisons worked with personnel from disability services offices to recruit students with LD/ADHD to participate in interviews. The same e-mail sent by faculty to students was submitted to disability service providers to forward to registered students with LD and/or ADHD. Twenty-nine students with LD/ADHD were invited to participate in the study through an interview. Due to the assistance of faculty in recruiting students to interview, and the undisclosed number of students in each online course, the authors are not able to calculate a response rate.

Interview protocol. A structured interview protocol (see Appendix A) was developed based upon a review of the literature related to online and blended learning and students with LD/ADHD in online and blended courses. Since a structured interview protocol was utilized to collect the data, all of the interviewers asked the same questions in the same order. The reliability of the interviewing procedure was verified when the transcripts were read by the authors. The protocol varied slightly for students who had taken a blended class only (seven questions) and for students who had taken an online course (13 questions). Students with LD/ADHD were also asked an additional three questions (e.g., "In what ways, if any, did your LD/ADHD impact your performance in your online or blended courses?" "Did taking an online class offer any advantages or disadvantages to you relating to your disability versus a face-to-face class?" "Did you self-disclose your disability to your professor in your online course?"). The complete protocol was piloted on two students and revised based on that feedback. The final protocol took between 25 and 50 minutes to complete.

Participating Institutions. The faculty at two participating institutions assisted in the recruitment of students for this study. The first participating institution is a public university in the Northeastern United States. The students from this institution were enrolled in undergraduate or graduate courses. These students (n = 18) participated in face-to-face interviews. The second participating institution is a community college in the Northeastern United States. The students from this institution were enrolled in undergraduate courses. These students (n = 2) were interviewed over the phone.

Interview sample. Ten students without disabilities and 10 students with LD/ADHD were interviewed for this study. Each student received a $20 gift card as compensation. The students represented 9 majors (see Table 1). Eleven were undergraduates (ranging from sophomores to seniors), and nine were graduate students. Thirteen of the students had taken only a blended course, two took only an online course, and five took both an online and blended course. The students had taken between one and 16 blended courses, and from one

Table 1
Sample Demographic Characteristics

Characteristic	Students with disabilities (*n*=10)	Students without disabilities (*n*=10)
Education Level		
Graduate	2	7
Undergraduate	8	3
Freshman	0	0
Sophomore	2	2
Junior	1	0
Senior	4	1
Unassigned	1	0
Major		
Education	1	4
Health	2	0
Physical Therapy	1	6
Statistics	1	0
Sociology	1	0
Communications	1	0
Engineering	1	0
Fine Arts	1	0
Undecided	1	0
Course Modality		
Online Only	0	2
Blended Only	6	7
Online and Blended	4	1
Documented Disability		
ADHD	3	
LD	7	
Disclosed Disability		
Yes	7	
No	3	
Number of Blended		
0	3	3
1 - 5	3	1
6 - 10	1	1
11 - 15	1	0
16+	2	2
Number of Online		
0	6	7
1	3	1
2 - 5	1	2

to five online courses. Only one student reported withdrawing from a blended class, and none of the students withdrew from an online class.

Students with disabilities. Each of the 10 students with LD and/or ADHD was registered with the disability services office at his or her institution and submitted documentation to verify the existence of the disability. Seven of the students reported having a learning disability and three reported ADHD. The students represented nine majors (with one student who was undecided). Four of the students had taken both online and blended classes, while six had taken blended classes only. Seven of these students reported self-disclosing their disability to a professor in a blended or online class. Three reported not disclosing in either environment. Five of the students who self-disclosed stated that they received the accommodation of extended time on tests or quizzes. One student reported withdrawing from a blended class, and none of the students had withdrawn from an online course.

Interview data analysis. Each recorded interview was transcribed in full and then read independently by each of the authors and by an external professional who directs a postsecondary program for students with disabilities. The data were examined via an inductive analysis process (Patton, 1987). In this manner, broad categories were allowed to emerge from the data, rather than reviewing the data with an a priori list. Thomas (2006) describes inductive analysis as "approaches that primarily use detailed readings of raw data to derive concepts, themes, or a model through interpretations made from the raw data by an evaluator or researcher" (p. 238). In this study, the research team read the transcribed interviews to derive categories after data collection was completed. Each of the resulting categories was compared and confirmed and a set of key words and themes were developed. The transcripts and the key words were entered into NVivo9, a qualitative software program, to provide additional frequency analysis of the data. Using this data, the categories were refined to reduce overlap between the categories utilizing the process highlighted by Thomas. The third author coded subcategories in each category. The first author confirmed the reliability of this coding. The research team refined the resulting categories and subcategories to reflect the major themes present in the data. The process allowed a set of key themes to emerge from the data. The parsimonious set of themes is presented in the results section of this article.

Results

Advantages to Online and Blended Courses

Access to course materials and resources. Both the students with and without LD/ADHD commented that one major advantage to online and blended courses was that the course materials were always available, and that they often featured more resources than face-to-face classes. One student with LD/ADHD explained that the course "had a place where if you lost material you could go and find it all" and that "if you have any questions, the syllabus is always there with the requirements." Likewise, a student with LD/ADHD commented:

> Completely online courses usually have a lot more information but if you go to class you would get a lecture and you could miss something. You can take notes but you can't go back. The online course has all of the information presented there and then you can pick and choose, go back if you forgot something you can go to the link. It's usually still there.

Another student with cognitive disabilities explained that it enhanced note taking, because the posted notes allowed time to pause and write, which allowed the student to learn at an independent pace.

Students without disabilities agreed with this perception. One stated that "on a day to day basis, I have more access and it's more convenient." Another student without LD/ADHD explained:

> When my professor posted Power Points online, there were videos and audios and links that were attached to it. I thought that was really helpful, because I was at my home and if I had a question about something, I could just easily go back and review what she said. Instead of having that feeling of that I have to interrupt class and ask the professor. I thought that was a big help.

Another student described "if you have to a miss a course or something she puts all of the notes online and if you're trying to study for something she'll put the study guides and the answers online. It's really useful."

Communication with instructors. Both groups of students described that some courses facilitated increased communication with the course professor. It was noted that "the instructors are much more available" online, and that on a day-to-day basis, there can be more access to the instructors. Access to instructors was the most commonly cited advantage by students with LD/ADHD, as several stated that online and blended courses afforded direct and rapid access to professors for answers to questions. Students without disabilities also found this direct communication to be helpful, as one student described:

> If you have any questions or any worries or any doubts usually an e-mail takes care of it. You get the words from the horse's mouth and you're not relying on word of mouth going around and around, what do you really mean by this? I can actually go right to him and get an answer.

Engagement with peers. Interestingly, the students with LD/ADHD were more likely to comment on the advantage of online and blended courses as a means to access and learn from peers than the non-LD/ADHD group. For example, one student with LD/ADHD stated "it's also nice to see what other students have to say on the discussion boards to make sure that your thinking is kind of on track with everyone else's." Another student with LD/ADHD stated that "the discussion is helpful too because if other kids are having problems with the same things you can go on there and talk to them about it." Additionally, both students with and without cognitive disabilities noted that the online discussions and responses fostered participation, and as one student without LD/ADHD stated, "I was able to

be a bit more bold." A student without disabilities commented on the utility of CMS to allow students to collaborate on projects:

> Yesterday, for the first time, we realized on our CMS we can chat to each other. We've been Instant Messaging and e-mailing and all of these other things and then we realized, "Look! We can chat right here". So we all hopped onto our CMS and it was very convenient.

Challenges

Unclear requirements and expectations. Both groups of students commented on issues regarding an occasional lack of clarity in online and blended courses, and the fact that important components, such as quizzes, might be posted and the student is not aware. For example, one student without LD/ADHD stated:

> If you forget about the quizzes, then you're kind of in trouble, when the professor is not handing out a quiz and you're not taking it and handing it back in, so if you forget about it, it looks like you just weren't trying or something.

Likewise a student with LD/ADHD explained:

> A lot of kids, not just myself, were missing quizzes without even realizing it. I think between the student and the professor there needs to be a strong understanding that quizzes are going to be at this certain time, that there will be deadlines.

Unclear course navigation. Many students with LD/ADHD commented on the overall layout and organization of the CMS, whereas none of the students without disabilities noted this. One student with LD/ADHD stated that "all of them [courses] are different. This one, it's not as straightforward as I would like it to be. Syllabuses aren't straight up front, all the modules aren't right up front, you have to search through [the CMS]." Likewise two other students with LD/ADHD commented on difficulty with navigating around the course, and one explained that despite being a daily internet user, the course "site was a little uninviting in certain areas and I think if I was someone who didn't use the internet all the time I would be thrown off by some of the things on [the CMS]."

Decreased anonymity. While online and blended courses offer a mechanism for increased participation, some of the students, both with and without LD/ADHD, found this to be a challenge. One student without disabilities commented that not being able to answer with a one-word response was a challenge:

> You can't get away with saying I think the answer is yes. Most of the time in a traditional classroom, there are other people who can say 'I think the answer is' so it kind of gives the challenge of really saying what you want to say on there. You have to lay it all out; there are no interruptions. You have to know what you are saying.

The trepidation of posting one's ideas in a public forum was echoed by a student with LD who said "that's just hesitation about putting out what I'm saying on paper for everyone to see that can never be changed because once you post it on the discussion board you can't edit it which is not good."

Increased anonymity. Although some students described that online and blended environments resulted in less anonymity, others commented on the increased isolation in such courses. Students both with and without disabilities cited that such courses can lead to a feeling of anonymity, and the lack of face-to-face contact can lead to less interaction, and what one student without LD/ADHD described as "the information or the personality of the person" speaking in a face-to-face discussion. Both groups also commented on cases where professors were non-responsive to emails or who provided little or non-constructive feedback. One student with LD/ADHD explained a situation this way:

> My professor doesn't give a lot of constructive feedback to the students, and honestly I didn't know and still don't know what I did wrong, if I did anything wrong, what I can improve on, things like that. So the feedback was very limited. I honestly, and I don't mean to be rude, but I haven't really learned anything. I honestly feel like from the first day you log on you learn it yourself, there has been very little direction from the professor.

Advice to faculty. The most commonly offered piece of advice to faculty teaching online or blended courses was to be responsive to students. One student without disabilities requested that faculty members should "please be responsive in the correspondences and to actually participate with the class." In a similar fashion, a student with LD/ADHD suggested that faculty members "make sure you're accessible to them for any questions they have. Give the option of face-to-face because sometimes you can't convey your message." Another student with disabilities stated:

> Be accessible. Make things, I don't want to say relatively simple because students would take advantage of that, but just explain things and tell students exactly what you want, and make constructive feedback, so it can help them when they write and post future assignments.

The respondents, particularly those with disabilities, also highlighted the issue of having clearly stated expectations with frequent reminders at key points. The students called for faculty to be sure the course navigation is clear with specific directions, and that all materials are well organized and "in the proper places, make sure you have all the material there and don't have stuff missing from the syllabus."

Students with disabilities. The students with cognitive disabilities were asked to explain any advantages offered by online or blended courses related to the impact of LD/ADHD on learning. Two of the students noted advantages to these courses on the basis of their ADHD. One described being able to "get up and walk around while doing a post", as opposed to how it would be in class, while the other elaborated, "If I lose any of the information when I'm in class, or I just haven't paid attention, I can catch up by going on [the CMS] and relearning the information or seeing it there and processing it more fully." Another student with disabilities described being able to take notes independently and being able to supplement the notes after class. The ability to use online tools such as spell check and synchronized calendars was also cited by multiple students as being advantageous.

The students with LD and/or ADHD also described some challenges offered by online and blended courses, most commonly the difficulty of receiving extended time for tests and quizzes. Other students cited difficulty in keeping up with reading loads in an allotted time frame, while one commented that having "stuff not mapped out on a wall but tucked away in my computer" impacted organizational skills.

Discussion

The existing but limited literature related to online and technology blended courses demonstrates that the digital medium presents both advantages and challenges for students with and without disabilities. The results of this study indicate largely similar findings for this sample of students with and without LD/ADHD. Both sample groups suggested that access to resources and online tools, along with the flexibility to work at one's own pace, are the main advantages to online and blended courses. Students without disabilities also noted communication with course instructors and engagement with peers in online and blended courses as advantages. Interestingly, students without disabilities identified the increased anonymity resulting in feelings of isolation, and the decrease in anonymity requiring class participation as challenges. This finding reflects the observations of McInnerney and Roberts (2004) and Perruci et al. (2008) who commented on the negative impact of social isolation for students with disabilities in online courses.

Similarly, both students with and without disabilities highlighted the following challenges related to online and blended courses: untimely responses by faculty to questions and posts; unclear course expectations and requirements; and required self-discipline to complete course assignments. Both students with and without disabilities also identified technology issues as a challenge with the digital medium; however, students with disabilities identified the challenge as a difficulty in obtaining extended time for tests and quizzes. As is noted in the literature (Dukes et al., 2009), organizational issues in online courses can be particularly problematic for students with LD/ADHD. The students with disabilities in this sample specifically identified issues with unclear course organization and navigation as barriers, whereas students without disabilities did not describe these issues. Students with LD/ADHD also highlighted the difficulty with completing the required reading for online and blended courses within the set time frame, and the difficulty faculty have in thoroughly explaining their answers to students' questions via email or posts, as challenges.

Limitations and Areas of Future Research

A limitation of this study is the small sample size of students. As a result it is difficult to generalize the findings from this investigation to a broader audience. A larger study with a more students across a broad range of institutions will add weight to the findings. However, the current findings validate much of what is known about students with LD/ADHD and how such students may perform in a digital environment. Future studies at the postsecondary level that examine not only student identified advantages and challenges, but also outcomes related

to learning and assessment of students with and without disabilities will add to our understanding of the impact of the digital learning environment.

Summary

The number of online and blended courses offered at postsecondary institutions across the nation continues to grow. Data from colleges and universities also show the population of students with and without disabilities increasing in number. Although more research is needed in this area, with larger and more heterogeneous samples, the present results indicate that the digital learning environment offers both advantages and challenges to learning for students with and without cognitive disabilities. These advantages and challenges are at times paradoxical in nature (e.g., within the digital environment students can feel isolated with the lack of face-to-face time [increased anonymity], while also feeling that they are required to participate in a course through posts [decreased anonymity]). The evolving digital learning environment requires that students with cognitive disabilities are active learners with the executive functioning skills and self-management to keep pace with course material and expectations without direct intervention from instructors. In order to best ensure that these students have full access to this growing segment of higher education, such skills should be a priority within secondary education and transition planning. Additionally, course developers and instructors in higher education should be cognizant of the need for structured courses with clear expectations and directions for all learners.

References

Allen, I. E., & Seaman, J. (2011, November). *Going the Distance: Online Education in the United States, 2011*. Babson Survey Research Group and the Sloan Consortium.

Badge, J. L., Dawson, E., Cann, A. J., & Scott, J. (2008). Assessing the accessibility of online learning. *Innovations in Education and Teaching International, 45*(2), 103-113.

Bissonnette, L. (n.d.) *Meeting the evolving education needs of faculty in providing access for university students with disabilities.* Retrieved from http://www.profetic.org/spip.php?article8126

Bohman, P. (2004). *Cognitive disabilities part 1: We still know too little and we do even less*. Retrieved from http://www.webaim.org/articles/cognitive/cognitive_too_little/

Bohman, P. R., & Anderson, S. (2005). *A conceptual framework for accessibility tools to benefit users with cognitive disabilities*. Retrieved from http://www.webaim.org/articles/framework

Burgstahler, S. (n.d.). *Real connections: Making distance learning accessible to everyone*. Retrieved from http://www12.cac.washington.edu/doit/Brochures/Technology/distance.learn.html

Barnard-Brak, L., & Sulak, T. (2010). Online versus face-to-face accommodations among college students with disabilities. *American Journal of Distance Education, 24*(2), 81-91.

CAST. (n.d.). About UDL. Retrieved from http://www.cast.org/udl/

Crow, K.L. (2008). Four types of disabilities: Their impact on online learning. *TechTrends, 52*(1), 51-55.

Dukes, L.L. III, Koorland, M. A., & Scott, S. S. (2009). Making blended instruction better: Integrating the principles of universal design for instruction into course design and delivery. *Action in Teacher Education, 31*(1), 38-48.

EDUCAUSE Center for Applied Research. (2008). Students and information technology, 2008. *ECAR Research Study 8*, 9-17.

Erickson, W., Trerise, S., VanLooy, S., Lee, C., & Bruyere, S. (2009). Web accessibility policies and practices at American community colleges. *Community College Journal of Research Practice, 33*(5), 403-414.

Keeler, C., & Horney, M. (2007) Online course designs: Are special needs being met? *The American Journal of Distance Education, 21*(2), 61-75.

Madaus, J. W., Banerjee, M., McKeown, K., & Gelbar, N. (2011). Online and blended learning: The advantages and the challenges for students with learning disabilities and attention deficit/hyperactivity disorder. *Learning Disabilities: A Multidisciplinary Journal*, *17*(2), 69-76.

Maryland Online. (2009). *Quality matters rubric standards 2011-2013 Edition*. Retrieved from http://www.qmprogram.org/files/QM_Standards_2011-2013.pdf

McInnerney, J. M., & Roberts, T. S. (2004). Online learning: Social interaction and the creation of a sense of community. *Educational Technology & Society*, *7*(3), 73-81.

Moisey, S. D. (2004). Students with disabilities in distance education: Characteristics, course enrollment and completion, and support services. *Journal of Distance Education, 19*(1), 73-91.

Parker, D. P., & Banerjee, M. (2007). Leveling the digital playing field: Assessing the learning technology needs of college-bound students with LD and/or ADHD. *Assessment for Effective Intervention, 33*(5), 5-14.

Patton, M. Q. (1987). *How to use qualitative methods in evaluation*. Newbury Park, CA: Sage.

Perrucci, V., Balboni, G., & Cacciamani, S. (2008). Sense of community in online courses and students with disabilities: Development of a questionnaire for university students. *Advances in Learning and Behavioral Disabilities, 21*, 209-222.

Pryor, J. H., Hurtado, S., DeAngelo, L., Sharkness, J., Romero, L. C., Korn, W. S., & Tran, S. (2008). *The American freshman: National norms for fall 2008*. Los Angeles: Higher Education Research Institute, UCLA.

Scott, S., McGuire, J. M., & Embry, P. (2002.) *Universal design for instruction fact sheet.* Storrs: University of Connecticut, Center on Postsecondary Education and Disability.

Shayo, C. (2008, April). *The role of technology and authentic task contexts in promoting inclusive learning for disabled and non-disabled college students*. Paper presented at SIGMIS-CPR 2008 Conference, Charlottesville, VA.

Simoncelli, A., & Hinson, J. M. (2008). College students' with learning disabilities personal reactions to online learning. *Journal of College Reading and Learning, 38*(2), 49-62.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*, 237-246.

U.S. Government Accountability Office. (2009). *Higher education and disability: Education needs a coordinated approach to improve its assistance to schools in supporting students.* Retrieved from http://www.gao.gov/new.items/d1033.pdf

Veal, W., Bray, M., & Flowers, C. (2005). Developing an online accessible science course for all learners. *Contemporary Issues in Technology and Teacher Education, 5*(3/4), 271-289.

World Wide Web Consortium. (2012). *W3C Home Page.* Retrieved from http://www.w3.org/

Appendix A: Student Interview Protocol

Student Interview Protocol

1. Can you tell me a little bit about yourself?
   For example,
   a. What year are you?
   b. What is your major?
2. How many courses have you taken that have used a web-based platform?
3. How many courses have you taken completely online?

(If student has not taken any online courses, go to questions in Blended Course Experiences. If student has taken any online courses go to questions relating to Online Course Experiences.)

Blended Course Experiences

1. Can you describe some of the specific features or tools of the online environment that faculty used to help you as a learner? (*Prompt – things like the calendar tool, the discussion boards, video/audio presentations, homework assignments, quizzes/tests, etc*.)
2. Can you describe some of the specific features or tools that were used in the online environment that made learning challenging?
   a. Can you talk about the technology skills that are required in these courses?
3. What methods did your professor use to evaluate your performance and understanding of the class material?
4. Does the amount of work or time spent on course activities differ in courses that use a web-based platform extensively versus traditional courses?
5. What types of approaches did you use to keep up with your coursework in the blended class?

6. Have you ever withdrawn from a course? If yes, based on a recent experience, can you comment on some of the main reasons? *(e.g.: pace of course too fast; content challenging; time issues)*
What advice would you give a new faculty member who is thinking of incorporating technology into his/her course design? Are there suggestions you could offer to faculty that would make their courses work better for you?

6. In what ways, if any, did your learning disability/ADHD/disability impact your performance in your blended

On-Line Course Experiences

1. Why did you decide to take a completely on-line course?
2. What were your perceptions or opinions regarding online courses before you started taking one?
3. Tell me about what you experienced the first time you logged onto the course.
   a. For example, how was the course content presented in the web-based platform? Was it primarily text based? Were videos used? Was audio used?
   b. Were prompts provided to guide your reading? If so, please describe them.
   c. How was your understanding of the readings measured? How often? *(Prompt – weekly?)*
   d. In responding to these questions, is there a particular course you were thinking about? *(Ask about course content area if not stated).*
4. What methods did your professor use to evaluate your performance and understanding of the class material?
5. What types of approaches did you use to keep up with your coursework in the online class?
6. Can you describe some of the specific features or tools of the online environment that faculty used to help you as a learner? (*Prompt – things like the calendar tool, the discussion boards, video/audio presentations, simulations, etc.*)
7. Can you describe some of the specific

courses? *(Ask only if not previously stated during interview).* 7. Did you disclose your disability to your professor in your blended course? Did you ask for accommodations in the course? If yes, what accommodations helped you? If not, why not?	features or tools that were used in the online environment that made learning challenging? a. Can you talk about the technology skills that are required in these courses? 8. Can you comment on your access to the instructor in your online course? How did you communicate? Did you find that the instructor was more or less accessible than in a face-to-face class? 9. Can you comment on how you got to know the other students in your online class? Did the professor do anything to help build a sense of a class community? 10. Have you ever withdrawn from a course? If yes, based on a recent experience, can you comment on some of the main reasons? *(e.g.: pace of course too fast; content challenging; time issues)* 11. What advice would you give a new faculty member who is thinking of teaching online? Are there suggestions you could offer to faculty teaching online courses that would make their courses work better for you? 12. In what ways, if any, did your learning disability/ADHD/disability impact your performance in your online courses? *(Ask only if not previously stated during interview).* Did you disclose your disability to your professor in your online course? In your blended course? Did you ask for accommodations in the course? If yes, what accommodations helped you? If not, why not?