

The experiences of students with learning disabilities in a higher education virtual campus

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Abstract Institutions of higher education are increasingly asking students to use the online environment, or virtual campus, when carrying out business related to college life. In this paper, we report findings from a study conducted to learn more about the experiences of college students with learning disabilities as they interacted with this virtual campus. Sixteen college students with documented learning disabilities were observed and interviewed while completing eight tasks in a virtual campus environment. Tasks were chosen from those typically performed by college students and included such items as locating the email address of an instructor, locating a journal article in the library's online database, and identifying the textbook for a course on the bookstore webpage. Findings indicate that these participants were both successful and not successful in task completion within the virtual campus. Factors that impacted performance included features of the virtual campus and participants' implementation of cognitive and behavioral strategies.

Keywords Web accessibility · Learning disabilities · Cognitive strategies · Usability, higher education

Introduction

An increasing number of students with learning disabilities are enrolling into colleges and universities (DaDeppo 2009; Heiman and Preceel 2003). Concomitantly, computer use on college and university campuses has expanded from specialized academic programs, such as computer science and graphic design, to use within many educational and administrative

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operations (Oblinger and Katz 2000). This expansion and the evolution of Internet technologies has led to the development of a new higher education space—a “virtual campus” where many administrative activities have been moved. Given the expectation that higher education students use the Internet for these administrative functions and the increasing number of students with learning disabilities, understanding the experiences of these students in the virtual campus is a key component to ensuring their success in higher education.

Inclusive higher educational environments are rare, and students with learning disabilities face obstacles to be successful (Heiman and Kariv 2004). Zwart and Kallemeyn’s (2001) study of college students with attention deficit hyperactivity disorder (ADHD) and learning disabilities identified inadequate study skills, poor note-taking abilities, and difficulty with test-taking as significant issues. Students with learning disabilities often deal with inadequate organization and time management skills (DaDeppo 2009). In addition, students with learning disabilities, required to disclose their disability in order to receive accommodations, often experience labeling and stigmatization that result in differential treatment by service providers and faculty (Barga 1996). Such obstacles may be the cause of the higher dropout rate noted when comparing students with disabilities (SWD) to students without disabilities (Newman et al. 2009).

Consideration of accessibility (making content on the Internet accessible to people with disabilities) in the context of the higher education virtual campus is still relatively uncommon (Seale 2006) with many institutions of higher education dealing with web accessibility and usability reactively rather than proactively. This reactive approach results in barriers to access that would not exist if accessibility and usability were considered during the early stages of web development. Early consideration would also result in cost savings to the institution: ensuring accessibility initially is less time intensive and less expensive (Foley 2011) than putting accommodations in place after a course or service has been developed (Burgstahler 2000).

In this paper, we report findings from a study conducted to determine how students with learning disabilities experience online services in an institution of higher education. Sixteen college students with learning disabilities were observed and interviewed while completing a series of prescribed tasks in a virtual campus environment. The data collected was used to identify features in a virtual campus that were coded as *helpful* and *not-helpful* in the students’ experience. Many of these features are consistent with established principles of usability (Nielsen 1999; Reeb 2008), reinforcing the need for web designers to consider such principles when designing the virtual campus. In addition to identifying helpful and non-helpful features, findings also revealed that participants used various cognitive and behavioral strategies to transcend some of the problems they experienced.

Literature review

What are learning disabilities?

Few studies have been published regarding web accessibility for individuals with learning disabilities. One reason for the dearth of research in this area might be the lack of a broadly accepted definition of the term *learning disability*. After reviewing all available definitions of learning disabilities, Kavale and Forness (2000) concluded that the term has not been defined with any precision but rather provides only a general picture of a group of students who experience academic problems. The most common learning disability experienced by

college students is difficulty with reading comprehension (Gjajria et al. 2007); however, the Learning Disabilities Association of America (LDA 2005) reports other types of learning disabilities including difficulty processing language,¹ misunderstanding of visual sensations and use of vision e.g. reversal of letters, difficulty copying accurately, and difficulty understanding spoken language. Given the reliance of webpages on text, language, and other visual stimuli, it is likely that students with learning disabilities have difficulty in the online environment.

Parker and Banerjee (2007) surveyed college students with and without learning disabilities in the areas of: comfort level, preferences, and ease of use of electronic media. They found significant differences between students with and without learning disabilities in all three areas. In some areas (e.g., use of spreadsheets and presentation software), individuals with learning disabilities reported greater comfort and ease of use than students without learning disabilities. In other areas (e.g., multi-tasking, online searching), students with learning disabilities reported less comfort.

Virtual campuses

While online college courses are becoming increasingly common, interaction of the college student with the college web site encompasses more than just online learning. Most colleges and universities have a web-based presence or virtual campus in which students take advantage of online learning resources (e.g., library, supplemental class materials) as well as register for classes, buy textbooks, check grades, and take care of other business related to college attendance (Oblinger and Katz 2000). The use of the term “virtual campus” to refer to this web-based presence, reflects the fact that colleges are changing in ways that make consideration of the accessibility of their virtual environment as important as consideration of their physical environment for individuals with disabilities.

Accessibility and usability

There are guidelines to assist developers in making web-based services accessible for individuals with disabilities. The two most well known guidelines for web accessibility include the Web Consortium Accessibility Guidelines 2.0 (World Wide Web Consortium Web Accessibility Initiative 2008) and guidelines based on Section 508 of the Rehabilitation Act Amendments of 1998 (Architectural and Transportation Barriers Compliance Board 2000). Neither guideline specifically addresses the needs of individuals with learning disabilities in an online environment (Friedmen and Bryen 2007). Other guidelines can be found that offer suggestions for improving web accessibility for students with learning disabilities based on research findings related to text-based learning materials and face-to-face learning environments (Burgstahler et al. 2004). Whether these are valid guidelines when applied to the online environment is unknown.

Consideration of accessibility of web-based services provided by institutions of higher education is critical from a number of perspectives. Pedagogically, the evolution from face-to-face classroom learning to online learning is accompanied by a paradigm shift in the way college instructors go about the task of teaching (Simonson et al. 2006). One factor that has not changed is the instructor’s responsibility for ensuring that all students, including those with disabilities, have access to course materials (Boyd and Moulton

¹ “Language” is an inclusive term for the complex communication systems humans use that include auditory and visual stimuli such as printed text and spoken word.

2004). Access to educational materials is also a legal issue. In the United States, post-secondary institutions must respond to the requirements of the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973 to ensure SWD are not discriminated against on the basis of their disability.

In comparison to accessibility, usability is an important factor to consider when creating useful web content for all students, and therefore would presumably be of benefit for students with learning disabilities as well. While the distinction between usability and accessibility is often blurred, Henry (2003) offers the following distinctions:

- *Usability* refers to the characteristics of a website that make it effective, efficient and satisfying to the user. Usability problems impact all web users regardless of ability. Examples of web usability include the load time of a web page and the consistency of styles and color throughout a website.
- *Accessibility* refers to the characteristics of a website that allow individuals with disabilities to access information and services. Problems with accessibility place individuals with disabilities at a disadvantage relative to individuals without disabilities. An example of a web accessibility issue is a webpage with images that do not have alternative (ALT) text that describes the content of an image for a user who cannot see the image.

Method

Site

The site for this study was a private, not-for-profit comprehensive institution of higher education in the northeastern United States, which will be referred to as Virtual University (VU). At the time of this study, VU enrolled ~2,500 undergraduate students and 600 graduate students. Ten academic programs were being offered totally online. Many of the students enrolled in those online programs lived geographically distant from the physical campus requiring that VU construct a virtual campus to provide administrative services as well as course delivery. As these virtual services were developed, they were simultaneously offered to on campus students as well.

Participants

Inclusion criteria for the study required that all participants be at least 18 years of age and have documentation submitted to the VU Office of Learning Services (OLS) indicating that they experienced a learning disability. Twelve of the participants were female and four were male. Participants ranged in age from 18 to 22 years and represented ten different academic majors (see Table 1).

We did not attempt to review the student participants' learning disability documentation. Rather we decided to ask them to describe their learning disability and its implications in their own terms. These self-descriptions were obtained during initial one-on-one interviews in which participants were asked to respond to the question, "Tell me about your learning disability." Many participants immediately responded by labeling themselves with their diagnostic classification (e.g., dyslexia, audio-discrepancy, attention deficit disorder). These participants were then asked to describe how their learning disability impacted their learning. It was these descriptions that we used in our analysis. We

Table 1 Participants

Name	Age	Gender	Class	Major
Adam	20	M	Sophomore	Government and politics
Alicia	19	F	Freshman	Psychology
Amanda	18	F	Freshman	Communications
Andy	18	M	Sophomore	Accounting
Lauren	22	F	Senior	Child life psychology
Raeann	20	F	Freshman	Health studies
Rachel	18	F	Sophomore	Therapeutic recreation
Rebecca	18	F	Sophomore	Psychology
Rianna	20	F	Junior	Psychology
Rhonda	21	F	Junior	Communications
Sam	19	M	Sophomore	Criminal justice
Sarah	22	F	Junior	Journalism
Tammy	19	F	Sophomore	Criminal justice
Tara	21	F	Junior	Psychology
Vera	19	F	Sophomore	Public relations
Xavier	18	M	Freshman	Health studies

use the term *learning differences* to distinguish the students' own descriptions of their condition from any diagnostic learning disability label. The students' descriptions tended to focus on their perceived impairments.

There was no a priori plan to place participants in groups based on their learning differences; however, during data analysis such grouping became useful in order to explore how situations in the virtual campus were experienced by individuals with similar learning differences. Using the constant comparative process, participants' self-descriptions were analyzed for similarities and differences. This comparison resulted in a loose grouping of participants who experienced learning in similar ways. The groupings that emerged were strikingly close to the diagnostic labels often used when classifying learning disabilities (LDA 2005). It is suspected that for these participants, their self-perceptions were couched in terms related to their learning disability diagnosis. This is consistent with Ferri's (2004) observation that an individual's first person account or self-description frequently mirrors the medical language that is attached to the individual's label of learning disability. Table 2 illustrates the learning differences described by the participants.

Protocol

Following the initial interview, participants were seen for one-on-one sessions in which they engaged in eight preselected tasks in the virtual campus while talking out-loud about what they were experiencing. This session was both video and audio recorded. In addition, the participants' actions on the computer were recorded by Adobe Connect. For this session, we chose tasks that we considered typical of those required of college students. In addition, to maintain confidentiality the tasks could not involve the entering of personal information. Tasks are listed below in Table 3.

Table 2 Informants' self-descriptions of learning differences

Attention	Informants described difficulty with being able to attend to learning activities. Often these informants also indicated they were distractible and had difficulty focusing on what they were doing
Aural comprehension	Informants in this grouping indicated they had difficulty with understanding information provided aurally
Language	Only one informant was placed in this grouping. This informant described her difficulty with remembering and understanding terms that were unfamiliar (e.g., science terminology). This difficulty was described as involving both verbal and written language
Math	These informants described difficulty with arithmetic calculation and application of math concepts
Memory	These informants described difficulty with memory. Difficulty with memory for these informants did not appear to be related to any one type of information (e.g., verbal or written, math or literature)
Processing speed	The informants in this grouping did not describe themselves as having a difficulty with reading or listening, but simply with the speed they performed tasks involving those processes
Reading	Informants indicated they had difficulty with reading. The specific difficulty with reading varied. Some individuals described having difficulty with transposing letters whereas others described having difficulty comprehending what they read
Test anxiety	Informants in this grouping described themselves as being anxious, particularly in testing situations. Such anxiety interfered with their ability to understand test questions and/or remember information during a test
Varied, multiple learning differences	This designation was assigned to informants who reported a number of varied problems without one seeming to be predominant

Table 3 Successful and not-successful participant performance on goal-based tasks ($n = 16$)

Task	Successful $n(\%)$	Not-successful $n(\%)$
Locating the homepage of the informants' academic (major) department homepage	13(81.25)	3(18.75)
Accessing the online course schedule and locating information related to a course in preparation for semester registration	14(87.5)	2(12.5)
Locating the text required for a course through the online bookstore	14(87.5)	2(12.5)
Identifying a book, on a topic chosen by the informant, from the online library catalog	13(81.25)	3(18.75)
Identifying a journal article, on a topic chosen by the informant, from the online library database service	8(50)	8(50)
Locating the date and time of an athletic game	15(93.75)	1(6.25)
Finding the time of the informants' last final exam for the semester	9(56.25)	7(43.75)
Locating the email address of a professor ($n = 13$; this task was added in response to participant performance)	12(92.31)	1(7.69)

Audio recordings were transcribed and subsequently placed on storyboards along with observations from the video and computer recordings. This allowed us to compare data from all sources. In addition, recordings of computer interactions were translated into flow charts. This information was coded using a constant comparative process.

Findings

Initial analysis involved simply coding participants' behavior as successful or not-successful in completing a task. We then used a constant comparative process to look at what helped the participants be successful and what hindered their success. An over-arching theme identified in the data is related to how features of the virtual campus both helped and hindered the participants performance. The findings related to this theme are similar in many ways to that of a usability study and indeed that literature was used to inform our final analysis. Another over-arching theme is related to what the participants chose to do during the tasks. The participants used a number of cognitive and behavioral strategies during their performance which helped them be successful.

Successful or not-successful participant performance

The code of *successful* was used when a participant completed the task without any assistance. Performance of the informants could vary as long as the goal of the task was achieved. The code of *not-successful* was used when a participant was unable to complete the task independently. Most frequently this took the form of the participant using such language as "I give up," or directly asking for help from the researcher. At such times, participants also tended to display behaviors suggestive of frustration or impatience. Table 3 details the frequency of successful and not-successful performance on each of the eight tasks.

When participants were not-successful during the think-aloud sessions, we asked them what they would do if they needed to complete the task in their every day life. Typically their response was that they would seek out help from friends, roommates, or college staff. A few informants indicated they had occasionally used online help services. We would like to acknowledge that such help-seeking behaviors suggest a resourcefulness that is to be admired and encouraged. However, it also most likely comes at a cost of time, effort and perhaps self-esteem and confidence. It is our contention that when determining the accessibility of the virtual campus, the more students need to rely on external support, the less accessible that environment should be considered.

Features of the virtual campus

We identified several features in the virtual campus that contributed either to successful or not successful performance by participants. These features fit into six categories that roughly parallel the literature on webpage design (see Table 4). In this section we discuss each of these categories and its effect on participants' experience in the virtual campus.

Table 4 Features of the virtual campus that contributed to either successful or not successful performance

Feature category	Description
Webpage appearance	Participants experienced success when color, changes in font, and graphics drew their attention to important features e.g., links, information. When important features were difficult to pick out e.g., close spacing and a cluttered look to the screen, performance was hindered. In addition, the use of abbreviations was not helpful during some tasks
Web page structure	Codes related to how information was organized and presented were included in this category. On some pages, information was organized in a manner that was not intuitively understood by the participants, resulting in performance that was not successful. Participants tended to be successful when the format was consistent from page to page, and conversely, had difficulty when such consistency was not present
Navigation	Navigational devices, such as back arrows and links, were used by the participants to move from one webpage to another primarily to find the page on which to carry out a task. Successful performance was noted when such navigation devices were placed in a consistent location from page to page. When not placed consistently, the appearance of the link was important e.g., colored, graphic
Input elements	The manner in which the participants interacted with the virtual campus was coded in this category. Input devices that provided guidance e.g., pull down menus, radio buttons, were found to be helpful. Search boxes without such guidance were unsuccessfully used by several participants
Language	The code of language was used to refer to instances where word choice on a link label or within the page content influenced participant performance. Using language unknown to the intended users e.g. college students was the source of some participants' unsuccessful performance
Availability of help features	A help feature that was found to help foster successful performance was automatic spelling assist

Webpage appearance

Usability guidelines encourage web designers to use color, changes in font, graphics and pictures to attract attention (Nielsen 1999). For most of the participants, these attention-gaining devices were helpful. However, in several instances, those students who indicated they were distractible found attention getting devices to hinder performance. For example, Vera found her attention drawn to pictures of merchandise on the bookstore page rather than the link needed to find a textbook.

The VU virtual campus uses color inconsistently. Many participants had difficulty finding the link to the final exam schedule, placed in the right column in a gray box. In contrast, participants easily found the e-shopping icon on the bookstore page. While this link is also placed in the right column, it is brightly colored and large.

VU virtual campus pages include the use of bold fonts, underlining, and italicizing and our participants performance confirmed the helpful nature of these devices. Rachel indicated, "The thing (on this page) that sticks out to me the most is this that's underlined (pointing to an underlined link)." Some of the participants indicated that they found graphics and pictures helpful. Andy found the soccer schedule quickly indicating, "I saw the sports emblem on the left and soccer must be that way." Tara noted that it would be easier to find information on sororities/fraternities if their logos were links.

One of the features that hindered performance was the use of abbreviations. For example, Vera was not successful in selecting a course on the registration task because she

had difficulty distinguishing between abbreviations close in appearance (PCL—Psychology Child Life, PHI—philosophy, PHT—physical therapy, PHY—physics, PSY—psychology). Similar abbreviations were found to impact her performance when selecting a textbook on the bookstore site.

Several of the participants indicated that the amount of text on a page is sometimes daunting. For instance, Xavier stated, “I feel like there’s a lot going on the left side with all the links and stuff.” Rebecca had difficulty with a list of databases. She stated, “I don’t like it...(I) wish it were spread out more.” The amount of visible information on a page also impacted our participants’ use. Participants during the think-aloud sessions used the scroll feature, but occasionally missed important information by not scrolling far enough. For instance, when searching for a book on the library website, students were faced with a list of library holdings that includes many different types of media (e.g., texts, DVDs, videos). While students could use a second search box to limit their library search by type of media, this box is located at the bottom of the page and several participants didn’t scroll down far enough and missed it.

Webpage structure

The way in which the information was organized on the webpage also influenced participants’ performance. For example, the final exam schedule is provided on a table cross listing the final exam time by the time the class typically meets. Three participants, moving slowly and taking each row in order, located their exams accurately with minimal searching. Other participants were not successful on this task. Rebecca incorrectly identified her exam time. Tara gave up before finding her exam time. Raeann expressed frustration with the table because one of her courses, which met at an unusual time, wasn’t included in the table. Amanda indicated that she had looked at this screen before and reported, “It didn’t make sense to me the first semester... but I get it (now).” When asked how she got it, she indicated, “I had to sit there and kind of really read it, and look at it.”

Participants found the consistency of format from webpage to webpage to be helpful. When asked about the appearance of the VU homepage, Rebecca reported, “The layout is pretty easy for the most part.” When asked, “What makes it easy?” She replied, “If you’re having trouble finding something it’s pretty easy to find...everything is like in its own spot.”

Navigation

The format of most VU webpages includes areas reserved for a number of navigational devices. When navigational devices needed for a particular task were placed in these consistent locations, participants tended to be successful. For instance, the horizontal menu bar is placed in a consistent location on most pages and was used successfully by many participants for accessing the library and the athletic schedule. When consistency of placement was not used, however, participants were often unsuccessful. On several of the athletic website pages, the horizontal menu bar is not included. During the task of finding the schedule of an athletic team, Amanda pointed out this absence and stated, “Right now, I don’t know how to get back to the (home)page...I’m stuck.”

Besides the horizontal menu bar, another consistent area for navigational devices on the VU virtual campus is the left column. While most important links are located in this left column, two tasks had important links located in the right column; locating the final exam schedule and identifying a textbook in the online bookstore. When participants were asked

to locate their final exam schedule, all but two participants had difficulty finding the link. Most of the participants engaged in extensive searching in an attempt to find the link, typically by first going through the links located in the left column. When asked what was the most difficult task performed during the think-aloud session, Rebecca indicated the exam schedule task because “they actually had the link on the right hand side. I’m usually drawn to the left. I didn’t see it on the right hand side.” In contrast, all but one participant was successful on the bookstore task even though this link is also on the right hand side, however it is brightly colored and large which helped to attract the participants’ attention.

In addition, the bookstore webpage has a second link to the e-shopping area in the left column. While participants’ performance on the bookstore task differed in that several of the participants chose the link on the left and others chose the e-shopping icon link on the right, The participants’ use of both the left and right column links to the e-shopping area was only one example of the multiple paths students took while engaged in tasks during the think-aloud sessions. It is assumed that this variability was helpful in that it allowed the participants to be successful despite individual differences in experience, knowledge, and perception. At least one of the participants was consciously aware of these multiple paths or options. When asked to find the next home game of the volleyball team, Rebecca stated, “You could do multiple options.”

Input elements

Five of the tasks used during the think-aloud session required the participants to enter information into some sort of input device (menu, search box). When the information to be selected was given to the participants, they tended to perform successfully. For instance, successful performance was noted on most tasks involving menus or radio buttons. This was particularly true when the input choices were limited by prior selections. For instance, the textbook selection page as previously described limits choices in the menu boxes based on previous input. When describing the bookstore procedure, Lauren indicated, “It’s pretty self-explanatory. I mean it pops up for you and gives you the options. You don’t have to wade through everybody’s options.”

For some tasks, search boxes were used successfully. For example, once participants were successful in finding the library catalog search page, they were all able to type a search term judged to be generally relevant to their topic in the search box. Other search boxes, however, were used unsuccessfully because participants weren’t sure what information was required. Although successful on the task of searching for an article, Lauren had an explanation for some of the difficulties participants experienced on this task. She indicated, “Finding the right key phrase is really important. Cause it’s really hard to do. For example, I’ve done a paper on Tay-Sachs. Well, do you use the dash? Or not? You get different papers if you put the dash in or take the dash out or if you capitalize letters or if you put an ‘s’ on the end. So it depends on what phrase you’re using. It’s hard to find papers if you don’t know what phrase you’re using.”

Many of the participants were unsuccessful in locating a journal article. The subtask that contributed to this lack of success was selecting a database. Most participants did not appear to have an understanding of how a database search is implemented, even though they used the term “database” in their description of what they were doing. Those participants who were not successful typically skipped the step of selecting a database, typing their search term into the database selection search box. While options are available to help with database selection, most participants, even those that were successful on this task, did not make use of these options. For instance, students can select the first letter of the title of

a database or the subject indexed by a database, and the database selection screen will provide a list of appropriate databases. Only Rebecca used one of these options, selecting “Education” from the menu of subjects for her topic of adolescence.

Language

Word choice when writing text for the web has been cited as critical for usability (Nielsen 1999). Performance was both helped and hindered by the specific choice of wording on several links on the VC virtual campus. For instance, when locating an athletic schedule, all participants went deliberately to the athletic tab on the horizontal menu bar. Participants also consistently chose the library tab when asked to find a book in the library. In contrast, the “academic” tab on the horizontal menu bar was seldom chosen with any confidence or efficiency. Typically, the selection of this tab was tentative with the participants using the pull-down menu to look through the possible links before actually deciding to select it. For the task of locating her academic homepage, Tara pulled down the menu on the academic link several times before finally selecting it. She indicated that she thought of academics as having to do with “academic awards.” The academics tab was also the link that had to be used when finding the time of the participants’ final exam. Again, most participants looked through a number of tabs on the horizontal menu bar before selecting the academic tab. Xavier, after looking through the academic tab several times, finally resorted to using the search box to find the final exam page.

The possible importance of language to participant performance was noted during initial data collection. Questions were therefore added to the think-aloud sessions to specifically probe for language issues. Participants uniformly answered that they understood the horizontal menu labels, yet their performance suggested otherwise. Lauren provided the best insight when she stated, “(The labels) make sense if you kind of know what you’re looking for. Like if you want more information about ‘oh, where do I apply’ then clearly Admissions. Or if you need to find quick information about VU, then you can go quick and click on (the link to) VU.” When asked if she could find information about “graduation,” she replied, “I could find it. It would be a matter of figuring out whose page it was off of. So is graduation off of the registrar’s page? Is it off of academics? Or is it off of student activities? Like who was it related to?”

When difficulty was experienced by the participants on the task of finding a book on the library site, it was consistently due to their difficulty in finding the library catalog search page. These participants didn’t identify the label “library catalog” as relating to finding a book. For example, Vera clicked on a number of links before finally clicking on the link to “library catalog.” When asked about her search, she indicated, “(I) didn’t read anything about ‘checking a book out,’ or ‘finding a book’.” This same reasoning was expressed by Alicia during the task of finding a journal article. After scrolling up and down the left column several times, she indicated that she was searching for the word “articles” and couldn’t find it anywhere.

Labels often seemed to be too close in meaning to other labels, which presented a problem for successful task performance. For instance, Rebecca was the only participant who was not successful in finding the course selection webpage. She went to the academic homepage and found a link in the left column labeled “Fall 2009 courses.” This brought up a pdf file listing alphabetically all of the courses offered during the semester rather than the course selection page. She was unable to locate another link on this page with a label that suggested to her that it was a link to the course schedule page.

Availability of automatic help features

Spelling of search terms was a problem for several of the participants. The automatic spelling assist was helpful when present, but it is not present on all pages. Vera, searching for an article on “women journalists” spelled out “women jornalists.” The database that she was working in returned the question, “Did you mean women journalists?” and she was able to successfully complete the task. Raeann, however, had a similar problem with physical therapy (physical therapy), but the database she was working in did not return an automatic spelling error and she was not successful.

Use of strategies for success

While features of the virtual campus were often found to challenge the participants’ performance, these participants were not simply passive recipients of web based information. We observed during the think-aloud sessions that all of the participants had developed one or more strategies that they activated to help them be successful on the virtual campus. Further, they often described other strategies that they used in their everyday life. In this section we discuss the strategies we observed.

Self-talk

Self-talk was used as a code to describe a strategy in which the participants talked out-loud to themselves. For example, when attempting to locate an article on the library page, Amanda lost focus momentarily but was able to use a self-talking strategy to remind herself of what she was doing. Vera used the same type of self-talk to redirect herself when she got distracted on the bookstore page.

Reading strategies

Many of the participants reported learning differences that interfered with their ability to read text. It was not just these participants that used reading strategies, however, during the online sessions. Highlighting with the mouse was the most common strategy. Several participants also used the cursor like a finger to point at the text as they read. As Alicia reported, “I have to. I can’t follow (the words) unless I have the mouse here.” Several participants in this study reported that the most helpful strategy for reading information on the virtual campus was to actually print it on paper and then use strategies such as underlining and highlighting on the resultant paper copy. For instance, Adam indicated that he likes having a paper copy so he can highlight and write notes in the margin. Lauren likes the paper copy as well, but she highlights information with the mouse and then copies only the highlighted section from the webpage, pasting it into a Word document.

Strategies used to help with spelling

Participants reported several strategies that they used to accommodate to their spelling problems. Raeann reported, “Sometimes searching is kind of annoying because of my spelling. Like sometimes when I’m searching on Google or Yahoo it won’t understand what I’m asking it. And I’ll go to a little dictionary on my laptop. I’ll respell it until I get it right and then I’ll go back.” Raeann was also observed copying and pasting from a website

into a VU search box. When asked why she did that, she indicated, “I copy and paste everything. I don’t like rewriting...because I have these spelling issues.”

Strategies for memory

Xavier indicated that if he finds something he needs to remember, he writes it down. When asked why he would write rather than print it out, Xavier indicated, “I’d write it on a sticky note. It’s more convenient, I don’t have to plug in my printer or wait for my printer to run it off.”

Strategies for help-seeking

Given that participants were not successful on a number of tasks during the think-aloud sessions, questions were added to the think-aloud debriefing about what they would do when faced with difficulty on an online task in their daily life. Help seeking behaviors varied significantly between the participants. While some participants indicated that they tend not to ask for help, other participants indicated they ask for help frequently.

Puustinen and Rouet (2009) categorize help seeking by whether the source of help is human or non-human. The participants in this study had an expressed preference for human help. In fact, several of the participants indicated that they would never consider using electronic help features. Alicia indicated, “I’d never go to a computer to help me, because I’d just read it over, and read it over, and try to do what it tells me and still not get it.” Although Vera indicated that online services make her life easier, “sometimes I have to go to the library, because I just can’t figure it out. I go find someone to help me.” Andy complimented VU on its attempts to provide more online help but indicated, “I’d rather go to a person.” The traditional dichotomy of human versus non-human help is blurring with the advent of online help systems such as the 24/7 online chat with a librarian and online tutoring system VU instituted this past year. Such services may be perceived as more personable, and therefore more acceptable to college students.

Summary of strategy use

It should be noted that the sampling frame of this study involved recruiting college students with documented learning disabilities. This documentation allows the student to request accommodations for their disability. The participants in this study therefore were individuals who acknowledge their learning differences, actively seek out help, and meet regularly with Learning Services staff. We suspect that the participants were therefore students who have some insight and understanding of how their learning differences impact their classroom performance and how to use strategies to accommodate to those differences. The sampling used in this study does not allow us therefore to infer that such strategies are used by all students who have learning differences. We are left with a question regarding what other strategies might be used and how commonly such strategies are seen in the population of college students with learning disabilities, many of whom do not seek out such services. Yet it is clear that the participants in this study have learned to use such strategies to be successful.

As it became clear that strategy use was an important factor in understanding performance in the virtual campus, we asked subsequent participants about their strategies and how they learned them. While all participants reported on additional strategies they had

developed over time, responses to how they learned them were vague. Perhaps strategies are translated online from successful off-line strategies such as highlighting. Certainly the similarities of online to offline strategies were noted during the participants' performance e.g. highlighting with the mouse. It may also be that such strategies are translated from one electronic source to another e.g., cutting and pasting.

Self-regulated strategy use has been cited as important for success in the college classroom (Ruban et al. 2003). Trainin and Swanson (2005) report that college students with learning impairments rely on cognitive learning strategies and help seeking in order to be successful. Studies also suggest that students with learning disabilities demonstrate differences in strategy use in comparison to students without learning disabilities (Reaser et al. 2007; Ruban et al. 2003). Given these differences, it is perhaps no surprise that a number of studies have been published related to the teaching and acquisition of such strategies involving college students with learning disabilities (Allsopp et al. 2005; Finn et al. 2008; Gajria et al. 2007). No studies were found that look at how such strategies translate into the online environment. This may be a fruitful area for future research.

Discussion

The participants in this study experienced both successful and not successful performance during the think-aloud sessions. Only four of the 16 participants were successful on all eight tasks. While the methodology used in this study does not allow inference to college students with learning disabilities as a population, the fact that so many of the participants in this study experienced difficulty with tasks expected of college students, suggests that VU, and perhaps other institutions of higher education, need to attend to the needs of these students.

One of the findings of this study is that participants' performance supports already recognized principles of usability (U.S. Department of Health and Human Services 2006). It is important to note, however, that not all participants found usability principles to be helpful. For instance, several participants with self-described attention problems found attention getting devices distracting and a hindrance to successful task performance. In addition, strategies used by the participants appeared to moderate the impact of features of the virtual campus allowing for success when a usability principle was not followed.

The responsibility for student success does not lie only with colleges and universities as they design their virtual campuses, but also with the students as they engage strategies to meet the demands of the online environment. A more useful way to address this topic might be to view the participant as an active agent, engaged in a two-way interaction with the virtual campus. Certainly, we are advocating that website designers include students with LDs in their usability testing of virtual campuses. We are also advocating, however, that personnel charged with student development look also at teaching cognitive and behavioral strategies for everyday use of the online environment. This is an important aspect of student development given the current emphasis on technology both in college and in post-college employment.

Limitations

This study was conducted to explore the experiences of students with learning disabilities in their interactions with virtual campus environments. Because of its focus on students

with learning disabilities, this study does not provide comparative data on the usability of the tasks examined for students without learning disabilities—that is, were students not successful because of their learning disability, or because the task itself was highly unusable. Additional research with comparison groups of students with and without learning disabilities would provide more information on the extent to which the usability of virtual campuses affects all student users.

Recommendations

The participants' performance provides lessons that should be given consideration for further research and implementation.

- Given that the participants were most successful with those tasks that provided a guided procedure, it is suggested that staff and administrators responsible for the development of online services pay attention to the way in which task procedures are presented on a webpage.
- In addition, language usage on the VU virtual campus was a problem for the participants in this study. Usability studies, focusing on language, should be carried out on all pages.
- It was apparent that the participants in this study were most successful when basic usability principles were followed. Higher education web designers are therefore encouraged to consistently follow usability principles in the design of the virtual campus. To ensure such consistency, it may be helpful for institutions of higher education to establish policies addressing the use of usability/accessibility guidelines in the design of their virtual campus. A review of the VU website indicated that on most pages, usability guidelines were followed. Whether such was the case because VC has website accessibility and usability policies, or because of diligence by the VU web designers was beyond the scope of this study, but it may be that such policies are a first step in general awareness.
- While the population of interest to this study is students with learning disabilities, there is little known about the usability of the virtual campus for any student (Seale 2006). The argument advanced by advocates of universal design is that when environments are made accessible for individuals with disabilities, usability by all also improves (Roberts et al. 2011). It may be that by applying universal design principles to the virtual campus, colleges and universities will be able to address accessibility for SWD, but also improve the usability of their services for all students.
- One of the more troubling findings of this study is the difficulty participants had in using the library site for finding both books and journal articles. Given that the role of information literacy is important in today's society, improving this performance would seem to be particularly important. Research related to library usage is already represented in the literature (Marill et al. 2006; Van Den Haak et al. 2003) but research should continue and the findings of such studies should be incorporated into the design of college library sites. Librarians need to advocate as well for inclusion of these findings in off-site database and catalog services.
- It was interesting that these participants did not use or express interest in using the electronic help features offered through the virtual campus. Such help services would seem to be a useful and readily available strategy for students with learning disabilities. It was clear that these participants were accustomed to asking for help when they

needed it but preferred getting that help directly from a person as opposed to an online service. This preference should be an important consideration when planning the implementation or expansion of online help services.

Conclusion

The participants in this study experienced difficulty with reading and attending to the information provided on a computer screen, organizing that information in a manner that was useable, and understanding the processes needed to complete the tasks successfully. In some instances, success was achieved through the insightful application of previously learned and self-initiated strategies. In other instances, however, these strategies were either not implemented or were not effective. The challenges these participants experienced may or may not have been related to their learning differences, and in many instances seemed to be challenges that many college students might experience because they were based on features of the virtual campus. Regardless of the cause of the challenge, the end result was that many of these participants failed to complete tasks that are expected of the college student. If inclusion of students with learning disabilities in the college experience is to be achieved, the interaction of personal capabilities with the virtual campus must be addressed.

Access of students with learning differences to an equitable educational experience has been a long and at times arduous journey for teachers, parents, advocates, and of course, students. Institutions of higher education are still struggling with providing “reasonable accommodations” to these students in the face-to-face classroom (Seale 2006). Students with learning differences may be marginalized once again by the current push within institutions of higher education to provide educational and operational services in an online environment.

Given the small sample size and exploratory nature of this study, it cannot be said with any confidence that students with learning disabilities in general would experience similar successes or failures in the VC or any other virtual campus. These findings do suggest that colleges and universities should be concerned about the experiences of these students. Given the increasing number of students with learning disabilities enrolling in higher education, it is in the best interest of colleges and universities, from both a business and legal standpoint, to expand efforts at ensuring equality in the educational experience, including accessibility of the virtual campus.

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