Embracing Learners With Visual Impairments in CSCL

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Abstract: This autoethnographic study aims to shed light on the collaborative experience of a learner with a visual impairment in a blended CSCL environment. Through the analysis of personal reflections, this qualitative study captures some emergent themes and challenges in both the face-to-face and virtual environments with the intent to improve diversity, accessibility, and equity in CSCL.

Keywords: CSCL, visual impairments, accessibility, inclusive design

Marginalized attention to learners with visual impairments in CSCL

Much scholarly work has described the characteristics of CSCL relative to traditional learning and examined its implementation, such as the importance of learning with peers, active participation in a community of learners, and access to enhanced collective thinking processes with the aid of technology (see, Kreijns, Kirschner, & Jochems, 2003; Stahl, 2013). With all of the emphasis CSCL places on collective learning and community, far too little attention has been paid to how such CSCL can be experienced by learners with disabilities. With the support of legislation that advocates equal access to general education for individuals with disabilities (e.g., Section 504 of the Rehabilitation Act 1973; IDEA 1975; and ADA 1990), it has been increasingly more imperative to address the needs of the growing number of learners with disabilities, who traditionally have had limited access to general education, in both K-12 and higher education (Rao, 2004). According to the U.S. National Center for Education Statistics, 95 percent of students with disabilities (ages 6 to 21) were served in secondary regular schools in 2012, and 11 percent of undergraduates reported having disabilities in 2011 (Snyder, de Brey, & Dillow, 2016). This implies that the general education system, where CSCL is increasingly prevalent, now embraces its responsibility to address students with disabilities in its discourse.

Although the historical emergence of CSCL in the early 1990s is indebted to computer-aided composition programs for learners with disabilities to some extent (see Stahl, Koschmann, & Suthers, 2006), recent literature reveals that a relatively small body of work has touched upon this imperative relationship between CSCL and disabilities with limited focus on cognitive disabilities (see Lingnau & Bientzle, 2009). However, in a CSCL-dominant ecology where vision is largely required, learners with visual impairments (hereafter, LVIs) have been faced with inaccessible instructional technologies, such as inappropriate graphic labels, ill-structured e-learning content for assistive technologies, and software/hardware interfaces designed without accessibility in mind (Babu, Singh, & Ganesh, 2010; Fichten, Asuncion, Barile, Ferraro, & Wolforth, 2009; Taylor, 2016).

While there have been some published accessibility guidelines which can significantly lower the barriers previously mentioned (e.g., WCAG 2.0, 2008; VPAT, 2016) and some universal design principles for learning (see Persson, Åhman, Yngling, & Gulliksen, 2015; Rose, 2000; Scott, Mcguire, & Shaw, 2003), LVIs still have to "encounter a recurrent set of problems with commonly used instructional technology" in CSCL environments (Taylor, 2016, p. 123). According to the 2011 U.S. National Center for Education Statistics report, "Limited staff resources to provide faculty and staff with training on accessibility issues" has been identified as the major barrier (by up to 52 percent of respondents) hindering the implementation of Universal Design in both 2-year and 4-year post-secondary institutions (Raue & Lewis, 2011). This tendency highlights that the lack of awareness of accessibility among faculty, staff, and instructional designers is the primary factor causing digital barriers for LVIs (Taylor, 2016) rather than technical or financial problems (Babu et al., 2010; Fichten et al., 2009; Lazar, Allen, Kleinman, & Malarkey, 2007). Understanding the CSCL experience of LVIs, therefore, is instrumental to define which challenges LVIs would face, and how to address those issues to prevent them from being excluded. This paper is intended to respond to the paucity of studies on the learning experiences of LVIs in CSCL environments.

Methods

Design and participants

This study follows an autoethnographic research method, which gives the authors an opportunity to expand the understanding of a social phenomenon by capturing personal experiences through the duality of their roles -

participants and researchers (Wall, 2006). All three participants are graduate students at a university in the northeast of the United States. Only one of the participants is blind, and is experienced with assistive technology and web programming; and not all sighted participants are familiar with the LVI's needs.

Procedures

The study took place over a four-week period in an introductory graduate course on CSCL that also adopted a blended CSCL framework. The course implemented a virtual text-based discussion tool, known as CREATE (Borge & Shimoda, under review). This prototype is developed to improve collaborative learning skills. The first virtual meeting on CREATE was considered a pilot designed to encourage participants to use and get familiar with the tool; while the second was structured to discuss questions that were posed by the instructor and related to the course content. The participants attended two face-to-face classes that were designed differently, requiring activities that adopted visual representations. Participants were asked to write self-reflections after each (face-to-face and virtual) meeting. Each participant wrote two reflections during face-to-face meetings and one through CREATE, giving a total of nine reflections. Two phases of data analysis were done, the first was individual and the group did the second collectively. In phase one, each participant reviewed all nine reflections and summarized each individually, highlighting the main themes and listing statements that focused on either emotional or technical challenges. In phase two, participants met twice to discuss the emergent themes, and reached a collective consensus about the three most significant ones. The analysis of the written reflections followed an iterative process, with a focus on common problems that interfered with the main collaborative task on both the group and individual level. In order to structure the analysis, common technical and emotional problems, such as isolation and frustration, which could face the LVI, were outlined using previous accessibility-related literature (Babu et al., 2010; Fichten et al., 2009; Lazar et al., 2007; Taylor, 2016).

Emergent themes

Challenges impeding the LVI

The distinct challenge the LVI encountered on the CREATE system resulted from the lack of web accessibility and limited channels of communication. He used assistive technologies—a screen reader in conjunction with a refreshable braille display—to access and interact with the online system. In the course of the virtual activities, he recurrently struggled with a few technical issues, such as screen reader crashes and conflicts with web browsers, inappropriate forms, graphic labels, and missing HTML semantic tags. The student reported that more than 5 additional hours were spent on testing the CREATE system, and familiarizing himself with some of its inaccessible elements before participating in the session. It was found that the student's responsive participation in the text-based discourse was hindered by the absence of the Accessible Rich Internet Application (WAI-ARIA 1.1, 2016) technique, which caused the most frustration and delay in the online group discussion. CREATE only offered one channel of communication, text-based discourse. So, combined with the accessibility issues, activities often led to misunderstandings between the sighted and the LVI. Seo (the first author) mentioned, "I wanted to talk more and add some more, but had to go with the flow due to the time and slow technology constraints. And, I often missed context. I said to myself, I wish we could have voice chat instead. Then, I would be more responsive and active" (Seo, Week 4 Reflection, September 18, 2016). The paucity of multimodality in CREATE made it expression of frustrations the LVI faced more difficult for the team to recognize.

In the face-to-face environment, on the other hand, the technical problems were significantly minimized because the sighted were able to identify visual and verbal cues that reflected the LVI's moods and reactions. The fact that the LVI could verbally communicate with others in real time, without having to overcome the inaccessible chat entry, largely affected his preference for face-to-face interaction. Although computer-based collaboration was also required in some activities, he was given the flexibility to employ a more accessible combination of tools to his favor: "I hooked up my braille display to my laptop and passed to Mona [the second author], and had her type down what the professor was explaining on the screen in Microsoft word so that I could read them in braille through the connected braille display device--it was successful!" (Seo, Week 6 Reflection, September 29, 2016).

The LVI repeatedly faced difficulties each time the class employed visual-based collaborations, such as creating and sharing diagrams, watching videos, playing with flashcards, etc. In contrast to the online environment, the presence of his sighted teammates, the instructor, and other classmates in the classroom helped him address challenges immediately. Verbal descriptions for videos, and tactile graphics for visual representations were the main alternatives. He preferred tactile materials to verbal descriptions for the complex diagrams since it gave him a chance to decode the meanings by himself, rather than having someone else

selectively describing it. The Swell Form heating machine (a heat processor) and swell touch paper (a chemical paper that allows dark and black lines to swell when inserted in the machine) were provided by the university. Using this technology permitted his class to easily produce the needed tactile graphics within a few seconds during the activities. In sum, the analysis shows that the face-to-face CSCL environment is more likely to embrace students with blindness, relative to an inaccessible virtual space, by addressing and transforming the unique challenges of the LVI into a chance for group support and collaboration.

Dissonant experiences

When looking at the reflections of all participants, it is clear that they faced similar challenges at the start of the course. However, when comparing the reflections across time, difficulties faded for the sighted, while remaining prominent for the LVI. In the face-to-face environment, inaccessibility issues persisted throughout. For example, one of the activities required the use of flashcards and some physical movement around the classroom to allow more interaction with other groups. The sighted learners confronted some setbacks in the beginning of the activity that they overcame by watching the visual demonstration of their peers. In contrast, the LVI needed more explanation from the members of his team, and others. Team members acknowledged such struggles and negotiated strategies that would allow them to work together cohesively and ensured equal participation opportunities in all activities. Such social strategies were the first step that the participants took before starting tasks and were constantly revisited by them. Through this form of social negotiation, the team was able to address inaccessibility problems as they occurred in the face-to-face context. Thus though the issues never disappeared the team got better at problem solving and creating more equitable access. Overtime the instructor and the rest of the class also became more aware of potential process problems for the LVI.

Given the distributed nature of the online activities, inaccessibility issues compounded the difficulty of online activities for the LVI. As such, activities that became easier overtime for sighted members remained equally difficult for the LVI. For instance, in the virtual environment and with the use of a new system such as CREATE, all participants struggled at first when completing the discussion activities because the activities were quite different from traditional instructional practices and it was a prototype system. Nonetheless, with practice, the activities became easier for the sighted participants. The LVI experienced constant frustration due to the lack of accessibility combined with the team's inability to collaboratively mitigate problems in real-time settings. Impediments to collaboration were caused by the team's inability to "see" what was going on for the LVI and work together to solve problems.

Team performance

It is essential to highlight the strong relation between the challenges that individuals encounter and their impact on the dynamic of the team's collaboration. What hindered the individual became a problem of the group. Accessibility issues caused delays for the LVI that not only influenced the LVI's performance, but also deviated the focus of the group. After testing out the CREATE environment, all participants expected delays and showed willingness to support each other by providing explanations and ensuring group cohesion. Nonetheless, they could not predict the extent of the challenges during the CREATE discussion sessions until the LVI identified them in a post to the team. Hence, in several incidents, sighted participants did not notice that their peer was left behind during discourse and the group was faced by a communication disconnect. Consequently, sighted members often spent time filling in the gaps and supporting their peer. Given time constraints and accessibility issues, discussion quality often suffered.

Discussion and conclusion

Through the personal reflections of the learners with and without visual impairments, we were able to explore some of the struggles that could face learners with visual impairments in an inclusive and blended CSCL environment. While web accessibility issues can be addressed quickly with a limited amount of technical skill (Lazar et al., 2007) by simply adding some required HTML attributes, the problems it causes are far reaching. Recognizing the challenges faced by the LVI, the designers of the CREATE system have since partnered with the participants as a means of documenting all of the accessibility issues and addressing them as part of the second iteration of the system. Many of the problems faced by the LVI in this context would likely be common problems for any LVI in a CSCL setting.

Within the small group, team members agreed on creating their set of rules such as prioritizing their tasks in order to meet the time constraints and having a checkpoint system to ensure that no one was left behind. As a result, a positive atmosphere allowed learners to feel safe and included, which made tackling difficulties faced by the LVI a community problem instead of an individual struggle. It is imperative to highlight that the inaccessible design was the cause of many setbacks, not the technical abilities of the learner with visual

impairment. This study calls for the training of those in charge of designing and instructing inclusive courses with a Universal Design strategy in mind, but also emphasizes the importance of cultivating an inclusive community. Future research is necessary to delve deeper into the design of activities and tools and how they could affect the social and cognitive performance of learners with disabilities.

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