

Promoting Inclusive Online Learning for Students with Disabilities in Information Systems Courses

Wu He, Shenghua Zha, Silvana Watson, and Yuming He

Recommended Citation: He, W., Zha, S., Watson, S., & He, Y. (2022). Promoting Inclusive Online Learning for Students with Disabilities in Information Systems Courses. *Journal of Information Systems Education*, 33(1), 7-14.

Article Link: <https://jise.org/Volume33/n1/JISE2022v31n1pp7-14.html>

Initial Submission:	19 December 2020
Accepted:	5 May 2021
Published:	15 March 2022

Full terms and conditions of access and use, archived papers, submission instructions, a search tool, and much more can be found on the JISE website: <http://jise.org>

ISSN: 2574-3872 (Online) 1055-3096 (Print)

Promoting Inclusive Online Learning for Students with Disabilities in Information Systems Courses

Wu He

Department of Information Technology & Decision Sciences
Old Dominion University
Norfolk, VA 23508, USA
whe@odu.edu

Shenghua Zha

Department of Instructional Design & Educational Technology
University of South Alabama
Mobile, AL 36688, USA
shzha@southalabama.edu

Silvana Watson

Department of Communication Disorders & Special Education
Old Dominion University
Norfolk, VA 23508, USA
swatson@odu.edu

Yuming He

Department of Information Technology & Decision Sciences
Old Dominion University
Norfolk, VA 23508, USA
yhe004@odu.edu

ABSTRACT

It is important to ensure educational equity for students with disabilities in online courses as more courses are taught online during the pandemic. This conceptual paper describes the key barriers for instructors to implement inclusive online classes, particularly technology courses, during the COVID-19 pandemic and suggests specific strategies to mitigate the negative impact on students with disabilities. We hope that this paper will motivate more Information Technology/Information Systems (IT/IS) instructors to implement more inclusive and accessible online courses to keep all students, including students with disabilities, motivated and engaged in online environments throughout the pandemic.

Keywords: Online learning, Inclusive learning, Diversity, Students with disabilities, Universal design, Collaborative learning

1. INTRODUCTION

The COVID-19 pandemic forced many universities to transition quickly to online instruction during the Spring Semester of 2020. There was little time for instructors to prepare for online courses and follow effective instructional design practices. This abrupt transition to online modality has negatively impacted various populations of students, including students with disabilities — especially students with hearing

impairments, deafness, and visual impairments (Mohammed, 2020) since many instructors were not prepared or lacked the experience to teach online. A recent report from Digital Promise (2020) showed a decrease of college students' satisfaction after schools switched to all courses offered online during the COVID-19 pandemic. The report indicated that undergraduate students experienced challenges participating in online courses. For example, many students disclosed they were having problems staying motivated. Students grieved

over the loss of interactions with their instructors and peers (Digital Promise, 2020). The latest College Pulse survey (2020) reported that more than 90% of respondents thought they should pay less tuition if classes were online. The majority of the respondents believed that online courses could be improved through the use of better technology.

The pandemic is still going on, and our daily life will be far from normal for some time. There is a high chance that online courses may have to continue for quite a while. As we plan for the coming semesters, we must reflect and identify areas of concern to address and continuously make improvements. Since equality, diversity, and inclusion are essential for higher education and the Instruction Technology (IT) workforce, we must be more innovative. The accessibility and quality of online teaching must meet the needs of all students, especially those with disabilities, instead of putting them at an unfair disadvantage. This also has future implications to student enrollment and university finances.

Disability is the limit or lack of an ability to perform a major life activity (World Health Organization, 1980). According to the 2017 American Community Survey (ACS), the overall rate of people with disabilities in the U.S. was 12.8%, which meant that nearly 40 million Americans had a disability. Based on a report from the U.S. Bureau of Labor Statistics (2018), people without a disability have a significantly higher labor force participation rate than people with a disability.

Furthermore, according to the National Science Foundation's National Center for Science and Engineering Statistics (2019), 19.5% of undergraduate students in the U.S. reported having a disability. However, many instructors do not know how to support students with disabilities in online classes. Many faculty members tend to doubt the existence of hidden disabilities (e.g., learning disabilities), and they do not want to provide accommodations for those students with hidden disabilities (Leak & Stodden, 2014). Lack of knowledge of disability types and training on how to design and deliver course accessibility as part of online classes contribute to the challenge to convince instructors to provide online accommodations for students with disabilities (Bunbury, 2020). Nevertheless, to ensure educational equity for students with disabilities in online education, it is critical for instructors to think about what they can do to make their online courses accessible to all students and specifically address the needs of students with disabilities. Neglecting students' needs has put those students at a disadvantage in remote learning since the pandemic started (Mohammed, 2020). This is particularly concerning since students with disabilities were amongst those facing the most significant obstacles, as the specific support services, accommodations, and learning tools they required were not always readily available in online courses during the quick transition to remote learning. For example, many deaf students in online courses did not have sign language interpreters as they usually did in on-campus face-to-face classes. Visually impaired students were also separated from their sighted friends who usually assisted them in classrooms. These issues can have a considerable negative impact on students' learning and academic success in higher education (Gronseth, 2018).

The situation was worse among minority learners with disabilities. A survey was administered to students at the University of Toronto asking for their experience during the

online course shift during the COVID-19 (Chan et al., 2020). Students of Black, low-income, and LGBT groups reported higher stress than others during the shift. In particular, 80% of Black students with some disabilities reported significant stress. This was confirmed in a comparison study between students with and without disabilities (Zhang et al., 2020). Students with disabilities experienced more COVID-related difficulties and held more concerns about online courses than their peers without disabilities.

In addition to the barriers encountered in higher education courses, students with disabilities are generally underrepresented in the IT/IS disciplines. Increasing the participation of individuals with disabilities in IT/IS fields can help improve technology innovation and make technological tools more accessible to a broad audience, helping employers meet legal requirements under the Americans with Disabilities Act (ADA). Ideally, the designers and builders of technology innovations should represent the population that would use the innovative technology. Since many of the current technology innovations are being used and will continue to be used by people with disabilities, they need to be involved in the design and creation of new technology, offering their perspectives and expertise to make it more effective and accessible to all who need accommodations. We believe that the IT industry will benefit immensely by including more people with disabilities into the IT workforce, which will not only meet the legal mandates, but also enhance the technology availability, efficiency, and easy-to-use groundbreaking tools. However, people with disabilities face many challenges to be included in the IT workforce. For example, disabilities and chronic illnesses were one of the top five personal factors that prevented students from succeeding in IT/IS majors as reported by Zhang and Aasheim (2011). Despite legislation on workplace diversity, people with disabilities still do not have the same access and work opportunities as those without disabilities.

This conceptual paper describes the key barriers students with disabilities face in online classes, particularly in technology courses, during the pandemic, and it suggests specific strategies to mitigate the negative impact on these students with special needs. We hope more IT/IS instructors will proactively adopt strategies to identify and help vulnerable students, including students with disabilities, understand the barriers to their learning going forward, and find ways to design accessible online courses to keep them motivated and engaged in online environments, throughout the pandemic, and in the future.

2. BARRIERS FOR INCLUSIVE ONLINE LEARNING

There are some barriers to implementing an inclusive online learning environment for students with disabilities (Hashey & Stahl, 2014; Hollingshead & Carr-Chellman, 2019). Although many instructors recognize that equity and inclusion are important factors to consider for teaching in a welcoming environment, these instructors face challenges in the actual implementation of fairness and inclusion in their teaching.

2.1 Insufficient Knowledge and Understanding of Assistive Technology or Accessibility Features in Technology

Most college-level faculty have not received training on assistive technologies. With the use of assistive technology,

including specialized software tools and hardware equipment, many challenges can be overcome. For students with visual impairments, programming tasks take on an extra level of difficulty and time. Tools, such as screen readers, can be used to speak out the code aloud for them. Other tools, such as screen magnifier and speech-to-text software, will also help those students with visual impairments. Instructors need to slow down in online lecturing and give them extra time to complete programming tasks during the online labs. Popular e-learning platforms, such as learning management systems and video conferencing tools, have accessibility features that need to be turned on manually. For example, the video conferencing tool Zoom's closed captioning feature needs to be turned on for the individual or group accounts before an online meeting is hosted. Cluttered page layouts in documents or PowerPoint slides can also cause difficulties for students with specific learning disabilities as they attempt to read and make sense of the information presented in the slides (Burgstahler, 2002; Edmonds et al., 2005; Greer et al., 2014).

2.3 Lack of or Insufficient Understanding of Universal Design for Learning (UDL)

Students have different abilities and represent a great range of different backgrounds, such as economic, physical, geographical, racial, linguistic, and cultural (Rao, 2012). Universal Design for Learning (UDL; CAST, 2018) is an instructional design framework focused on providing learners with multiple ways to engage, receive instruction, and express learning. UDL recommends multiple means of engagement, multiple modalities of instruction, and multiple means of assessment to support and accommodate diverse learning needs and a variability of learners (Grogan & Ruzic, 2000; Hollingshead & Carr-Chellman, 2019). For example, text-based learning is insufficient and will not offer the flexibility to meet the various students' learning needs (Hollingshead, 2018).

2.3 Lack of Training and Practice to Implement Effective Online Engagement

Student engagement in online courses is difficult to achieve (Hollingshead & Carr-Chellman, 2019). Technology can be used to facilitate interaction and engage students in online courses. However, technology cannot replace the support and facilitation of instructors. Online students complained that they struggled to stay motivated, and they hoped to have more interaction with instructors and other students (Digital Promise, 2020). This could happen to many online technology-oriented Information Systems (IS) courses. For example, an introductory programming course is an essential foundation for IS students. Students can lose interest if they have trouble running a program and could not get timely help for debugging their program to keep up with the rest of the class. Some students are reluctant to ask questions directly to the instructor. Thus, extra support from instructors or teaching assistants is needed to help those students.

3. SPECIFIC STRATEGIES

To overcome barriers described above, we offer the following six strategies.

(1) Many instructors use video conferencing tools, such as Zoom, to provide online lectures or for virtual office hours

during the pandemic. One frequently asked question is how to add captions and subtitles to Zoom videos, recordings, and meetings. Closed captions and subtitles can drastically improve video accessibility for hearing-impaired or deaf students. There are specific ways to add captions and subtitles to Zoom recordings and live Zoom meetings via speech recognition technology. Tandy and Meacham (2009) recommend presentations to use large and sans serif fonts. They suggest creating a high contrast between text and background and avoid reliance on color to convey information since some students are color blind.

(2) Flexibility and differentiation in online courses are necessary. Instructions should consider offering flexible pacing for students to ensure that students with disabilities have the time and support needed to master the content in the online course (Hollingshead & Carr-Chellman, 2019).

(3) Breaking down the content into different smaller chunks or modules. Each module may last approximately 20-25 minutes (Bao, 2020), allowing students with disabilities to follow the content easily. Recorded lectures should be made available to students as well.

(4) Work with the university office of disability and train teaching assistants ahead of time, so that they can offer effective support to online students with disabilities. They can assist and answer questions from students with disabilities during and after class using appropriate communication tools, such as chat tools or emails.

(5) Using the UDL framework as a guide (Burgstahler, 2002), instructors can make online teaching more accessible, engaging, and useful for students with disabilities. It is recommended that instructors use different ways to present the same content, including various media and resources, such as videos with captions, group or partner discussions through wikis or discussion boards, podcasts, digital handouts, braille handouts, and providing more examples (Meyer et al., 2014; Steinfeld & Maisel, 2012).

(6) Universities need to expand their services, including support related to online learning for students with various disabilities. For instance, hearing-impaired students can benefit from online services, such as receiving transcription of both synchronous and asynchronous lectures (UNESCO, 2020), and online tutoring services, including Peer Assisted Learning (Theodosopoulos & Hardman, 2020).

In addition to the above six strategies, we have some specific recommendations for supporting collaborative activities in online environments. As Israel et al. (2015) pointed out, computing often involves collaborative activities and requires students to come up with creative solutions to ambiguous or ill-defined problems. Instructors need to encourage collaboration between students, provide collaborative activities in their courses, and provide support for students with disabilities who need to interact with their peers without disabilities in those collaborative activities. In practice, this is quite challenging since many IT/IS instructors may not know how to provide adequate support to students with disabilities as they collaborate with their peers in online environments. Student-centered collaborative and active learning approaches, such as pair programming (Edwards et al., 2010; Li et al., 2021) and Process Oriented Guided Inquiry Learning (POGIL) (Purkayastha et al., 2019; Trevathan & Myers, 2013), should be considered and leveraged to support collaborative activities in the online environment for all

students, including those with disabilities. For example, Trevathan and Myers (2013) used Web 2.0 technologies (i.e., a wiki, blogs, and social networking) to implement POGIL in an information technology course. Later, they scaled up POGIL techniques for teaching a massive information systems course with approximately 350 students undertaking an IS course to improve interactivity (Trevathan et al., 2014). The POGIL technique should be tested to engage students in online IS classes as well. This approach recommends having four students work in one group (one breakout room per group). Each group member has specific roles when completing a POGIL activity (Table 1). Those activities usually target higher-order thinking skills. Students follow the instructions and steps on an instructional sheet to complete an activity as a group, report what they learned from this activity, and provide answers to the questions listed on the sheet. The instructors or teaching assistants facilitate the group discussion. Online POGIL may be performed via a combination of asynchronous tools, such as wiki and discussion boards, or a mix of asynchronous and synchronous tools (e.g., Zoom). Asynchronous tools are used for report and summaries while synchronous tools are used for real-time discussions.

Team Roles	Responsibilities
Recorder	records all answers and questions, and provide copies to the team and facilitator (instructor)
Speaker	talks to the facilitator and other teams
Manager	keeps track of time and makes sure everyone contributes appropriately
Reflector	considers how the team could work and learn more effectively

Table 1. Team Roles in POGIL (Hu & Avery, 2015; Mitchell & Hiatt, 2010)

While the POGIL model has the capability to engage students by assigning students from the same class into different roles, it does not guarantee that students with disabilities will receive adequate support. The program of Peer-Assisted Study Sessions (PASS), which uses senior students to assist student learning, can help those students struggling in the course (Zha & He, 2021). PASS has been offered in learning centers at many universities worldwide (Dawson et al., 2014). In this program, students who have finished the same courses with good grades are hired as cross-year student leaders. One purpose of hiring them to facilitate teaching and learning is to set them as role models for students. If students from under-represented minority groups are recruited to lead a PASS session, it is possible that they would motivate other minority students in IT/IS classes to learn the subject. Student leaders are trained in technology, pedagogy, and communication skills before offering PASS sessions to students. Although the learning activities spanned from concept recitation to problem-solving, results of a meta-analysis study showed that activities focusing on problem-solving outperformed others in PASS sessions (Zha et al., 2019). In those sessions, student leaders explained their roles as learning partners instead of content experts. They worked

with students to solve problems by formulating problems, seeking solutions, and interpreting results. Students were encouraged to use texts, audio, and mouse drawings to participate in the sessions and help each other. With appropriate training on specific disabilities, such as learning disabilities, student leaders may become effective partners to support the learning of students with learning disabilities.

4. SHARING PERSONAL EXPERIENCE

We would like to share some anecdotal experience in teaching students with learning disabilities (LD) in our online classes. Before sharing our experiences, we will describe some of the characteristics of students with LD to better understand their challenges in an online learning environment. It is important to be cognizant of those characteristics to better understand the strategies and accommodations used.

The attributes of students with LD vary on a continuum, representing a heterogeneous population of abilities. Some students with LD have organization, visual and/or auditory perception, and mathematics difficulties, while others have reading decoding, written expression, and comprehension issues (Fletcher et al., 2019). These characteristics may negatively contribute to their self-worth, motivational, and social competence (Gregg, 2014). For these reasons, instructors need to carefully plan their online instruction.

In the past three years, we have worked closely with undergraduate students with LD in programming courses online and face-to-face. We noticed that most of our students with LD often were worried about how their peers saw them, which affected their relationship with a programming partner and with the other students in the course. Some students actively collaborated with their peers and were excited about the opportunity to work with a peer, while other students with LD were reluctant and unwilling to work with a partner. When teaching face-to-face, it was possible to give students time to get to know each other before assigning them to complete a task together. However, in an online environment, that became more difficult because the students did not have the same interaction convenience to get to know each other. Thus, it became very important to plan ways in which the students could get to know each other before having to collaborate on a course assignment. To reduce anxiety and uncomfortable feelings among students, the instructor used Zoom to meet with the class and then assigned students to breakout rooms to interact with their small group. This helped lessen the communication barriers. Students could share their screens and chat with their partners. Other tools were available to students to support the completion of their collaborative tasks, such as Google Docs and online instant message tools. We found that it was important for the instructor to know the students before assigning them a partner. It was critical for students to meet in small groups with a topic to discuss in order to break the ice, allowing students to get to know their peers and their partners. Group size did matter. Pair programming and other small group collaboration (i.e., 3 or 4 students) seemed to work better, especially for those students who were reluctant to collaborate. We found that it was important to provide written and oral directions, as well as visuals, such as illustrations and pictures. Additionally, the online classes were recorded, allowing the students to go back to review the class meetings. Content presentation had to be

sequential and interactive to engage students. Sometimes, students were assigned to small groups in meeting rooms with questions to discuss and have one person from the group report their conclusions. Other times, they had the options to share their opinions in the oral, written, or graphic format with the group. Students also had questions that could be answered through polling. Another important concept we had to keep in mind was tolerance for error. Students, especially those who have LD, need effective feedback, especially in an online course (Rockey, 2020). Our role as instructors in an online course is to support students by letting them know what is correct and why, and what is incorrect and how to make it correct.

5. RECOMMENDATIONS FOR INSTRUCTORS

Instructors serve a variety of students in their courses and have the duty to be prepared in the best methods for successful implementation of inclusive education for all students (Courey et al., 2013). We realize that in practice, there may be no “perfect” solution to address these issues in the short run and trade-offs are necessary to achieve an acceptable or desirable solution. Currently, many universities have limited resources to fully address online course accessibility (Greer & Deshler, 2013) and provide academic support for students with disabilities, especially in the rapid transition to online teaching during the COVID-19 pandemic. Given the reality of the online technology environment, it could be very challenging for many instructors to implement the most desirable teaching environment and practices for supporting students with disabilities and those without disabilities at the same time in a fully online environment. However, we have to do the best we can for all students with the resources and constraints that we have. At a minimum, instructors should give some intentional consideration and strive to identify and minimize barriers for students with disabilities in their classes (Greer et al., 2014; Hunt, 2021; Repetto et al., 2010). Israel et al. (2015) recommended adopting instructional strategies and practices by considering the individual needs of each student to develop meaningful, engaging, and accessible computing experiences for students with disabilities. Perrucci et al. (2008) suggested building and assessing a virtual community to promote the integration of students with disabilities in online courses. We recommend IS instructors to learn more about the Universal Design for Learning framework and check out related best practices and resources, such as the NSF AccessComputing Alliance at <https://www.washington.edu/accesscomputing/> and Think College at <https://thinkcollege.net/>. We also recommend that IS instructors consider joining a community of practice to promote more inclusive online learning, such as the one at <https://www.washington.edu/doit/programs/accesscyberlearning>.

6. CONCLUSION

Teaching online classes during the pandemic has presented some challenges in providing equity for all students. However, it has also brought opportunities for instructors to learn and implement research-based instructional practices that have the potential to improve learning outcomes for all students, including students with disabilities in online classes. Instructors of IS courses may have or will be likely to have

students with disabilities in their online courses at some point. Out of equity concerns, there are many strategies that IS educators can employ to increase opportunities for students with disabilities to succeed in information systems education.

A diverse IT workforce should include those with various disabilities since they do not have equal representation in the IT workforce (Woszczynski et al., 2006). IS programs offer many technology courses, such as programming and web design courses. Technology and web accessibility are necessary for achieving equality, diversity, and inclusion if we are to achieve fairness in society. To facilitate integration, learning, and development of a diverse student population, IS educators have the moral responsibility to promote technology accessibility, be role models in the creative use of technology tools for online instruction by designing accessible online courses, and making reasonable adjustments in their teaching to accommodate and support students with disabilities. These steps will help bridge the digital divide for those students and allow students with disabilities to complete their degrees and participate in the current and future IT workforce (Bruyère et al., 2003). This paper aims to raise IS instructors’ awareness of equity issues and gaps in online course design and teaching, better understand the unique needs of students with disabilities, and take measures to address their particular needs. By making the online courses more accessible and inclusive, instructors of IS courses will increase learning success for both students with and without disabilities.

As Tandy and Meacham (2009) asserted, an accessible online course will improve the chances for many students with disabilities to complete their degrees and thus, expand their life opportunities for meaningful and productive careers. As we increasingly rely on technology to deliver course content, we need to plan and design our online courses with accessibility and equity in mind so that students with disabilities may encounter fewer barriers to learn. Accessibility has the potential of boosting students’ learning outcomes as well as better interactions with peers in the online class. In addition, IS instructors may be able to identify research opportunities as they strive to make online courses more accessible for students with disabilities. Federal agencies, such as the National Science Foundation and the Department of Education, have grant programs to support efforts to broaden the participation of students with disabilities in higher education and a range of careers.

7. ACKNOWLEDGEMENTS

This work is partially supported by the U.S. National Science Foundation under Grant Numbers 1623646 and 1712251.

8. REFERENCES

- American Community Survey (ACS). (2017). *American Community Survey Data*. Available at <https://www.census.gov/programs-surveys/acs/data.html>
- Bao, W. (2020). COVID-19 and Online Teaching in Higher Education: A Case Study of Peking University. *Human Behavior and Emerging Technologies*, 2(2), 113-115.
- Bruyère, S., Erickson, W., & Schramm, J. (2003). Disability in a Technology-Driven Workplace. *Workplace Visions*, 5, 1-8.

- Bunbury, S. (2020). Disability in Higher Education – Do Reasonable Adjustments Contribute to an Inclusive Curriculum? *International Journal of Inclusive Education*, 24(9), 964-979.
- Burgstahler, S. (2002). Universal Design of Distance Learning. *Information Technology and Disabilities*, 8(1).
- CAST (2018). Universal Design for Learning Guidelines version 2.2. <http://udlguidelines.cast.org>
- Chan, L., Daswani, G., Hird-Younger, M., Hunter, M., & Way, K. (2020). *Equity and Online Learning Survey Results*. Research Memo 1, Discovering University Worlds, University of Toronto. <http://hdl.handle.net/1807/101843>
- College Pulse (2020). College, COVID, and the Future of Learning. <https://collegepulse.com/blog/university-leaders-heres-how-you-can-develop-a-strategy-for-the-2020-2021-school-year>
- Courey, S. J., Tappe, P., Siker, J., & LePage, P. (2013). Improved Lesson Planning with Universal Design for Learning (UDL). *Teacher Education and Special Education*, 36(1), 7-27.
- Dawson, P., van der Meer, J., Skalicky, J., & Cowley, K. (2014). On the Effectiveness of Supplemental Instruction: A Systematic Review of Supplemental Instruction and Peer-Assisted Study Sessions Literature Between 2001 and 2010. *Review of Educational Research*, 84(4), 609-639.
- Digital Promise (2020). *Suddenly Online: A National Survey of Undergraduates During the COVID-19 Pandemic*. https://digitalpromise.org/wp-content/uploads/2020/07/ELE_CoBrand_DP_FINAL_3.pdf
- Edmonds, C. D., Allen, M., Todd, R., & Kaplan, S. (2005). Closing the Circuit: Accessibility from the Ground Up. *Information Technology and Disabilities*, 11(1).
- Edwards, R. L., Stewart, J. K., & Ferati, M. (2010). Assessing the Effectiveness of Distributed Pair Programming for an Online Informatics Curriculum. *ACM Inroads*, 1(1), 48-54.
- Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2019). *Learning Disabilities: From Identification to Intervention (2nd ed.)*. New York: Guilford.
- Greer, D., & Deshler, D. (2013). Looking at Online Learning Through the Accessibility Lens. *Better: Evidence-Based Education*, 5(3), 16-17.
- Greer, D., Rowland, A., & Smith, S. (2014). Critical Considerations for Teaching Students with Disabilities in Online Environments. *TEACHING Exceptional Children*, 46(5), 79-91.
- Gregg, N. (2014). Adults with Learning Disabilities: Factors Contributing to Persistence. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of Learning Disabilities* (pp. 85-103). The Guilford Press.
- Grogan, D., & Ruzic, R. (2000). Walking the Walk: Universal Design on the Web. *Journal of Special Education Technology*, 15(3), 45-49.
- Gronseth, S. (2018). Inclusive Design for Online and Blended Courses: Connecting Web Content Accessibility Guidelines and Universal Design for Learning. *Educational Renaissance*, 7, 14-22.
- Hashey, A., & Stahl, S. (2014). Making Online Learning Accessible for Students with Disabilities. *TEACHING Exceptional Children*, 46(5), 70-78.
- Hollingshead, A. (2018). Designing Engaging Online Environments: Universal Design for Learning Principles. In *Cultivating Diverse Online Classrooms Through Effective Instructional Design* (pp. 280-298). IGI Global.
- Hollingshead, A., & Carr-Chellman, D. (2019). Engaging Learners in Online Environments Utilizing Universal Design for Learning Principles. *eLearn*. <https://elearnmag.acm.org/archive.cfm?aid=3310383#>
- Hu, H., & Avery, B. (2015). CS Principles with POGIL Activities as a Learning Community. *Journal of Computing Sciences in Colleges*, 31(2), 79-86.
- Hunt, J. (2021). Identifying Barriers to Accessibility. <https://medium.com/swlh/identifying-barriers-to-accessibility-1b9518936be>
- Israel, M., Wherfel, Q. M., Pearson, J., Shehab, S., & Tapia, T. (2015). Empowering K-12 Students with Disabilities to Learn Computational Thinking and Computer Programming. *TEACHING Exceptional Children*, 48(1), 45-53.
- Leak, D. W., & Stodden, R. A. (2014). Higher Education and Disability: Past and Future of Underrepresented Population. *Journal of Postsecondary Education and Disability*, 27(4), 399-408.
- Li, L., Xu, L. D., He, Y., He, W., Pribesh, S., Watson, S. M., & Major, D. A. (2021). Facilitating Online Learning via Zoom Breakout Room Technology: A Case of Pair Programming Involving Students with Learning Disabilities. *Communications of the Association for Information Systems*, 48, 88-100.
- Meyer, A., Rose, D. H., & Gordon, D. (2014). *Universal Design for Learning: Theory and Practice*. CAST, Inc.
- Mitchell, E., & Hiatt, D. (2010). Using POGIL Techniques in an Information Literacy Curriculum. *The Journal of Academic Librarianship*, 36(6), 539-542.
- Mohammed, W. F. (2020). How COVID-19 Affects Education for People with Disabilities in Ghana. <https://globalvoices.org/2020/07/03/how-covid-19-affects-education-for-people-with-disabilities-in-ghana/#>
- National Center for Science and Engineering Statistics (2019). *Women, Minorities, and Persons with Disabilities in S&E*. <https://www.nsf.gov/statistics/women/>
- Perrucci, V., Balboni, G., & Cacciamani, S. (2008). Sense of Community in Online courses and Students with Disabilities: Development of a Questionnaire for University Students. In *Personnel Preparation*. Emerald Group Publishing Limited.
- Purkayastha, S., Guntu, M., Ravindran, R., & Surapaneni, A. K. (2019, November). Learning Gains of Process Oriented Guided Inquiry Learning in an Online Course Setting. *Proceedings of the 2019 European Conference on e-Learning* (pp. 495-XII). Academic Conferences International Limited.
- Rao, K. (2012). Universal Design for Online Courses: Addressing the Needs of Non-traditional Learners. *Proceedings of the IEEE International Conference on Technology Enhanced Education*, Kerala, India.
- Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual High Schools: Improving Outcomes for Students

- with Disabilities. *Quarterly Review of Distance Education*, 11(2), 91-104.
- Rockey, A. (2020). Reimagining Online Education: How Perceived Constraints Became Affordances in an Undergraduate Online STEM Course. *Creative Commons*. <https://er.educause.edu/articles/2020/9/reimagining-online-education-how-perceived-constraints-became-affordances>
- Steinfeld, E., & Maisel, J. (2012). *Universal Design: Creating Inclusive Environments*. John Wiley & Sons.
- Tandy, C., & Meacham, M. (2009). Removing the Barriers for Students with Disabilities: Accessible Online and Web-enhanced Courses. *Journal of Teaching in Social Work*, 29(3), 313-328.
- Theodosopoulos, G., & Hardman, S. (2020). *Perspectives On: A Case for Peer-Assisted Learning*. <https://charteredabs.org/publications/perspectives-on-a-case-for-peer-assisted-learning/>
- Trevathan, J., Gray, H., & Myers, T. (2014) Scaling-up Process-Oriented Guided Inquiry Learning Techniques for Teaching Large Information Systems Courses. *Journal of Learning Design*, 7(3), 23-38.
- Trevathan, J., & Myers, T. (2013). Towards Online Delivery of Process-Oriented Guided Inquiry Learning Techniques in Information Technology Courses. *Journal of Learning Design*, 6(2), 1-11.
- UNESCO (2020). Inclusive Distance Learning for Students with Disabilities at the University of Padua. <https://en.unesco.org/news/inclusive-distance-learning-students-disabilities-university-padua>
- U.S. Bureau of Labor Statistics (2018). Labor Force Characteristics of People with a Disability. <https://www.bls.gov/spotlight/2018/labor-force-characteristics-of-people-with-a-disability/pdf/labor-force-characteristics-of-people-with-a-disability.pdf>
- World Health Organization (1980). *International Classification of Impairments, Disabilities, and Handicaps: A Manual of Classification Relating to the Consequences of Disease*. Published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976. World Health Organization.
- Woszczyński, A., Myers, M., & Moody, J. (2006). Student Perceptions of Diversity Issues in IT. *Journal of Information Systems Education*, 17(4), 449-458.
- Zha, S., Estes, M. D., & Xu, L. (2019). A Meta-Analysis on the Effect of Duration, Task, and Training in Peer-Led Learning. *Journal of Peer Learning*, 12, 5-28.
- Zha, S., & He, W. (2021). Pandemic Pedagogy in Online Hands-on Learning for IT/IS Courses. *Communications of the Association for Information Systems*, 48, 80-87.
- Zhang, A., & Aasheim, C. (2011). Academic Success Factors: An IT Student Perspective. *Journal of Information Technology Education*, 10, 309-331.
- Zhang, H., Nurius, P., Sefidgar, Y., Morris, M., Balasubramanian, S., Brown, J., Dey, A. K., Kuehn, K., Riskin, E., Xu, X., & Mankoff, J. (2020). How Does Covid-19 Impact Students with Disabilities/Health Concerns? <https://arxiv.org/abs/2005.05438>

AUTHOR BIOGRAPHIES

Wu He is E.V. Williams Research Fellow and associate professor of information technology at Old Dominion University. His research areas include cyber security, social media analytics, e-learning, data mining, computing education and human information behavior. He has been the principal investigator or co-principal investigator of grants totaling over \$3M USD funded by the National Science Foundation, National Security Agency, and other federal agencies. He is also the Editor-in-Chief of *Information Discovery & Delivery* and Associate Editor of *Behavior & Information Technology*.



Shenghua Zha is an assistant professor of instructional design and educational technology in the College of Education and Professional Studies at the University of South Alabama, Mobile, Alabama. She received her Ph.D. in Information Science and Learning Technology from the University of Missouri-Columbia. Her research interests include computer science education in K-12 and pre-service teacher education, online learning, and technology-integrated learning strategies. She has published in peer-reviewed journals, such as *Journal of Educational Computing Research*, and presented at national and international conferences.

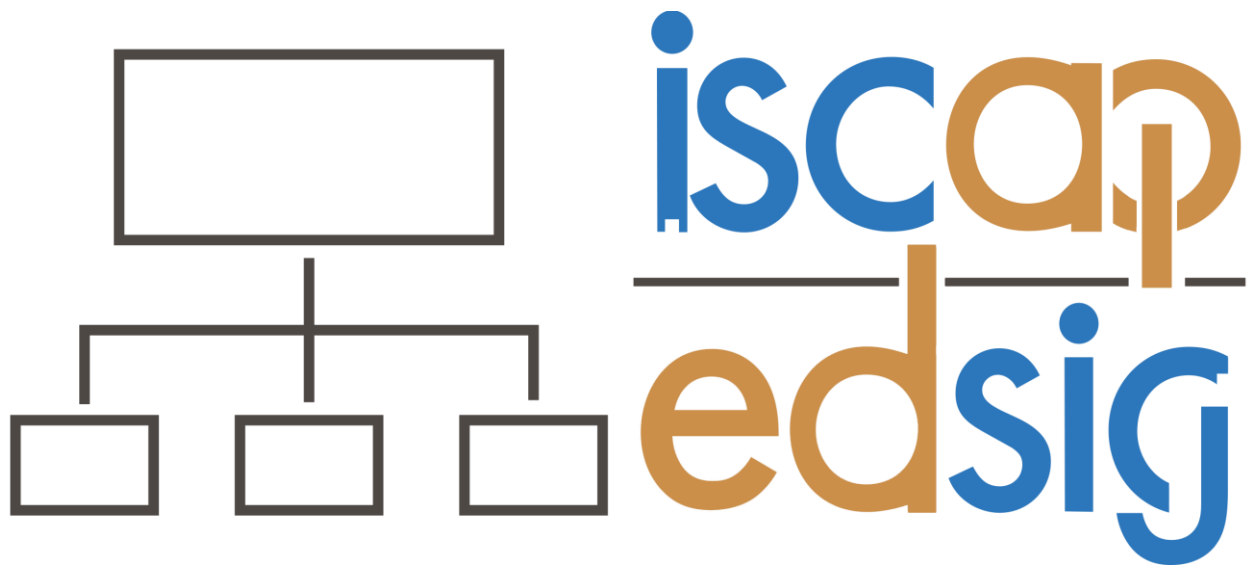


Silvana M. R. Watson is a professor of special education at Old Dominion University. Her research interests focus on (1) promoting evidence-based practices for students with learning disabilities, attention deficit hyperactivity disorders, and English learners with and without disabilities; (2) teacher preparation; and (3) examining the nature of students' learning difficulties. She has disseminated her work through presentations at international, national, and state professional conferences, peer-reviewed publications, book chapters, other academic publications, and consultations with educational agencies. She is one of the co-PIs of the National Science Foundation's grant awarded to the Old Dominion University to support the investigation of pair programming as a teaching method to support undergraduate students with learning disabilities taking instructional technology courses. She has been awarded a large grant from the U.S. Department of Education, Office of English Language Acquisition, to assess and instruct English learners with and without disabilities.



Yuming He is a Ph.D. student in information technology from Strome College of Business at Old Dominion University. He holds a master's degree in Computer Science (2018). His research interests include using business intelligence tools and big data technologies to help organizations earn business value, dealing with cybersecurity issues by emergent technology, and interaction between human decisions with recent technological disruptions. He has published in several peer-reviewed journals, such as *Communications of the Association for Information Systems*, *Issues in Information Systems*, and *Journal of Computational Science*.





**Information Systems & Computing Academic Professionals
Education Special Interest Group**

STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the *Journal of Information Systems Education* have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

Copyright ©2022 by the Information Systems & Computing Academic Professionals, Inc. (ISCAP). Permission to make digital or hard copies of all or part of this journal for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial use. All copies must bear this notice and full citation. Permission from the Editor is required to post to servers, redistribute to lists, or utilize in a for-profit or commercial use. Permission requests should be sent to the Editor-in-Chief, *Journal of Information Systems Education*, editor@jise.org.

ISSN 2574-3872