Communications of the Association for Information Systems

Volume 48 Article 26

3-29-2021

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Recommended Citation

Iyer, D. G., & Chapman, T. A. (2021). Overcoming Technological Inequity in Synchronous Online Learning. Communications of the Association for Information Systems, 48, pp-pp. https://doi.org/10.17705/1CAIS.04826

Communications of the Association for Information Systems

Research Article DOI: 10.17705/1CAIS.04826 ISSN: 1529-3181

Overcoming Technological Inequity in Synchronous Online Learning

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Abstract:

The recent coronavirus disease of 2019 (COVID-19) pandemic possibly represents a catalyst for broader changes looming ahead for higher education, which includes a shift to online learning. Researchers have proven synchronous learning components to reduce the transactional distance that students experience in online learning environments, and such components play an important role in many information systems (IS) courses. However, students who cannot reliably access the technological resources that they need for synchronous learning remain left behind in these learning environments. We summarize strategies that individual IS faculty and institutional information technology (IT) departments can implement to assist such students. Faculty-level strategies include implementing complementary asynchronous features, clearly communicating expectations, and implementing intervention strategies to foster collaborative work. Institutional solutions include providing software applications via the cloud for students who need to access them remotely and loaning computer resources such as laptops to students who lack them and effectively training faculty and students in online learning. These measures will help higher education institutions to bridge the transactional distance that students experience as online learning becomes more prevalent in the months and years ahead.

Keywords: Online Learning, Synchronous, Transactional Distance, Technological Inequity.

This manuscript underwent editorial review. It was received 7/15/2020 and was with the authors for four months for two revisions. Heikki Topi served as Associate Editor.

1 Introduction

Advances in technology have facilitated a move towards online learning in recent years (McBrien, Cheng, & Jones, 2009). Students experience transactional distance (Moore, 1993), which researchers have described a psychological space and disconnect between students and instructors and between students and their peers, more in asynchronous online learning than in synchronous online learning (Hsiao, 2012). Asynchronous online learning heavily depends on asynchronous communication between instructors and students, while synchronous learning involves synchronous communication between instructors and students through live virtual meetings and conferences. The recent coronavirus disease of 2019 (COVID-19) pandemic forced higher education institutions to quickly transition to online learning. In response, many instructors have tried to bridge the distance between themselves and their students by using synchronous learning components in their online courses. However, as the extent to which instructors interact with students in an online environment increases with synchronous learning, it necessarily disenfranchises student learners who cannot reliably access the course content through such methods. This disadvantage can be technical (e.g., unreliable Wi-Fi or outdated computer systems that cannot run the newer collaborative software platforms) or social (e.g., resulting from dependent care responsibilities or overlapping work commitments that prevent synchronous learning). As universities move from asynchronous to synchronous learning, student learners who cannot fully participate in such content will fall further behind through no fault of their own. In this paper, we focus on the technological disadvantages that some students face, which faculty (via creatively designing curricula) and institutional support can mitigate. The problem concerns how to construct an online learning curriculum that offers the advantages of synchronous learning while not excluding disadvantaged online learners in the process, which is especially critical in information systems (IS) courses.

IS curricula demand high level of active student participation for course success (Burkett, 2002; McKinney & Denton, 2006; Mitri, 2015). Classes such as beginning and advanced programming, enterprise systems, systems analysis and design, and business analytics all require instructors to commit significant time to engage in hands-on demonstrations and/or in facilitate student practice. In a traditional classroom setting, researchers have proposed active learning techniques that can facilitate the necessary demonstration, practice, and feedback cycle that indicates active learning (Serva & Fuller, 2004; Woodward & Young, 2007; Williams & Chinn, 2009). In an online learning environment, instructors can use many currently available tools to replicate the active learning strategies that instructors use in traditional classrooms. These tools include collaboration and video conferencing software such as Microsoft Teams, Zoom, GoToMeeting, and many others. However, such tools often require the presenter and student learners to have robust hardware and connectivity. For many universities, such requirements do not pose a significant problem, although smaller state colleges might find such requirements difficult to maintain in the long term. Nevertheless, some students face significant challenges in accessing computing resources that facilitate synchronous communication and learning whether due to social, technological, or economic factors beyond their control. Therefore, as IS faculty members, we face the daunting question of how to promote active learning in our courses that rely on synchronous online learning without disenfranchising those students who might find it challenging to access such platforms.

2 Active Learning Instructional Techniques in a Synchronous Online Environment

As we state in Section 1, active learning techniques facilitate a demonstration-practice-feedback cycle that researchers have found to be highly effective for student learners, particularly as they relate to IS curricula (McKinney & Denton, 2006). To speak about possible strategies in tackling the technological inequity problem in synchronous online learning, we consider the case of a typical software development course that multiple IS curricula heavily support (Bain, Bhatnagar, & Chapman, 2017). For example, effective systems analysis and design courses promote skills related to developing sequential and logical thinking patterns. As such, they suit an active learning instructional format.

To help students achieve such skills in an online environment, both instructors and students need to have an online collaborative space whereby the active learning cycle can occur. Many online tools such as Blackboard, Canvas, and so on contain such a space through which instructors and students can collaborate. Instructors should find any combination of online tools effective for teaching systems analysis and design so long as that combination allows for demonstration, student practice, and instructor feedback. Below, we discuss a strategy that the second author used to deliver a course at an academic

institution in the United States. To reinforce active learning, the author used the following instructional model during the recent, sudden shift to online instruction due to the COVID-19 pandemic. The institution serves a combination of semi-rural, suburban, and semi-urban students.

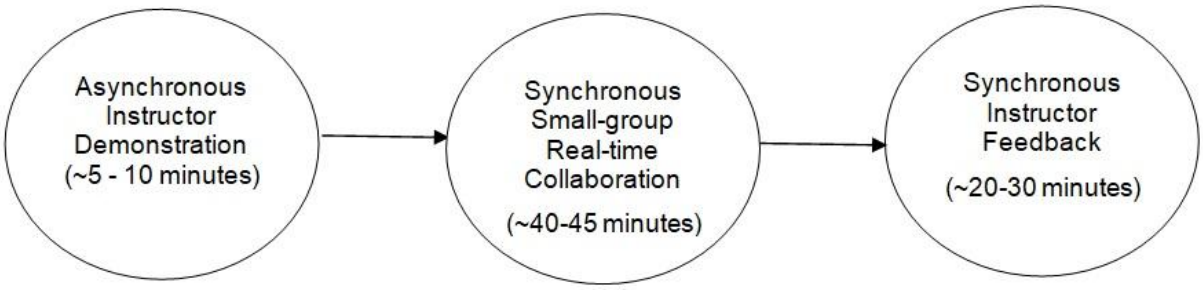

Figure 1. Online Instructional Flow for Programming Instruction

In the scenario that we cite above, the instructor first delivers a recorded demonstration of a concept through a short, asynchronous lecture. Instructors can record such lectures using software such as Panopto or any other video production program. All students, even students who lack reliable access to synchronous meetings, can access this learning component asynchronously. The students can then practice the concept in an online synchronous collaborative space either individually or as a group. The online collaboration also allows the instructor to objectively assess each student's activity level and, thereby, reduce the transactional distance that the students feel. The last step in the learning cycle comprises individual and/or group feedback that the instructor delivers through a synchronous delivery medium.

3 Student Perceptions of Synchronous Online Learning

In this section, we discuss our findings about student concerns before the transition to online learning in early 2020 and feedback from students after they completed the semester. Understanding the student perspective reveals the gap in the effectiveness of the instructional model that we discuss above. It highlights challenges that students who experience technological access inequities in synchronous online courses face.

3.1 Pre-online Transition Student Concerns

Prior to the immediate transition to online learning in early 2020, Youngstown State University (where the first author works) solicited concerns from about 100 honors students via a short survey. The university administered the open-ended questionnaire via a Web link emailed to students. The students emphasized the need for tips on transitioning to online learning and using the learning management system effectively. In response, individual faculty communicated to students the revised expectations for participation and engagement in the online format of their courses. Students also expressed concern over uninterrupted internet access. The institutional IT department responded by offering 200 loan laptops and hotspots at short notice to students.

3.2 Post-semester Student Feedback

The university received follow-up feedback when the semester ended via a Web-based 10 minute survey emailed to all students and drew an 8.8 percent response rate. Students' responses revealed that they felt they did not effectively use the institutional learning management system. Additionally, they found that the various synchronous collaborative platforms (such as Microsoft Teams, Zoom, Webex, etc.) that instructors used for synchronous meetings put them at a disadvantage and that they found navigating from one platform to the other for different courses confusing. Note that, in addition to the institutional learning management system, faculty had several choices for synchronous collaborative platforms to use in their online courses. Furthermore, the institution did not require instructors to use a uniform platform. Moreover, students felt that some instructors did not have enough prior experience with such platforms to engage with them effectively or to encourage active participation. These results indicate that students value consistency in synchronous collaborative platforms, sufficient training for faculty in online content delivery, and training for students in effectively using learning management systems.

The post semester feedback also indicated that students tended to turn to their peers more often than to their instructors, which aligns with extant literature that has found students value a sense of social presence and need to connect to others in an online course (Park & Bonk, 2007). While the model that we present above accommodated students' need to interact with one another during the recent switch to online-only instruction, it also unfairly affected students who could not access such online collaborative platforms synchronously (particularly in regard to group projects). Some students who faced technological access challenges used shared technological resources with family members and, in some cases, had outdated laptops. Surprisingly, these students had misjudged their need for dedicated access to updated technological resources for such online synchronous IS courses and failed to take advantage of the computing resources that the institution offered them prior to the online transition. Additional informal student feedback for individual instructors rendered via email revealed that some students felt frustrated about other students who would or could not participate fully in the online activity, which resulted in their feeling disconnected. Online group work can suffer if students face difficulty in developing trust with their group members or if they face scheduling constraints (Brown, Eastham, & Ku, 2006). Thus, the technological inequity that some students face affects all students engaged in collaborative tasks in a synchronous course.

4 Strategies to Overcome the Technological Inequity in Synchronous Online Learning

In this section, we explore strategies that individual IS instructors and institutions can employ at the organizational level through the information technology (IT) department to overcome the online learning challenges that we discuss in Section 3.

4.1 Individual Faculty Level Strategies

We recommend several complementary features in a synchronous online course that individual instructors can implement. First, instructors should complement the synchronous collaboration phase of the learning cycle that we present above with asynchronous platforms such as Blackboard discussion forums. By doing so, instructors can help facilitate asynchronous discussion between themselves and students and obtain analytical reports to help track student activity. Such collaborations satisfy the need for multiple perspectives that students value (Park & Bonk, 2007) while instilling a sense of community in those students who face challenges in accessing synchronous learning components. In this way, they can bridge the transactional distance that they perceive. In addition to synchronous feedback in the learning cycle, instructors should deliver the feedback through video recordings, email, or through the institution's learning management system for those students who cannot access such synchronous components in a timely manner. Instructors need to implement these additional measures as successful online courses exhibit a strong teacher presence in the online forums plus other support options such as email, phone, or synchronous webinar-style tutorials (Lambert, 2020). To this effect, we propose a modified model of online instructional flow (see Figure 2).

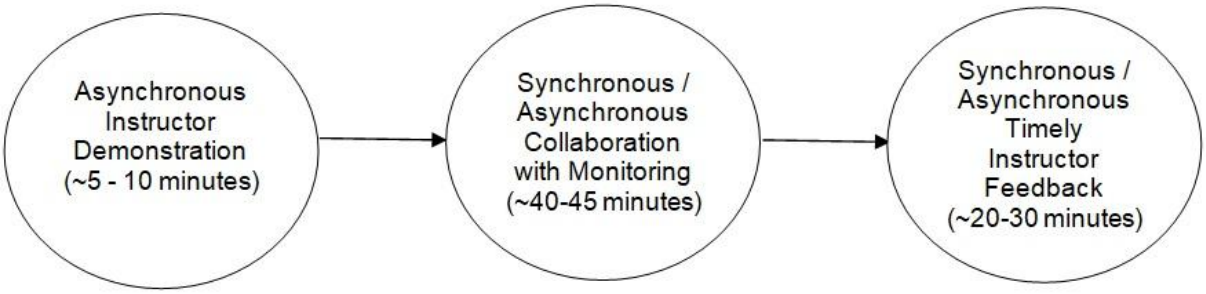

Figure 2. Proposed Online Instructional Flow for Programming Instruction

Instructors need to clearly and frequently communicate their expectations about students' participation in an online course to ensure that students clearly understand the parameters. Including an asynchronous discussion forum centered on expectations and objectives can be helpful in this regard. Instructors can

deploy intervention strategies such as periodically reviewing team agreements and differentiating roles to foster effective communication and build trust among students collaborating on tasks (Brown et al., 2006). Furthermore, to be better prepared in the future, instructors should proactively participate in various seminars or workshops that their institutions offer or else avail themselves of free webinars and articles from various sources. For example, our institutions offered free webinars to faculty in June and August to prepare for following semesters. These solutions do not redeem the technological inequity that some students face in accessing synchronous components. They do, however, provide accommodations to prevent such inequity from affecting their learning. Still, a truly inclusive educational model requires an integrated approach (Wood, 2015) with long-term solutions for addressing the technological inequity. These solutions must form part of the institutional strategies that we discuss in Section 4.2.

4.2 Institutional-level Strategies

The COVID-19 pandemic seems to have become a catalyst for the formidable change in higher education that we face—the shift to more online learning. As programs that higher education institutions across the world offer become just a click away for potential students, competitive advantage for institutions stems from building an online learner "community". As we discuss in Sections 2 and 4.1, synchronous online learning can help institutions create such a community. However, institutions must focus on those students for whom such synchronous learning constitutes a technological or logistical challenge.

Potential solutions at the institutional level include providing computing resources such as laptops with updated operating systems for disadvantaged students. The first author's institution successfully rented out 200 such laptops and hotspots on short notice to students who lacked a device at home during the COVID-19 crisis, which ensured that students could successfully resume their learning over the semester during the sudden shift to online learning. This initiative should expand to include students who have limited access due to shared or outdated computational devices. For institutions with a limited budget, partnering with services that rent refurbished computers and laptops or adjusting student financial packages to cover for the rental cost might be alternative options. Another option would be to collaborate with local businesses that can provide these resources as part of a training or research partnership. However, we recommend that institutions do not deploy these policies only when faced with calamities and crises such as COVID-19. Higher education institutions must prioritize efforts to bridge technological inequity among their students under all conditions so that they can learn effectively. Broader policy changes such as the non-profit initiative of one laptop per child distribution that originated in Massachusetts Institute of Technology in 2007 tried to address this inequity in education with mixed results. Institution-level initiatives that identify students at risk using a vulnerability criterion and approaching digital integration as a long-term strategy will address the technological inequity and the broader socioeconomic divides that underlie it (Romero, 2012).

IT departments should also ensure that they make specific software required in IS courses such as analytical tools, database management software, and so on available to students remotely via an institutional cloud. Though students can freely download and use software such as Python and Tableau, students who have outdated computers or operating systems will be unable to install them on their computers. Offering these software applications as a cloud solution ensures that students can access them remotely via a Web browser. The IT department at the first author's institution deployed this solution during the recent transition to online learning. Companies such as Microsoft offer credit to higher education institutions that use their products, which institutions can use to procure application-hosting cloud services so that students and faculty can access those services remotely. We understand that institutions cannot make such a shift on short notice; they also need to make the shift as part of a long-term IT strategy. By forging collaborative relationships with industrial partners, an institution can help boost its IT infrastructure and expand its ability to distribute computing resources to students who need it. Various potentially viable models for such partnerships exist (Dalmini, 2001). We recommend that institutions make such solutions permanently available to students who access online learning under normal circumstances. Doing so will ensure that an online environment does not unduly penalize students whose learning typically relies on access to institutional computer labs.

To alleviate the concern that students feel regarding the various synchronous collaborative platforms that instructors use, institutions should reduce the number of collaborative software platforms that they support. To integrate technology into teaching and learning in a standardized manner, institutions need an institutional IT policy that considers inclusive settings for technological access (Kajee, 2010). Furthermore, students need to receive formal training/workshops from their institutions on how to participate effectively

in online learning. This training should be part of the first-year experience program that institutions offer. Initiatives such as these ones, while difficult, help to ensure a baseline of faculty and student expertise in online content delivery and learning.

We summarize our key findings about the challenges that students who experience technological access inequity in online synchronous courses face along with potential solutions in Table 1 below.

Table 1. Key Findings of Student Challenges and Potential Solutions

Key findings: student challenges	Potential solutions
Lack of technological access to synchronous course components	Include additional asynchronous components in various online instruction phases Conduct an institutional effort to identify vulnerable students and, if necessary, provide computing resources, provide cloud access to software needed in online courses, boost IT infrastructure by forging collaborative relationships with industry, and adopt an IT policy with inclusive settings for technological access
Feeling disconnected	Faculty should clearly and frequently communicate expectations about course participation Include an asynchronous discussion forum in the course to review expectations and objectives Intervention strategies (periodically review team agreements and role differentiation) to foster effective communication and trust in collaborative tasks
Ineffective use of learning management systems	Train students in online learning platforms as part of the first-year experience
Overwhelmed too many synchronous collaborative platforms	Implement an institutional policy to downsize the number of synchronous collaborative platforms supported
Instructors' ability to effectively engage students in synchronous collaborative platforms	Institutional training for faculty in online pedagogical practices Ensuring faculty can readily access such training and other online pedagogical resources

5 Conclusion

The landscape for higher education continues to quickly change due to changes in student priorities, institutions' financial models, and students' expectations. Online course offerings across the globe also continue to expand. To accommodate these changes, institutions must foster student success across all student subpopulations. Thus, they need to ensure that online learning does not unfairly limit some students from properly accessing online learning components. The digital divide in higher education can manifest itself as social exclusion, digital exclusion and accessibility issues in diverse contexts (Khalid and Pedersen, 2016). In this paper, we focus on digital exclusion, which comprises of lack of access to the Internet and hardware devices in synchronous online learning. Individual IS faculty members can effectively deploy technological tools in their online courses to demonstrate concepts, foster collaboration, and offer meaningful feedback to students both synchronously and asynchronously. Institutions can tailor their IT policies to assist students in procuring access to technological resources that they lack. The strategies that we focus on in this paper are a subset of potential solutions to the problem and summarize known best practices. Those institutions and programs that proactively ensure equity in access to learning components will successfully navigate the changes ahead. Future studies must investigate more ways to bridge the technological inequity that students face by drawing on a framework that looks into various resources needed to bridge such a digital divide dependent on the various individual, institutional, and national factors that contribute to such a divide.

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