

Literature Review: Online Teaching and Learning – Synchronous or Asynchronous?

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Introduction

This paper describes the opportunities and challenges, as found in a literature review, focused on observations and affordances of synchronous and asynchronous online learning modalities. Findings have been compiled into themes by the authors.

Three factors for successful online courses

To begin, it is important to consider the overwhelming support for the following three factors found to contribute most to the success of online courses (D'Agustino, 2012; Swan et al, 2000).

- Consistency in course design
- Contact with course instructors
- Active discussion/interaction among learners

Jaggars & Xu (2016) confirm that “quality of interpersonal interaction” was the principal factor related to successful student outcomes within higher education online courses.

When considering whether interaction among learners or with the instructor should be synchronous or asynchronous, we are best to acknowledge that neither option is intrinsically better than the other, but rather “when, why and how” to deploy both is the design thinking we should aim for (Hrastinski, 2008, p. 52).

Three dimensions for comparing synchronous and asynchronous instruction

The literature reveals the following three dimensions provide an effective basis for online course instructors and designers to weigh the pros and cons of each modality. The order presented below is significant – the first two are practical considerations and must be addressed before moving to the third.

1. Inclusivity and Accessibility
2. Technical Viability and Support
3. Pedagogical Rationale

“To state the obvious, if students and instructors cannot participate fully in the life of the course or if the technology sets up access roadblocks the IT support cannot address, the course should be redesigned until the roadblocks are removed.”

- Mick & Middlebrook, 2015, p 137

Prioritizing the three dimensions above is a great reminder that computer-mediated communication requires application of the latest information on design for inclusivity, and platforms that support accommodations. Instructors must receive information on accessibility issues from students with enough time and resources to address solutions. Co-operation with institutional partners to address individual accessibility needs is essential (Mick & Middlebrook, 2015).

Opportunities of Synchronous

Mitigate asynchronous risk of low impact

One of the most significant critiques of online learning is the failure of its participants to forge meaningful relationships with one another (Mick & Middlebrook, 2015). This may be an area where synchronous sessions hold the greatest promise. Immediacy behaviours in asynchronous modalities can be hard for instructors to establish and maintain (Arbaugh, 2001), yet are natural in synchronous environments. When in small classes or groups, students participate in synchronous discussions more often than in asynchronous discussions (Farros et al., 2020). Synchronous sessions may be beneficial to connect participants, establish spontaneity, rapport and camaraderie, particularly in the 'forming' stages of community building within a course (McInnery and Roberts, as cited in Leslie, 2020). These types of sessions might constitute a small percentage of course time, and do not necessarily require the whole class to gather at once. In fact, small group gatherings, scheduled by the group rather than by the instructor, can be more inviting, inclusive, and participatory.

Recognize emotions and feelings

Synchronous sessions can help students and instructors infer what others feel, believe, and know. Being able to see the person who is talking can be valuable to learners, especially when interpreting humour (Dow, 2008). As with all digital learning, the viewer should be able to see what they need to pay attention to, and not see extraneous or distracting elements. Moallem (2003) observes that face-to-face is a better fit for resolving conflicts of interest than an asynchronous, text-based discussion.

Opportunity to examine one's teaching philosophy

Blending synchronous and asynchronous offers instructors an opportunity to rethink and critically reflect on their pedagogical assumptions and approach (Petty et al, 2015). With careful instructional design and reflective iteration, online instructors can leverage the opportunities of each modality.

Pace, when immediacy is ideal

When the primary goal is explicitly to create a sense of community, synchronous sessions have high satisfaction ratings (McDaniels et al, 2016). Students have reported feeling a greater sense of connection to their instructors when they can see and hear them (Bork & Rucks-Ahidiana, 2013), and to their peers, especially during the 'forming' stage of group development, when "students had the opportunity to interact, connect, warm up to, and get to know each other in real time" (McInnery and Roberts, 2004 cited in Leslie, 2020.) Also, when the objectives of a given session are logistical or for discussion of simple facts/sharing information, synchronous sessions can be more efficient and satisfying for participants (Hewett, 2006). Pace can be a strength and a challenge of synchronous instruction.

Active group learning, when carefully planned

For active group learning, live sessions with appropriate coaching may work well. Sufficient resources are required to be able to coach all groups meaningfully. Live chat was used to complete case studies synchronously with high levels of success and approval (Rehman & Fatima, 2021). A major caveat to this finding is that carefully planned course design (assessing prior knowledge, clear instructions, and addressing common misconceptions from a pretest ahead of time) were key to the success of synchronous sessions described in the literature.

Immediate clarification and error correction

Students surveyed in a graduate education program (n=92) highlighted the benefits of the “immediate clarification and reduction of course complexities” afforded by synchronous sessions (Serdyukov, 2020). However, best practices in any modality include clear instructions for tasks, how to get help and when help is available. Avoiding unnecessary complexity over spending synchronous time addressing confusion is clearly the first step. Beyond that, synchronous coaching sessions, especially personalized or done in smaller groups could be of benefit.

Challenges of Synchronous

Fostering online engagement in the synchronous class is not easy or natural

The affordances of synchronous sessions can easily be lost if the facilitator is not able to foster appropriate engagement. For example, Cox, Carr, and Hall (2004) observed two blended courses with synchronous chat sessions. Both were observed to make inappropriate use of the synchronous affordances. The facilitators of one course focused increasingly on didactic course delivery. The second lacked active facilitation, leaving groups of learners to spend much of their time working out peer facilitation and effective process on their own. Unsurprisingly, conflict and frustration were observed in this case. Similarly, Serdyukov (2020) documented the negative impact on students’ perceptions of synchronous sessions when instructors did not use these sessions to facilitate active learning and interactions with peers.

Different instructors will vary in their comfort and enthusiasm for the remote synchronous modality, as they may be surprised that it requires a different approach than would be taken in a classroom (Lapitan et al, 2021; Karam et al, 2021). Many may experience uncertainty about their ability to adjust to new modalities for delivery. Instructors are forced to “anticipate and thus avoid frustrations over digital technology that can spread from instructors to students – breeding discontent and distraction in online settings” while conducting live teaching and learning sessions (Mick & Middlebrook, 2015, p. 136).

Immediacy is favoured over care for completeness and depth of thought

In many cases, synchronous sessions are an effective way to start or end a learning task. Caution is advised when learning is expected to occur from start to finish in a live session. Capacity for direct participation, metacognition, complete notetaking, reflection, and questioning is limited and unequal among learners. Quick exchanges/responses

could result in incomplete learning, frustration with pace, and uncensored/careless comments that can degrade the social fabric (Mick & Middlebrook, 2015).

Guidance on synchronous virtual teaching is critical to the success of the approach

Virtual didactics are a fairly new phenomenon, and there is much to consider for the educator before taking on the approach. Specifically, instructors require help learning about technologies and theories that guide their use. Mayer's work on the cognitive theory of multimedia learning is particularly important, as is mentorship from experienced peer educators, review of applicable adult learning principles, studies of multimedia in education and best practices put forth by universities and digital technology companies for things like accessibility considerations (Nunneley et al, 2020). In short, it is important to consider limitations in human cognitive processing capacity (Mayer, 2009), as well as individual differences and readiness when designing and running sessions – e.g., Nilson and Goodson (2019) point out that some learners are not able to rapidly enter and read chat entries.

Students may be excluded or reluctant to participate in synchronous communication

Some learners are simply uncomfortable interacting in remote synchronous settings, even when they embrace online course materials (Wells et al, 2008). Remote voice and live video connectivity may impede students who struggle with the format or exclude those who cannot access such connections. Allowing students multiple means of conducting and representing their learning is an important consideration in all modalities (Jaggars et al, 2013; Shé et al, 2019).

Students must be notified of the expectation and schedule for synchronous interaction

The number one reason students enroll in an online course is for the flexibility (Moore, 2011; Troop et al, 2020). To make an informed decision on course enrollment commitments, online courses with scheduled synchronous elements must be clearly labeled as such upon registration (Mick & Middlebrook, 2015).

Synchronous sessions require more preparation and time of the instructor and less flexibility for all

Synchronous sessions are often thought of as a virtual parallel to the physical classroom setting. However, to run a synchronous session successfully, the instructor must spend time developing resources and familiarizing themselves with the technology so they can troubleshoot any issues that occur during the session. They must also orient students on how to use the features of the platform and articulate ground rules and expectations to enable them to participate confidently and meaningfully (Farros et al., 2020; Karam et al., 2021; Leslie, 2020). The instructor, too, is bound to the class schedule and has less flexibility in their own schedule.

Key considerations for running synchronous remote sessions

- **Consider access and equity first.** Time zones, bandwidth, other obligations can limit availability and access for synchronous learning. Early, flexible scheduling is encouraged. Ideally, learners are able to choose from a few scheduling options and engage in low-bandwidth communication as needed.
- **Plan to use synchronous sessions sparingly.** Identify any learning tasks that can benefit from the opportunities of the synchronous modality. Plan synchronous sessions for these tasks only. Allow the rest to be accomplished asynchronously to maximize flexibility for learners.
- Focus on **collaboration and active learning** to build a peer learning community, knowledge sharing and thoughtful discussions.
- Be **attentive to cognitive load** to engage in an optimal degree of cognitive processing (Nunneley et al, 2020).
 - Consider reducing learning objectives and content when adapting a session usually given in-person.
 - It is essential to limit extraneous content and distracting graphics.
- Aim for some form of **interaction** every 10 to 15 minutes.
- **Get to know learners** and activate their knowledge – be deliberate through polling and targeted questioning to meet them where they are at.
- **Set expectations up front**
 - Proactively inform learners how questions should be raised.
 - Remember the technology and modality may be new to learners, so establishing the **'rules of engagement'** is a key orienting piece (Rana et al, 2017). Often neglected is what Rowe (1986) describes as “wait time” - allowing time for learners to process when taking questions.
 - Provide a **technical overview** for learners – assume the technology is new for them
- **Test technology in advance** and have a back-up plan in case of failure (e.g., materials available to students on a central site; have text-based Q&A and/or phone call options ready)

Opportunities of Asynchronous

Flexibility of pace

Accommodates learner differences and allows cognitive room for construction and internalization of content (Hiltz, Turoff & Harasim, 2007; Mick & Middlebrook, 2015). Flexible pace is a core affordance of asynchronous online learning in general (Day & Lloyd, 2007).

Scale, inclusivity/equity

Every student can interact, no matter how many in the class. Even the timidest student can be involved, and as Bali (2016) notes, asynchronous conversations cannot be interrupted. Exchanges are easily scaled to pairs, groups or whole class as appropriate, and social exchanges can be carefully constructed by participants to build relationships.

This, in contrast to synchronous discourse, which has been described as “fairly linear, almost always meaning that not everyone can participate” (Warnock, 2009, p. 69-70). Thoughtful planning and structure of group work sessions, and allocating sufficient facilitation resources, can be used to address challenges of scale in both synchronous and asynchronous activities.

Flexibility of scheduling and time on task

Particularly useful when students are working across different time zones (Arbaugh, 2001; Berger, 1999, Bali 2016). No limit to ‘airtime’ for students, meaning they can contribute for any duration they choose (Brower, 2003).

Time lag provides students the opportunity to access on their terms – to employ assistance related to disabilities and/or technology needs (Mick & Middlebrook, 2015).

Higher order thinking and time to process

When synchronous and asynchronous discussion formats were directly compared in a randomized experiment, higher order thinking skills were more evident in the asynchronous format than the synchronous format (Brierton et al, 2016). Asynchronous discussions can provide greater opportunities for the analysis and synthesis of arguments, and deeper learning, for example (Majowicz, UWT&L Conference, 2021).

Permanence, for instructor reflection and targeted intervention

Given the nature of asynchronous tools, particularly those available in an LMS, asynchronous interactions are more likely to be useful for participants after they occur in the form of a record of discourse (Laurinen & Marttunen, 2007). The record is also useful for instructors to gather information on student engagement, common questions/misconceptions, outliers in a group and stages of learning requiring more guidance (Kovanović, Gašević, Hatala & Siemens, 2017; Mick & Middlebrook, 2015).

Challenges of Asynchronous

Risk of low impact (lack of meaningful interpersonal relationships)

Too often, instructors and students report a failure to forge meaningful relationships with one another (Mick & Middlebrook, 2015). This is one of the most significant critiques of online learning, and attention must be paid to mitigate this risk. Experienced online instructors emphasize “courses do not run by themselves” and require careful attention to connection and community (Wilson & Opperwall, 2020). Low levels of impact can lead to high attrition rates (Dziuban, Hartman, & Moskal, 2004), and an increase in academic misconduct (Leslie, 2020), among other things. Design elements in asynchronous spaces that can and do allow course participants to bond include open discussion areas, social sharing, and playfulness (Kear, 2011).

Risk of procrastination and other self-regulation struggles

Asynchronous learning requires highly developed autonomous learning, time management skills and self-regulation (Leslie, 2020; Troop et al, 2020). Many learners

need explicit support in developing these life skills on top of the other learning challenges of the course. It is worthwhile to provide the cognitive space and support for learners to succeed and provide credit/recognition for acquiring such skills.

Learner cooperation is harder to achieve asynchronously for some pedagogical approaches

Complex psychological processes may work in unexpected ways when taking a learning experience from the face-to-face (F2F) classroom to a computer-mediated communication (CMC) format, especially asynchronously.

In the case of constructive controversy pedagogy (rooted in F2F theory and research), asynchronous formats decreased motivation (interest-value) and achievement compared to synchronous and F2F (Saltarelli & Roseth, 2014). Cooperation is key to this approach and seems to be harder to achieve in the asynchronous CMC format.

Asynchronous group work requires planning and coaching

Unclear ground rules and solely asynchronous social connections may increase students' sense of temporal uncertainty or concern about when and if their partner will complete their portion, when compared to synchronous group work (McGuire & Kable, 2012; Saltarelli & Roseth, 2014). You can encourage groups to meet synchronously when it suits all members, as opposed to scheduling these types of sessions for the whole class.

Technology support might not be available when assistance is needed

The flexibility afforded to learners working asynchronously means that some will end up needing assistance outside of regular business hours. Institutional technical support is essential to maintaining reliable service for asynchronous learning (Mick & Middlebrook, 2015).

Key considerations for asynchronous interaction design

- **Fostering student engagement requires a strategic, intentional approach.**
 - Consider opportunities to encourage student-content, student-instructor, student-student (whole class, small groups, or pairs as it suits the context) and student-self (i.e., reflection) interactions (Wilson & Opperwall, 2020; Johnson, S.M., 2021).
 - Focus on humanizing learning in any mode or format by prioritizing the importance of social, informal and affective experiences (Bali, 2016).
- **Interactions with extended time delays can cause disengagement and incoherence.**
 - Balance flexibility with pedagogical requirements to ensure learners aren't left hanging or unable to complete a learning task due to delayed interactions with others.

- Be aware that individuals prefer short response latencies (Kalman et al, 2006) and time increases goal decay (Monk et al, 2008) and interactional incoherence (Herring, 1999).
- **Clear expectations for engagement, scheduling and interaction etiquette are necessary.**
 - Simply asking learners to engage, and setting learning materials in front of them, does not provide a structured set of success parameters learners need.
 - A course schedule, guidelines for peer and instructor interaction, and clear, consistent instructions are needed for learners to become acquainted, comfortable, and confident in the asynchronous learning environment (Kelly, Garber-Pearson & Vannini, 2020).
- **Student may need more self-regulation support in asynchronous environments.** Consider how instructors and course design can support self-regulation.
 - Zimmermann's three-phase cyclical model of student self-regulation – forethought, performance, and self-reflection can be helpful for planning and design. For more information, see [Tips for Fostering Students' Self-Regulated Learning in Asynchronous Online Learning Environments](#) (Ebner, 2020).
 - Clearly communicate availability of technical support and instructor/instructional supports, including coaching/check-in opportunities
 - Encourage student time and risk management skill development. This can include scaffolding difficult or complex tasks, setting milestones across the course, providing opportunities for peer support and offering one-on-one and group coaching.

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