

Polysynchronous learning: a model for student interaction and engagement

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The advent of MOOCs has drawn renewed interest in online pedagogies and new impetus for efforts to understand the ways in which face to face, online and blended modalities afford distinct patterns of student interaction and engagement. At the same time, the ubiquitous availability of mobile devices is presenting new opportunities for face to face students to engage in new ways with teachers, peers and content during and after class through multiple ever-present communication streams. In order to cater for students undertaking their studies in these new technology mediated environments, more needs to be known about the way in which student interaction and engagement changes in such environments. This paper discusses a new theoretical stance on the interaction patterns of students in face to face and online settings. The term *polysynchronous learning* is proposed to encompass the new learning opportunities afforded by contemporary online learning technologies.

Keywords: interaction, engagement, synchronous, asynchronous, polysynchronous learning

Background

In order to cater for increased demand from students for flexibility in the ways in which they undertake their learning, universities have adopted a range of different approaches to online learning. The three most typical models are: a) face to face courses supported by online resources, b) blended courses which include face to face sessions and regular online discussion, and c) fully online courses, including Massive Open Online Courses (MOOCs). One of the key differences between these models is the way in which opportunities for student-teacher, student-student and student-content interaction (see Moore, 1989) are provided. In particular, such courses differ in the degree to which students have the opportunity for synchronous and asynchronous interaction and the opportunity to use face to face, video, audio and textual modalities for these interactions. Traditionally, in each of these models student participation face to face tends to be separate to participation online, and interaction with peers and teachers tends to be separate from interaction with content. This compartmentalisation and separation of participation modalities and interaction activities is being challenged by new models afforded by contemporary technologies.

Historically online and blended learning models tended to allow only asynchronous participation by remote students (Abrami et al., 2011). Students typically were provided with access to online resources as well as recorded lectures, and were then supported to undertake discussion with peers and teachers through asynchronous discussion forums. A key limitation of this kind of learning environment was that it didn't tend to afford the kinds of real-time collaborative activities that are now needed to develop professional communication and collaboration capabilities for the modern workplace. Additionally it is now generally acknowledged that some of the most effective pedagogical approaches involve cooperative learning activities (Putnam, 1998). Such activities can be more efficiently carried out through rapid synchronous exchanges of dialogue, and synchronous sharing of visual material. In this context, learning designs using contemporary online learning technologies such as web conferencing systems (e.g. Adobe Connect or Blackboard Collaborate) can afford new pedagogical approaches leading to new kinds of student interaction and engagement.

This paper builds on emergent ideas from (previously reported) case studies of blended synchronous learning in which new patterns of interaction and engagement emerged, and proposes a new theoretical stance on the interaction patterns of students in face to face and online settings. The term *polysynchronous learning* is proposed to encompass the new learning opportunities afforded by these contemporary online learning technologies and learning designs.

Background to the case studies

Case studies undertaken as part of a recent Office of Learning and Teaching (OLT) Innovation and Development Grant funded project, 'Blended synchronicity: Uniting on-campus and distributed learners using media-rich real-time collaboration tools', provided illustrations of the ways in which patterns of interaction can

change once synchronous blending of face to face and online modalities is introduced, and once multiple streams of synchronous and asynchronous communication are enabled through the functionality provided by contemporary online teaching technologies and the ubiquitous availability of mobile devices (see Bower et al., 2014). Specifically seven case studies involving blended synchronous learning designs were explored. Scrutiny of these learning designs and the student interactions they afforded has allowed new thinking about student interaction to emerge. The following section provides some brief descriptions of two scenarios illustrating some of the emergent ideas.

Interaction Scenarios

Scenario 1. Remote and face to face participation in lectures with multiple interaction streams

In the Blended Synchronicity study there were four cases studies in which lecturers used web conferencing technologies such as Adobe Connect (<http://www.adobe.com/au/products/adobeconnect.html>) or Blackboard Collaborate (<http://www.blackboard.com/platforms/collaborate/overview.aspx>) to allow concurrent participation by face to face and remote students (see Bower et al., 2014). In this scenario, remote students are able to listen to or view the lecture presentation through the audio/video streaming capabilities of the web conferencing software, as well as participating in audio discussions. They are also able to pose questions through text chat streams, and can also request attention or answer yes/no questions through status visibility features of the software. Students in the lecture theatre, who are encouraged to bring a laptop or mobile device to the lecture, can also read and contribute to the online chat dialogue. Finally, the software allows for easy recording of sessions, and those viewing/listening to the recording can also see the chat dialogue and presentation slides.

The following are the key elements of this scenario:

- Simultaneous remote and face to face participation;
- Multiple channels of communication (students can ask questions during lecture delivery rather than needing to interrupt, students can undertake a stream of dialog between each other during lecture delivery, and students can explore content and share content with each other during lecture delivery); and
- Lecture recording (recorded sessions are viewed/listened to later by those present and absent and an asynchronous discussion emerges from the synchronous lecture).

Scenario 2. Shared engagement with content

Another key idea emerging from case studies within the Blended Synchronicity project was shared interaction with content. For example in one case study the lecturer used the polling tool in Adobe Connect to allow students to answer multiple choice, true/false or short answer questions posed throughout the lecture, and see summaries of other student responses before listening to the lecturer address emergent misconceptions. A very high level of engagement of both face to face and remote students was evident through this technique. The approach is similar to approaches afforded by audience response systems ('clickers') and tools like Socrative, however the availability of the text chat stream within the software also allowed students to ask follow up questions of the lecturer or discuss the problems posed amongst themselves.

Other examples of shared engagement with content which were evident within the Blended Synchronicity project involved small group problem-focused collaborative activities where group members had shared access to visually rich resources. In one example, students worked together on a pathology diagnosis using shared visualization of microscopic tissue images within Adobe Connect break out rooms. In another example, students worked in pairs on an authentic scenario where they had to negotiate their way through a Second Life virtual Chinese restaurant and marketplace using their Chinese language skills. In both of these examples students were able to communicate with each other using text and audio streams, could touch base with students from other groups when needed and were able to draw on a shared visual experience as part of their collaboration.

Another example of shared engagement with content is the situation where students studying on their own, for example reading online materials or sections of a text book, or listening to a lecture which they have missed, post comments, reflections or questions to an online discussion forum and then see an immediate response. Because of the ubiquitous availability of mobile devices, asynchronous communication can become synchronous because in large class cohorts there is almost certainly somebody (and often a large number of people) online at any given moment. In this way what would have been a very private study session becomes a shared one which can enhance the experience in really important ways (see further discussion below).

The following are the key elements of these scenarios:

- Interaction with peers and teachers in the context of problem-focused engagement with content;
- Multiple streams of communication between peers, small groups or the whole class; and
- Remote and face to face participation.

Emergent ideas across these scenarios

Analysis of these scenarios suggests that student learning experiences are changed by a) the existence of multiple streams of interaction; b) the recording of sessions; c) opportunities to engage in shared interaction with content; and d) synchronous responses to asynchronous communication using mobile devices.

Multiple streams of interaction can allow for a much more active learning experience, where students are constantly constructing, articulating and querying their own knowledge representation, rather than being constrained by a single audio stream in which their share might be 30 seconds to a minute out of a one or two hour class. The recording of sessions can allow students who were present at the class to re-engage with content at their own pace later and ask questions or discuss ideas with their peers which they didn't think of or didn't have the opportunity to discuss during the session. Shared online interaction with content allows the benefits of cooperative learning to be harnessed not just through designed activities in class, but when students are undertaking their private study. Evidence from years of cooperative learning research demonstrate the value of activities in which peers are able to support each other by providing an ear to other students' reflections, collaboratively resolving misconceptions, or working together on solving a problem (see, for example, Johnson, Johnson & Smith, 1998; Slavin, 1996). Finally, transforming discussions within online forums from asynchronous to synchronous can turn the normally private activity of viewing content, engaging in problem solving or exploring media-rich interactive resources, into a social activity, again allowing the benefits of cooperative pedagogies to be realised. As a result of the changes in student learning experiences afforded by these new patterns of interaction there is a need for new theorising about interactivity and synchronicity.

Interactivity and Synchronicity

As discussed above, Moore's (1989) categories: student-teacher, student-student and student-content interaction has been found to be an effective way of thinking about interaction in both face to face and online settings. Traditionally researchers have viewed interactions between learners and teachers or between learners and learners as occurring either synchronously (participants virtually or physically co-present communicating at the same time), or asynchronously (communication occurring over a period of elapsed time) (see, for example, Bernard et al., 2009 for a highly cited meta analysis of studies comparing the value of each modality). Garcia and Baker Jacobs (1999) add a third modality, *quasi-synchronous*, which refers to streams of text chat which can be responded to immediately or after a short delay, due to the way that postings stay accessible for a few minutes after they are uploaded.

This categorisation of interaction types and this distinction between synchronous, asynchronous and quasi-synchronous modality is complicated by a) the creation of digital interaction '*footprints*' through recording of synchronous audiovisual presentations and chat logs (see Wexelblat & Maes, 1999), which can be a hub for ongoing asynchronous engagement and b) the ubiquitous availability of mobile devices which turn asynchronous discussion into synchronous discussion by enabling immediate back and forth responses. It is becoming apparent that the integration of these interaction types and communication modalities results in a qualitatively different learning experience.

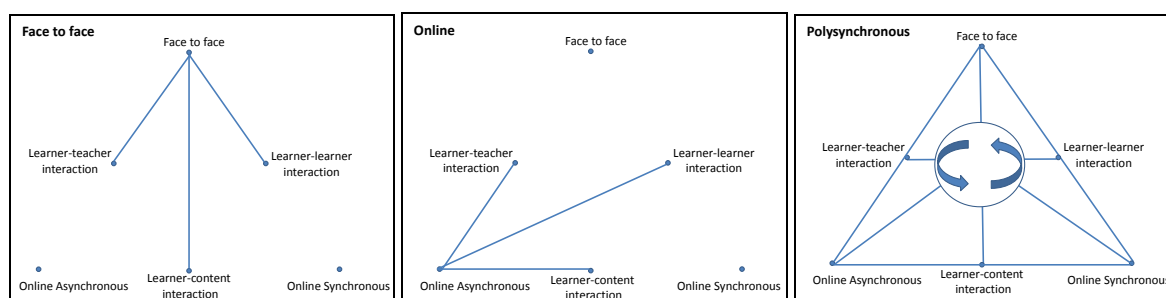


Figure 1. Interaction patterns in Face-to-face, Traditional online and Polysynchronous learning environments.

I have co-opted and adapted the term *polysynchronous learning* to capture these new types of learning experiences. I define polysynchronous learning as *the integration of learner-learner, learner-content and learner-teacher interaction through a blending of multiple channels of face to face, asynchronous online and synchronous online communication*. Figure 1 illustrates the differences in patterns of interaction across modalities in face to face, traditional online and polysynchronous learning environments.

Conclusion and implications

I have argued in this paper that the integration of synchronous and asynchronous activities, including activities involving learner-learner, learner-teacher and learner-content interaction can result in a learning experience that is qualitatively different than the sum of the component parts. Such activities can potentially have a major positive impact on learner engagement and consequently learning outcomes. However, there are challenges for course and subject designers and for teachers in providing a focussed and well organised learning experience for students in polysynchronous environments. Poorly designed polysynchronous learning environments can potentially have a detrimental effect on learning, with learners becoming distracted by irrelevant dialogue within multiple communication streams, struggle to maintain concentration due to the high cognitive load in attending to multiple sources of content and discussion simultaneously, or engage only at a shallow level due to the rapid and abbreviated responses which are the convention in mobile communication channels.

More research is needed which derives learning design principles and guidelines for teachers applicable to polysynchronous environments. Earlier research has demonstrated the value of interaction through designed rather than incidental learning activities (e.g. Borokhovski et al., 2012), especially when designed activities are informed by well accepted principles such as constructive alignment (see Biggs & Tang, 2011), and cooperative learning (Johnson, Johnson & Smith, 1998; Slavin, 1996). The challenge is to identify how best to apply what is known about learning design and about teaching to polysynchronous contexts.

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