DOI 10.14622/Advances_48_2022_10

Effects of synchronousness in online learning experiences and the level of social presence in the pandemic 2021

Hocheol Yang[1], *Jihyun Kim*[2], *Stephanie Kelly*[3] *and Ryan Goke*[4]

[1] California Polytechnic State University

[2] University of Central Florida

[3] North Carolina A&T State University

[4] North Dakota State University

E-mails: Hyang25@calpoly.edu; jihyun.kim@ucf.edu; sekelly@ncat.edu; ryan.goke@ndsu.edu

Short abstract

This study examines the differences between synchronous and asynchronous online courses on students' social presence and learning experiences during the COVID 19 pandemic 2021. The final sample included 170 undergraduate students who took both synchronous and asynchronous online courses in the United States. The results of two sets of one-way repeated measures Multivariate Analysis of Variance (MANOVA) indicated synchronous online courses significantly lead to more positive learning experiences than asynchronous courses, at least when the emergency remote teaching was implemented in the COVID 19 pandemic 2021, supporting for the expanded Instructional Beliefs Model (IBM). Specifically, students reported significantly higher levels of *course satisfaction, affective learning, cognitive learning, and motivation to learn* for synchronous online courses than asynchronous online courses. Students also report experiencing significantly higher levels of social presence, such as *social richness, co-presence, passive interpersonal, actor within a medium, community within a medium* for synchronous online courses than asynchronous online courses.

Keywords: distance learning, quality of education, synchronousness, social presence, COVID 19

1. Introduction

Online learning became a central interest among educators and students when Emergency Remote Teaching (ERT) (Hodges, et al., 2020) took place due to the COVID-19 pandemic. Specifically, both synchronous and asynchronous modalities were offered as means to replace in-person instruction (Marinoni, van't Land and Jensen, 2020; Fabriz, Mendzheritskaya and Stehle, 2021). It has been considered that the differences in synchronousness are not the influential factors of online learning experiences and asynchronous courses are as effective as synchronous courses depending on the course implementations (Lew and Nordquist, 2016); educational institutions adopted these modalities to offer a more flexible schedule to students (Marinoni, van't Land and Jensen, 2020). But by the end of the pandemic, studies started to find that many students found themselves dissatisfied with their learning experiences, partly because faculty were not able to effectively use distance learning technology, leaving them with little motivation to try to overcome their professors' technological limits in ERT (Frey, 2021; Garland and Violanti, 2021), yet it is still unclear if it is just impacting students' satisfaction or their overall learning experiences.

Synchronous online learning experiences are those in which students meet at a designated, recurring time with their teacher and peers through an online platform (Amiti, 2020). Asynchronous learning environments are those in which students can access the materials at their convenience from anywhere at any time (Chen, Sun and Jin, 2019), providing them with a more flexible learning environment that can be tailored by the student to their needs. For both online structures, student learning can be enhanced through active

participation (Khotimah, 2020). Some experiments of synchronous vs. asynchronous lecturing have found no difference in students' academic achievement, satisfaction, sense of community (Olson and McCracken, 2015), or conceptual understanding (Dahlstrom-Hakki, Alstad and Banerjee, 2020) in one-time learning experiences. However, students require time to adjust to the online platform and step into their online learner identity (Yamagata-Lynch, 2014), which means these variables may change over the course of a semester.

Students who prefer asynchronous learning often prefer that modality because they have the option to engage with the course material when it works best for their schedule (Kelly and Westerman, 2016). In performance-based courses such as public speaking, asynchronous courses are often preferred because they give students the opportunity to record multiple takes and submit their best effort rather than having only one shot in real-time (Nurwahyuni, 2020). Another advantage of asynchronous online learning is that, when lectures are provided, students have the option to review them as many times as they wish, stop and take a break when needed, and even use closed caption features to ensure understanding (Foutz, 2021). Yet, those benefits of rewatching lectures and preparing multiple assignment submissions take time and motivation. As such, students who are successful in asynchronous online courses need more internal motivation than those in synchronous courses (Giesbers, et al., 2014) and must spend more time reasoning through the course material on their own (Guo, 2020). Therefore, the below hypotheses were established and tested.

H1a–d. Students will report increased online learning experiences for synchronous classes than asynchronous classes, such as (a) Course Satisfaction, (b) Affective Learning for Course Evaluation, (c) Perceived Cognitive Learning, and (d) Motivation To Learn.

Because of the interactive component of synchronous learning, students are likely to perceive more social presence with both their instructor and peers (Moallem, 2015; Rockinson-Szapkiw and Wendt, 2015; Yang, et al., 2022) and have a stronger attachment to the course material (Peterson, Beymer and Putnam, 2018; Rockinson-Szapkiw and Wendt, 2015). The Instructional Beliefs Model (IBM) (Weber, Martin and Myers, 2011) also predicts a strong association between social presence and students' learning experiences in cognitive, affective, and behavioral learning. Therefore, the following hypothesis is proposed:

H2. Students will report higher levels of social presence toward synchronous classes than asynchronous classes.

2. Methods

The final sample included 170 undergraduate students in the United States. Initially, 398 undergraduate students responded to the research survey. To ensure the eligibility of the study participants and to maximize the good quality of the data, a series of data cleaning processes were performed. First, because the purpose of the study is to compare one's learning experiences of asynchronous and synchronous online courses, responses from 210 individuals who reported taking only one type of online course (either asynchronous or synchronous) were removed. Second, 7 individuals who failed an attention check in the middle of the questionnaire were eliminated from the data. Lastly, 9 individuals reported that they have taken the survey more than once; thus, the duplicated responses from these individuals were removed from the data.

Data collection occurred via an online survey tool in April 2021, near the end of the Spring semester. After IRB's approval, one of the primary researchers contacted several instructors at multiple universities in the U.S. and asked them to share a research participation opportunity with their students. Then, a recruitment message was distributed to students through their instructors.

3. Results

This study applied two sets of one-way repeated measures Multivariate Analysis of Variance (MANOVA). The ordering effects were controlled by the study design's counter-ordering and did not find significant differences between ordering groups. Before the test, Shapiro-Wilk's *p-values* did not indicate a violation of normality. Mauchly's χ^2 significance test of sphericity was used to check this assumption but none of the results showed a statistically significant level of the *Chi-square* indicating the violation of the sphericity assumption ($p \leq .001$).

H1: The effects of synchronousness on online learning experiences

The first set of one-way repeated measure MANOVA tested the effects of synchronousness on online learning experiences. The test result indicated significant effects of effects of synchronousness on students' learning experiences [Wilks' Lambda = .884, F (5, 167) = 3.64, $p \leq .01$], explaining 11.6 % of total variances. The result supported H1, as well as all the sub hypotheses of it, as described in Table 1.

Table 1: Descriptive statistics of learning experiences

Laerning experience		Sync		A-Sync	
	N	*M*	*SD*	*M*	*SD*
CS (Course Satisfaction) ***	172	4.53	1.68	3.99	1.82
ALCE (Course Evaluation) **	172	5.65	1.40	5.33	1.53
ALEOC (Enroll in another Online Course) *	172	5.28	1.66	4.88	1.91
ALIE (Instructor Evaluation) ***	172	6.03	1.34	5.52	1.62
PCL (Perceived Cognitive Learning) *	172	5.08	1.12	4.77	1.28
MTL (Motivation To Learn) **	172	5.04	1.45	4.77	1.57
Note: $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$					

Students reported that they experienced a significantly higher level of CS for synchronous online courses than asynchronous online courses [F (1, 171) = 16.03, $p \leq .001$], explaining 8.6 % of total variances. Students reported that they experienced a significantly higher level of ALCE for synchronous online courses than asynchronous online courses [F (1, 171) = 7.51, $p \leq .01$], explaining 4.2 % of total variances. Students reported that they experienced a significantly higher level of ALEOC for synchronous online courses than asynchronous online courses [F (1, 171) = 5.81, $p \leq .05$], explaining 3.3 % of total variances.

Students reported that they experienced a significantly higher level of ALIE for synchronous online courses than asynchronous online courses [F (1, 171) = 14.38, $p \leq .001$], explaining 7.8 % of total variances. Students reported that they experienced a significantly higher level of PCL for synchronous online courses than asynchronous online courses [F (1, 171) = 9.61, $p \leq .01$], explaining 5.3 % of total variances. Students reported that they experienced a significantly higher level of MTL for synchronous online courses than asynchronous online courses [F (1, 171) = 6.82, $p \leq .01$], explaining 3.8 % of total variances.

H2: The effects of synchronousness on social presence

The second set of one-way repeated measure MANOVA tested the effects of synchronousness on social presence. The test result indicated significant effects of the influence of synchronousness on the dimensions of social presence [Wilks' Lambda = .362, F (5, 167) = 58.90, $p \leq .001$], explaining 63.8 % of total variances. The result supported H2, as well as all the sub hypotheses of it, as described in Table 2.

Table 2: Descriptive statistics of social presence

Social presence		Sync		A-Sync	
	N	*M*	*SD*	*M*	*SD*
Social Richness *	172	5.76	1.50	5.01	1.84
Co-presence *	172	4.42	1.65	3.10	1.57
Passive interpersonal *	172	4.23	1.66	1.84	1.26
Actor within a medium *	172	3.94	1.66	2.16	1.77
Community within a medium *	172	4.72	1.67	3.34	1.78
Note: *$p \leq .001$					

Students reported that they felt a significantly higher level of social richness for synchronous online courses than for asynchronous online courses [F (1, 171) = 20.57, $p \leq .001$], explaining 10.7 % of total variances. Students reported that they felt a significantly higher level of co-presence for synchronous online courses than asynchronous online courses [F (1, 171) = 72.84, $p \leq .001$], explaining 29.9 % of total variances. Students reported that they felt a significantly higher level of passive interpersonal for synchronous online courses than for asynchronous online courses [F (1, 171) = 269.25, $p \leq .001$], explaining 61.2 % of total variances.

Students reported that they felt a significantly higher level of the actor within a medium for synchronous online courses than asynchronous online courses [F (1, 171) = 158.56, $p \leq .001$], explaining 48.1 % of total variances. Students reported that they felt a significantly higher level of community within a medium for synchronous online courses than asynchronous online courses [F (1, 171) = 91.19, $p \leq .001$], explaining 34.8 % of total variances.

4. Discussion

First, the study results showed significantly enhanced online learning experiences in synchronous classes than in asynchronous classes. Students reported that they experienced a significantly higher level of course satisfaction, affective learning, cognitive learning, and motivation to learn for synchronous online courses than asynchronous online courses. The results imply the current problem of implementing asynchronous online courses (Kunin, Julliard and Rodriguez, 2014) or its inherent limitations of it. At least during the pandemic's Emergency Remote Teaching (ERT) (Hodges, et al., 2020), the result of this study supports arguments that asynchronous online courses didn't do well for students learning experiences when it is not their preferred modality option (Rippé, et al., 2021). Most of the students may not be wanted to have asynchronous courses but they can also learn better with asynchronous courses during the pandemic. Based on the results, it looks like allowing the implementation of asynchronous courses widely in the pandemic was not a good decision. It also suggests more careful curriculum development and implementation guides are necessary for further use of asynchronous online courses to enhance students' online learning experiences in the post-pandemic and ERT era.

For example, in teaching a printing process management topic using a specific technique, the asynchronous only approach may not provide sufficient instruction to students. Because it is difficult to supply an optimized learning environment by standardizing students' distance learning technology and varying degrees of prior experience. As an extreme case, to incorporate such variability, the best way would be simply to let students read through the manufacturers' manual. Instead, having a short synchronous hands-on time with instructors synchronous or having group appointments that could alleviate impacted online learning experiences. Therefore, it is advised to avoid a single modality approach, especially the asynchronous one,

and consider more flexible modality options, such as mixed and hybrid modalities. Also, the results suggest that educational institutions need to spend more resources and time inventing and implementing classes with an asynchronous only modality.

Second, the study results showed a significantly enhanced level of social presence (Yang, et al., 2022) in synchronous classes than in asynchronous classes. Students also reported that they experienced a significantly higher level of social richness, co-presence, passive interpersonal, actor within a medium, community within a medium for synchronous online courses than asynchronous online courses. As predicted by IBM (Weber, Martin and Myers, 2011) and supported by the results of this study, when we design and implement online courses, it is important to consider the aspects that can enhance social presence. Although asynchronous online courses could offer higher flexibility in scheduling online courses that allow globalized and inclusive course offerings (Garland and Violanti, 2021), it is important to consider having some elements that can enhance social presence is recommended.

For example, having a small portion of synchronous meetings in asynchronous online courses would be helpful to enhance students' learning experiences. Not just because it can accommodate unpredictable differences among students, as discussed earlier, but because the results suggest the association between social presence and online learning experiences. Students may find it easier to be socially motivated and engaged in the course activities when they are synchronously working together. Also, when instructors are working on developing educationally effective implementation methods, having considerations regarding the effects of social factors would be helpful (Yang, et al., 2022). Therefore, further investigations regarding the mediating associations, as proposed in IBM (Weber, Martin and Myers, 2011), between the dimensions of social presence and online learning experiences are important to develop more educationally effective asynchronous online courses.

5. Limitations and future research directions

Although the present study revealed meaningful findings, there are a few limitations that should be considered when interpreting the results. First, the study collected data using a convenience sampling method, which may not fully reflect the nature of the population. Although the sample consisted of participants from multiple universities across the United States, it cannot guarantee the representativeness of the population. To further enhance external validity, future research should consider using a nationally representative sample through a random sampling procedure.

Second, the study did not consider the varying degrees of technology affordances in online courses. Each course or instructor may utilize different technology features in their courses. For example, the results showed the amount of gap in learning experiences is smaller than the gap in social presence. Thus, the range of learning tools and technology options to engage in communication and/or learning might influence student learning experiences. To better understand which aspects of technology features and how they influence student learning experiences in synchronous and asynchronous courses, follow-up research is needed.

Third, given that data were collected during COVID-19, there is a possibility that the nature of the pandemic may have partially affected the pattern of the results. For example, students did not have any other option but to take online courses because of the lockdown and/or restricted physical gatherings in a classroom. Some students may not have had the flexibility to choose a particular type of online course (synchronous or asynchronous); rather, they may have taken whatever option that is available for them. The popularity of online education has continuously increased (Allen and Seaman, 2017), and it will likely continue to do so. To fully understand how different types of online courses affect student learning experiences when

students take those courses based on their interests and choices, researchers are encouraged to replicate this study during non-pandemic times.

Lastly, although the simple study design of this study is best to clarify the impact of synchronousness, it is known that both students' success and satisfaction with online learning rests heavily on their traits and capabilities as well (Kauffman, 2015). For example, student self-efficacy tends to predict learning satisfaction through students' interactions with classmates, instructors, and technology (Shen, et al., 2013). Simply put, the students who are more confident in their ability to communicate and learn online, who have a clear understanding of the course expectations, and who believe they are performing well tend to have higher satisfaction with the course (Palmer and Holt, 2008). Additionally, students report higher satisfaction with the course when they perceive more instructional, peer, and technical support (Lee, et al., 2014). While students have diverse needs that vary on an individual basis (Croxton, 2014), some of their biggest frustrations with online courses include technological issues and the instructor being unavailable (Elshami, et al., 2021). However, support from the institution and its instructors can give students a more positive outlook on the course (Almusharraf and Khahro, 2020).

References

Allen, I.E. and Seaman, J., 2017. *Digital learning compass: distance education enrollment report 2017*. [pdf] Babson Survey Research Group, e-Literate, and WCET. Available at: <https://onlinelearningsurvey.com/reports/digtiallearningcompassenrollment2017.pdf> [Accessed June 2022].

Almusharraf, N. and Khahro, S., 2020. Students satisfaction with online learning experiences during the COVID-19 pandemic. *International Journal of Emerging Technologies in Learning,* 15(21), pp. 246–267. https://doi.org/10.3991/ijet.v15i21.15647.

Amiti, F., 2020. Synchronous and asynchronous e-learning. *European Journal of Open Education and E-learning Studies,* 5(2), pp. 60–70. https://doi.org/10.46827/ejoe.v5i2.3313.

Chen, Y., Sun, X. and Jin, Y., 2019. Communication-efficient federated deep learning with layerwise asynchronous model update and temporally weighted aggregation. *IEEE Transactions on Neural Networks and Learning Systems,* 31(10), pp. 4229–4238. https://doi.org/10.1109/TNNLS.2019.2953131.

Croxton, R.A., 2014. The role of interactivity in student satisfaction and persistence in online learning. *Journal of Online Learning and Teaching*. 10(2), pp. 314–324.

Dahlstrom-Hakki, I., Alstad, Z. and Banerjee, M., 2020. Comparing synchronous and asynchronous online discussions for students with disabilities: the impact of social presence. *Computers & Education*, 150: 103842. https://doi.org/10.1016/j.compedu.2020.103842.

Elshami, W., Taha, M.H., Abuzaid, M., Saravanan, C., Al Kawas, S. and Abdalla, M.E., 2021. Satisfaction with online learning in the new normal: perspective of students and faculty at medical and health sciences colleges. *Medical Education Online*, 26(1): 1920090. https://doi.org/10.1080/10872981.2021.1920090.

Fabriz, S., Mendzheritskaya, J. and Stehle, S., 2021. Impact of synchronous and asynchronous settings of online teaching and learning in higher education on students' learning experience during COVID-19. *Frontiers in Psychology*, 12: 733554. https://doi.org/10.3389/fpsyg.2021.733554.

Foutz, B., 2021. Instructor misbehavior: when instructors online are naughty; not nice. In: S. Kelly, ed. *Online instructional communication.* Newcastle upon Tyne, UK: Cambridge Scholars Publishing. pp. 97–106.

Frey, T.K., 2021. Overcoming technological barriers to instruction: situating Gen Z students as reverse mentors. *Frontiers in Communication*, 6: 630899. https://doi.org/10.3389/fcomm.2021.630899.

Garland, M.E. and Violanti, M.T., 2021. Rock my world: rewind to a better transition to remote learning. *Frontiers in Communication*, 6: 641873 23. https://doi.org/10.3389/fcomm.2021.641873.

Giesbers, B., Rienties, B., Tempelaar, D. and Gijselaers, W., 2014. A dynamic analysis of the interplay between asynchronous and synchronous communication in online learning: the impact of motivation. *Journal of Computer Assisted Learning*, 30(1), pp. 30–50. https://doi.org/10.1111/jcal.12020.

Guo, S., 2020. Synchronous versus asynchronous online teaching of physics during the COVID-19 pandemic. *Physics Education*, 55(6): 065007. https://doi.org/10.1088/1361-6552/aba1c5.

Hodges, C., Moore, S., Lockee, B., Trust, T. and Bond, A., 2020. The difference between emergency remote teaching and online learning. *Educause Review*, [online] Available at: <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning< [Accessed June 2022].

Kauffman, H., 2015. A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology*, 23; 26507. http://dx.doi.org/10.3402/rlt.v23.26507.

Kelly, S.E. and Westerman, D.K., 2016. New technologies and distributed learning systems. In P.L. Witt, ed. *Communication and learning*. Boston/Berlin: DeGruyter Mouton. pp. 455–480.

Khotimah, K., 2020. Exploring online learning experiences during the Covid-19 pandemic. In: *Proceedings of the International Joint Conference on Arts and Humanities (IJCAH 2020*). Surubaya, Indonesia, 3–4 October 2020. Atlantic Press. https://doi.org/10.2991/assehr.k.201201.012.

Kunin, M., Julliard, K.N. and Rodriguez, T.E., 2014. Comparing face-to-face, synchronous, and asynchronous learning: postgraduate dental resident preferences. *Journal of Dental Education*, 78(6), pp. 856–866. https://doi.org/10.1002/j.0022-0337.2014.78.6.tb05739.x.

Lee, S.J., Srinivasan, S., Trail, T., Lewis, D. and Lopez, S., 2014. Examining the relationship among student perception of support, course satisfaction, and learning outcomes in online learning. *The Internet and Higher Education*, 14(3), pp. 158–163. https://doi.org/10.1016/j.iheduc.2011.04.001.

Lew, E.K. and Nordquist, E.K., 2016. Asynchronous learning: student utilization out of sync with their preference. *Medical Education Online*, 21(1): 30587. https://doi.org/10.3402/meo.v21.30587.

Marinoni, G., van't Land, H. and Jensen, T., 2020. *The impact of Covid-19 on higher education around the world*. [pdf] International Association of Universities. Available at: <https://www.iau-aiu.net/IMG/pdf/iau_covid19_and_he_survey_report_final_may_2020.pdf> [Accessed 18 June 2021].

Moallem, M., 2015. The impact of synchronous and asynchronous communication tools on learner self-regulation, social presence, immediacy, intimacy and satisfaction in collaborative online learning. *The Online Journal of Distance Education and e-Learning*, 3(3), pp. 55–77.

Nurwahyuni, R., 2020. An analysis of students' perception on synchronous and asynchronous learning in speaking skill during pandemic Covid-19. In: M. Zini Miftah, ed. *Proceedings of International Conference on English Language Teaching (INACELT).* Palangka Raya, Indonesia, 19 September 2020, pp. 189–201.

Olson, J.S. and McCracken, F.E., 2015. Is it worth the effort? The impact of incorporating synchronous lectures into an online course. *Online Learning*, [e-journal] 19(2). Available at: <https://eric.ed.gov/?id=EJ1062939> [Accessed June 2022].

Palmer, S.R. and Holt, D.M., 2008. Examining students satisfaction with wholly online learning. *Journal of Computer Assisted Learning*, 25(2), pp. 101–113. https://doi.org/10.1111/j.1365-2729.2008.00294.x.

Peterson, A.T., Beymer, P.N. and Putnam, R.T., 2018. Synchronous and asynchronous discussions: effects on cooperation, belonging, and affect. *Online Learning*, [e-journal] 22(4), pp. 7–25. Available at: <https://eric.ed.gov/?id=EJ1202382> [Accessed June 2022].

Rippé, C.B., Weisfeld-Spolter, S., Yurova, Y. and Kemp, A., 2021. Pandemic pedagogy for the new normal: fostering perceived control during COVID-19. *Journal of Marketing Education*, 43(2), pp. 260–276. https://doi.org/10.1177/0273475320987287.

Rockinson-Szapkiw, A. and Wendt, J., 2015. Technologies that assist in online group work: a comparison of synchronous and asynchronous computer mediated communication technologies on students' learning and community. *Journal of Educational Multimedia and Hypermedia*, 24(3), pp. 263–279.

Shen, D., Cho, M.-H., Tsai, C.L. and Marra, R., 2013. Unpacking online learning experiences: online learning self-efficacy and learning satisfaction. *The Internet and Higher Education*, 19, pp. 10–17. https://doi.org/10.1016/j.iheduc.2013.04.001.

Weber, K., Martin, M.M. and Myers, S.A., 2011. The development and testing of the instructional beliefs model. *Communication Education*, 60(1), pp. 51–74. https://doi.org/10.1080/03634523.2010.491122.

Yamagata-Lynch, L.C., 2014. Blending online asynchronous and synchronous learning. *International Review of Research in Open and Distributed Learning,* 15(2), pp. 189–212. https://doi.org/10.19173/irrodl.v15i2.1778.

Yang, H., Kim,, J., Kelly S. and Merrill Jr, K., 2022. Learning in the online classroom: exploring the unique influence of social presence dimensions. *Communication Studies,* 73(3), pp. 245–262. https://doi.org/10.1080/10510974.2022.2074491.