Literature Review

Exploring the Use of Asynchronous Online Discussion in Student Engagement

Belinda (WanQi) Jin

Werklund School of Education, University of Calgary

EDER779.06 Computer-Supported Learning

Dr. Paulino Armando Preciado Babb

July 26, 2024

Abstract

The paper provides comprehensive literature on asynchronous online discussion forums in post-secondary using a systematic methodology. It aims to look for strategies to enhance engagement and interactions in these forums by addressing specific issues, exploring methods to improve engagement, and discussing the role of online instructors in facilitating discussions. The research involved a thorough literature search across leading journals, focusing on keywords such as “asynchronous”, “asynchronous discussion”, “online engagement”, and “discussion forum” It examined literature from 2006 to 2024, primarily drawing from the *International Journal of Computer-Supported Collaborative Learning (ijCSCL)*, along with other well-known journals like *Computers and Education*, *The Internet and Higher Education*, *International Journal of Advanced Computer Science and Applications, Journal of Internet Services and Applications,* and *the British Journal of Educational Technology and Society.* Fifteen relevant papers were then selected for in-depth analysis, focusing on student engagement and interactions as well as teachers' involvement in asynchronous online discussion environments.

Keywords: Asynchronous online discussion, student engagement, collaborative learning, instructor involvement, online learning, *ijCSCL*, systematic literature review.

Exploring the Use of Asynchronous Online Discussion in Student Engagement

Overview

The gradual historical increase in online learning has brought attention to critical issues in instructional design, particularly in computer-supported collaborative learning (CSCL). Stahl et al. (2022) have identified challenges for online learning, such as the substantial effort required from teachers to engage and motivate students and the difficulty of fostering meaningful student interaction online. Moreover, the implementation of CSCL across various interaction modes and environments presents further complications, such as challenges in managing synchronous and asynchronous interactions and difficulties in integrating with existing practices. Given these challenges, it is crucial to explore effective strategies to enhance student engagement and interaction in online learning environments.

Online discussions are commonly used to "support a variety of educational activities" and enhance learning in both blended and online courses (Gao et al., 2013). They also serve as the primary communication method between learners and instructors in fully online courses and promotes a collaborative learning experience (Brinton et al., 2014; Kent et al., 2016; Ludvigsen and Mørch, 2010; Singh and Mørch, 2018). Well-designed asynchronous online discussions not only promote students' active learning (Baker et al., 2005; Murphy, 2004; Xie & Correia, 2024), but also enhance their engagement (Parks-Stamm et al., 2017; Xie & Correia, 2024). Maddix (2012) states, "Effective online courses are highly dependent on the success of online discussion" (p. 382) and stresses that "effective online discussion can create a dynamic learning context that fosters learning, growth, and community among students and the teacher" (p. 373). With the widespread use of online discussion forums in post-secondary asynchronous course settings, many significant issues have been raised, particularly relating to student engagement and student-teacher interaction. As highlighted by Jo et al (2017) and Wood and Bliss (2016) in their study, these concerns merit careful consideration. To address these issues, my

research focuses on examining how the current literature explores enhancing engagement and interactions within online asynchronous discussion forums.

It is important to understand the specific challenges and opportunities associated with online discussions in order to improve their effectiveness. What specific issues affect online discussion and engagement? How can engagement be improved through online discussion forums? How does the role of online instructors in facilitating online asynchronous discussions influence student engagement and improve learning outcomes in asynchronous online learning environments?

Through a critical literature review, this paper aims to explore the research conducted in the past years on technology-mediated applications (online discussion forums) in support of collaborative learning in higher education asynchronous course settings, mainly focusing on student engagement and teachers' involvement.

Methodology

To offer a comprehensive literature on student engagement and instructor involvement in asynchronous online discussion forums in recent years, my research followed four systematic review steps:

Step 1. Preparation

As part of an in-class activity, I collaboratively worked with other 15 doctoral scholars to download all the editorial issues and journal articles in *ijCSCL* from 2006 to 2024 and uploaded all into Mendeley – a Reference Management Software. In this way, we built a collective database to prepare for making it easier to access and organizing resources for our current and future research. To understand the issues, theories, and perspectives within the selected issues of *ijCSCL*, we exported information from the entire database as a BibTeX file and converted it into an Excel spreadsheet format. This allowed us to see detailed information (such as abstracts and keywords) of the entire database. The abstracts and keywords of each article helped us analyze and evaluate each publication and theme within *ijCSCL.* Most importantly, it helped us find relevant articles for our own topics.

Step 2. Literature Search

Lately, I conducted a thorough search for papers primarily through the *International Journal of Computer-Supported Collaborative Learning (ijCSCL)*. In addition, I found some relevant articles from *Computers and Education, The Internet and Higher Education, and British Journal of Educational Technology and Society*. Using keywords such as “Asynchronous”, “online discussion”, “asynchronous discussion”, “discussion forum”, “online”, “engagement”, “collaborative learning”, and “teacher role in discussion”, “discussion question design” the search covered the period from 2006 to 2024. *ijCSCL* was chosen as part of an in-class activity due to its focus on the design, theory, and practice of technology-enhanced collaborative learning. It is multidisciplinary, featuring contributions from fields such as computer science, education, and psychology. Additionally, the other journals included are well-recognized channels for learning science research.

Step 3. Paper Selection

After reviewing the abstracts of the search results, I carefully selected studies that specifically focus on student engagement and interactions in asynchronous online discussion environments. Studies solely addressing synchronous discussions and environments were excluded. In total, 15 papers were selected for in-depth reading.

Step 4: Analysis

I thoroughly reviewed all the selected articles, conducting compelling idea sampling by examining related papers cited within these studies. I applied colour coding to categorize and define themes within the information, such as issues, benefits, challenges, student engagement/interactions, and teacher involvement. This process was aimed at critically evaluating various discussion environments that have been rigorously studied, thereby representing the current research efforts in designing asynchronous discussion environments and providing valuable insights for future research in the field.

Findings

The results of this systematic review of the literature are divided into two themes. The first theme presents the findings from the primary resource *ijCSCL*, focusing on the participation and performance of students and instructors within the asynchronous online discussion. The second theme expands the scope by incorporating findings from additional literature sources in the field of learning science research. These sources include well-recognized journals and other channels in learning science research, such as *Computers and Education*, *The Internet and Higher Education*, *International Journal of Advanced Computer Science and Applications, Journal of Internet Services and Applications,* and *British Journal of Educational Technology and Society.* This section aims to provide a broader perspective by incorporating diverse studies that explore various aspects of online collaborative learning, thereby enriching the overall understanding of the topic.

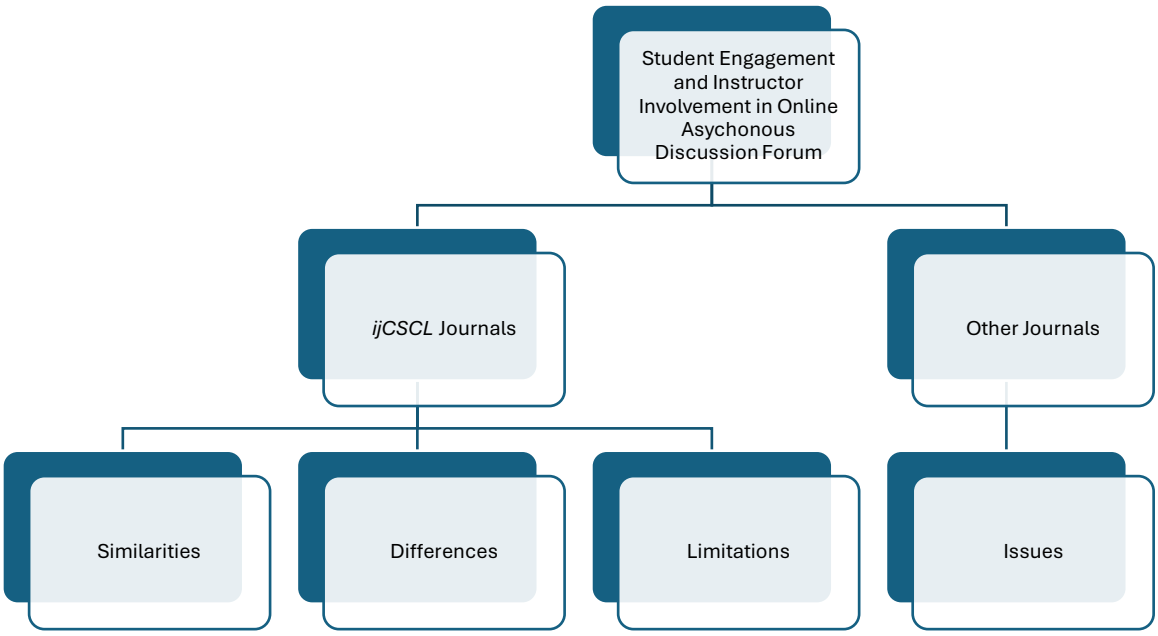

Figure 1: The structure of findings from two themes

Theme 1: Results from *ijCSCL*

In the primary resource *ijCSCL*, only four articles specifically address asynchronous online discussions. The review is structured chronologically to illustrate the progression of the chosen topic over time. The articles span from 2007 to 2020, providing a comprehensive view of the developments in this area:

Schellens et al. (2007) explore the impact of scripting in asynchronous discussion groups on students' knowledge construction. Through a design-based approach, the study compares two cohorts of students, revealing that role assignments significantly improve knowledge construction. The study highlights that "more intensive and active individual participation in the discussion groups and adopting a positive attitude towards the learning environment also positively relates to a higher level of student knowledge construction" (Schellens et al.,2007, p. 225). The findings support the use of roles in

enhancing online collaborative learning, though the design and implementation of these roles require careful consideration to avoid “overscripting” (Schellens et al., 2007).

Wise et al. (2014) explore the connection between students' online listening behaviours and the quality of their contributions to online discussions and examine how learners’ attention to peers' posts (online 'listening') influences their participation and interaction in discussions. The study introduces the concept of online listening as a crucial, active part of discussion participation, distinct from passive terms like "lurking". Empirical evidence shows that depth and revisitation of peers' posts positively influence the quality of students' posts, fostering more responsive and richer argumentation. For example, the study found that "a greater depth of listening was associated with better content quality and more revisitation was associated with richer responsiveness" (Wise et al.,2014, p. 205). The findings suggest that guiding students to engage in deeper and more revisited reading can enhance their contributions, contrary to the common behaviour of focusing on breadth over depth due to feeling overwhelmed by high-volume discussions (Wise et al., 2014). As the authors conclude, "When students took the time to read and re-read some of their peers’ posts, there were related benefits in the quality of the posts they contributed" (Wise et al.,2014, p. 206). The study emphasizes the importance of effective listening behaviours in enhancing the collaborative learning process in online discussions.

Fu, E. L. F. et al. (2016) developed a classification for various discourse patterns in text-based asynchronous discussion forums, helping to distinguish between knowledge sharing, knowledge construction, and knowledge building (Fu, E. L. F. et al., 2016). The study investigates the various discourse patterns that emerge in asynchronous online discussions and attempts to classify them. Using data from Knowledge Forum® in Hong Kong, the study analyzes student discussions across different subjects and grades through qualitative coding and narrative analysis. Nine discourse patterns are identified, showcasing diverse collaborative interactions and their effectiveness. Key findings emphasize that while online discussion forums are commonly used, they often result in "sharing personal opinions

and fragmented information" rather than sustained, productive inquiry (Fu, E. L. F. et al., 2016, p. 442). The findings highlight the need for instructional guidance to support productive discourse, offering implications for enhancing the enactment of CSCL innovations in classrooms. Moreover, the study highlights that effective knowledge building requires "sustained inquiry" and collective efforts to "move forward the frontiers of community knowledge" (Fu, E. L. F. et al., 2016, p. 466).

Yoon et al. (2020) examine how to enhance science teachers' professional development (PD) through an online, asynchronous format. The research focuses on strategies for fostering collaboration and building a sense of community in online asynchronous professional development settings, emphasizing the design for social capital. By incorporating social capital mechanisms alongside essential PD features, the study aims to support teachers in building collaborative knowledge. Teachers reported high satisfaction with the PD's quality and usability, particularly noting the benefits of social capital elements such as "tie quality, depth of interaction, and access to expertise" (Yoon et al., 2020, p. 351). One teacher highlighted the importance of community connection, stating, "I found a community and community connection within that small population" (Yoon et al.,2020, p. 364). Another teacher appreciated the practical implementation support, noting, "Being able to discuss with the other teachers who were in the videos [Design Collaborators] ...was really cool" (Yoon et al.,2020, p. 361). Despite some challenges in building trust and deeper relationships online, the study underscores the potential for asynchronous PD to effectively foster teacher collaboration and professional growth.

Similarities

These four articles from *ijCSCL* provide valuable insights into the design and implementation of asynchronous online learning environments via online discussion forums. While they share the same common goals of improving knowledge construction and collaborative learning, they approach these objectives through different lenses, such as roles, listening behaviours, discourse patterns, and social capital. Schellens et al. (2007) and Wise et al. (2014) focus on specific strategies (role assignments and

online listening) to enhance student engagement and knowledge construction. Fu, E. L. F. et al. (2016) offer a broader perspective by classifying discourse patterns, providing a comprehensive framework to understand and guide collaborative interactions. Yoon et al. (2020) extend the discussion to professional development, highlighting how social capital mechanisms can foster collaboration and community among teachers. They highlight the importance of balancing structure and flexibility, encouraging active engagement, and supporting deep, meaningful interactions. These principles will inform work as an instructional designer, helping create online courses that foster self-regulation, participation, and active learning.

Differences

The four articles, while all focused on asynchronous learning environments and collaborative learning differ significantly in their research focus, methodologies, key findings, and practical implications. Schellens et al. (2007) investigate the impact of scripted roles on knowledge construction in student discussion groups, utilizing a design-based approach to compare cohorts and finding that role assignments significantly improve knowledge construction. In contrast, Wise et al. (2014) examine the connection between online listening behaviours and the quality of student contributions in online discussions, employing empirical evidence to show that deeper and revisited reading of posts enhances post quality. Fu, E. L. F. et al. (2016) take a different approach by developing a classification of discourse patterns in text-based discussion forums, using qualitative coding and narrative analysis to identify nine discourse patterns and emphasizing the need for instructional guidance to support productive inquiry. Finally, Yoon et al. (2020) focus on enhancing science teachers' professional development through an asynchronous online format, integrating social capital theory and highlighting the benefits of social capital elements in fostering teacher collaboration and satisfaction, despite challenges in trust-building. These differences underscore the varied approaches and insights each study brings to the understanding of asynchronous collaborative learning.

Limitations

The context of all four studies from *iiCSCL* is somewhat outdated, originating from the early stages of the COVID-19 pandemic. It would be more relevant to examine studies conducted after the onset of COVID-19, as they are likely to address the significant shifts and developments in online learning and asynchronous discussions that have occurred since then.

Across the four studies, there is a common limitation in the detailed exploration of how instructors can effectively engage and involve students in online discussion forums. Each study primarily focuses more on student behaviours and interactions on specific aspects of engagement (e.g., role assignments, listening behaviours, discourse patterns, social capital in professional development). This focus potentially overlooks a more holistic view of engagement that includes emotional, motivational, and broader behavioural factors influenced by instructor involvement.

This limitation is also evident in the broader themes covered by *ijCSCL* itself over the years. While the *ijCSCL* has highlighted themes related to instructors' involvement in computer-supported collaborative learning, key themes over the years include:

Figure 2. *Use a sticky note to summarize what happened in the ijCSCL in the year you looked into*

- **2006**: Focus on the choice of the tool
- **2012**: Teacher involvement
- **2013**: Collaborative learning across space and time, both synchronous and asynchronous
- **2015**: Improving learning outcomes, supporting teachers, and enhancing student interactions through innovative tools and methodologies
- **2021**: Collaboration, social scripts, network theory, group focus, network analysis, activity theory (systems), epistemic analysis, and agency
- **2024**: Transition from small, teacher-controlled groups to larger classroom settings and exploration of alternative theoretical approaches to cognition and action (distributed, situated, embodied, mediated)

Despite these diverse themes, the research from the journal has not specifically addressed instructors' involvement in online asynchronous discussions. Current research is limited to instructors' participation in online discussion forums and how their teaching presence engages students within these forums. Understanding the dynamics from both perspectives-students and instructors is crucial for enhancing student engagement and improving learning outcomes. Consequently, I am moving forward to search for relevant studies in other journals. These journals may offer more recent and comprehensive insights into the role of instructors in online asynchronous discussions and provide a broader perspective on how to effectively engage students in these settings.

Theme 2: Results from Other Journals

Many articles from other journals, such as *Computers and Education*, *The Internet and Higher Education*, *International Journal of Advanced Computer Science and Applications, Journal of Internet Services and Applications,* and *British Journal of Educational Technology and Society,* have addressed the issues associated with online discussion forums, particularly as institutions increasingly design and

implement these forums. Despite their potential benefits, many students find it challenging to engage in online discussions, which consequently hampers their problem-solving capabilities. Online forums can suffer from inactivity and sudden bursts of messages, resulting in low cognitive engagement and feelings of isolation among students due to insufficient feedback (Nakahara et al., 2005). The forum structure also makes it difficult to monitor active student engagement, with tasks like message tracking being particularly time-consuming (Nakahara et al.,2005). Long-standing issues such as information overload, chaos, and lack of responsiveness have been documented for over 15 years (Wise et al., 2017; Thomas, 2002). These problems contribute to a chaotic learning environment where students struggle to follow discussions and receive timely feedback, ultimately affecting their learning outcomes and overall experience. Research from various journals highlights these challenges and benefits associated with online discussion forums. For instances:

Alturise (2020) examines the challenges encountered by faculty and students when transitioning to online learning during the pandemic. The study, conducted through surveys, indicates that 59.08% of faculty members struggle to accomplish course objectives using the online discussion forums in the Blackboard learning management system (LMS) (Alturise, 2020). Moreover, 77.17% of students encountered difficulties in participating in these online discussions, resulting in diminished problem-solving skills (Alturise, 2020). The study also reveals that teamwork skills were not effectively developed in the online setting, as there was no way to physically collaborate on projects (Alturise, 2020). Faculty members also expressed dissatisfaction with online courses, with nearly 50% noting that practical skills are adversely affected (Alturise, 2020). The research offers recommendations for developing improved methods to enhance interaction, facilitate teamwork, and foster online discussions.

In addition, research by Ruthotto et al. (2020) indicate that larger online discussion groups are associated with lower levels of engagement. The research also highlighted unequal participation rates among different demographic groups, emphasizing the importance of creating inclusive online learning

environments. The study analyzed interactions within the Piazza online discussion platform among 1914 students enrolled in the Georgia Institute of Technology's Online Master of Science in Computer Science (OMSCS) program. The findings indicated significant demographic disparities, including the observation that older students are more actively engaged and less likely to lurk, suggesting that "older adults in advanced education settings seem to be different than younger learners in their self-direction and competence" (Ruthotto et al.,2020, p. 10). The study also revealed that Black and Asian students participate less actively compared to their White peers. Moreover, the research found that students in larger classes are more likely to be nonparticipants, with larger class sizes being associated with decreased active participation and increased lurking behaviour. Overall, the study emphasized the importance of considering demographic factors and class size when designing and implementing online education programs.

De Lima et al. (2019) explore the use of asynchronous online discussion forums within LMS from the viewpoint of instructors. Through semi-structured interviews with 12 experienced instructors, the study identifies four main categories of benefits: deeper discussions, enhanced collaboration, comprehensive information records, and improved information visualization (De Lima et al., 2019). However, it also highlights significant challenges, including difficulties with forum structure, low student motivation, and challenges in tracking and providing feedback (De Lima et al., 2019). The study proposes several improvements like integrating gamification, adding multimedia resources, and enhancing the forum interface to make it more engaging for students. The findings aim to assist instructors, developers, and researchers in creating more participatory and effective online discussion environments.

While all three articles address the challenges of online learning and the need for improved engagement and interaction, they differ in their research methods and focus on demographic insights, specific recommendations, and scope of impact. Alturise (2020) and Ruthotto et al. (2020) emphasize the challenges in student engagement and skill development, while De Lima et al. (2019) offer a

comprehensive view from the instructors' perspective with clear benefits and recommendations for improvement.

Conclusion

To summarize from research and their findings, online discussion forums have become a powerful tool in online education. Despite their potential, effective implementation requires addressing these significant challenges. Asynchronous discussions are considered a powerful platform for knowledge construction due to their ability to facilitate thoughtful commentary and reflective responses (Lipponen, 2002; Wise et al., 2014). The key idea is that learners can collectively and individually develop their ideas through dialogue interaction, leading to collaborative learning in online discussions (Stahl et al., 2022). Therefore, well-designed and well-supported online discussions can significantly enhance learning (De Lima et al.; 2019; Lipponen, 2002; Wise et al., 2014).

Building on these insights, future research will focus on exploring instructors' involvement and the role of instructors in online forums and devising strategies to enhance their teaching presence. It is important to note a limitation in the existing research: the detailed exploration of how instructors can effectively engage and involve students in online discussion forums is often overlooked. This limitation could be addressed by examining some engagement strategies in synchronous settings that might be applicable to asynchronous environments. Highlighting this point in the conclusion can provide a more comprehensive understanding of engagement.

Embracing complex thinking may contribute to a deeper understanding of students' experiences in online discussions, providing educators with valuable insights to enhance their facilitation practices in these discussions (Vogler et al., 2017, p.177). By addressing these challenges and leveraging the strengths of asynchronous discussions, we can create more effective and engaging online learning environments.

References

Alturise, F. (2020). Difficulties in teaching online with Blackboard learn effects of the COVID-19 Pandemic in the Western Branch Colleges of Qassim University. *International Journal of Advanced Computer Science and Applications, 11*(5), 74–81. https://doi.org/10.14569/IJACSA.2020.0110512

Anderson, T., & Dron, J. (2010). Three generations of distance education pedagogy. *The International Review of Research in Open and Distributed Learning, 12(*3), 80e97.

Baker, A. C., Jensen, P. J., & Kolb, D. A. (2005). Conversation as experiential learning. *Management Learning, 36*(4), 411–427. https://doi.org/10.1177/1350507605058130

Brinton, C. G., Lam, H., Chiang, M., Zhenming, L., Shalil, J., & Wong, F. M. F. (2014). Learning about social learning in MOOCs: from statistical analysis to generative model. *Learning Technologies, IEEE Transactions on, 7*(4), 346e359. Retrieved from http://arxiv.org/abs/1312.2159

De Lima, D. P. R., Gerosa, M. A., Conte, T. U., & De M. Netto, J. F. (2019). What to expect, and how to improve online discussion forums: The instructors' perspective. *Journal of Internet Services and Applications*, *10*(1), 22. https://doi.org/10.1186/s13174-019-0120-0

Fu, E. L. F., van Aalst, J., & Chan, C. K. K. (2016). Toward a classification of discourse patterns in asynchronous online discussions. *International Journal of Computer-Supported Collaborative Learning*, *11*(4), 441–478. https://doi.org/10.1007/s11412-016-9245-3

Gao, F., Zhang, T., & Franklin, T. (2013). Designing asynchronous online discussion environments: Recent progress and possible future directions. *British Journal of Educational Technology*, *44*(3), 469–483. https://doi.org/10.1111/j.1467-8535.2012.01330.x

Jo, I., Park, Y., & Lee, H. (2017). Three interaction patterns on asynchronous online discussion behaviours: A methodological comparison. *Journal of Computer Assisted Learning*, *33*(2), 106–122. https://doi.org/10.1111/jcal.12168

Kent, C., Laslo, E., & Rafaeli, S. (2016). Interactivity in online discussions and learning outcomes. *Computers & Education*, 97, 116–128. https://doi.org/10.1016/j.compedu.2016.03.002

Lipponen, L. (2002). Exploring foundations for computer-supported collaborative learning. In Stahl, G. (Ed.) *Proceedings of CSCL 2002* (pp. 72–81). Boulder, CO: ISLS.

Ludvigsen, S. R., & Mørch, A. I. (2010). Computer-Supported Collaborative Learning: Basic concepts, multiple perspectives, and emerging trends. In *International Encyclopedia of Education* (Vol. 5, pp. 290–296). https://doi.org/10.1016/B978-0-08-044894-7.00493-0

Maddix, M. (2012). Generating and facilitating effective online learning through discussion. *Christian Education Journal 9*(2), 372-385.

Murphy, E. (2004). Recognising and promoting collaboration in an online asynchronous discussion. *British Journal of Educational Technology, 35*(4), 421– 431. https://doi.org/10.1111/j.0007-1013.2004.00401.

Nakahara, J., Yaegashi, K., Hisamatsu, S., & Yamauchi, Y. (2005). iTree: Does the mobile phone encourage learners to be more involved in collaborative learning? In *Computer Supported Collaborative Learning 2005* (1st ed., pp. 470–478). Routledge. https://doi.org/10.4324/9781351226905-61

Parks-Stamm, E. J., Zafonte, M., & Palenque, S. M. (2017). The effects of instructor participation and class size on student participation in an online class discussion forum: Instructor participation and class size. *British Journal of Educational Technology, 48*(6), 1250–1259. https://doi.org/10.1111/bjet.12512

Ruthotto, I., Kreth, Q., Stevens, J., Trively, C., & Melkers, J. (2020). Lurking and participation in the virtual classroom: The effects of gender, race, and age among graduate students in computer science. *Computers & Education, 151*, 103854. https://doi.org/10.1016/j.compedu.2020.103854

Schellens, T., van Keer, H., de Wever, B., & Valcke, M. (2007). Scripting by assigning roles: Does it improve knowledge construction in asynchronous discussion groups? *International Journal of Computer-Supported Collaborative Learning*, *2*(2–3), 225–246. https://doi.org/10.1007/s11412-007-9016-2

Singh, A. B., & Mørch, A. I. (2018). An analysis of participants' experiences from the first international MOOC offered at the University of Oslo. *Nordic journal of digital literacy*, *13*(1), 40–64. https://doi.org/10.18261/issn.1891-943x-2018-01-04

Stahl, G., Koschmann, T., & Suthers, D. (2022). Computer-Supported Collaborative Learning. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (3rd ed., pp. 406–427). Cambridge University Press. https://doi.org/10.1017/9781108888295.025

Thomas, M. J. W. (2002). Learning within incoherent structures: The space of online discussion forums. *Journal of Computer Assisted Learning, 18*(3), 351–366. https://doi.org/10.1046/j.0266-4909.2002.03800.x

Vogler, J. S., Schallert, D. L., Jordan, M. E., Song, K., Sanders, A. J. Z., Te Chiang, Y. Y., Lee, J.-E., Park, J. H., & Yu, L.-T. (2017). Life history of a topic in an online discussion: A complex systems theory perspective on how one message attracts class members to create meaning collaboratively. *International Journal of Computer-Supported Collaborative Learning*, *12*(2), 173–194. https://doi.org/10.1007/s11412-017-9255-9

Wise, A. F., & Chiu, M. M. (2011). Analyzing temporal patterns of knowledge construction in a role-based online discussion. *International Journal of Computer-Supported Collaborative Learning, 6*(3), 445–470. https://doi.org/10.1007/s11412-011-9120-1

Wise, A. F., Hausknecht, S. N., & Zhao, Y. (2014). Attending to others' posts in asynchronous discussions: Learners' online "listening" and its relationship to speaking. *International Journal of Computer-Supported Collaborative Learning*, *9*(2), 185–209. https://doi.org/10.1007/s11412-014-9192-9

Wise, A. F., Cui, Y., Jin, W., & Vytasek, J. (2017). Mining for gold: Identifying content-related MOOC discussion threads across domains through linguistic modeling. *The Internet and Higher Education*, *32*, 11–28. https://doi.org/10.1016/j.iheduc.2016.08.001

Woods, K., & Bliss, K. (2016). Facilitating successful online discussions. *The Journal of Effective Teaching*, *16*(2), 76.

Xie, J., & Correia, A. (2024). The effects of instructor participation in asynchronous online discussions on student performance: A systematic review. *British Journal of Educational Technology*, *55*(1), 71–89. https://doi.org/10.1111/bjet.13350

Yoon, S. A., Miller, K., Richman, T., Wendel, D., Schoenfeld, I., Anderson, E., & Shim, J. (2020). Encouraging collaboration and building Community in Online Asynchronous Professional Development: designing for social capital. *International Journal of Computer-Supported Collaborative Learning*, *15*(3), 351–371. https://doi.org/10.1007/s11412-020-09326-2