

The Correlation Between Synchronous Learning Dexterity and Asynchronous Learning Dexterity with Student Learning Performances of Instructional Model Development Course in Higher Education

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Abstract: *This study analyzes the relationship between students' synchronous and asynchronous learning dexterity and their learning performance in an online learning environment in higher education. Using a quantitative correlational design, data were collected from 33 graduate students through asynchronous and synchronous learning agility questionnaires and final course grades. Data were analyzed using Spearman's rho correlation to determine the strength and direction of the relationships between variables. The results showed a strong, positive, and significant correlation between student learning outcomes and synchronous learning dexterity ($r = .867, p < .01$) and asynchronous learning dexterity ($r = .725, p < .01$). These findings suggest that students who are agile in both real-time and self-paced learning activities achieve higher learning outcomes. This investigation demonstrates the value of instructional design in integrating synchronous learning approaches with asynchronous learning flexibility to enhance student engagement and learning outcomes. Overall, these results provide empirical support for designing adaptive learning models that balance both modes (synchronous and asynchronous) to optimize student performance of Instructional Model Development Course and student experience in higher education.*

Keywords: *synchronous learning dexterity, asynchronous learning dexterity, online learning, blended learning, students' performances*

Introduction

Rapid technological advances have transformed the way higher education institutions design and deliver learning. The widespread adoption of online, blended, and adaptive learning environments has provided opportunities for students to interact with content, instructors, and peers in more flexible and personalized ways (Means et al., 2013). The two



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dominant modalities in this digital transformation are synchronous and asynchronous learning, each offering advantages that influence student engagement, motivation, and performance (Hrastinski, 2008; Martin et al., 2020). Understanding how these modes relate to learning outcomes is crucial for developing pedagogically effective and data-driven online learning strategies.

Synchronous learning involves real-time interaction through virtual classrooms, video conferencing, or live chat sessions. This live interaction allows learners to receive instant feedback, collaborate dynamically, and feel a sense of social presence—all factors known to enhance engagement and academic achievement (Aldosari et al., 2022; Händel et al., 2022; Hung et al., 2024; Ratan et al., 2022; Skylar, 2009). In contrast, asynchronous learning allows learners to access materials and contribute to discussions at their pace, enabling deeper reflection and self-directed learning (Alfares, 2024; Lee & Bonk, 2019; Rahmatiah et al., 2021; Sakkir et al., 2023). Asynchronous learning encourages autonomy and flexibility over time, which often results in higher cognitive engagement and better academic outcomes when designed appropriately (Alhazbi & Hasan, 2021; Fabriz et al., 2021; Susiyawati et al., 2024).

Recent research emphasizes that the two modes (synchronous and asynchronous) should not be used in isolation. Instead, an integrated approach that combines the immediacy of synchronous learning with the flexibility of asynchronous learning can produce optimal learning outcomes (Raes et al., 2020). Despite the growing literature on online engagement, empirical evidence measuring the strength of the relationship between synchronous or asynchronous participation and student achievement remains limited, particularly in the higher education context of developing countries like Indonesia. Addressing this gap is crucial to inform the design of more inclusive and effective digital learning ecosystems.

This gap is particularly relevant in courses like Instructional Model Development at a University in Cirebon, where students must actively combine theory, design principles, and reflective practice. In these types of

classes, students learn through both synchronous activities (like real-time discussions, feedback sessions, and group design tasks) and asynchronous activities (like reading on their own, posting on discussion boards, and doing reflective assignments). Variations in students' ability to manage real-time engagement and independent learning activities may result in differing learning experiences and academic outcomes. Yet, few studies have systematically examined how students' synchronous and asynchronous learning dexterity correlates with performance in such subject-specific contexts. To make courses better and teaching more effective, it's important to know how students' interest and skill in these two ways of learning affect their grades.

Therefore, this study investigates the correlation between students' synchronous and asynchronous learning agility and their learning performances. The study aims to determine the strength and direction of these relationships. We anticipate these findings to enhance our comprehension of how behaviors in different online learning modes impact academic achievement. Furthermore, these results will offer empirical suggestions for educators and instructional designers to balance the immediate responsiveness of synchronous learning with the flexibility of asynchronous learning in adaptive and blended learning environments.

The study was conducted at a university in Cirebon that offers online learning. This online learning was implemented to provide the widest possible access to students in the Cirebon area. This research will provide a more in-depth overview of the online learning process and provide recommendations for improving it.

Method

This study used a quantitative correlational research design to examine the relationship between students' synchronous and asynchronous learning dexterity and their learning outcomes. Correlational research is appropriate for investigating the strength and direction of naturally occurring relationships between variables without manipulating any

conditions (Cresswell, 2014). This study aimed to determine whether higher synchronous and asynchronous learning agility predict better learning outcomes.

Participants were 33 graduate students in the master's program at a university in Cirebon. Participants were selected using purposive sampling because they receive consistent exposure to synchronous and asynchronous learning sessions throughout the semester. Purposive sampling was conducted to ensure that respondents had relevant experience with the learning modalities studied (Etikan et al., 2016).

Data were collected from two primary sources: (1) final course grades, which represent students' final academic achievement in the course, and (2) scores from synchronous and asynchronous learning dexterity questionnaires. The synchronous and asynchronous learning dexterity instruments were adapted from a validated questionnaire by Koh et al. (2025), which assesses online behavior and participation. The questionnaire used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) and was administered online at the end of the course.

Data collection took place over the course of one academic semester. Students engaged in weekly synchronous learning sessions via videoconferencing platforms such as Zoom and Gmeet and asynchronous activities via the Moodle-based Learning Management System, which included discussion forums, video materials, and reflective assignments.

The research data were then processed using a normality test. It was found that the data were not normally distributed. Therefore, the data were analyzed using Spearman's Rho correlation test, which is appropriate for non-parametric and ordinal scale data. This analysis aims to determine the strength and direction of the relationship between learning performance (final_score) and two agility variables (sync_score and async_score).

Results

Spearman's rho correlation analysis was conducted to determine the relationship between students' final score and their synchronous learning

dexterity score (sync_score). The results showed a strong, positive, and statistically significant correlation between the two variables, $r_s = .867$, $p < .01$, $N = 33$ (Table 1). This finding indicates that students exhibiting elevated synchronous learning dexterity in educational activities are likely to attain superior learning outcomes.

Table 1. Correlation test results for the final_score and sync_score variables

Correlations				
			final_score	skor_sync
Spearman's rho	final_score	Correlation Coefficient	1.000	.867**
		Sig. (2-tailed)		0.000
		N	33	33
	skor_sync	Correlation Coefficient	.867**	1.000
		Sig. (2-tailed)	0.000	
		N	33	33

****.** Correlation is significant at the 0.01 level (2-tailed).

For the asynchronous learning agility variable, the results of the correlation analysis using Spearman's rho showed a strong and positive relationship between students' learning outcome scores (final_score) and their asynchronous learning dexterity scores (async_score). The correlation coefficient obtained was $r = 0.725$, with a significance level of $p = 0.000002$ ($p < 0.01$), based on data from 33 participants (Table 2). This indicates that students who demonstrate higher levels of asynchronous learning dexterity in learning activities tend to achieve higher learning outcome scores. According to Cohen's (1988) guidelines, a correlation value above 0.50 reflects a strong relationship, implying that asynchronous engagement significantly contributes to academic performance outcomes.

Table 2. Correlation Test Results for the Final_score and Async_score Variables

Correlations			
		final_score	skor_async
final_score	Pearson Correlation	1	.761**
	Sig. (2-tailed)		0.000
	N	33	33
skor_async	Pearson Correlation	.761**	1
	Sig. (2-tailed)	0.000	
	N	33	33

****.** Correlation is significant at the 0.01 level (2-tailed).

Discussion

The results of this study indicate that synchronous participation plays a significant role in influencing learning achievement in blended or online learning environments. According to Hrastinski (2008), synchronous online learning supports immediacy, motivation, and social presence, all of which are crucial for enhancing student engagement and performance. Real-time interaction through synchronous learning enhances accountability and understanding, leading to improved learning outcomes (Händel et al., 2022; Martin et al., 2012; Ramirez Perez et al., 2024; Yang et al., 2019).

The substantial correlation ($r_s = 0.867$) signifies a considerable effect size according to Cohen's (1988) classification, suggesting that synchronous learning dexterity significantly influences student learning performance. This finding aligns with previous investigations that emphasize the educational value of real-time interaction, feedback, and collaboration in virtual classrooms (Aubrey & Philpott, 2023; Pekdoğan & Kanak, 2016; Wu et al., 2022; Young & Son, 2023). Furthermore, these results underscore the need for educators to integrate synchronous activities as a key component in both online and blended learning. Thus, sustained synchronous engagement can significantly enhance cognitive and affective learning outcomes in digital educational environments.

The findings of this study support a growing body of literature emphasizing the pedagogical value of asynchronous learning environments in higher education. Asynchronous learning allows students to interact with learning materials, peers, and instructors at their pace, enabling deeper reflection and self-directed learning (Alzahrani et al., 2023; Hrastinski, 2008; Khodaei et al., 2022; Rosen & Kelly, 2023). This flexibility often results in improved cognitive processing and retention, which are crucial for sustained academic achievement. Students who effectively manage their learning in asynchronous learning activities demonstrate higher levels of academic success due to improved self-regulation and time management skills (Broadbent & Poon, 2015).

Furthermore, the significant correlation observed in this study corroborates previous evidence that consistent engagement in asynchronous online discussions and activities is positively correlated with better performance and satisfaction in blended and online learning. Asynchronous participation encourages reflective dialogue, critical analysis, and collaborative meaning-making—all of which strengthen learning outcomes. This aligns with Lee and Bonk (2019), who emphasized that asynchronous modalities can enhance student autonomy and persistence and can be a key predictor of long-term academic success.

Overall, these findings suggest that integrating asynchronous components into a blended or adaptive learning framework can enhance student learning performance by encouraging flexibility, reflection, and learner autonomy. This supports the shift from instructor-centered to learner-centered and technology-enabled learning in higher education. Future research could explore how different types of asynchronous activities—such as discussion forums, peer feedback, and multimedia-based reflection—specifically impact various dimensions of student achievement. Combining synchronous and asynchronous learning—called bichronous learning—can enhance flexibility and connectedness. In this context, synchronous sessions serve as opportunities for students to

actively engage, receive immediate feedback, and collaboratively build understanding (Cahyani et al., 2021; Hung et al., 2024; Martin et al., 2020; Utomo & Ahsanah, 2022).

Conclusion

This study examined the relationship between students' synchronous and asynchronous learning dexterity and their learning outcomes. Spearman's rho correlation analysis yielded two principal findings. First, there was a strong positive correlation between asynchronous learning dexterity and learning outcomes ($r = 0.725$, $p < 0.01$). This means that students who were more involved in asynchronous learning activities tended to do better in school. Second, synchronous learning dexterity exhibited a more robust positive correlation with learning outcomes ($r = 0.867$, $p < 0.01$), signifying that active participation in real-time learning sessions is crucial for enhancing educational results.

These results add to the growing body of evidence that both synchronous and asynchronous learning methods are necessary for effective online and blended education. Synchronous learning promotes immediacy, social presence, and motivation through real-time interaction, while asynchronous learning provides flexibility and opportunities for reflection and self-regulated learning. When balanced strategically, these two modes can create a bichronic learning environment that combines the strengths of immediacy and flexibility, thereby optimizing student engagement and achievement.

Pedagogically, this study underscores the need for instructors to design adaptive and interactive online learning environments that intentionally blend synchronous and asynchronous components. Real-time chat or video conference sessions should be utilized for collaboration, feedback, and community building, while asynchronous activities should focus on reflective and individual learning. This dual approach not only supports the diverse needs of students but also aligns with the student-

centered and technology-driven learning paradigm increasingly emphasized in higher education.

Future research should expand on these findings by using larger and more diverse samples, exploring causal relationships, and integrating mediating variables such as motivation, digital literacy, or learning analytics indicators. Mixed methods studies could also offer more details about students' perceptions and behavioral engagement patterns in both synchronous and asynchronous environments. In conclusion, this study offers empirical validation for the concept that synchronous and asynchronous learning dexterity are complementary elements of effective online and blended learning frameworks. By carefully integrating both modalities, educators can improve student achievement, foster sustained engagement, and advance the overall quality of online higher education.

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