



A Comparison of the Level of the ESP Language Learners' Performance in a Synchronous and asynchronous Online Courses

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Abstract

The field of education research has devoted significant focus to the study of online learning for over twenty years, acknowledging the several aspects that can impact its efficacy, including potential obstacles. To attain a thorough comprehension, it is crucial to analyse the functioning of various components within particular settings meticulously. This study aimed to evaluate the influence of synchronous and asynchronous learning approaches on the academic achievement of medical students specialising in English for Specific Purposes (ESP). The study sample consisted of 252 individuals, with an equal distribution of male and female students aged 18 to 30. These participants were drawn from many academic fields, including nursing, operating room, anaesthesia, and medicine. The study results indicate that students in the synchronous group had superior performance compared to their asynchronous counterparts, emphasising the benefits associated with real-time engagement and prompt feedback. It is noteworthy to mention that gender-based disparities did not have a substantial impact on student achievement in any learning mode. The findings of this study have significant significance for professionals in the field of education and instructional design. They underscore the need to enhance synchronous and asynchronous learning settings to offer a more comprehensive and efficient educational experience.

Keywords: *Synchronous Online Learning; Asynchronous Online Learning; ESP; Higher Education*

1. Introduction

Education research has maintained a sustained focus on online learning for over two decades (Singh & Thurman, 2019). The number of students enrolling in online learning is increasing faster than before (Seaman, Allen, & Seaman, 2018). In the 21st century, technology, digitalisation, and e-learning have transformed the educational approach, enhancing the effectiveness and relevance of traditional learning methods (Rabiman, Nurtanto, & Kholifah, 2020). Multiple factors shape the effectiveness of online learning, and certain elements can create barriers. These challenges include administrative issues, limitations in social interaction, proficiency in academic and technical skills, learner motivation, and effective time (Bartley & Golek, 2004; Mayer, 2002). Other factors like an ineffective design and multimedia materials arrangement can compromise online learning quality. (Mayer, 2002). Therefore, the

optimal study of online learning should depend on carefully considering how they are used across contexts (Pei & Wu, 2019).

Ensuring the delivery of high-quality education has consistently been a priority for all stakeholders in higher education institutions. This concern is particularly pronounced in institutes situated in less-developed regions, where recruiting proficient teachers and establishing essential physical infrastructure poses challenges. A recent viable alternative, the adoption of online education, could potentially provide a much-needed solution (Berry, 2017). Online higher education courses have significantly risen this century (Farros, Shawler, Gatzunis, & Weiss, 2020). Synchronous and asynchronous learning are two approaches (delivery modes) to online learning.

Synchronous online learning pertains to a method of digital education in which students and educators engage in real-time interactions via online platforms (Fadhilah, Sutrisna, Muslimah, & Ihsan, 2021; Giesbers, Rienties, Tempelaar, & Gijsselaers, 2014). It is believed to increase the connection between instructors and other learners (Watts, 2016). This approach replicates the conventional classroom setting, enabling instant communication, discourse, and collaborative tasks despite geographical distances. (Ashley, 2003; Cook et al., 2008). Synchronous learning offers advantages such as active participation, valuable visual aids, and swift feedback, particularly for inquiries and comments (Francescucci & Rohani, 2019). Nevertheless, there are downsides to synchronous learning, including the complexities of scheduling due to time zone variations for students from diverse geographical locations, the potential for some students to be passively engaged, and the challenges in managing interactions within larger groups of students (Persada et al., 2022).

In contrast, asynchronous online learning enables students to access materials and complete tasks at their own pace without real-time interaction (Hrastinski, 2008). This approach offers flexibility, accommodating different schedules and time zones (Francescucci & Rohani, 2019; Simarmata, 2018). Unlike synchronous learning, it does not require immediate participation. Nonetheless, asynchronous learning has limitations, including the absence of visual cues and the potential impact on communication effectiveness due to reading and writing skills, leading to delayed feedback for questions and comments (Simarmata, 2018).

With the increasing availability of online courses and programs in higher education (Farros et al., 2020; Morris, Ivancheva, Coop, Mogliacci, & Swinnerton, 2020), there is a growing need for further research to furnish stakeholders with crucial insights for informed decision-making regarding online learning. Teachers, administrators, and policymakers require evidence that online education delivers high-quality learning experiences (Berry, 2017). As enrolment in online courses continues to rise, stakeholders are confronted with the choice between asynchronous and synchronous modes of instruction (Berry, 2017). Therefore, additional research is essential to compare the educational experiences between these two modes.

The primary aim of the present study was to assess how synchronous and asynchronous learning methods influenced the academic achievements of ESP medical students. Specifically, the study sought to determine whether one group of students had outperformed the other group. The study also intended to determine the impact of gender on the performance of male and female students in synchronous and asynchronous classes. It will add to the literature on the impact of synchronous online learning and asynchronous learning on student performance and the role of gender in the two approaches.

2.Literature Review

Student Performance in Synchronous and Asynchronous Learning

In recent years, numerous studies have examined assessing the impacts of synchronous and asynchronous learning methods on different aspects of education (Bartley & Golek, 2004; Pei & Wu, 2019; Shirkhani & Shiran, 2023; Zeinali Nejad, Golshan, & Naeimi, 2021). Ogbonna, Ibezim, and Obi (2019) studied how synchronous and asynchronous e-learning affect students' cognitive and academic achievement. Both methods improved achievement and word processing skills, with asynchronous mode showing higher cognitive achievement and synchronous mode improving skill acquisition. Novantara (2017) author concluded that asynchronous learning offers 24-hour, seven-day access to self-contained content, while synchronous learning faces challenges like requiring instructor availability. Nevertheless, synchronous learning permits real-time content adjustments.

Duncan, Kelly, and McNamara (2011) findings revealed that the quality and quantity of student participation in synchronous interactions had a more significant statistical impact on the overall course grade than asynchronous interactions. Likely, the synchronous mode of online learning was superior to an asynchronous mode of online learning in terms of many factors (Padaguri & Pasha, 2021). Zeng and Luo (2023) showed that asynchronous learning was slightly more effective in promoting student knowledge than synchronous online learning. Guo (2020) concludes that the students who attended the synchronous sessions experienced an average test grade drop of 3.5%, whereas those who did not attend experienced a 14.5% drop. In the same way, the quantity of language produced by students in the synchronous CMC group is higher than that produced by students in the asynchronous CMC group. In contrast, Buxton (2014) pointed out that participants in the asynchronous course expressed higher satisfaction and rated their learning experiences more positively. Likely, Demirtaş and Türk (2022) showed that students in the asynchronous group outperformed the synchronous group.

Comparison of end-of-course grades between synchronous and asynchronous students in online Algebra courses indicated a minor decrease in end-of-course grades and standardised test scores compared to asynchronous students (Berry, 2017). Likely, Libasin, Azudin, Idris, Rahman, and Umar (2021) noted that the online synchronous approach improves students' academic performance more than an asynchronous one. In contrast, Shirkhani and Shiran (2023) showed that the asynchronous social network enhanced learners' reading comprehension significantly more effectively than the synchronous one.

Considering the impact of synchronous and asynchronous learning on the development of grammar learning among Iranian undergraduate students (Memari, 2020), it was highlighted that synchronous learning is more adept at enhancing language learners' productive skills. In contrast, asynchronous learning is effective for refining abilities and subskills that necessitate reflection and comprehension. The findings of a study by Hassani, Chalak, and Tabrizi (2020) revealed that the number of global comments provided by the students in the asynchronous group was significantly more than that of the participants in the synchronous group. On the other hand, the number of local comments provided by the participants in the synchronous group was significantly higher. In addition, the findings showed that the participants of the asynchronous group incorporated significantly more comments into their revised versions.

Performance by Gender in Synchronous and Asynchronous Learning

Extensive research has been conducted on gender differences in the online classroom (Allen & Seaman, 2015; Barber, Sullivan, & Walker, 1997; Selfe, 1990, 1999; Selfe & Selfe, 1994; J. Wolfe, 2000; J. L. Wolfe, 1999). Findings "suggest that male and female students experience the online classroom environment differently" (Sullivan, 2001). A set of studies points out that gender impacts different aspects

of student performance. For instance, Demirtaş and Türk (2022) showed no difference between the scores of females and males in synchronous and asynchronous lectures.

Also, (Amparo, Smith, & Friedman, 2018) examined the role of gender and student performance in online synchronous and asynchronous classes and concluded that males' and females' performance did not differ. In the same way, The study focused on exploring gender differences within an online asynchronous discussion setting. The outcomes of a study exploring gender differences within an online asynchronous discussion setting revealed that there was not a significant gender gap in performance during online asynchronous discussions among pre-service teachers when factors such as their previous achievements and familiarity with computers and the web were taken into consideration (Topçu, 2006).

Another line of research is indicative that gender affects student performance in online classes. Research on asynchronous online learning suggests that women often perform better than men (Ashong & Commander, 2012; Johnson, 2011; McSporrán & Young, 2001). Likely, Volchok (2018) compared the Academic Achievement of Male and Female Students in Partially Online Courses at a Community College" and found that female students achieved tremendous success than male students across different measures. These included adjusted final course grades, pre-semester cumulative Grade Point Averages excluding extra credit points, and scores on initial semester supplementary assignments given to all enrolled students. Significant differences between the synchronous and asynchronous groups, based on gender and performance, were also identified for Iranian EFL learners regarding vocabulary learning (Lotfi & Pozveh, 2019). Likely, Mousapour Negari and Zeynali (2023) identified a significant difference between males' and females' tendency to use multimodal scaffolding on the freewriting complexity of EFL learners.

A third line of research includes studies with mixed results. For example, Nichols, Xia, Parco, and Bailey (2022) investigated the performance of male and female students in three synchronous online life science classes. The results showed that in Class 1, male students outperformed females regarding raw grades. In Class 2, males also had a substantial advantage of about a total letter grade. However, in Class 3, there were no significant differences, as both genders received similar grades. Lack of consensus on the role of gender on performance in synchronous and asynchronous learning contexts points to the necessity of avoiding over-generalisation of the results of previous studies and the need to investigate these variables in the particular context.

Despite the significant growth in online learning use, as seen in the rise of massive open online courses (MOOCs) since 2012 (Daniel, 2012), assessing the efficacy of synchronous and asynchronous teaching methods remains challenging. Evaluation efforts have yielded inconsistent findings (Bartley & Golek, 2004; Cook et al., 2008; Francescucci & Rohani, 2019), leading to intricate decision-making when choosing a teaching approach for medical education. Moreover, addressing the impact of synchronous and asynchronous learning on student outcomes will add to the current literature and improve online learning. Empirical evidence elucidating best practices for synchronous online instruction is needed to implement these courses best. The present study, therefore, intended to provide further insights by examining the impact of synchronous learning and asynchronous learning in a new context. Unlike prior research, this study focused on a medical higher education institution with constrained financial resources, offering a unique perspective.

The study concentrates on this specific context because there is little research on the impact of synchronous and asynchronous online learning on students' performance in Iran's medical higher education context. Moreover, undergraduate medical students are mainly driven by common core curricula and examinations stipulated by the universities' teaching committee, which reversely creates a sharp gap when deciding the appropriateness and effectiveness of synchronous and asynchronous teaching methods for these groups of students. It was assumed that conducting such a study would benefit

all stakeholders in similar local and international contexts who may be undecided about choosing between synchronous and asynchronous delivery modes.

3. Research Questions

The previously stated objectives were formulated into the following research questions:

1. Is there a difference in student performance between synchronous and asynchronous classes?
2. Is there a difference in the academic performance between male and female students in a synchronous classroom setting?
3. Is there a difference in academic performance between male and female students in the asynchronous class?
4. Is there a difference between the performance of male and female students in synchronous and asynchronous classes?

4. Method

4.1. Design of the Study

The research employed a quasi-experimental design to investigate the academic achievement of undergraduate students pursuing a Bachelor of Arts degree enrolled in synchronous and asynchronous online courses for the initial semester of the academic year 2021-2022. Completing these courses was a prerequisite for attaining a Bachelor's degree at an esteemed Iranian University of Medical Sciences. The students participated in compulsory English courses of 3 credits each, which were a necessary precondition for fulfilling the requirements of their Bachelor's degree.

4.2. Participants

The study included a total of 252 participants, consisting of 126 male students and 126 female students. The participants were selected from several disciplines: nursing, operating room, anesthesia, and Midwifery. All participants fell within the age range of 18 to 30. The allocation of students to ESP course sections was determined by the educational affairs office, taking into consideration their respective degrees of language proficiency. To exclude any potential instructional effects, classes taught by the same instructor were selected from the pool of available possibilities. Care was taken to ensure an equal representation of male and female students in both the synchronous and asynchronous groups. Exclusion was implemented for students who lacked willingness to volunteer or demonstrated reluctance to participate. Thorough deliberation was undertaken to incorporate participants with comparable levels of language proficiency. To achieve this objective, the researchers received the participants' scores from their previous semesters' general English language classes and the Konkoor (Iranian National University test) from the educational affairs office.

4.3. Instruments

Adobe Connect

Adobe Connect is a versatile web conferencing and virtual classroom platform that facilitates real-time online interactions, presentations, and collaboration. It offers features like video conferencing, screen sharing, chat, and whiteboarding, allowing participants to engage in discussions, share content, and work together. Adobe Connect provides customisable layouts and engagement tools, making it suitable for webinars, training sessions, and remote meetings. The platform ensures accessibility through web browsers and mobile apps, enabling participation from various devices. With recording and analytics capabilities, Adobe Connect enables reviewing sessions and tracking participant engagement.

Navid

The majority of Iranian medical universities use the online learning management system (LMS) Navid (<http://sumsnavid.vums.ac.ir/>). Educators can effortlessly manage courses, create multimedia-rich, interactive content, and nurture collaboration through discussion forums and group projects. The platform simplifies evaluation and grading, monitors progress, customises learning paths, and enables personalisation. Learners can participate from anywhere with mobile accessibility, while analytics and reporting provide insight into performance. The Navid LMS is compatible with other applications, supports user administration and notifications, and is multilingual.

Online Exam

The study used an online exam to measure students' performance in synchronous and asynchronous classes. It included multiple choice, matching, fill-in-the-blanks and cloze questions. Since the participants were studying the same content, one exam was conducted for each group. The exam was conducted electronically via the Sejab platform (<http://exam.larums.ac.ir/>). It is an officially renowned accredited platform for conducting online electronic multiple-choice tests and exams across Iranian medical universities. The exams were conducted in a controlled setting in a closed book environment to remove the impact of cheating on the students' scores. The reliability, validity and difficulty level of the exam was checked. The exam satisfied the reliability, validity and difficulty indexes.

Video Contents Used in the Asynchronous Classroom

Faculty members from Larestan and Shiraz University of Medical Sciences meticulously recorded the instructional sessions. The recordings were conducted in an acoustically optimised room, utilising advanced equipment such as Snagit or Camtasia software. Each session was 34-90 minutes. These recorded sessions were uploaded onto Navid (<http://sumsnavid.vums.ac.ir/>), a widely used learning management system across Iran's medical education domain. Notably, all written content videos shared on Navid underwent professional recording and editing procedures at the Virtual University of Medical Sciences, gaining approval from the institution's advisory committee.

4.4. Instruction in the Synchronous Courses

In the Synchronous group, students logged in via Adobe Connect with assigned credentials provided by the educational affairs office. The instructor initiated sessions by welcoming students, addressing their queries, and inviting questions about previous content. Summarising past material, the instructor engaged students through questions to assess understanding. The content was presented using screen sharing, supplemented with tools like PowerPoints and videos. The instructor used a webcam occasionally for visual connection, and interaction was encouraged through oral responses and chat-based queries. Sessions concluded with content summaries, homework assignments, and addressing questions. Attendance was tracked using Adobe Connect features.

4.5. Instruction in the Asynchronous Courses

The course content in asynchronous courses comprised pre-recorded lectures, assignments, and reading materials, all delivered through the Navid platform, allowing students to access materials at their convenience. The course commenced with an introductory module outlining the course objectives, structure, and guidelines; discussion forums were established, enabling student-instructor and student-peer communication to foster engagement and interaction. The instructional materials were uploaded regularly to maintain a consistent pace of learning. Assessments were designed to evaluate comprehension, with clear grading criteria and prompt feedback. In addition to formal assessments, group activities and collaborative projects were incorporated to promote peer interaction and collaborative skills.

4.6. Data Analysis

The analysis of student performance in synchronous and asynchronous class settings involved using descriptive statistics, T-tests, and MANOVA. Furthermore, the validity and reliability of the exam were evaluated through techniques such as factor analysis and Cronbach's alpha.

5. Results and Discussion

The findings of the present study show that the student's performance in the synchronous group was better than those in the asynchronous group (see Table 1). This finding is in line with studies that show that synchronous online learning increases student performance more than asynchronous online learning (Abrams, 2003; Duncan et al., 2011; Guo, 2020; Libasin et al., 2021; Lotfi & Pozveh, 2019; Memari, 2020; Padaguri & Pasha, 2021; Zeng & Luo, 2023). The findings of the present study strongly imply that engaging in synchronous online learning, characterised by live interactions with both instructors and peers (Fabriz, Mendzheritskaya, & Stehle, 2021), leads to a notable enhancement in student performance (Akbari, Heidari Tabrizi, & Chalak, 2023; Libasin et al., 2021). This observed positive impact is likely attributed to a convergence of factors inherent to the synchronous learning environment.

Among these, the availability of immediate feedback emerges as a pivotal element (Cavalcanti et al., 2021; Fabriz et al., 2021; Ypsilandis, 2002). The real-time nature of interactions enables students to seek clarification promptly, receive ongoing feedback on their progress, and address any misconceptions, facilitating a continuous cycle of learning refinement (Chou, 2002; Francescucci & Rohani, 2019; Giesbers et al., 2014; Mabrito, 2006; Martin, Sun, Turk, & Ritzhaupt, 2021). Additionally, the structured nature of synchronous interactions contributes significantly to this favourable outcome; active engagement underpins this positive impact (Francescucci & Rohani, 2019). The dynamic involvement required in real-time interactions compels students to be fully present and participatory, fostering attentiveness, critical thinking (Kuh, 2003), and meaningful contribution. Furthermore, the immediate availability of real-time clarifications is a noteworthy contributor to the observed positive trend (Giesbers et al., 2014). Lastly, the potential for social and collaborative dynamics within synchronous learning environments, facilitated by peer interactions, can further amplify the positive influence on student performance (Falloon, 2011).

Table 1. T-test of the students' performance in synchronous and asynchronous classes

Synchronous Group			Asynchronous Group			P value	Eta square
Mean	SD	N	Mean	SD	N		
16.19	2.97	126	15.55	3.09	126	.097	

The present study's findings indicate no discernible gender-based differences in performance among male and female students who took part in asynchronous classes. This conclusion is supported by the data shown in Table 2. Similarly, the examination revealed no discernible influence of gender on student achievement in the synchronous classroom setting, as depicted in Table 3. Additionally, the research revealed no statistically significant disparity in the academic accomplishments of male and female students in both synchronous and asynchronous educational environments (Table. 4). The results align with previous studies, which suggest that there is no significant influence of gender on student performance in both synchronous and asynchronous learning environments (Amparo et al., 2018; Demirtaş & Türk, 2022; Topçu, 2006).

Table 2. T-test of the male and female students' performance in asynchronous classes

Male			Female			P value	Eta square
Mean	SD	N	Mean	SD	N		
15.20	3.14	63	15.91	3.01	63	.200	-

Table 3. T-test of the male and female students' performance in synchronous and asynchronous classes

Male			Female			P value	Eta square
Mean	SD	N	Mean	SD	N		
16.38	3.00	63	16.00	2.94	63	.470	-

Table 4. MANOVA of the male and female students' performance in synchronous and asynchronous classes

Wilks' Lambda	Value	P value	Eta square
	.984	.365	.016

The prevailing results observed in multiple studies indicate that gender does not significantly influence student performance in synchronous and asynchronous learning environments. This can be due to several (Cohen & Ellis, 2008) significant factors. To begin with, it is essential to note that individuals possess a wide range of learning styles and preferences, which are not influenced by their gender (Demirbas & Demirkan, 2007; Mohammed, Narayanasamy, Mutalib, Kaur, & Ariffin, 2011). This implies that individuals can excel in any learning environment, regardless of gender. Furthermore, providing fair and just access to educational resources and materials inside digital platforms maximises opportunities, hence mitigating any discrepancies based on gender (Dania, 2014). The inherent flexibility of asynchronous learning allows for accommodating diverse schedules and commitments, providing benefits to all students and mitigating any potential gender-related effects (Cohen & Ellis, 2008).

Moreover, it is frequently observed that online platforms tend to prioritise individual achievements rather than collective dynamics, hence reducing the significance of gender-related group interactions. The diminished impact of stereotype threats and the emphasis on digital competencies (Karagözoglu & Gezer, 2022) mitigate gender-related disparities in online education. In light of the emphasis on educational equity (Campbell & Storo, 1996; Tate & Warschauer, 2022), support systems have been designed to accommodate a wide range of demands without regard to gender. In conclusion, although gender may not manifest as a prominent determinant, it is imperative to investigate additional relevant factors thoroughly to comprehend student academic achievement.

Conclusion

The observation that synchronous learners performed better than their asynchronous counterparts highlights the potential advantages of real-time interaction and immediate feedback. Educators may consider incorporating more interactive elements into asynchronous courses to bridge this performance

gap and enhance the learning experience. The advantage observed within the synchronous group underscores the potential educational gains derived from real-time interaction, immediate feedback, and structured engagement. The significance of these factors underscores the importance of creating avenues for direct student-teacher and peer interaction, which can lead to a deeper comprehension of the subject matter and more robust learning outcomes. Nevertheless, a comprehensive understanding of the factors influencing this performance disparity necessitates acknowledging the multifaceted nature of the learning process. Individual learning preferences, instructional methodologies, course content complexity, and student engagement extent all contribute to the observed outcomes.

The absence of discernible gender-based differences in student achievements suggests that educational outcomes are not significantly influenced by gender when considering these specific instructional modalities. The absence of gender-driven variations in performance across different instructional formats underscores the potential for equitable educational opportunities for all students, regardless of gender. This emphasises the importance of designing inclusive pedagogical approaches that cater to diverse learning styles and preferences without being hindered by gender biases. The lack of statistically significant differences in academic accomplishments between male and female students, regardless of the learning environment, challenges traditional assumptions about gender-related educational disparities. As a result, efforts to enhance educational equity should focus on factors beyond gender, such as learning strategies, engagement levels, and individual abilities.

As educational landscapes continue to evolve and embrace diverse instructional methodologies, the insights from this study become pivotal in shaping effective pedagogical practices. Educators are encouraged to leverage the advantages of synchronous learning while enhancing the design and facilitation of asynchronous learning environments. This study contributes to the evolving discourse on gender and academic achievement by emphasising the role of instructional modalities in shaping educational outcomes. The results encourage a shift in focus from gender-based differences to the broader educational context and teaching methodologies. By acknowledging and leveraging the impact of instructional formats on student success, educators and policymakers can foster more inclusive and effective learning environments for all students. Future research endeavours should delve deeper into the underlying mechanisms driving the observed performance discrepancies, thereby facilitating the development of tailored strategies to optimise student learning experiences across both modalities.

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