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The Impact of Online Synchronous Language Learning and Gender on ESP Learners' Technical Vocabulary Learning and Language Learning Anxiety: A Mixed-Method Study

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Abstract

This explanatory sequential mixed-method study investigates the effect of online synchronous language learning through using Adobe Connect's breakout rooms on vocabulary learning and language learning anxiety of 60 ESP learners selected through convenience sampling from Kashan University of Medical Sciences. Moreover, it explores the learners' perceptions of the effectiveness of this kind of instruction. Initially, the participants were randomly assigned to the equal experimental (Adobe breakout rooms) and control (in-person) groups after checking homogeneity regarding English proficiency level. During the 13 treatment sessions, the experimental group engaged in collaborative vocabulary tasks online through breakout rooms. Quantitative and qualitative data were collected using a developed test of vocabulary, the Foreign Language Classroom Anxiety Questionnaire, and the semi-structured interview and then were analyzed using two-way ANCOVA by SPSS 20 and thematic analysis by MAXQDA 2024, respectively. Findings revealed that online learning improved learners' vocabulary learning but did not significantly reduce their anxiety due to the system's technical issues. However, learners viewed online instruction positively, noting benefits like enriched vocabulary acquisition through active engagement and real-time feedback, and reduced anxiety by providing a calm, focused, and supportive environment. Moreover, results showed that gender differences did not significantly affect vocabulary acquisition or anxiety. These findings can guide teachers and curriculum developers in using virtual instruction effectively in ESP contexts.

Keywords: Online synchronous learning, Breakout rooms, ESP learners, Language learning anxiety

1. Introduction

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The use of technology has always been a recurrent line of education research (Lo & Lin, 2019; Doumanis et al., 2018). The development of Computer-Assisted Language Learning (CALL) in the 1960s introduced computer technology as a viable alternative to entirely in-person language classes (Bush &Terry, 1997). The introduction of the Internet to the technology field resulted in the development of virtual language instruction in SLA, especially virtual synchronous instruction (Levy & Hubbard, 2005). Virtual language instruction is now widely used, especially during the COVID-19 pandemic, with Learning Management Systems (LMS) playing a crucial role in its success (Liguori & Winkler, 2020).

Schoonenboom (2014) and Celikbas (2018) noted that synchronous LMSs, including Adobe Connect and Big Blue Button, became particularly prominent during the Coronavirus pandemic. Dent and Koenka (2016) distinguished general achievement from diagnostic achievement (knowledge of vocabulary items). As they noted, vocabulary has received particular attention in SLA studies. Zhao et al. (2016) stated that vocabulary items empower learners to express their intended meanings despite unsatisfactory grammatical proficiency. Coxhead (2018) stated that vocabulary items constitute one of the main aspects of English for Specific Purposes (ESP) courses. ESP students are mainly apprised of the technical vocabulary items of their field of knowledge. As he pointed out, the learners' vocabulary acquisition might be associated with learner-related factors, such as motivation and anxiety. These factors comprise the language learners' individual attributes (propensities), which differentiate them from their peers and sway the rate and ultimate state of their language acquisition in language classrooms (Adnan et al., 2020; Dörnyei, 2005; Ellis, 2008). Most of the studies addressing these factors have been confined to traditional in-person classrooms (e.g., Parvaneh et al., 2020; Soleimani & Rahmanian, 2020), neglecting the examination of these factors like anxiety in the context of virtual instruction (especially using breakout rooms), across diverse academic settings. Considering these issues, the study investigated how virtual synchronous language instruction (focusing on breakout rooms) impacts technical vocabulary learning and language learning anxiety in ESP learners. It also explored the learners' perceptions of the effectiveness of this type of instruction in improving vocabulary learning and reducing anxiety. The study aimed to answer the following questions:

Do online synchronous language learning and gender significantly affect ESP learners' vocabulary learning and language learning anxiety?

What are ESP learners' perceptions of the utility of online instruction in ameliorating their vocabulary acquisition and language learning anxiety?

2. Review of Literature

Astuti and Anjarwati (2021) pointed out that SLA researchers have developed different types of virtual language instruction ranging from in-person to completely online synchronous courses. According to them, the relevant types of this kind of instruction can be arranged on a continuum from the traditional in-person courses, which employ certain features of virtual language instruction, to the courses, which depend entirely on the uses of the LMSs. This learning management system enables its users to: a) chat with other users with the help of public-chatting and private-chatting features; b) take advantage of the microphone and camera features of the system to engage in audio-visual interaction with the users of the system; c) share different kinds of files with the other attendees; d) share the screen of the computer or smartphone with the users; and e) carry out different educational tasks in the breakout rooms which the host of the session can monitor. Moreover, Chandler (2016) noted that Zoom and many other videoconferencing programs include a breakout room feature, where participants can be divided into smaller groups for activities, discussions, or sub-meetings. Through breakout rooms, students can engage in practical communicative activities and assignments with a smaller group of peers.

The study of second language vocabulary items has been a persistent area of research in the field of SLA (Gu & Johnson, 1996). Zhou (2012) defined vocabulary in two ways, emphasizing its crucial role in language acquisition. In its first meaning, vocabulary encompasses all the words of a certain language, forming the language lexicon. In its second meaning, vocabulary refers to all of the single words and multi-word language sequences that a person uses in the process of oral and written communication to express his/her intended meanings. This definition underscores the fact that vocabulary items can be learned through reading tasks, particularly through incidental vocabulary learning (Day et al., 1991; Horst, 2005). Watts (2008) further pointed out the positive impact of highlighting vocabulary items in reading comprehension texts, enhancing their visual appeal, increasing their saliency, and facilitating their acquisition.

MacIntyre and Gardner (1994) pointed out that anxiety affected the quality of learning a language in the context of the classroom, and they made an effort to specify the levels of anxiety. According to them, it is

possible to examine anxiety at two main levels, namely trait anxiety and state anxiety. As they explained, trait anxiety constitutes an aspect of the person's personality and refers to the proclivity to experience nervousness permanently during life. On the other hand, state anxiety comprises the feelings of uneasiness that stem from certain situations or events. They noted that state anxiety is related to SLA due to its situation-specific nature. Accordingly, they named the language learners' state anxiety in the context of the classroom foreign language classroom anxiety. As they noted, this kind of anxiety comprises the language learners' negative emotions, including their tension, which emanate from their language learning experiences in the context of the classroom. Day et al. (1991) stated that foreign language classroom anxiety would likely affect the learners' language acquisition in different language courses, including ESP courses.

In the field of SLA, researchers have been dedicated to the development of ESP courses that cater to learners' language learning needs in specific fields of knowledge (Dudley-Evans & St. John, 1998; Hutchinson & Waters, 1987). Furthermore, Hyland (2006) and Hyland and Jiang (2021) highlighted the significance of ESP courses for students of medicine, who need to use English extensively in their education and after graduation. As they concluded, there is a clear need for more empirical studies on various aspects of medical English, including its vocabulary items, in different contexts. This call for further research underscores the potential for growth and development in the field of ESP courses.

The present study incorporated collaborative language learning tasks delivered through virtual instruction utilizing breakout rooms. Additionally, it concentrated on technical vocabulary learning in ESP courses, focusing on the learners' language learning anxiety.

3. Method

3.1. Research Design

The present study used an explanatory sequential mixed-method design to examine the effects of virtual instruction on medical students' vocabulary learning and language learning anxiety. In the initial (quantitative) phase, the researcher collected data using a researcher-made vocabulary test and the Foreign Language Classroom Anxiety Scale (Horwitz et al., 1986). The subsequent (qualitative) phase utilized semi-structured interviews to provide depth and context to the results obtained in the first phase.

3.2. Sampling and Participants

Aligned with the study's objectives, in the quantitative phase of the study, the researcher used convenience sampling to select 60 male and female intermediate-level ESP learners (34 females and 26 males; age range, 19-28) in two equal intact classes of Kashan University of Medical Sciences, Kashan, Iran, as the participants of the quantitative phase based on their results on Oxford Placement Test (Allan, 2004) out of an initial pool of 73 ESP learners in September 2022.

The aforementioned classes were randomly assigned to the experimental and the control groups. The inclusion criteria for the study were junior/intermediate students, successful completion of the university's general English course, and enrollment in the specialized English course for medicine students. On the other hand, the exclusion criteria involved attending language lessons in the language institutes. In the qualitative phase, participants were randomly selected until data saturation was achieved (18 (8 males and 10 females) participants). Prior to the study, the researcher obtained written consent from all participants, who were also required to attend a session outside of regular class times to familiarize themselves with the software.

3.3. Materials and Instruments

The researcher used the OPT (Allan, 2004) to select intermediate-level learners and developed a 40-item semi-technical vocabulary pretest and posttest aligned with the study's objectives. The vocabulary was selected from the course books "English for the Students of Medicine (I) & (II)" (Deedari & Zia Hossainin, 2017; Tahririan & Mehrabi, 2018), with the posttest having a different item sequence to prevent test effect. At the suggestion of Dörnyei (2005), the content validity of the test was assessed by five ESP teachers with ten years of experience in material design. They were asked to check the test for suitability, wording, clarity, and relevance. Additionally, using Cronbach's alpha measure, the pretest and posttest had reliability indices of .83 and .82, respectively, making them appropriate for use in the Iranian EFL context.

Moreover, the researcher utilized Horwitz et al.'s (1986) Foreign Language Classroom Anxiety Scale (FLCAS) to assess participants' language learning anxiety before and after treatment sessions. This 33-item scale, rated on a 5-point Likert scale, was found to have satisfactory validity (.83) and reliability (.93). A pilot study confirmed a reliability index of .87, making it suitable for use in the Iranian EFL context. Moreover, an interview checklist (10 questions) was used to explore the learners' perceptions of the utility of online synchronous instruction in

vocabulary learning, focusing on their language learning anxiety. Concerning content validity, language, and content appropriateness, the researcher asked five ESP instructors and two psychologists to evaluate the items on this checklist. Some items were revised based on the above-mentioned experts' feedback. The psychologists were initially tasked with assessing the alignment of the interview questions with the psychological constructs of learners' language learning anxiety. Based on their expert input, the researcher adjusted several items to better align with these constructs. Subsequently, ESP instructors evaluated the items in terms of their compatibility with the characteristics of ESP virtual courses. The researcher made further modifications based on their feedback, ensuring that the interview was suitable for use in the present study. The set of questions was ultimately presented to the panel of seven experts (two of them were PhD holders in TEFL) in the form of a checklist to systematically verify the appropriateness and relevance of the questions for the study's context. All seven experts were well-acquainted with the context of the study, and their insights were compiled into a checklist to ensure the suitability of the questions. For better transparency of the questions and answers, the questions were asked in Persian and then translated into English. Finally, students' responses were recorded for transcription and further thematic analysis.

3.4. Procedure and Data Analysis

The researcher administered pretests to both the virtual learning group and the control group before treatment sessions. The virtual group, the focus of the study, received collaborative vocabulary tasks via Adobe Connect breakout rooms over 13 sessions of 90 minutes each, while the control group received in-person instructions. The researcher utilized Nunan's (1989), Skehan's (1996), and Willis's (1996) perspectives on collaborative tasks, emphasizing the four main characteristics of using the target language: collaboration, focus on meaning, and producing an outcome. Willis's (1996) stages of collaborative tasks (pre-task, during-task, and post-task) were also considered in task development.

At the pre-task stage (in the main room of Adobe Connect), learners in both the virtual instruction and control groups were asked to activate their background knowledge by answering questions about the session's topic.

During the task stage (in the Adobe Connect breakout room), the researcher randomly assigned five learners to each of the six groups in each group type to facilitate collaboration. A representative was chosen for each group to enable the researcher to manage class time effectively and encourage students to share their knowledge through role-playing or

discussion/debate. The researcher instructed groups to use the target language to perform collaborative vocabulary learning tasks, interact and share knowledge to understand and define specific technical words (10 highlighted words, each session) in a text and write a two- to three-paragraph (i.e., a minimum of 150 words) summary of their discussions using all of the highlighted words. Regular monitoring, feedback, and answering questions were provided to support task performance. The researcher asked the participants to organize their ideas and their peers' ideas in the form of a list and write them in the "Note" Pod of the Adobe system to use them in the process of paragraph writing. She encouraged collaborative writing tasks among learners by assigning specific roles based on individual strengths, monitoring group performance, and providing feedback on English language usage.

In the post-task stage (in the Adobe Connect main room), groups presented their work and discussed new vocabulary, with the researcher providing feedback and additional information on highlighted words. Moreover, new vocabulary was introduced using flashcards prepared by the instructor. The control group, following similar procedures in in-person classes without using the Adobe Connect system, relied on PowerPoint files and paper tasks, a crucial part of the research design that allowed for a comparison of the two instructional methods.

In the quantitative phase, the researcher used descriptive and inferential statistics, including the two-way ANCOVA test together with the normality tests (i.e., Kolmogorov-Smirnov & the Shapiro-Wilk tests) and homogeneity of the variance test (i.e., Levene's test) for performing the data analysis. Afterward, qualitative data were collected through semi-structured interviews with 18 from the virtual group, using Adobe Connect for interviews (at least 20 minutes) and thematic analysis to analyze the data. During these interview sessions, the researcher utilized questions from the checklist corresponding to research questions. Subsequently, the researcher transcribed all recorded interviews. The transcribed data was then imported into MAXQDA 2024 for coding and analysis. Thematic analysis was employed to extract the underlying themes from the participants' responses to the interview questions. Researchers use thematic analysis to familiarize themselves with the data, develop codes, search for themes, review themes, define and name themes, and write reports (Braun & Clarke, 2022).

Moreover, in the process of the thematic analysis, there were three levels of analysis: initial coding, focused coding (category), and axial coding (theme development). During the interviews, the researcher located spots linked to the interview questions during the first rounds of

reading and rereading the data. While reading through the data, the researcher looked for words, sentences, and paragraphs that contained a message or idea relevant to the interview questions (initial coding). By locating these points and identifying them through using MAXQDA, the researcher dealt with codes. The codes were words or statements that were relevant to the interview questions. The researcher determined the codes in the data by highlighting the recurrent keywords, phrases, and sentences (also referred to as in-vivo codes taken directly from the participants' wordings) and by specifying similar ideas, points of view, attitudes, and perceptions. When the researcher was assessing the data, she noticed separate items and ideas associated with the interview questions and recognized interconnections and commonalities among the specific codes (known as focused coding). Also, the researcher integrated similar codes to determine broader categories. This step helps researchers to explore the underlying structure of their data and develop more nuanced interpretations. Finally, themes emerged where codes and categories were grouped or matured based on characteristics or meanings. The themes extracted are higher-order concepts that provide a more abstract and comprehensive understanding of the data. By following these coding steps in MAXQDA, researchers can systematically analyze their data, uncover key insights, and develop rich and nuanced interpretations.

Lincoln and Guba's (1985) concept of trustworthiness (including credibility, transferability, dependability, and confirmability) was utilized to ensure the trustworthiness of the qualitative data. Credibility forms the bedrock of qualitative inquiry, guaranteeing that the study's findings authentically mirror the phenomena under scrutiny. In my research, credibility was meticulously established through in-depth engagement with participants, facilitated by thorough interviews conducted after the quantitative phase. This prolonged engagement allowed for a profound understanding of participants' viewpoints and experiences, enriching the data with depth and authenticity. The interviews were structured to cover a wide range of topics related to vocabulary learning, language learning anxiety, and virtual learning experiences, ensuring comprehensive data collection. Furthermore, triangulation, drawing insights from interviews and existing quantitative data, added layers of credibility by validating and strengthening the study's conclusions. Peer debriefing sessions were also conducted, involving discussions with colleagues well-versed in qualitative research to review the research process, findings, and interpretations critically. These sessions provided valuable insights and alternative perspectives, further enhancing the credibility of the study.

Moreover, transferability, or the ability to apply findings to other contexts or populations, was supported by providing a detailed and contextualized description of the research process and outcomes. Through thick description, the study aimed to enable readers to evaluate the applicability of the findings to similar settings, thereby enhancing the transferability of the study. Clear explanations of methodology and analytical techniques further bolstered the transferability of insights to related research contexts. Additionally, the inclusion of participant demographics and background information in the research findings enhanced the understanding of the study's relevance to different learner groups and educational settings.

Furthermore, dependability, focusing on the consistency and reliability of research processes and outcomes, was ensured through meticulous documentation and checks. An inquiry audit meticulously recorded each stage of the research process, including data collection, analysis, and interpretation. This detailed documentation allowed an external auditor to validate the study's reliability and consistency. Intercoder reliability checks were conducted by involving multiple researchers in the thematic coding and analysis process, ensuring consistency and validity in data analysis. Intercoder reliability for thematic analysis was assessed using Cohen's kappa coefficient, resulting in a high agreement level of $\kappa = 0.85$, indicating strong reliability in coding and interpreting qualitative data. Content validity of interview questions was also ensured through expert reviews (through a panel of experts) and feedback from professionals familiar with the research context and objectives. This process helped refine and validate the interview questions, contributing to the overall dependability of the study.

Finally, confirmability, emphasizing objectivity and neutrality in research processes and interpretations, was maintained through rigorous documentation and reflexivity. An audit trail transparently documents decision-making processes and interpretations, enabling external auditors to assess the objectivity of the study's findings. Reflexivity, through continuous self-awareness and critical reflection, addressed potential biases and enhanced the objectivity and confirmability of the research outcomes. The researcher's reflexivity was evident in the detailed reflections on personal biases, assumptions, and perspectives, ensuring transparency and objectivity throughout the research process.

4. Results

The subsequent sections will comprehensively present the research findings, encompassing a detailed analysis derived from both qualitative and quantitative methodologies.

4.1. Results of the Quantitative Data Analysis

The results of the normality tests regarding the performances of the virtual group on the pretests and posttests of the study are shown in Table 1.

Table 1. *Tests of Normality for Pretests and Posttests of the Virtual Group*

		Kolmogorov-Smirnov			**Shapiro-Wilk**		
		Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pretests	Vocabulary learning	.127	30	.200	.960	30	.371
	Language learning Anxiety	.151	30	.080	.947	30	.139
Posttests	Vocabulary learning	.139	30	.144	.940	30	.093
	Language learning anxiety	.126	30	.200	.969	30	.458

As shown in Table 1, the p-values in the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests (i.e., Sig) were higher than .05. Therefore, the data were normally distributed.

Moreover, Table 2 provides the results of the normality tests regarding the control group's performance on the study's pretests and posttests.

Table 2. *Tests of Normality for Pretests and Posttests of the Control Group*

		Kolmogorov-Smirnov			**Shapiro-Wilk**		
		Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pretests	Vocabulary learning	.151	30	.080	.943	30	.099
	Language learning Anxiety	.156	30	.071	.935	30	.082
Posttests	Vocabulary learning	.121	30	.200	.974	30	.585
	Language learning anxiety	.148	30	.122	.961	30	.413

As shown in Table 2, the p-values of the normality tests were higher than .05. Therefore, the data were normally distributed. Thus, considering the aim of the first research question, two-way ANCOVA was used to analyze the data. Table 3 provides the descriptive statistics for the two groups' performances on the vocabulary posttest.

Table 3. *Descriptive Statistics for Vocabulary Posttests of the Two Groups*

Gender	Group	Pretest	Posttest
Male	Virtual	21.63±3.98	32.00±3.40
	Control	21.89±2.76	22.00±1.61
Female	Virtual	22.57±2.47	34.57±2.85
	Control	20.58±3.29	21.08±1.78
Total	Virtual	22.07±3.34	33.20±3.37
	Control	21.37±3.00	21.63±1.71

As shown in Table 3, the male and female learners in the virtual group had better performances on the posttest (M=32, SD=3.40; M=34.57, SD=2.85) in comparison with those of the control group (M=22, SD=1.61; M=21.08, 1.78). Nonetheless, the researcher had to check the homogeneity of variances and the ANCOVA test. Table 4 shows the relevant results of this test.

Table 4. *Leven's Test of the Two Groups on the Technical Vocabulary*

F	df1	df2	Sig.
1.021	3	56	.390

In Table 4, the p-value (0.390) from Levene's test > 0.05, the typical significance level in social science tests. Thus, data meets the homogeneity assumption for variances, allowing ANCOVA analysis. Table 5 provides the relevant results.

Table 5. *Two-Way ANCOVA Test for the Technical Vocabulary of the Two Groups*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2072.138	4	518.034	81.768	<.001	.856
Intercept	711.717	1	711.717	112.340	<.001	.671
Vocabulary Pretest	9.899	1	9.899	1.563	.217	.028
Gender	10.613	1	10.613	1.675	.201	.030
Group	1945.652	1	1945.652	307.109	<.001	.848
Gender * Group	36.119	1	36.119	5.701	.020	.094
Error	348.446	55	6.335			
Total	47521.000	60				
Corrected Total	2420.583	59				

As shown in Table 5, the p-value of the main effect of the gender (.201) exceeded .05. However, the main impact of the type of instruction (<.001) and the p-value of the interaction effect between the gender and type of instruction (.020) was less than .05.

Consequently, the learners' gender did not influence their vocabulary learning. Nonetheless, virtual instruction and the interaction between the learners' gender and virtual instruction significantly influenced the male and female learners' vocabulary learning.

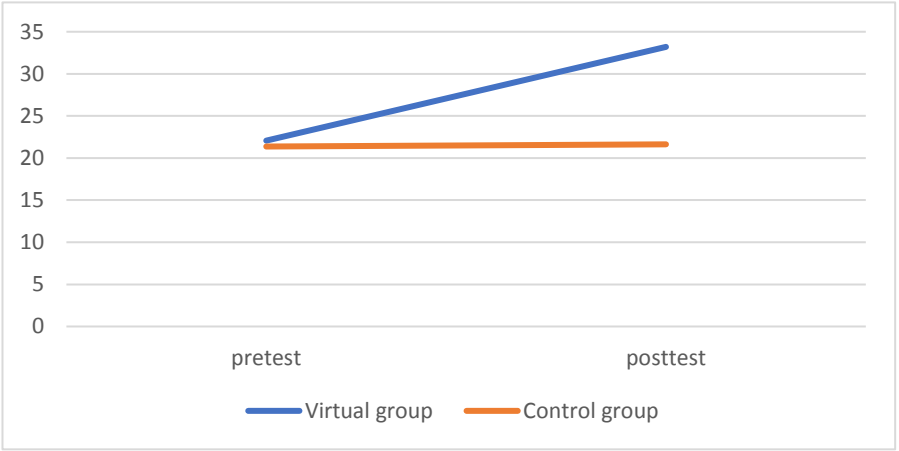

Figure 1. Performances of the Two Groups on the Technical Vocabulary

As shown in Figure 1, the performance of the virtual group regarding vocabulary learning improved more than the control group.

Table 6 provides the descriptive statistics for the two groups' performances on the anxiety posttest.

Table 6. *Descriptive Statistics for Language Learning Anxiety of the Two Groups*

Gender	Group	Pretest	Posttest
Male	Virtual	92.81±6.39	91.63±6.58
	Control	97.44±6.39	96.50±6.40
Female	Virtual	97.21±7.14	95.93±7.07
	Control	103.83±7.86	102.58±7.84
Total	Virtual	94.87±6.99	93.63±7.04
	Control	100.00±7.58	98.93±7.52

As shown in Table 6, the male and female learners in the virtual group had better performances on the posttest (M=91.63, SD=6.58; M=95.93, SD=7.07) compared to those of the control group (M=96.50, SD=6.40; M=102.58, SD=7.84). That is, the mean values of anxiety in the experimental group were less than those in the control group. Thus, data meets the homogeneity assumption for variances, allowing ANCOVA analysis. Table 7 shows the relevant results.

Table 7. *Levene's Test of the Two Groups on Language Learning Anxiety*

F	df1	df2	Sig.
.604	3	56	.615

As shown in Table 7, the p-value in the results of Levene's test (i.e., .615) was larger than the cut-off point of .05. Table 8 provides the pertinent results.

Table 8. *Two-Way ANCOVA Test for Language Learning Anxiety of the Two Groups*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3414.049	4	853.512	544.999	<.001	.975
Intercept	.000	1	.000	.000	.988	.000
Anxiety Pretest	2587.961	1	2587.961	1652.508	<.001	.968
Gender	.246	1	.246	.157	.694	.003
Group	.522	1	.522	.333	.566	.006
Gender * Group	.124	1	.124	.079	.780	.001
Error	86.134	55	1.566			
Total	559729.000	60				
Corrected Total	3500.183	59				

According to Table 8, the p-value of the main effect of the gender (.694) was larger than .05. Moreover, the main effect of the instruction type (.566) and the p-value of the interaction effect between the gender and type of instruction (.780) exceeded .05. Therefore, learners' gender, the instruction, and the interaction between them did not significantly affect the learners' anxiety.

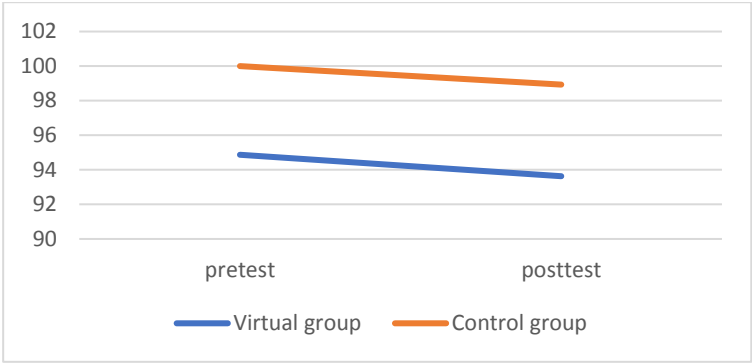

Figure 2. Performances of the Two Groups on the Language Learning Anxiety

As shown in Figure 2, The decrease in language learning anxiety in the virtual group was not significantly different from the control group.

4.2. Results of the Qualitative Data Analysis

In this section, the researcher describes participants' perspectives using interview extracts.

4.2.1. Virtual Learning and Vocabulary Learning

Eight themes emerged regarding vocabulary learning from the voice of students experiencing virtual synchronous classrooms using breakout rooms: (a) enriched vocabulary through exploration; (b) socially constructed vocabulary development; (c) enhanced vocabulary recall; (d) real-time vocabulary assessment; (e) easy access and enhanced vocabulary learning; (f) multi-sensory vocabulary enhancement; (g) flexible learning environment; and (h) focused vocabulary learning. These themes are explained below:

(a) Enriched Vocabulary through Exploration

Some participants highlighted that virtual instruction helps in exploring new words and concepts. For example, participant 5 (P5) noted:

> *"The breakout rooms, chat box, and microphone features of Adobe Connect allowed me for interactive discussions and sharing of opinions. Group discussions facilitated active use of new words and helped me remember similar words."*

This excerpt indicates that the interactive features of the platform allowed learners to actively engage with vocabulary tasks, and construct knowledge through sharing knowledge and negotiating, leading to vocabulary exploration.

(b) Socially Constructed Vocabulary Development

Collaborative activities and virtual tools can create active learning environments by incorporating interactive activities and group discussions. P 17 mentioned:

> *"In each breakout room session, we chose one of our group members to read the paragraph and check the accuracy of English grammar in the suggested sentences. Another group member examined the word choices in the sentences. We collaboratively chose the most appropriate sentences and helped each other edit them."*

In this regard, P 14 pointed out:

> *"The chat and microphone features on Adobe Connect were beneficial. They allowed me to engage with my instructor and classmates. With the chat feature, I could listen to the instructor while simultaneously typing my questions in a chat box, to which my peers responded."*

These excerpts indicate how peer real-time interaction and collaboration facilitated the construction and reinforcement of vocabulary knowledge.

(c) Enhanced Vocabulary Recall

Learners acknowledged the effectiveness of virtual instruction in improving their ability to remember and retain new vocabulary. P 5 noted:

> "*During task performance, my group members and the professor's feedback made me cognizant of my pronunciation problems and prompted me to check the correct pronunciation of all new words."*

Furthermore, P 16 pointed out that:

> *"I could focus more on the new words because I could use the options of "Draw" in the Adobe Connect whiteboard and type the tasks. Moreover, I could write the synonyms of the words mentioned by my teammates on the whiteboard's margins to be used for writing the task. In addition, we can write the writing task on the "Notes" pod. Moreover, the class was recorded and I reviewed the content of the class after its termination. Thus, I could better memorize the words."*

Here, constructive feedback, access to resources and system features, and staying mentally active facilitated the acquisition and retention of vocabulary items.

(d) Real-Time Vocabulary Assessment

The participants appreciated the immediate feedback and continual assessment provided by virtual instruction. P 9 mentioned:

> *"I could listen to the instructor and type in a chat box and ask my question, and my peers answered my question."*

As stated by P 10:

"The professor used to quiz us every two or three sessions about the content of the previous sessions using the "Question & Answer" or "Poll" pods. This evaluation helped me review the previous lessons. Moreover, the online quizzes were less stress-inducing than the paper-and-pencil examination."

(e) Easy Access and Enhanced Vocabulary Learning

Virtual language learning through the Adobe Connect platform provides a proper classification of each course content. P 13 highlighted:

"In our virtual classes, during post-task in the main room, our professor shared the useful links using the "Files" pod and shared the PDF or PowerPoint files of the lessons with us using the "Share Document" feature of Adobe. Moreover, I could easily save the files on my computer, and access the information of each lesson that I had placed in separate files."

This extract shows that digital learning resources are accessible by the use of the system and can be easily categorized to expedite vocabulary acquisition.

(f) Multi-Sensory Vocabulary Enhancement

Online learning enables learners to have access to various teaching resources including print files (e.g., PDF files), audio files (recorded classes), and visual files (vocabulary flashcards). As mentioned by P 6:

"We could use the whiteboard and other Adobe features to learn vocabulary. We could write the words and their meanings and synonyms and we could change the color of the text and underline it. Moreover, the flashcards with word-related pictures helped us to learn vocabulary better."

Additionally, P 11 noted that:

"We could guess the meaning of words from within the text, and if none of us knew the meaning of a word, we could search it using online dictionaries.

Here, the features of the system can simplify and accelerate understanding of the meanings of new words through visualization and searching different online resources.

(g) Flexible Learning Environment

A virtual learning environment using a flexible platform with different features enables students to do everything from studying solo to participating in a lively group discussion. P 2 pointed out that:

"We could enter the class from anywhere and there was no need to be physically present. The classes were recorded and we could

> *review them again later. We could use the whiteboard and write and take notes in the Notes or Chat pods, and these contents would be saved for the teacher."*
>
> Furthermore, P 12 maintained that:
>
> *"My professor used the system content library to provide us with supplementary materials such as PDF files and flashcards of the new words. Moreover, I could use the playback to ensure that I did not miss any important vocabulary items or concepts."*

The participant's experience showcases how the system caters to various learning styles and preferences by offering features like a content library for extra materials and playback for a thorough review. This promotes self-directed learning, flexibility in scheduling, and customization of the learning experience. The virtual learning system allows learners to access classes from any location, utilize platform features, and learn at their own pace.

(h) Focused Vocabulary Learning

Learners benefit from reduced distractions and a systemic approach to learning within the virtual environment. P 18 pointed out that:

> *"I felt that I was more focused in the Adobe classes compared to the face-to-face classes because the virtual classes did not have the crowd and noise of the face-to-face class."*
>
> Furthermore, P 5 noted that:
>
> *"In a traditional face-to-face class, my classmate sitting next to me often asks questions while the teacher is teaching, causing distractions. However, I find it easier to concentrate in virtual classes without such interruptions."*
>
> Also, P 9 noted that:
>
> *"In breakout room sessions, we were very active and participated in discussions and I could concentrate more compared to face-to-face and usual online classes in which teacher just teaches and writes down things on the board and students are usually passive"*

The participant's experiences highlight how virtual classes facilitate focused learning by removing external distractions such as background noise and interruptions from classmates.

4.2.2. Virtual Instruction and Language Learning Anxiety

Six themes emerged regarding learner anxiety from the voice of students experiencing virtual breakout room classrooms: (a) calm and focused learning environment; (b) stress reduction through affordances of the environment; (c) stress reduction through engagement; (d) pacifying

learning environment; (e) increased anxiety as a result of medium effects; (f) human-induced anxiety. These themes are explained below:

(a) Calm and Focused Learning Environment

Virtual language instruction offers a user-friendly environment that reduces distraction. P 2 pointed out that:

> *"Breakout room classes were not stressful and I could easily concentrate on doing the task and enjoy the class. In in-person classes, the teacher might ask a question related to the lesson at any moment and I experienced much anxiety."*

(b) Stress Reduction through Affordances of Environment

in virtual Adobe classes, the flexibility and accessibility of the materials can reduce stress among the students and encourage them to use different features of the platform. P 15 noted:

> *"The tasks we did were saved for the teacher through Chat and Notes pods, and Whiteboard, therefore, I would feel less stressed about losing the content. Moreover, the class was recorded and I could access the teaching materials."*

(c) Active Engagement and Supportive Environment

According to the respondents, active engagement in virtual instruction can provide emotional support, share insights, and collectively problem-solve, reducing individual stress levels. P 13 pointed out:

> *"Collaborating in Adobe breakout room classes significantly reduced our stress. When faced with unfamiliar words or concepts, the group dynamic allowed for mutual learning and support. This shared responsibility in completing tasks alleviated the pressure of working alone."*
>
> The classes fostered a collaborative environment, allowing individuals to share their strengths and learn from each other, leading to reduced stress and an enriched learning experience.

(d) More Freedom of Action

Individualized learning approaches within virtual instruction provide tailored support to learners experiencing anxiety, offering strategies and resources to manage their anxiety effectively. P 9 noted that:

> *"In Adobe Connect classes, the tasks were open-ended and I could write any sentence I liked with the words I knew, this made me less anxious."*

(e) Increased Anxiety as a Result of Medium Effects

Virtual learning can increase anxiety due to the technical problems learners may encounter during the classes. These infrastructure-related

issues and miscommunication may disrupt the learning process, leading to frustration, and disengagement. P 15 noted that:

> *"Sometimes, I was not able to enter our classes. My Internet connection was satisfactory. Nonetheless, the system did not let me enter the class. Moreover, sometimes, the system threw me out of the class. These issues caused anxiety because I couldn't actively participate in performing the task."*

Likewise, P 17 pointed out that:

> *"The platform did not work well in some sessions. As a result, I could not hear my peers' voices due to poor connection, and this caused misunderstanding. Therefore, I was concerned about completing the task on time."*

(f) Human-Induced Anxiety

Virtual instruction can cause anxiety in learners due to their inadequate technical skills and increased responsibility caused by changing the environment. Moreover, the time limit may cause anxiety among the learners due to not completing the task within the given time. P 18 noted that:

> *"I sometimes couldn't easily adjust the volume of my microphone while performing the task and I face problems in connecting my microphone and speaking with my peers."*

Moreover, P 10 noted that:

> *"We didn't have enough time, maybe it would have been better if the professor had allocated more time to the task. Sometimes, the sound glitches wasted our time and slowed down the process of task performance, although the professor allowed extra time for doing the task."*

Furthermore, P 3 noted that:

> *"The increased responsibility compared to face-to-face classes causes some stress. We had to manage the task, time, and platform to ensure that nothing was overlooked. This added level of accountability could contribute to feelings of stress."*

All in all, ESP learners found virtual instruction beneficial for vocabulary learning and anxiety reduction but expressed concerns about technical issues with the systems.

5. Discussion

As mentioned before, this study aimed to investigate the impact of virtual synchronous instruction and gender on learners' vocabulary acquisition and their perceptions of the utility of this kind of instruction on vocabulary learning. The results indicated that virtual instruction and

the interaction between learners' gender and instruction significantly affected vocabulary learning, which aligns with the results of several studies (Ahmed et al., 2022; Shah, 2023). Similar to the results of the present study, Ahmed et al. (2022) highlighted the beneficial impact of virtual instruction on vocabulary learning and their findings evinced that e-learning platforms, namely Adobe Connect, could provide opportunities for students to practice using vocabulary in interactive activities or discussions with their peers, which could further reinforce their understanding and retention. Consistent with the present study, the findings of the Roudgar et al. (2022) study accentuate the significance of receiving immediate feedback from their peers on online platforms like Adobe Connect.

In a similar vein, Shamsan et al. (2021) pointed out that the beneficial impact of virtual instruction on the learners' vocabulary learning stems from the fact that this kind of instruction enables the learners to focus on the vocabulary items and to guess their meanings without being interrupted by contextual factors (e.g., background noise, peers' interruptions, the temperature of the class, etc.) of the in-person classes.

Similar to the present study results, Lumley and O'Sullivan (2005) and Kheder and Rouabhia (2023) noted that gender may not affect learners' acquisition of different aspects of the language, like vocabulary. As they concluded, this issue stems from the fact that learners' cognitive and affective factors, like motivation, are more influential in their language acquisition than gender.

Considering these issues, it can be argued that, in the present study, the beneficial impact of virtual instruction on the learners' vocabulary learning stemmed from its compatibility with the learners' different learning preferences and styles and its utility for improving their ability to focus on the words without being interrupted by various intervening factors.

Moreover, the findings of the qualitative data indicated that learners generally had positive attitudes toward virtual instruction for vocabulary learning, with themes including, enriched vocabulary through exploration, socially constructed vocabulary development, enhanced vocabulary recall, real-time assessment, easy access, and enhanced vocabulary learning, multi-sensory vocabulary enhancement, flexible learning environment, and focused vocabulary learning.

In corroboration with the themes that emerged in the present study regarding the learners' perception of the utility of virtual learning on vocabulary acquisition, Karaaslan et al. (2018) and Namaziandost et al. (2021) attested the satisfaction of the students with online learning and

stated that students participated in active learning and used collaborative word-building activities (e.g., finding new words' synonyms and collocations and using them in sentences) to learn and better memorize the new vocabularies.

The present study results aligned with Lan et al. (2020) who asserted that learners often have positive attitudes toward virtual instruction because it increases their awareness of the importance of planning in language learning which can result in optimal levels of vocabulary acquisition. This aligns with the current findings where learners appreciated the structured and strategic approach facilitated by virtual instruction.

Correspondingly, the results of the present study mirrored those from Vu and Bui's (2021) study, confirming that students had positive attitudes towards virtual learning, particularly emphasizing the effectiveness of breakout rooms. This student-centered approach promotes interaction and group work, facilitating learning and encouraging learners to engage with various platform features like Textbox, Chat, Notes, Polls, screen sharing, and microphone use.

In a similar vein, Ahmed et al. (2022) displayed positive attitudes of the students toward online learning due to more interaction with their classmates and immediate and constructive feedback from their peers. Similar to the results, Pouria and Zamani Behabadi (2023) pointed out that students had a positive attitude toward learning vocabulary through Adobe Connect and expressed that learning via this platform was exciting and challenging and enabled them to actively participate in learning by raising hands and asking the question and writing in the chatbox. They also expressed their satisfaction with the features and accessibility of the platform.

Furthermore, the findings agreed with those of Roudgar et al. (2022), in which students used multi-sensory vocabulary activities, benefiting from seeing images and illustrations of vocabulary and their collocations through a virtual platform.

Similarly, Tseng et al. (2020) highlighted a positive perception of students of virtual learning and accentuated the important role of collaboration and pair work among learners, which results in longer retention. Visual flashcards and annotations may give learners textual and graphical input, and this kind of multimedia software has been found to improve vocabulary learning.

Furthermore, Considering the first research question, the quantitative results indicated that learners' gender, virtual instruction, and the interaction between them did not significantly influence their anxiety.

These results contradict the results of the studies carried out by Suzuki (2017), Rajabi et al. (2021), and York et al. (2021). These studies underlined the effectiveness of virtual instruction in reducing learners' anxiety in their relevant settings. Moreover, the results do not support the results of the studies conducted by Fondo and Jacobetty (2020). This study reported that the learners' gender influenced their language learning anxiety. That is, the female learners suffered from a greater degree of anxiety in their classes. Furthermore, they stated that, in general, female language learners suffer from a higher degree of learning anxiety in comparison with male learners because they are more influenced by affective factors. Nonetheless, as they stated, certain contextual factors may overshadow the difference between male and female learners' anxiety.

The discrepancy between the obtained results in this study and the findings of previous research can be attributed to several probable reasons. Firstly, variations in sample size and composition may have played a role, with differences in participant demographics, language proficiency levels, or cultural backgrounds influencing anxiety responses to virtual instruction. Secondly, methodological differences, such as variations in research tools, measurement techniques for anxiety levels, or the specific type of virtual instruction utilized, could have led to contrasting outcomes. Additionally, contextual factors, including the specific language being taught, institutional policies, and the overall learning environment, may have influenced learners' anxiety experiences in virtual settings differently across studies. The timing, duration, and implementation of virtual instruction may also have varied, impacting how learners perceive and respond to anxiety-inducing situations. Lastly, the presence of other educational interventions or unaccounted factors, such as additional support services or classroom dynamics, might have affected anxiety responses, contributing to the observed discrepancies in research outcomes.

Contrary to the findings, Liu and Wang (2023) noted that virtual language teaching may increase the learners' anxiety due to the built-in features of the LMSs including their countdown feature to remind the learners of their time limitations. Moreover, they pointed out that in virtual instruction, some learners are constantly in a state of tension since they are afraid of getting disconnected.

Finally, one study by Gargalianou et al. (2016) found that female learners prefer virtual language instruction due to reduced language learning anxiety and cost-effectiveness. However, more research is needed to understand the factors contributing to anxiety in virtual

instruction and how male and female learners experience and manage it differently.

Considering the diverse sample in this study, virtual language instruction did not have a significant impact on learners' anxiety levels. The lack of influence from gender and the absence of interaction between gender and virtual instruction on anxiety may be due to the inclusive and adaptable nature of virtual learning, which helps mitigate gender-related anxiety triggers and promotes a more equitable learning environment.

Finally, regarding research question two, learners perceive virtual language instruction as effective in reducing their language learning anxiety. This qualitative finding does not precisely align with question one, which found that virtual instruction does not significantly impact students' anxiety levels. This discrepancy can be attributed to different data collection and analysis methodologies. While question two focused on qualitative insights and learner perceptions, question one relied on quantitative measures, potentially overlooking nuanced aspects of anxiety experiences in virtual learning environments. Additionally, variations in sample characteristics, such as learner demographics or language proficiency levels, could have influenced the divergent findings.

The findings were consistent with Martin and Alvarez Valdivia (2017) and Liu and Wang (2023) who highlighted the role of effective feedback and coping strategies in reducing learners' anxiety, aligning with the themes of stress reduction through affordances of the virtual environment and engagement leading to stress reduction found in the current study. Similarly, Jiang et al. (2023) noted that online education had a beneficial effect on reducing language learning anxiety, supporting the theme of a calm and focused learning environment in this study.

Kumari et al. (2021) addressed the relationship between attitude and anxiety related to online learning. The findings of the study showed a high attitude with low or mild anxiety regarding online learning among learners, which is in line with the results of the present study.

Abdelwahed et al. (2023) and Al-Maraira and Shennaq (2021) findings highlighted factors inducing anxiety in virtual learning, including lack of time, technical issues and lack of technical skills, an abrupt transition to online learning, and feeling overburdened, which are consistent with the themes of the present study (e.g., increased anxiety as a result of medium effects, and human-induced anxiety). Among the possible reasons for students' anxiety, we can mention that students who had lower self-evaluation about their English learning had less confidence in their language performance and thus they were anxious about their language performance in online classes.

However, the overall understanding of anxiety in virtual language instruction remains inconclusive, as noted by Russel (2020) and Amini et al. (2022). Despite exploring various dimensions and strategies to reduce anxiety, further research is needed to reach conclusive findings and address gaps in understanding. Future studies should continue examining the complex relationship between anxiety and virtual learning through diverse methodologies to comprehensively understand and address learners' anxiety in online language classrooms.

In conclusion, this article highlights the multifaceted nature of virtual language instruction and its impact on learners' experiences. While virtual instruction demonstrates clear benefits in areas such as vocabulary acquisition, challenges such as technological issues and anxiety remain pertinent considerations. The role of learners' gender adds nuance, revealing differences in how individuals engage with virtual language learning. As language education evolves, it is crucial to leverage the strengths of virtual instruction while mitigating its limitations to create an inclusive and effective learning environment for all learners, irrespective of gender or background.

6. Conclusion

The findings indicate that virtual instruction emerged as a potent catalyst for enhancing vocabulary learning among participants. Through immersive digital environments and interactive tools, learners exhibited heightened engagement and improved retention of vocabulary items. This aligns with the broader educational discourse emphasizing the transformative potential of technology-mediated learning environments.

Furthermore, the interplay between learners' gender and virtual instruction yielded intriguing insights. That is, gender differences did not significantly affect vocabulary acquisition or anxiety levels. This underscores the need for tailored instructional strategies that account for gender-specific learning preferences and motivational factors.

The qualitative phase enriched these findings by elucidating learners' experiential perspectives. Across thematic analyses, participants consistently praised virtual instruction for its role in fostering enriched exploration, collaborative learning experiences, and real-time feedback. These qualitative narratives complement the quantitative findings, highlighting the multifaceted benefits of integrating technology-driven pedagogies into ESP instruction.

By embracing innovative instructional paradigms and leveraging digital tools judiciously, educators can create dynamic and inclusive learning environments that resonate with the evolving needs and

aspirations of contemporary learners. As virtual instruction continues to evolve, future research avenues could explore longitudinal effects, pedagogical adaptations for specific learner profiles, and the synergistic interplay between virtual and traditional instructional modalities. Such endeavors hold promise for fostering equitable, empowering, and effective language learning experiences in diverse educational contexts.

The results of the study underscored the necessity of redressing the current teacher education courses including the ESP teacher education courses in the foreign language contexts, especially in the EFL context of Iran. This overhaul process has to focus on two aspects of these courses, including the teacher educators and the course content. First, there is a need to re-educate the teacher educators to provide them with adequate information on virtual language instruction and the learner factors. An examination of the characteristics of most of the EFL/ESP teacher educators indicates that they are mainly concerned with the practical considerations of language instruction and disregard the innovative language teaching approaches such as virtual language instruction and the major learner factors such as gender, and language learning anxiety that are determining factors in the process of language learning. The re-education of the teacher educators has to make them cognizant of the utility of virtual language instruction and the significance of learner-related factors in the context of the classroom.

Second, there is a need to include certain modules in the present education courses for the EFL and ESP teachers in which the teachers are provided with adequate information on virtual language instruction and are trained to utilize different LMSs effectively.

Moreover, the curriculum developers have to revise the present EFL/ESP textbooks to include certain virtual language learning tasks in them. That is, the textbooks of these courses have to involve more tasks, including vocabulary-learning tasks, which align with the virtual language learning courses. Furthermore, the textbooks should offer male and female learners more information on learner factors like anxiety. They can include effective strategies in lists, encourage learners to use them, and prompt them to assess and provide feedback on their effectiveness based on personal experiences.

The study results emphasize the need for EFL/ESP teachers to enhance their digital literacy and knowledge of virtual language instruction. Teachers should also understand learner factors like gender and anxiety to implement appropriate instructional strategies in the classroom.

7. Limitations of the study

Like any research endeavor, the present study is subject to several limitations that warrant acknowledgment. One significant limitation concerns the use of convenience sampling and a sample size of 60 participants. This could impact the reliability and external validity of the findings. It is important to note that the use of convenience sampling was not a deliberate choice but rather a necessity imposed by the structure of university courses. The researcher had limited control over participant recruitment, as the study was conducted within the parameters of the university's curriculum. Despite this limitation, the study offers valuable insights, and the results were interpreted with a nuanced understanding of the constraints associated with the sampling method employed.

Additionally, the study's scope was limited to male and female ESP learners in a university setting, excluding participants from other language courses and focusing specifically on the influence of gender on vocabulary learning and anxiety, omitting other significant learner factors such as motivation and attitudes. Future research should consider a broader range of learner variables to gain a more comprehensive understanding of language learning dynamics. Age was not controlled for in the study, highlighting the need to exercise caution when generalizing results to different age groups of language learners.

8. Suggestions for further research

Future research can explore longitudinal studies to track learners' progress and compare virtual instruction with traditional methods. Investigating additional learner factors like motivation, attitudes, and cultural backgrounds can offer a holistic view of how they intersect with virtual instruction, enriching our understanding of language learning processes. Moreover, other research can encompass technical vocabulary in other fields of study or various aspects of the target language, such as grammar.

Age-group comparisons constitute another avenue for exploration, shedding light on how different age cohorts respond to virtual language instruction. This investigation can inform age-appropriate teaching strategies and interventions tailored to the unique needs of younger learners, adults, and older individuals.

Examining innovative pedagogical strategies (e.g., gamification and interactive simulations) and cross-cultural studies can enhance virtual language instruction. Furthermore, focusing on teacher training and professional development is crucial for creating enriching virtual learning experiences. Cross-cultural studies offer another dimension of research

potential, unraveling cultural nuances that influence learners' perceptions, preferences, and outcomes in virtual settings. This exploration can facilitate the development of culturally responsive virtual language instruction strategies.

Lastly, it is paramount to focus on teacher training and professional development in virtual language instruction. Evaluating the impact of specialized training programs on educators' pedagogical practices and technological proficiency can equip teachers with the skills needed to create enriching virtual learning experiences.

In conclusion, by embarking on these avenues for further research, one can deepen our understanding of virtual language instruction, empower educators with evidence-based practices, and enhance the learning experiences of ESP learners globally. Continued research and innovation are crucial to driving transformative advancements in language education.

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