Comparing Visual Interaction and Screen-recorded Approaches in English Grammar Learning: An Educational Intervention

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ABSTRACT

Background: Face-to-face interactions help teachers teach by sharing information with learners directly through body gestures. In virtual instruction, educators are forced to keep up with the instructional programs technologically. This research compared visual interaction and screen-recorded methods in enhancing English Foreign Language (EFL) grammar learning of senior high school students.

Methods: This research is an educational intervention with a pre-test and post-test design and a control group. Using the simple random sampling method, one school was selected from all-boys senior high schools. A total of 40 eligible male students were randomly allocated to two intervention and control groups (n=20 per group) as a statistical sample learning English in Hormozgan from September to February in the academic year of 2022-2023. They were individuals aged between 17 and 18 majoring in mathematics. The intervention group was taught quoted and reported speech using audio files, PowerPoint slides, and recorded videos, while the control group received screen-recorded videos. The data was gathered using two 25-item pre-tests and post-tests as instruments. The collected data were analyzed through Statistical Package for Social Science (SPSS) version 20 using independent and paired t-tests.

Results: The Mean±SD of the intervention and control group in the pre-test phase were 87±1.27 and 86±1.19, respectively, showing no significant difference between the two groups (P=0.789). The Mean±SD for the control and intervention groups were 89.25±.93 and 97.50±.51, respectively, indicating that the experimental group outperformed the control group in the post-test (P=0.013). Moreover, the Mean of learning scores in the experimental group increased significantly (P=0.000), while no significant changes were observed in the control group (P=0.091).

Conclusion: The findings indicate that incorporating video lectures can enhance students' ability to learn, create an engaging atmosphere, prevent their boredom and disruptions, and ultimately transform an ordinary virtual class into a dynamic and collaborative experience.

Keywords: Grammar, Learning, Reported Speech, Teaching, Education, Distance, Visual Interaction

Introduction

Foreign language teaching is an intricate, multifaceted, and dynamic process that relies on various instructional context characteristics (1). Over the last few years, specifically during the COVID-19 pandemic, when the world struggled to survive, many aspects of people's lives have been affected. One of these aspects is language education, the way interaction enhances English Foreign Language (EFL) learners' comprehension, and the distinctive interactional patterns dominating EFL contexts (2). Before the pandemic, there were fewer online classrooms, and most of the world focused on holding in-person classes in education departments. However, the virus outbreak urged all countries to continue their educational programs virtually (3). Accordingly, many sudden changes had to be made in a few months in the fields of educational goals and programs, ways of conducting classrooms, presentation platforms, teaching methods, procedures of evaluating learners, and class management. In this situation, students were required to remain at home following classes without the physical presence of teachers. It was still possible for them to ask questions and share their ideas via online interaction, but it was different from traditional in-person classes (4, 5).

Human-human interaction (teacher-student and student-student) will help the teaching-learning process to run smoothly. When this interaction takes place, the teaching-learning process becomes balanced between two sides of that process (the teacher and the learner). Not only will the teacher be active in this communication, but also the students will actively participate in the teaching-learning process (6). As the interaction is meaning-based and is performed to facilitate information sharing and prevent communication breakdowns, it is the basis of Foreign/Second Language learning (F/L2), through which learners improve both their social and communication skills and construct their identities through collaboration and negotiation (7). Online

teaching lacks human-to-human interaction since the teacher is the only active participant (8). On the other hand, online learning has become a common practice in schools and universities, with students worldwide taking virtual courses as part of their education. Despite the growing popularity of e-learning and distance education, online courses still suffer from high dropout rates (9). Moreover, it is often criticized for its lack of interactivity (10). Interactive content in an online learning environment, powered by technology, presents an exciting opportunity to enrich students' learning experience. Given that visual information prevails online, designing visual learning methods that facilitate interactivity is essential for successful online learning (11). However, it's worth noting that some students have a positive attitude towards increased interaction in face-to-face learning (12).

Previous research has shown that interactivity is crucial for the effectiveness of online learning. The studies have highlighted that interactivity is a fundamental aspect of online education, playing a significant role in both attracting and retaining students for online courses (13-15). Interactive online tools allow teachers to better communicate with students and improve their online learning experience. While visual interaction techniques are often employed to compensate for the loss of face-to-face interaction in a traditional educational setting (16), this study focused on human-computer interactivity in a computer-mediated learning environment to investigate the learner-content interactivity that addresses the learning-specific online content, such as the teacher's eye gaze, activities and instructions to understand their impacts on learners in grammar learning. Interactive slides allow educators to transform their current resources into a fresh and captivating learning mode, enhancing dynamics and engagement (17, 18).

Learning languages through interaction is a pedagogical focus as interaction provides teachers and learners with strategies for facilitating comprehension, formal accuracy, academic achievement, and literacy

development (19). In recent years, researchers have conducted various studies on visual interaction. They examined the effects of adding voice/visual interaction to online classes to engage and motivate students. Based on three andragogy, intentional/self-regulated learning, and engagement theories, they found that students are as engaged in synchronous activities as in asynchronous ones when the facilities and opportunities for learning are provided to the students (20, 21). Other experts reported that students were more willing to learn and excelled when there was more interaction in online classes (22, 23).

Some studies discovered that students' lack of engagement in higher education can be attributed to various factors, including the absence of handouts when using online lecture notes and PowerPoint presentations (24-31). Moreover, studies on various types of classroom interactions show that visual interaction in online classes can have a positive impact on classroom atmosphere and engagement. It can make the context clearer and easier for students to understand (20, 32-38). There have been well-designed studies on virtual instruction, but there is not enough research comparing the effects of visual interaction and screen-recorded methods on grammar learning, especially reported speech clauses in virtual instruction. In order to bridge this gap, we compared the visual interaction theory, specifically recorded videos showing the teachers' gaze, voice, and activities, with a screen-recorded approach to study their impact on students' grammar learning. This expands the scope of interactivity from human-human interaction to human-computer interaction in an online learning environment. The main objective was to evaluate senior high school students' online learning experience and to clarify the educational effectiveness of these approaches in enhancing grammar learning.

Methods
Study Design and Setting

This interventional study was conducted to compare the educational intervention effectiveness of visual interaction and screen-recorded approaches on grammar learning of teenage EFL students. It involved conducting pre- and post-tests and presenting the phases of the materials to both the intervention and control groups in Hormozgan from September to February in the academic year of 2022-2023.

Participants and Sampling

The study's statistical population included all 12th-grade male high school students in Hormozgan who were 17 to 18 years old and studying mathematics during the academic year of 2022-2023 in Shahid Akhondi high school. The students who voluntarily completed the informed consent were included in the study. Failing to respond to more than 20% of the questions in the pre-test, lacking the ability to comprehend, communicate verbally, or express in writing, and declining to provide informed consent resulted in exclusion from the study. Before participating in the research process, students were given all the information they needed to know. Moreover, the students were convinced that neither the test nor its results would impact their educational path and academic performance.

After the homogenizing process, a simple random sampling technique was used to choose a sample size of 40 students for the study. Participants were divided into two control and interventional groups, including 20 students (Figure 1). The sample size was determined using G*Power software, considering an effect size of 0.47, a test power of 0.95, and a significance level of 0.05 (39). The random allocation was carried out at the beginning of the second phase.

Tools/Instruments

The data collection tools were two 25-item research-made tests on grammar knowledge. The pre-test was employed to determine the participants' English grammar ability and their levels of English grammar. It was administered in the first session to homogenize the students. The questions were on different topics, and the sum of the scores was 100.
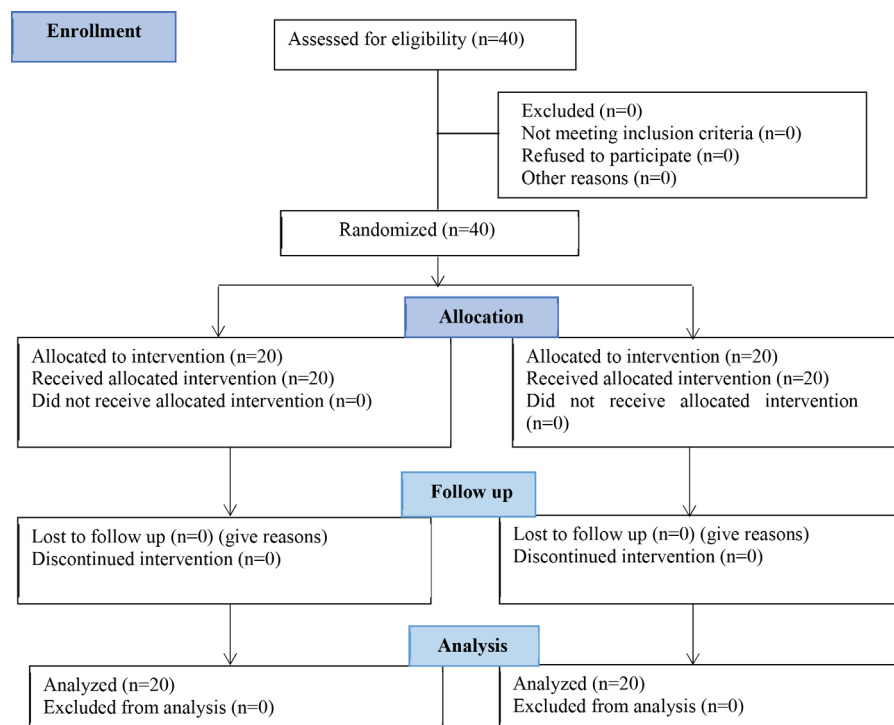
Figure 1: The CONSORT diagram showing the flow of participants

Validity and Reliability: This instrument enjoyed a reliability of 0.84 (using Cronbach's alpha coefficient); the Content Validity Ratio (CVR) and Content Validity Index (CVI) of this test were 0.83 and 0.81, respectively, as estimated by the researchers. The post-test employed to assess the impact of visual interaction was on the quoted and reported speech; its sum of scores includes 100. The face validity of pre-and post-tests was confirmed by the expert's opinion. The reliability of the whole test was calculated using Cronbach's alpha as 0.85. Both the pre- and post-tests have the same instructor, exercises, instruction, and test time.

Data Collection

To explore the effectiveness of visual interaction and screen-recorded methods on learners' grammar learning, the research data was collected in three major phases, including pre-test, intervention, and post-test, from September to February in the academic year of 2022-2023.

Pre-test: The pre-test of the study was taken from Efeotor (40) to assess students' proficiency in English grammar. The test consisted of 25 multiple-choice grammar questions, ranging from easy to difficult. Students were not required to study a specific topic, as the questions covered various grammar topics. The total score of the test was 100 points (4 points for each question). All participants took the test in their school's examination hall. The time limit for answering the questions was 20 minutes. The examination conditions, such as incidence of light, hall temperature, and quality of the chairs, were the same for all students.

Intervention: The materials used to investigate the effect of visual interaction and screen-recorded methods on students' grammar learning were two lectures on quoted and reported speech taken from "Understanding and Using English Grammar" (41). Although both lectures had the same content, they had some differences. One of them was a video lecture in which the instructor explained the content and used gestures to help the students understand better. The gestures included pointing, clapping, gestural definition, and gaze guidance (looking at materials while teaching). Unlike the first method, the second one involved a screen-recorded video of PowerPoint slides, where students only had to listen to the instructor's voice explaining the content. The instructor

used the same intonation, description, and explanations in both lectures and did not try to give any hints to the students. Both groups of control and interventional students attended six 75-minute sessions twice a week. The participants in the experimental group were required to watch a 45-minute video lecture using gaze guidance, pointing, clapping, and gestural definition after doing a pretest for 10 minutes. In the conventional method, the students watched a screen-recorded video of 18 PowerPoint slides for the same duration. The second research phase occurred a week later and included the post-test, which lasted approximately 20 minutes.

Post-Test: The post-test was also adapted from "Understanding and Using English Grammar" (41). The subject was the quoted and reported speech that contained four sections, each with a different number of questions. The total number of post-test questions was 25. Sections 1 and 4 were fill-in-the-blank questions. The 2nd and 3rd parts of the exam were short answer questions. The questions for all participants were the same, and everyone answered the questions under the same conditions in 20 minutes. Before the test, the students received all the information they needed to answer the questions.

Data Analysis

To obtain the results of the tests, we used an independent t-test to compare the means of two groups to determine whether the interventions of video lecture and screen-recorded slides actually have an effect on the population of interest. Paired t-test was employed for comparing the means of pre and post-test scores of both interventional and control groups. Moreover, we used independent t-test to compare the sample means scores (of pre and post-tests) between interventional and control groups. To conduct these tests, we employed SPSS version 20.

Ethics: The research carried out in accordance with ethical guidelines and approved by the ethics committee of Farhangian University. Participation in the study was completely voluntary and required informed consent. Besides, Participants were assured that all collected information would remain confidential. After the study, both groups stand to gain from the learning methodologies of the other group.

Results

The participants included 40 high school male students of 12th graders majoring in mathematics aged between 17 and 18 years old. Table 1 shows the descriptive indicators of year, gender, age, and field status variables.

The intervention and control groups' Mean±SD ages were 17.5±1.39 and 17.2±1.79 years, respectively, with no statistically significant difference between the two groups (P=0.16). Running the independent samples t-test for the pretest scores of two control and interventional groups demonstrates that there is no statistically significant difference in the scores of the control group (86±1.19) and intervention group (87±1.27) in their grammar knowledge (P=0.789). This finding indicates that the students in both groups were homogenous in terms of their performance on the grammar comprehension test and there is no significant difference statistically between these two groups.

The intervention group received visual interaction, while the control group received the screen-recorded videos. All participants who were randomly assigned have completed the study and the follow-up evaluation successfully. Prior to the intervention, there were no significant differences between the visual interaction and screen-recorded video classrooms (P=0.789), as shown in Table 2.

However, after the intervention, paired t-tests were conducted to compare the mean scores of the pre and post-tests for each group. The statement asserts that based on Table 2, both groups have experienced an increase in post-test scores, but this increase is not significant in the control group (P=0.091), whereas it is meaningful in the intervention group (P<0.001). This suggests that the intervention (Visual interaction) has a positive impact on the participants in the intervention group. (Table 2, Figure 1).

Table 1: Demographic information of the participants

Variables	Grouping	Frequency			
		Control		Intervention	
		No	Percentage	No	Percentage
Year/ Grade	12	20	100	20	100
Age	17	5	25	3	15
	18	15	75	17	85
Gender	Male	20	100	20	100
Field	Mathematics	20	100	20	100

Table 2: Comparison of the grammar comprehension scores in intervention and control groups

Groups	Pretest	Post-test	P-value
	Mean±SD	Mean±SD	Between–group
Screen-recorded (Control group)	86±1.19	89.25±0.93	0.091
Visual interaction (Intervention)	87±1.27	97.50±0.51	<0.001
P-value (Within-group)	0.789	0.013	---

SD: Standard Deviation

The results indicated that the level of learning scores significantly increased in the visual interaction group (97.50±0.51, P<0.001) compared to the control group or the group who received the screen-recorded video (89.25±0.93, P=0.091) (Table 2).

Furthermore, a statistical analysis using an independent samples t-test was performed to assess the grammar comprehension scores in the post-test following the teaching sessions for both the control and intervention groups. The analysis revealed a significant increase in the post-test scores of the intervention group (97.50±0.51) compared to the control group (89.25±0.93) with a p-value of 0.013. This outcome indicates that the intervention has a substantial effect on enhancing the post-test scores of the intervention group (Table 2).

According to Figure 2, both the visual interaction and screen-recorded groups exhibit an increase in their mean scores of grammar comprehension. However, the visual interaction group demonstrates a notably higher average increase in learning of quoted and reported speech compared to the screen-recorded group.

Discussion

This study investigated the effects of visual interaction on students' grammar learning
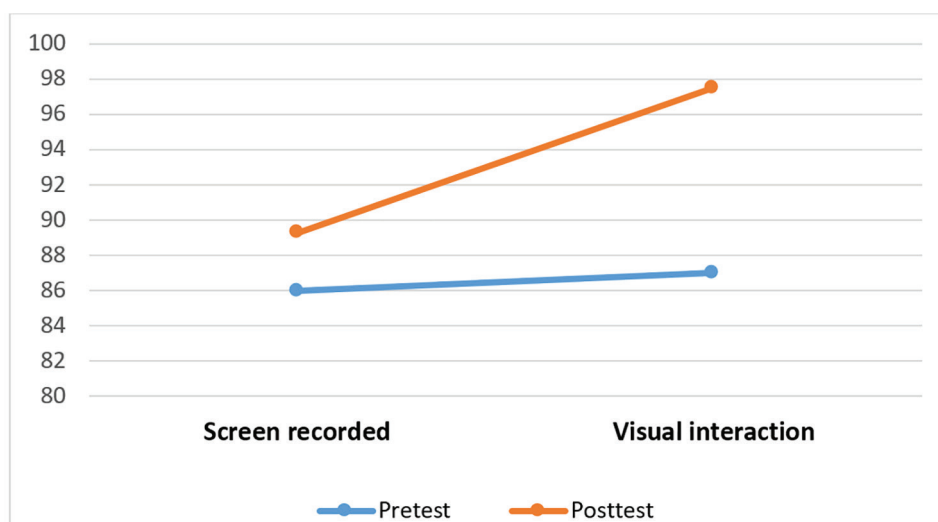
Figure 2: Schematic view of pre-test and post-test grammar ability scores in control and intervention groups

in virtual classes. The results showed that students in the interventional group receiving visual instruction outperformed the learners of the control group receiving the screen-recorded videos. The findings of this study align with prior research indicating that employing visual interactive tools improves students' grammar learning by enhancing their engagement and focusing on the virtual task (14, 35, 36).

Moreover, visual interactions are useful for strengthening and motivating students' learning processes (33). Visual interaction enhances students' academic performance due to the teacher's captivating gaze and body language focusing on educational materials. Besides, incorporating video lectures for visual interaction enhances students' learning capabilities, fosters an interactive atmosphere, and prevents boredom and frequent disruptions. This outcome aligns with previous studies that explore the impact of the instructor's gaze and body orientation on students, affirming that virtual interaction can transform an uninspiring online class into a dynamic and collaborative one (21, 28, 32, 37).

Utilizing visual interactions, such as using a webcam, creating a PowerPoint slide with audio narration, and recording videos during teaching, has proven to be effective in enhancing student engagement and understanding of reported speech clauses. These results are consistent with the research revealing that students performed better in voice-over presentations due to the combined presence of teachers and their gaze guidance, which creates an active learning environment (36).

In intervention groups, the number of students answering the questions in class was more than in the control group. This confirmed that interventional students understood what the teacher had taught them, while the students of the control group had difficulties understanding the materials. Therefore, using pictures, guessing games, and pantomime (if a webcam is available) can help teachers teach the materials as clearly as they can. Additionally, the students in the control group were more bored, often requesting short

breaks during class. Staring at the screen, listening to the teacher, and being inactive for extended periods can be dull and exhausting for the students. Therefore, using video clips, games, and discussions engages the students in the learning process and makes them more active. This finding aligns with the results of other studies (17, 18).

Another aspect was the place or platform for holding classes. Physical classes could be held at schools and institutes. Students could sit in their own classes and listen to the teacher's instructions. More importantly, they could play games together and do group activities. But, virtual classes had to be held on online platforms like Adobe Connect, Skype, Google Meet, and Zoom. Hence, students did not have the chance to play games in their groups; they just had to listen to their teachers' instructions. So, students would get bored during the classes, and this made it hard to follow the instructions in online classes (30, 31)

Virtual and physical classes were different in the methodology of teaching. In physical classes, choosing a method that matches students' proficiency was almost easy. Teachers evaluate their students, identify their strengths and weaknesses, and when they have discovered learners' level of proficiency, then they would choose the best method for implementation. Teachers could use games, group tasks, individual tasks, discussions, and drills. In contrast, choosing a method in virtual classes was really hard for teachers. They could present the materials by using PowerPoint slides. Although, they could still play videos, and hold discussions, it was not enough and these activities could not help the teachers in communicating with their students. Types of interactions were also different in these two situations. In physical classes, teachers and students had physical interactions like body language, eye contact, games, and physical responses like pointing; they all could help the students better understand the context. On the other hand, in virtual classes, the interaction was visual, totally different from the physical

interaction. These results correlate with the research conducted by Pirrone and colleagues on the influence of technology on students' metacognition (12).

Limitations and Suggestions

The study was narrowed down to a single city (Hormozgan) and one secondary school, with only senior students participating. For future studies, it is recommended that the studies of these types test a larger number of participants so that the findings can be generalized. Working with different types of schools in different locations also leads to more valid and reliable results. The findings from the present study have theoretical and practical implications. In theory, access to the instructor's presence and gaze behavior provides learning benefits. First, improved social connection through direct gaze promotes student engagement and motivation by facilitating prosocial behavior. Second, the shared attention draws students' attention to relevant information that has been or will be drawn on the board through gaze guidance cues, which would support classroom practice according to the signaling principles of multimedia learning (32). In practice, the instructors' gaze behavior guides and directs students' attention to when and where it is most helpful, which can also explicitly tell students where and when to look for information (21).

Conclusion

This study examines the effect of visual interaction on EFL students' grammar learning in online courses. In other words, gestures and gaze guidance were employed in teaching reported and quoted sentences to identify their potential impact on students' learning. Data analysis showed that learners who received visual interaction performed better than students who listened to screen-recorded videos of PowerPoint slides. Given the challenges of holding in-person classes, particularly during times such as the COVID-19 pandemic, it is essential to leverage technology for virtual learning. Online classes can be facilitated more effectively for teachers and provide better learning opportunities for students with the use of various tools. Using visual interaction (gaze guidance, body gestures, video clips, PowerPoint slides, and webcam) to deliver online courses in the classroom improves EFL learners' grammar knowledge by drawing students' attention to the materials that the teachers or trainers are teaching. In addition, these techniques help them focus and learn more easily. Also, the visual interaction prevents students from getting bored and distracted during the online course and helps them focus their attention on the materials taught. The findings show students' interaction during the lesson makes them more active. Moreover, video lectures give students a sense of social presence, which leads them to learn better and feel more comfortable listening to the teacher.

Authors' Contribution

MG revised the manuscript, performed the statistical analysis, and interpreted the data, while SJS developed the original idea, wrote the manuscript, and collected the data. Both authors read and approved the final manuscript.

Conflict of Interest

The authors have no conflict of interest.

Ethical Considerations

The study was conducted in accordance with the ethical guidelines and approved by the ethics committee of Farhangian University (Approval Number: 52200/1759/100). Before the commencement of the study, all participants were provided with comprehensive information regarding the research objectives. Participation in the study was entirely voluntary and based on informed consent. We also assured them

that all collected information would remain confidential. After the study, both groups stand to gain from the learning methodologies of the other group. Data collection and analysis were conducted with strict confidentiality and anonymity, ensuring the privacy and protection of all participants involved.

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Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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