

A Teacher-Mediated Smartboard Intervention Foreign Language for Beginners Oral Skills

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Abstract - There are serious deficiencies in structured oral practice among exam-focused novice foreign language classes, leading to issues of pronunciation and dialogic proficiency among the learners. This paper, therefore, seeks to explore an application developed specifically for this context by teachers that uses smartboards. The application is based on a closed-loop learning system that allows for curation of syllabus-aligned words, phrases, and sentences, with model pronunciation, learner recordings, automatic assessment of pronunciation accuracy, and downloadable learner analysis. Using a quantitative and qualitative quasi-experimental research design that uses pre-tests and post-tests, this research study explored a non-probability sample of twelve second-year pre-university students studying a foreign language (specifically evaluated using the foreign language at the CEFR A1 beginner level) in Bangalore, India. Quantitative data was collected using application monitoring and oral tests, while qualitative data was gathered via reflections by students and observations by teachers. Paired samples t-test analysis revealed significant differences in all of the oral proficiency variables tested. Pronunciation accuracy increased by 32.6 percentage points ($p < .001$, $d = 2.71$), sentence fluency rose by 27.5 percentage points ($p < .001$, $d = 2.41$), and dialogue response accuracy increased by 30.7 percentage points ($p < .001$, $d = 2.57$). Analysis of the downloading process has shown that the reduction in the number of attempts was accompanied by a decrease in the variation in recordings within each group, which helped prove phonological automatization. Qualitatively, thematic analysis demonstrated the learners' increased confidence, reduced speaking anxiety, and higher involvement in the activities conducted in class. Thus, the proposed intervention proves the efficiency of using iterative practice and automated feedback with the mediation of teachers guided by analytics in order to develop elementary oral skills. Rather than replacing teachers with technology, the smartboard application can become an instrument for improving teacher performance. This approach could possibly become replicable anywhere in the world.

Keywords: Computer-Assisted Language Learning (CALL), Pronunciation Learning, Smartboard Pedagogy, Teacher Mediation, Oral Skills Development, Learning Analytics, Feedback-Driven Practice

I. INTRODUCTION

Integration of technology in language classrooms has come a long way in the last two decades, but empirical studies have continuously shown that effective learning occurs best when there is an integration of digital media in appropriate pedagogical designs that are mediated by teachers (Schmitz-Hübsch et al., 2025). Tool-driven methods that put more emphasis on technological innovations over educational objectives often produce momentary engagement, but not consistent learning in terms of fundamental linguistic competencies, like pronunciation and oral fluency. To make sure that technological innovations serve their educational purpose, they must be incorporated into pedagogical practice as amplifiers of teaching.

Developing proficiency with oral skills at an introductory level continues to be problematic for instructional designers. Good pronunciation, phonological skills, and speaking ability are important foundational elements for future success in communication (Peterson et al., 2016). In spite of this, oral skills are neglected in classrooms due to the high levels of centralization and examination-oriented nature of the education system. Due to time constraints and stringent requirements in the curriculum, coupled with traditional assessment methods that favor reading, pronunciation is usually overlooked because of the lack of opportunities for students to practice in this area. CALL literature shows that digital learning tools can help to develop good pronunciation through listening practice and monitoring Tavakoli, (2026). But the effectiveness of these digital learning tools largely relies on the teacher's ability to exercise complete control over the content, orchestrate lesson sequencing, and directly guide student interactions.

There are two distinct areas of gaps in the extant literature concerning digital speech training for language development. First, language teaching in non-Western schools does not seem to have received adequate attention despite the presence

of difficulties, including large classes, examination-based instruction, and a lack of resources. The majority of the research conducted under CALL emphasizes learning among adults in Western higher educational institutions. Secondly, there is an absence of comprehensive research using the smartboard system incorporating aspects of teacher-designed content modification, voice recording by individual learners, immediate automatic feedback, and downloadable analytics. Thus, there is insufficient empirical data on oral language development in this comprehensive educational setting, limited Sakakini & Sheet, (2019).

This study directly addresses both these gaps by studying the use of a smartboard application that is developed specifically to aid beginners learning a foreign language at a pre-university college, privately operated, in Bangalore, India. Using a closed-loop learning system, the study examines how the collective smartboard hardware aids an integration between individual practice and classroom mediation.

Unique Contributions

This paper offers three distinct contributions to the field of educational technology and second language acquisition:

- Provides empirical evidence on smartboard-assisted pronunciation learning among secondary school students in a South Asian, exam-oriented educational context.
- Develops a unified system combining classroom instruction, student voice recording, automated feedback, and learning analytics.
- Demonstrates how learning analytics support teachers in identifying and addressing pronunciation difficulties through data-driven interventions.

The paper is divided into different sections. Section II deals with the literature review related to CALL pronunciation learning, teacher mediation, and learning analytics. Section III gives an overview of the methodology followed and the smartboard system design. Section IV includes quantitative and qualitative results. Section V highlights results and theoretical implications. Section VI concludes with limitations and future work.

II. LITERATURE REVIEW

CALL and L2 Pronunciation Development

Pronunciation acquisition relies heavily on the ability of learners to correctly perceive the sounds before being able to pronounce them, which makes listening an important prerequisite to speaking. CALL provides an effective tool for such acquisition through constant exposure to authentic sound input and unlimited listening practice outside the confines of traditional classroom settings (Li, 2023). With repetition of listening and recording sessions as well as feedback on errors made, it is possible for learners to gradually enhance their pronunciation skills. Self-monitoring

further facilitates pronunciation learning because it enables students to compare their pronunciation with the model's and identify discrepancies Abrami et al., (2013). Additionally, automated feedback, even when imprecise, promotes learning through corrective behavior and continued development, but studies have mainly focused on adults and not much on educational settings within schools (Benaissa et al., 2025). With the advancement of virtual realities that include metaverse-based learning environments, it is clear how interactive technology can be helpful in fostering motivation and autonomy in learning language activities (Çelik & Ersanlı, 2025).

Teacher Mediation and Pedagogically Informed CALL

Gains in learning through technology-based language learning can be achieved through the proper integration of technological tools together with the appropriate pedagogy, not by the use of technology per se (Lai, 2026; Cabrera-Solano et al., 2026). It is important for teachers to ensure that the technological tools used correlate with the educational objectives, learner needs, and language levels to achieve better results compared to simply using general-purpose tools. This will allow for the proper exploitation of the learners' linguistic abilities through multilingual learning environments that facilitate language development and participation (Cenoz & Gorter, 2020). The use of Smartboards has been found to be especially advantageous for pronunciation instruction because of their combination of visual, audio, and interactive features that increase motivation, decrease cognitive overload, and help students retain information (Ozer & Kılıç, 2018). Instructional scaffolding using appropriate adjustment in task difficulty and frequency of practice increases student confidence and participation and decreases speech anxiety (Van Batenburg et al., 2019). Emotional/affective factors are important in the development of oral skills, and an appropriate technology-assisted learning environment is helpful in increasing learner motivation and communication willingness (DaSilva Iddings et al., 2022).

Learning Analytics and Closed-Loop Feedback

The use of analytics in Computer-Assisted Language Learning (CALL) has become an effective tool, as it allows for the systematic collection and analysis of data from learners' interactions, thus providing useful insights into making appropriate decisions in order to improve instruction and help learners succeed (Siemens & Baker, 2012; Chen et al., 2026). Analytics can be especially beneficial in pronunciation training, as oral language proficiency is hard to track and assess in a conventional classroom setting. Automatic tracking of pronunciation attempts and progress allows for gathering relevant data and offering timely assistance to learners, which helps improve intelligibility and speaking skills (Kafipour & Khoshnood, 2023). Learning analytics can be used for diagnostic purposes, too, where problems are detected in pronunciation and then addressed through proper guidance on pronunciation improvement. Closed-loop feedback systems rely on learning performance

data in order to plan future activities, thereby fostering intentional learning, error reflection, and gradual improvement of pronunciation proficiency Song et al., (2024). Iterative feedback-based learning models underscore the necessity of incorporating performance data into learning processes in order to foster learner agency in this process (Hossain, 2026). Moreover, learning performance reports allow teachers to detect learners' difficulties and tailor their learning approach accordingly Sunarya et al., (2025).

Research gap

While these developments have been made, the literature has also pointed out that a large number of CALL programs make inadequate use of analytics or provide information in a manner that is not accessible to teachers. Commercial CALL software often focuses on the test scores that learners receive at the end of the program and ignores reporting for teachers. There is, therefore, a call for the development of analytics systems that are clear, downloadable, and pedagogically relevant. Following this call, studies have recently recommended the incorporation of analytics into a pedagogical cycle, which will include diagnostic assessments, learner practice, and instructional improvement. This will ensure that the learning is not simply performance-driven, but sustainable as well. The current study takes off from here by integrating the analytics tool into a smartboard-based CALL system mediated by teachers in order to create a closed-loop learning system. Although previous studies have demonstrated the effectiveness of technology-assisted pronunciation instruction, most

investigations have focused on adult learners in higher education settings. Furthermore, relatively few studies have integrated teacher mediation, smartboard technology, automated feedback, and learning analytics within a unified instructional framework. These limitations highlight the need for classroom-based research in school-level foreign language education contexts.

III. METHODOLOGY

Research Design

This study employed a pre-test and post-test design was used in this research together with a mixed methods design. Quantitative data focused on measuring improvements in pronunciation accuracy and oral proficiency. Qualitative data collected from the perspective of learners and instructors offered contextual knowledge regarding the process of learning through the technology tool being tested. Five stages characterized the closed-loop cycle of the intervention, including model audio/video exposure, guided oral practice, audio/video recording by learners, automated pronunciation feedback, and feedback-driven re-attempt. This type of design is consistent with theoretical frameworks on skill acquisition, which stress repetition, feedback, and correction as vital processes in second language oral skill development. This design allowed for learning analytics as well as incorporating technology in data-driven teaching practices, as suggested in modern CALL research recommendations for integrating pedagogical and technological perspectives in classroom-based language learning.

Conceptual Framework

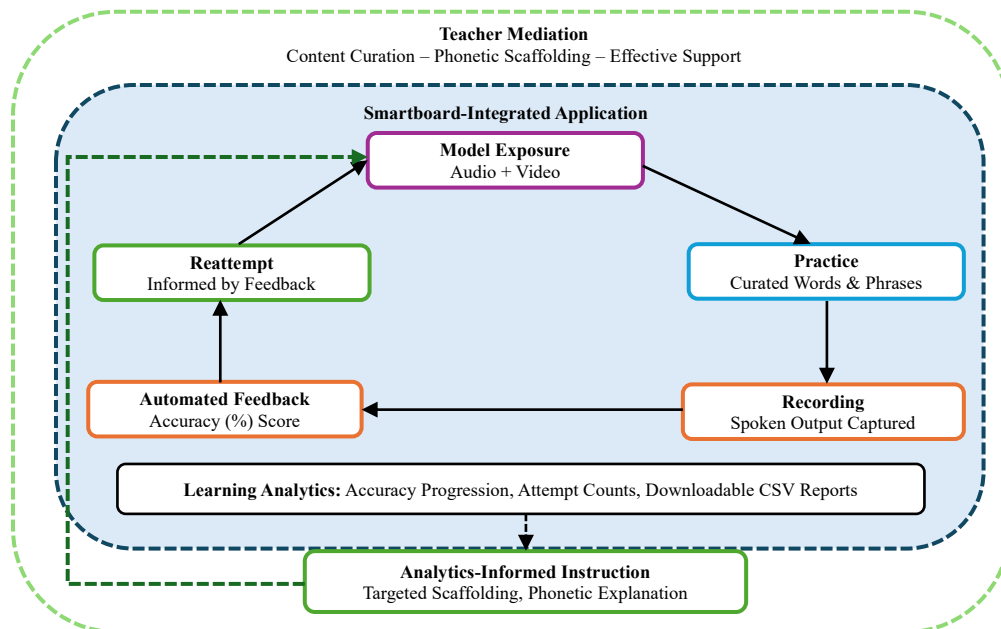


Fig. 1 Closed-Loop Learning Architecture for Teacher-Mediated Smartboard CALL

In fig. 1 displays the theoretical framework that forms the foundation of the intervention. Exposure, guided practice, learner documentation, automatic feedback, and re-attempting are five cycles in a smartboard application layer. Analytic feedback obtained from each cycle becomes part of the analytics-driven teacher's decision-making process, which in turn gets fed back into the cycle in the form of scaffolding. The whole process is enveloped by a teacher-mediated outer layer to ensure that the teacher is the core pedagogical agent rather than a peripheral facilitator.

Context and Participants

The study was carried out at a private pre-university college in Bangalore, India, where a foreign language is taught as an additional language besides English. Teaching of the foreign language tends to be test-oriented and does not include much scope for organized activities like speaking, which leads to poor pronunciation skills among students. The experiment was carried out in a smart board-assisted environment, which helped with activities related to collective listening, speaking, and feedback and allowed the instructor to provide necessary guidance in controlling classroom processes. There were 12 students in second-year pre-university (N = 12) who were 16 to 18 years old and at the CEFR A1 level. They were second-year pre-university students who had completed one year of foundational foreign language instruction, yet they displayed limited initial proficiency in oral production and pronunciation. The convenience sampling method was adopted by considering a complete group. English was used as the support language in giving instructions and

translations. All ethical considerations, including the Institutional Review Board's permission, were fulfilled. The study received approval from the pre-university. Written consent was obtained from participants and relevant institutional authorities prior to data collection.

Intervention Tool

Smartboard-Integrated Learning Application

This particular intervention made use of a specially designed smartboard app that had two different modules, which can be seen in fig. 2 below. Module one, which is the pronunciation and vocabulary practice module, is essential in the assessment process since the content revolves around vocabulary, words, and sentences from the foreign language curriculum. In this module, the learner was required to hear the pronunciation and record his/her voice before repeating the exercise. The percentage accuracy in pronouncing the words was automatically calculated along with other results, such as the attempt number and the time stamp. The above results were analyzed in both the pre-test and post-test assessments. The second module used, which was titled 'Video Conversational Learning,' was structured to give students exposure and practice in conversation through video clips and English subtitles. The students watched and recorded themselves practicing conversations from the videos. Unlike Module 1, Module 2 was not evaluated using any analytical score but was meant purely for practice purposes rather than formal assessment.

The screenshot displays the 'French Learning Smartboard — Phoneme Pronunciation Checker + Analytics' interface. It is divided into several functional modules:

- English → French Translator:** Features a text input field with 'how are you', 'Translate' and 'Clear' buttons, a 'French Output' field showing 'comment ça va', and a 'Speak Translation' button. A note at the bottom states: 'Translation uses a built-in dictionary sample. Expand dictionary in code for more coverage.'
- Pronunciation Checker — Phoneme Level (Approx.):** Includes a 'Target French' input field with 'j'ai un frère', 'Play Target' and 'Reset' buttons, a 'Record & Check' button, and an 'Attempts: 0' counter. A small note explains the checker compares phoneme strings via a local mapping.
- French Text-to-Speech & Random Practice:** Offers 'Manual Entry' and 'Random (French)' tabs. Below the 'Random' tab, it says 'Generate random French word or sentence (English meaning shown below):' and includes 'Generate', 'Word only', and 'Sentence only' buttons. It shows a French phrase 'j'ai un frère' and its English meaning 'I have a brother'.
- Analytics & Logging (Module 4):** Contains a form for 'Enter student name or ID (required)' and a 'Practice' dropdown. It also has a 'Session tag (optional, e.g., pre1)' field and a 'Clear Local Logs' button. Below this, there are four summary boxes: 'Local Attempts' (0), 'Last Logged' (—), 'Class Mean (post)' (—), and 'Paired t stats' (Run stats to compute).

Fig. 2 Smartboard Application – Pronunciation Practice Interface

Pronunciation and Vocabulary Practice Module

The Pronunciation and Vocabulary Practice Module acted as the major part of the instructional and assessment program. This module allowed teachers to generate vocabulary that was aligned with their syllabus, thus providing them with complete control over the process. The students were able to listen to model pronunciations, record themselves, and make a comparison between their pronunciation and the model pronunciation. The system had automatic accuracy scores using percentages and recorded the number of attempts for each question. Information about the performance was available for download in CSV format, making it possible to make data-driven and evidence-based decisions. The module created a closed-loop process of practice, feedback, and improvement.

Automated Pronunciation Scoring Process

For the pronunciation assessment, an automatic speech recognition algorithm was used that compared learner

pronunciation recordings against standard pronunciation recordings stored by the system. The degree of similarity was used to calculate a pronunciation score in percentages. The higher the score, the more similar the learner's pronunciation was to the standard pronunciation. Scores were mainly used for formative assessment purposes.

Introduction Video-Based Conversational Learning Module

Besides the main pronunciation practice module, the application also had a video conversation practice module, which offered contextually based oral input via brief, teacher-selected videos of Foreign language conversation, with subtitles in English. As depicted in fig. 3, learners had the option to replay the video clips and repeat selected dialogue turns, recording their responses. English subtitles helped decrease the cognitive overload for novice learners. This module was created only as a medium of guided practice and was never employed for assessment. Studies show that such a multisensory yet non-threatening environment increases learner engagement and pronunciation skills, and oral confidence.

Watch the Conversation

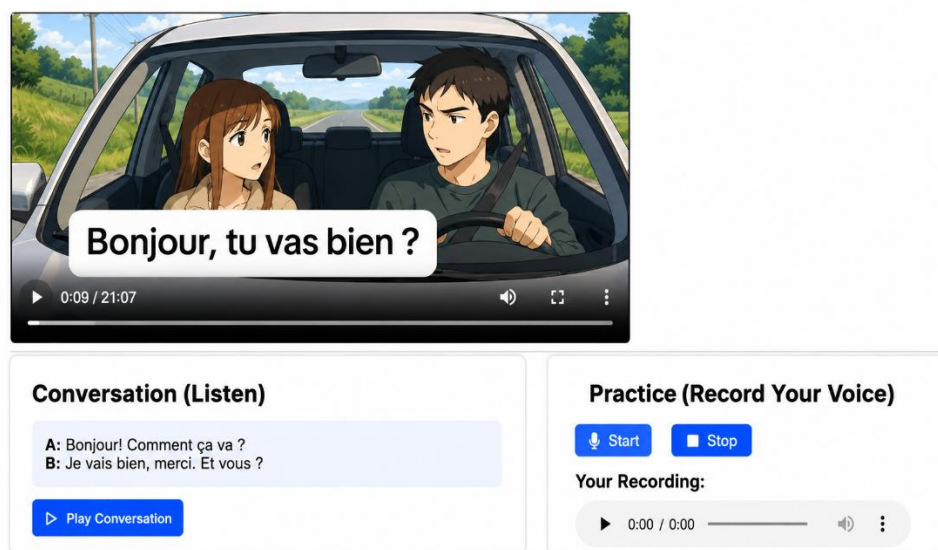


Fig. 3 Video-Based Conversational Practice with Subtitles

Data Collection

A mixed-methods convergent design was used to obtain qualitative and quantitative information by merging quantitative measurements with qualitative information derived from observations in the classroom and participants' responses. The assessment items were constructed according to the objectives outlined in CEFR A1, as well as following the foreign language curriculum. The assessment framework was assessed by knowledgeable language teachers to determine the validity and suitability of the content for beginner-level learners.

Data for the measurement of quantitative variables were obtained via tests that were conducted before and after

completion of the pronunciation and vocabulary practices module. These include the percentage of correct pronunciation, the number of attempts, and the total learner scores. The application would record this information automatically in CSV file formats for the analysis of learning gains and changes in performance.

The qualitative data were gathered from student feedback, teachers' reflections, and observation reports. The following information was gained on the confidence of learners, usability of applications, involvement, improvement in pronunciation, and efficiency of instruction. Combining the quantitative and qualitative results ensured the analysis of the entire process of learning, which is recommended in mixed-methods CALL research. A more detailed account of

these automatic quantitative measures obtained from the learning application can be found in Appendix B.

Data Analysis

Data analysis was conducted in a mixed-methods approach in which both quantitative and qualitative data were individually analyzed before being combined to give an overall picture of the results and processes involved. Such methods have been used widely in previous CALL studies to ensure analytical thoroughness while still acknowledging the complementarity of numeric data and interpretive findings. The structural evaluation metrics, automated tracking indicators, and qualitative reflection protocols utilized in this study are comprehensively detailed in the appendices. Specifically, Appendix A outlines the tiered oral assessment items, Appendix B catalogs the backend application logs, and Appendix C provides the framework for thematic student feedback.

Quantitative Analysis

The quantitative data extracted from the application analysis and pre-test/post-test evaluations were subjected to descriptive and inferential statistical analysis. Descriptive statistical values, such as the mean, standard deviation, and gain score, were computed to show improvements made by the participants in their foreign language pronunciation ability and task performance. A paired samples t-test was

performed to test whether there was a significant difference between the pre-test and post-test scores with the use of an alpha value of 0.05. Furthermore, Cohen's d was calculated to determine the effect size of learning gains, which facilitates the interpretation of the findings in small-sample CALL research.

Qualitative Analysis

Thematic analysis was employed to analyze qualitative data gathered through students' responses, teacher reflections, and observations in class, using the framework. Qualitative data were read several times to familiarize themselves with the information, after which inductive coding was done, whereby repeated patterns associated with the learners' engagement, pronunciation, feedback given, and usability of the application were coded. Code sharing similar ideas was grouped into themes, which represented the common experience of the participants. Triangulation of different sources of data increased the credibility of the study, whereas consistent analyses of themes ensured analytical rigor.

Mixed-Methods Integration

The integration of the findings was conducted through a convergent methodology after analyzing both qualitative and quantitative data. This was done by interpreting the findings from both approaches and comparing them to determine convergence, divergence, and complementarity.

TABLE I PRE-TEST AND POST-TEST ASSESSMENT COMPONENTS USED TO EVALUATE BEGINNER-LEVEL FOREIGN LANGUAGE ORAL SKILLS

Assessment component	Skill focus	Description	Data source
Word pronunciation	Segmental accuracy	Learners pronounced isolated foreign language words drawn from the classroom syllabus	App-based recording
Phrase production	Prosody and stress	Short phrases focusing on rhythm and intonation	App-based recording
Sentence-level speech	Fluency and intelligibility	Simple declarative and interrogative sentences	App-based recording
Dialogue comprehension	Oral understanding	Short dialogue prompts requiring oral response	Teacher-administered
Accuracy score	Pronunciation match (%)	Automated similarity score comparing learner output with the model	App analytics
Attempt count	Practice behavior	Number of recording attempts per item	App analytics

The identical assessment framework was used both before and after the intervention so that the performances could be compared directly, as shown in table I. Changes in oral skills were assessed quantitatively through the measurement of pronunciation accuracy rates and number of attempts, whereas qualitative data indicated the learners' self-confidence, perception of feedback, and readiness to engage in oral practice activities. By combining all types of data, a detailed picture of the learning outcomes and process was obtained. Although statistical analysis revealed the success of the intervention, qualitative research showed the importance of teacher mediation, repeated practice, and reduced anxiety levels in the development of oral skills consistent with contemporary mixed-methods CALL research.

IV. RESULTS

This section provides the results of the analysis that was conducted as part of this research. The results are structured according to the following parameters: initial performance of the learners, their performance following the intervention, and comparison between the two test phases.

Pre-Test Performance

The purpose of the pre-test was to gauge how proficient learners were in using their beginner-level foreign language speaking skills. Findings revealed low pronunciation skills as well as problems delivering a conversation, even though learners had been exposed to the language through writing. Most learners were able to understand some vocabulary but

struggled with phoneme production, stress, and connected speech, usually demonstrating hesitations as well as some influence from the phonology of the English language. Test results prior to the instruction period were low, very diverse among the students, and showed the unequal level of oral proficiency and need for pronunciation training supported by guided practice, repetition, and feedback.

Post-Test Performance

The integration of smartboards into teaching resulted in considerable progress in areas of pronunciation, fluency, and speaking skills of the students. Students demonstrated proper articulation, rhythm, and increased speaking confidence. Some students needed less effort in achieving the desired level of pronunciation accuracy, indicating the development of phonological awareness and automaticity of the process. Post-tests revealed reduced variance in the learners' results compared to pretests, which indicates increased consistency in learners' performance. Thus, this research proved the efficiency of structured training combined with automation and mediation of teachers in developing oral skills and reducing proficiency variance among the learners.

Statistical Quantitative Analysis

The test for the significance of the observed difference between pre-test and post-test scores was carried out using the paired samples t-test as shown in table II. The analysis results showed that there was a significant improvement in pronunciation skills from pre-test to post-test because the post-test score mean was significantly higher compared to the pre-test score mean. The p-value obtained across all metrics was highly significant ($p < .001$), which indicates that the performance increase is extremely unlikely to be due to chance alone. Furthermore, the computed effect size, which is large in value, implies that the practical significance of the intervention on learners' oral foreign language is also great. Significance level and effect sizes provide valuable data when interpreting study results, especially in smaller-scale educational research studies. The normality of the score differences distribution was tested prior to the use of paired-samples t-test analyses. Standard deviation and confidence intervals are provided for a better understanding of the performance improvements among the learners.

TABLE II COMPARISON OF PRE-TEST AND POST-TEST ORAL PRONUNCIATION PERFORMANCE (N=12)

Measure	Pre-Test mean (%)	Post-Test mean (%)	Mean difference	95% CI of difference	t (df = 11)	p value	Effect Size (Cohen's d)
Pronunciation accuracy	46.3	78.9	32.6	24.9 – 40.3	9.41	< .001	2.71
Sentence fluency	48.7	76.2	27.5	20.3 – 34.7	8.36	< .001	2.41
Dialogue response accuracy	44.1	74.8	30.7	23.2 – 38.2	8.89	< .001	2.57

Note: Paired-samples t -tests were conducted to examine differences between pre-test and post-test scores. Confidence intervals (95% CI) indicate the range within which the true mean difference is expected to lie. Effect sizes were calculated using Cohen's d .

These findings constitute strong evidence to prove that the smartboard-based and teacher-led intervention played a significant role in improving the pronunciation skills of the learners. In combination with the learning analytics obtained from the application, such as a lower number of attempts and higher success rates, it confirms the effectiveness of the closed-loop instruction model that integrates exposure, production, feedback, and reattempts.

Learning Analytics Outcome

In addition to the measures of success based on the tests taken, the learning tool collected analytical information

regarding the interaction process for the participants during the intervention phase. Such information gives another perspective on how the pronunciation development process occurred over time at both individual and class levels.

In fig. 4 depicts the gradual development of performance by the learners throughout six training sessions. During the intervention period, there is a gradual improvement in pronunciation attempts because of increasing speech automaticity and motor planning skills. At the same time, there is steady growth in the accuracy of pronunciation. Stabilization of the lines in the latter session underscores decreasing variance in skills development and successful data-driven phonological mastery.

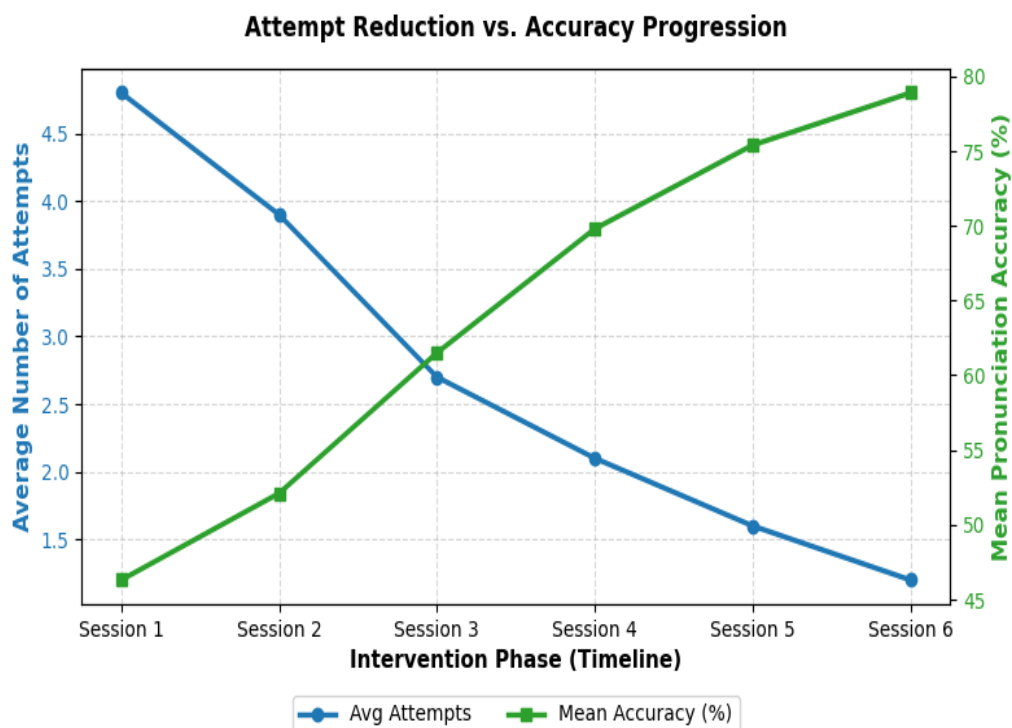


Fig. 4 Closed-Loop Learning Analytics Trajectory

Note: Mean accuracy represents the average pronunciation accuracy score generated by the application. Mean attempts indicate the average number of recording attempts required before achieving satisfactory pronunciation performance.

Attempt Reduction

One interesting trend found in the results of the analytics is that the number of attempts needed by the learners to produce pronunciation with satisfactory accuracy gradually decreased. While initially learners had to make several attempts to reproduce the pronunciation of the model, after each session, the average number of attempts made by the learner for each word gradually diminished. Such a trend shows phonological control as well as increasing confidence in learners. In CALL research, such trends are considered a sign of automatization and improved speech motor planning, particularly in beginner learners.

Accuracy Progression

There were also some steady improvements shown in the learners' pronunciation scores through analytics. The analysis indicated that each individual learner profile recorded gradual progression towards perfection and not rapid growth, thus implying that progress was cumulative and due to constant practice. These have helped prove that there is indeed a correlation between effective pronunciation and exposure/reproduction cycles. Moreover, the scores of the learners improved gradually without significant fluctuations throughout the other class sessions. This indicates that the

learners had already learned significant phonetic information and did not rely on random guessing anymore. This, in particular, shows how crucial a closed-loop feedback cycle can be since there is a direct correlation between all the stages involved: exposure, reproduction, feedback, and re-reproduction are tightly integrated.

Individual and Class-Level Trends

Despite the existence of an apparent improvement throughout, however, the findings obtained in this case showed that there were still differences between the individual learning trajectories of the learners. Although some of the students displayed quick improvements early on in the process, other students required more time to get started. However, those that displayed weaknesses were able to continue improving throughout the experiment, suggesting that the pacing and repetition strategy used managed to overcome any disadvantage. Overall, the trend towards convergence in score ranges is reflective of the lower variance in post-test scores.

Qualitative Findings

Besides the above-mentioned information and analyses, qualitative data were also obtained through student feedback, teacher reflections, and classroom observation. This kind of data provides insight into how the students viewed the intervention and which pedagogical methods influenced its effectiveness.

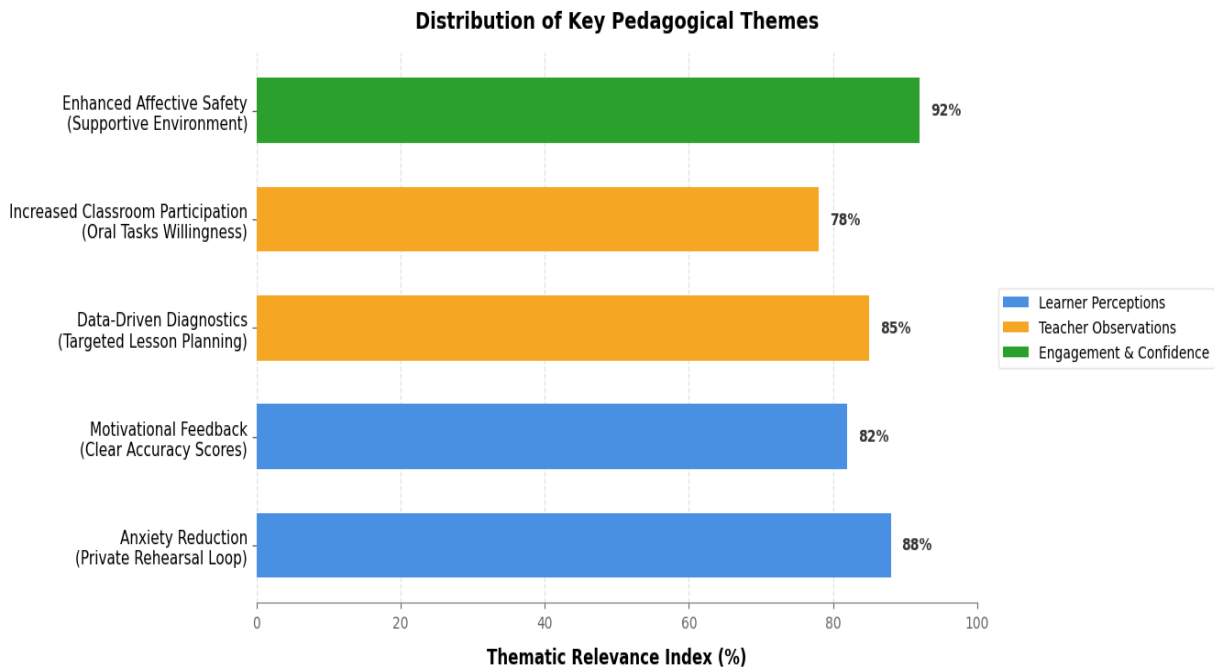


Fig. 5 Qualitative Distribution of Pedagogical Themes

In fig. 5 depicts the relevance of the themes based on the perceptions of the learners, observations made by the teachers, and learner involvement in the class. Theme one entailed enhancing affective safety and accounted for 92%, while theme two entailed eliminating anxiety via private rehearsal cycle and accounted for 88%. The results show that not only were the emotional barriers reduced, but there is also evidence for diagnosis.

Learner Perceptions

The students all agreed that the inclusion of software made pronunciation practices less intimidating and more accessible. The learners mentioned that they became more confident because of the opportunity to listen and record their voices without feeling the pressure of others watching them. It is consistent with research findings indicating that technology-enhanced oral practice can facilitate lowering affective filters because the speed and repetition process were controlled by the learners. In addition, it should be noted that the learners appreciated the explicit nature of feedback received, particularly the percentage score received, which helped them track their progress. Feedback was viewed as a source of encouragement rather than as something threatening and important for promoting self-regulation.

Teacher Observations

As far as the teacher was concerned, the intervention helped her make better-informed teaching decisions. Analytics aided in identifying repetitive pronunciation mistakes and enabled explicit teaching of those pronunciation aspects within classroom interactions. As previous studies have revealed, learning analytics can lead to higher teacher sensitivity and diagnosis abilities in the context of computer-assisted language learning. Another point to mention was that

students had become more motivated to participate in speaking tasks in their future lessons.

Engagement and Confidence

Learner engagement and confidence were recurring themes in both observation and feedback. They were realized via teacher mediation, computer-mediated control, and private practice. This corresponds to studies in language acquisition, which link language acquisition to cognitive processes as well as emotional states such as confidence and security.

V. DISCUSSION

The findings suggest that the smartboard-assisted, teacher-mediated intervention may contribute positively to the development of pronunciation skills and oral proficiency among beginner foreign language learners. Improvements observed in pronunciation accuracy, sentence fluency, and dialogue response performance indicate the potential value of integrating iterative practice, automated feedback, learning analytics, and teacher guidance within a structured instructional framework. However, given the limited sample size and the absence of a control group, these findings should be interpreted as preliminary and exploratory rather than conclusive.

Quantitative and Qualitative Findings

The significant improvement in the scores before and after the test is an indication that the strategy was effective in enhancing the learners' pronunciation skills and conversational abilities. Indeed, this was confirmed by the data gathered from the analytics, since it indicated improved accuracy and fewer attempts. Qualitative data collected showed increased confidence, decreased fear of speaking,

and readiness to repeat themselves, which is important for early language learning. Reflections from teachers indicated that changes made through analytical insights and pronunciation support were instrumental in helping learners make progress. The results, therefore, reveal that using technology, learning analytics, and teacher mediation provided an effective context for developing oral skills.

Pronunciation Gains Through Iterative Practice

One important discovery made from this experiment is the usefulness of iteration in pronunciation practice through recording, playing back, and feedback. The repetition of exposure to the correct pronunciation through modeling, followed by pronunciation by the learner and self-maintenance, increased the importance of the perceptual-production loop in second language speech acquisition. The decrease in attempts necessary to make an accurate pronunciation indicates increasing phonological automatization. Also, the feedback in the application motivated more practice than evaluation, which contributed to continued learning. This shows how important it is to have structured and feedback-led practice when trying to improve pronunciation skills.

Analytics-Driven Closed-Loop Learning

One important aspect of this study is the employment of analytics-driven closed-loop learning, in which the learner's performance information helps in facilitating the process of self-regulation as well as making decisions regarding instruction. This tool generated reports using accuracy levels, numbers of tries, and trends in learner performance in order to facilitate the systematic evaluation of learners' performance. This information would enable the instructor to identify foreign phonetic issues of pronunciation and offer appropriate help. This was consistent with the findings from the literature concerning data-driven teaching. The use of visual feedback tools for students helped motivate and self-regulate themselves owing to the numerical results provided. More importantly, the role of analytics did not undermine the role of teacher judgment in analyzing information and modifying instructions.

Summary of Discussion

In summary, the development of the students' pronunciation skills and their oral abilities has been achieved as a result of the joint effect of practice, feedback, analytical teaching, and teacher mediation. Even though the use of the interactive smartboard program allowed the learners to listen, record, and get feedback, teacher help was indispensable in interpreting the feedback, demonstrating pronunciation, and resolving phonological problems. Feedback consistent with syllabus requirements likewise helped build confidence in students and minimize their anxieties when speaking. This study makes a contribution to CALL research by showing how analytics-enabled and teacher-mediated technology can be used effectively to improve oral language skills among beginning-level students in school settings, providing a

practical model for data-informed and pedagogically grounded foreign language instruction.

Limitations and Future Directions

Even with the promising results, some limitations need to be considered. First, due to the small sample size ($n=12$) and single institution design used, it is difficult for the results obtained to be generalized, and thus the results should only be taken as exploratory. Furthermore, the short intervention period also hinders the generalization of pronunciation learning to spontaneous speaking environments. Moreover, the research was based mainly on English as a supporting language without the systematic inclusion of the languages spoken by the learners in their homes, which might contribute even more to the success of the process. The limitation to only A1-level learners is an additional constraint since it does not enable generalizing results to other proficiency levels to strengthen and extend these findings. The current study used the design of a single-group pre-test/post-test without any control group. This implies that improvement in the performance of the learners cannot be conclusively linked to the intervention alone. Further studies should use the method of a randomized controlled trial or a comparison group design to establish stronger causal relationships.

VI. CONCLUSION

The aim of this study was to investigate whether a teacher-mediated smartboard-assisted instructional program could support novice pre-university students in developing basic oral foreign language skills within an examination-oriented educational context. The findings suggest that when technological applications are pedagogically integrated and aligned with instructional objectives, they may contribute positively to both linguistic and affective aspects of foreign language learning. The analysis showed that statistically significant developments occurred in all essential areas of oral proficiency domains ($N=12$, $df=11$, $p < .001$). Pronunciation Accuracy increased by 32.6% (pre-test: 46.3% to post-test: 78.9%) with a dominant effect size (Cohen's $d = 2.71$). Sentence Fluency advanced by 27.5% ($d = 2.41$), and Dialogue Response Accuracy rose by 30.7% ($d = 2.57$). The strong indicators, coupled with the application analysis indicating an inverse correlation between a continued decline in speech attempts and increased cumulative accuracy levels, indicate fast phonological automatization. The qualitative information indicated reduced affective barriers, decreased anxiety, and increased student confidence through the use of privacy loops within the application. The importance of teacher mediation was affirmed as the system is effective as an educational tool amplifier when teachers can download data logs for phonetic diagnosis. This study provides empirical data for the inadequately studied area of secondary education CALL under conditions of resource-poor centralized assessment. Further research should include larger samples using randomized controlled trials in order to increase generalization potential. Also required is a longitudinal analysis in order to determine long-term effectiveness with

respect to pronunciation recall and oral transfer, as well as translanguaging techniques utilizing native languages alongside digital scaffolding.

Declaration Statement

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This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest regarding the publication of this paper.

Data Availability

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval

This study was conducted in accordance with institutional ethical guidelines. Ethical approval was obtained from the relevant institutional authority prior to data collection. Informed consent was obtained from all participants, and participation was voluntary. The confidentiality and anonymity of participants were maintained throughout the study.

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REFERENCES

- [1] Abrami, P. C., Venkatesh, V., Meyer, E. J., & Wade, C. A. (2013). Using electronic portfolios to foster literacy and self-regulated learning skills in elementary students. *Journal of Educational Psychology*, 105(4), 1188. <https://psycnet.apa.org/doi/10.1037/a0032448>
- [2] Benaissa, M., Attou, Y., Seddik, M., & Nfissi, A. (2025). Can AI-Based Teacher-Bots (T-Bots) Enhance Students' Speaking Skills? A Case Study of "My AI" on Snapchat in Moroccan Higher Education. *Arab World English Journal (AWEJ), Special Issue on CALL*, (11), 144-159. <https://doi.org/10.24093/awej/call11.9>
- [3] Cabrera-Solano, P., Castillo-Cuesta, L., & Ochoa-Cueva, C. (2026). Active Learning and Feedback in EFL Teacher Education Through AI-Supported Flipped Classrooms. *Education Sciences*, 16(6), 827. <https://doi.org/10.3390/educsci16060827>
- [4] Çelik, F., & Ersanlı, C. Y. (2025). Developing and Integrating Metaverse into EFL Listening Skills to Increase Learners' Self-Determination Based on Social Constructivist Theory. *Journal of Computer Assisted Learning*, 41(6), e70151. <https://doi.org/10.1111/jcal.70151>
- [5] Cenoz, J., & Gorter, D. (2020). Pedagogical translanguaging: An introduction. *System*, 92, 102269. <https://doi.org/10.1016/j.system.2020.102269>
- [6] Chen, X., Shu, D., & Barrot, J. S. (2026). Teacher beliefs about e-assessment for learning in English as a foreign language writing: an ecological perspective. *Computer Assisted Language Learning*, 1-32. <https://doi.org/10.1080/09588221.2026.2612993>
- [7] DaSilva Iddings, A., Butler, E., & Flint, T. (2022). Multilingualism, emotion, and affect. *The Cambridge Handbook of Childhood Multilingualism (Cambridge Handbooks in Language and Linguistics, pp. 304-324)*. Cambridge University Press. <https://doi.org/10.1017/9781108669771.017>
- [8] Hossain, M. S. (2026). Empowering Student Agency Through Learner-Centered Design and Feedback-Driven Iteration. In *Empowering Education with Iterative Models and Design Thinking* (pp. 251-290). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3373-7102-3.ch010>
- [9] Kafipour, R., & Khoshnood, A. (2023, February). Effect of feedback through dynamic assessment on EFL field-dependent and field-independent learners' speaking skill development. In *Frontiers in Education* (Vol. 8, p. 1049680). Frontiers Media SA. <https://doi.org/10.3389/educ.2023.1049680>
- [10] Lai, Z. C. C. (2026). AI in EFL blended learning: Impact on speaking performance and learning resilience. *Asian-Pacific Journal of Second and Foreign Language Education*, 11(1), 11. <https://doi.org/10.1186/s40862-025-00367-4>
- [11] Li, R. (2023). Effects of mobile-assisted language learning on EFL learners' listening skill development. *Educational Technology & Society*, 26(2), 36-49. [https://doi.org/10.30191/ETS.202304_26\(2\).0003](https://doi.org/10.30191/ETS.202304_26(2).0003)
- [12] Ozer, O., & Kılıç, F. (2018). The effect of mobile-assisted language learning environment on EFL students' academic achievement, cognitive load and acceptance of mobile learning tools. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(7), 2915-2928. <https://doi.org/10.29333/ejmste/90992>
- [13] Peterson, S. S., McIntyre, L. J., & Forsyth, D. (2016). Supporting young children's oral language and writing development: Teachers' and early childhood educators' goals and practices. *Australasian Journal of Early Childhood*, 41(3), 11-19. <https://doi.org/10.1177/183693911604100303>
- [14] Sakakini, A., & Sheet, M. (2019). Using Smart Boards, Mobile Phones, and Skype to Teach English as a Second/Foreign Language in Lebanon. *International Journal of Science and Research*, 9(7), 1310-1315. <https://doi.org/10.21275/SR20715103939>
- [15] Schmitz-Hübsch, A., Bareiß, L., Jahn, E., & Wirzberger, M. (2025). eduScrum meets focUS: a computer-assisted training to promote self-regulation skills in higher education. *Frontiers in Computer Science*, 7, 1593889. <https://doi.org/10.3389/fcomp.2025.1593889>
- [16] Siemens, G., & Baker, R. S. D. (2012, April). Learning analytics and educational data mining: towards communication and collaboration. In *Proceedings of the 2nd international conference on learning analytics and knowledge* (pp. 252-254). <https://doi.org/10.1145/2330601.2330661>
- [17] Song, C., Shin, S. Y., & Shin, K. S. (2024). Implementing the dynamic feedback-driven learning optimization framework: a machine learning approach to personalize educational pathways. *Applied Sciences*, 14(2), 916. <https://doi.org/10.3390/app14020916>
- [18] Sunarya, P. A., Sunarjo, R. A., Abbas, M., Al-Kamari, O. A., & Maulana, S. (2025). Ai-driven educational data analytics and intelligent tutoring in learning factory environments. *International Transactions on Education Technology (ITEE)*, 4(1), 14-30. <https://doi.org/10.33050/itee.v4i1.950>
- [19] Tavakoli, H. (2026). The Effectiveness of Technology-Mediated Task-Based Language Teaching on the Pronunciation of English Vowels: A Study of Persian-Speaking EFL Learners. *CALICO Journal*, 43(1), 108-144. <https://doi.org/10.3138/calico-2024-0014>
- [20] Van Batenburg, E. S., Oostdam, R. J., Van Gelderen, A. J., Fukkink, R. G., & De Jong, N. H. (2019). Oral interaction in the EFL classroom: The effects of instructional focus and task type on learner affect. *The Modern Language Journal*, 103(1), 308-326. <https://doi.org/10.1111/modl.12545>