https://doi.org/10.5007/2175-8026.2026.e108766

INVESTIGATING THE ROLE OF PHONOLOGICAL AWARENESS IN IMPROVING PRONUNCIATION SKILLS AMONG IGCSE STUDENTS

Farhan Muhammad Naeem[1**]

Muhammad Kamal Khan[1**]
[1]Allama Iqbal Open University, Islamabad, Pakistan

Abstract

This study examined how phonological awareness training impacts Pakistani learners' pronunciation skills using a quasi-experimental design with control and experimental groups. Initially, the experimental group demonstrated significantly lower baseline scores across all measures compared to controls: phonological awareness (74.2 vs. 112.8), phonological memory (57.6 vs. 118.2), rapid symbol naming (66.2 vs. 97.2), and alternative phonological awareness (52.6 vs. 101.6). Following targeted intervention, the experimental group showed improvements across all metrics. Phonological awareness increased from 74.2 to 135.8 points, phonological memory improved from 57.6 to 129.6 points, rapid syllable naming rose from 66.2 to 137 points, and alternative phonological awareness jumped from 52.6 to 133.6 points. Post-intervention analysis revealed significant pronunciation improvements in the experimental group, with average gains of 0.4-0.6 points.

Keywords: phonological awareness; pronunciation; intervention; language teaching; articulation.

*Farhan Muhammad Naeem is a PhD, Postgraduate Student at the Department of English and Applied Linguistics, Allama Iqbal Open University. His research interests center on understanding the mechanisms underlying pronunciation acquisition, with a particular focus on how phonological awareness serves as a foundation for spoken language proficiency. Email: farhanmuhammadnaeem@gmail.com. ORCID: https://orcid.org/0009-0008-1656-1749.

**Muhammad Kamal Khan is a PhD, Associate Professor at the Department of English and Applied Linguistics, Allama Iqbal Open University. He focuses on innovative pedagogical methodologies and multimodal learning environments, as well as Phonetics and Phonology, Multilingualism and Indigenous Languages. Email: m-kkhan@outlook.com. ORCID: https://orcid.org/0000-0001-7897-3708.

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Introduction

In professional environments and international communication, clear pronunciation facilitates effective communication, reduces the likelihood of misunderstandings and increases the credibility of the speaker. However, developing correct pronunciation remains one of the main difficulties for many learners. Low levels of phonological awareness limit the ability to achieve a high level of language proficiency, including pronunciation, and affect overall communicative effectiveness. Phonological awareness (PA) plays a central role in shaping pronunciation skills, as it relates to the ability to recognise and manipulate speech sounds, which is foundational for accurate pronunciation. It is important to note that PA not only impacts the ability to identify and manipulate sounds but also influences the correct articulation of those sounds in speech; by mentally isolating phonemes, learners can better coordinate the motor movements required to produce them accurately.

For this reason, there is a need for a deeper understanding of the role of phonological awareness in the development of pronunciation skills. To ensure clarity throughout this study, it is necessary to distinguish between the terms "phonological awareness" and "phonemic awareness". Phonological awareness is a broad, umbrella term that encompasses the ability to recognize and manipulate various units of oral language, such as sentences, words, syllables, and rhymes (Nurzhanova et al., 2020; Isatayeva et al., 2018). Phonemic awareness, however, is a specific and advanced subset of phonological awareness; it refers exclusively to the ability to hear, identify, and manipulate the individual sounds, or phonemes, in spoken words. While phonological awareness provides the foundational understanding of sound structures, phonemic awareness is critical for the precise articulation required in pronunciation.

Despite the existence of numerous studies on phonics teaching and language development, the issue of integrating phonological awareness into the International General Certificate of Secondary Education (IGCSE) curriculum remains insufficiently studied. In this study, phonological awareness is understood through a cognitive-linguistic framework as the explicit ability to perceive, analyse, and manipulate the sound structures of language, ranging from individual phonemes to syllable structures. Adopting a psycholinguistic model, this research posits that accurate pronunciation is not merely a motor activity but relies heavily on the quality of a learner's underlying mental representations of sound categories. Consequently, phonological awareness is treated here as a critical cognitive interface that mediates between auditory input and articulatory output, facilitating the restructuring of phonological knowledge necessary for overcoming first-language interference and achieving intelligibility in a second language.

According to the findings of the study by Zhang and Peng (2024), for native Chinese speakers, orthographic awareness is a key factor influencing spelling, while morphological and phonological components play an important role in

Chinese language learners. Carracedo (2025) explored how inquiry-based learning influences the development of critical thinking and enhances students' academic achievement in English phonics and phonology. The findings indicated that learners engaged through this approach demonstrated notably higher academic performance and better long-term retention of knowledge than those taught using conventional teaching methods. Uzun (2025) studied the effectiveness of a curriculum aimed at developing phonological awareness skills of English language learners. Using a content analysis of participants' reflections ($N = 25$), the researcher found that the course had a positive impact on the development of phonemic awareness skills, as well as on learners' affective attitudes towards the learning process. Particular attention was paid to the phonological orientation of the tasks and the role of the teacher, which contributed to the successful acquisition of the language sound system.

Mohammadi Najafabadi et al. (2025) explored the roles of spelling knowledge, phonological awareness, rapid automatic naming, and phonological working memory in relation to reading comprehension. Their findings revealed that phonological awareness and rapid automatic responses were the most significant predictors of reading comprehension abilities. Similarly, a study conducted by Zhang et al. (2025) examined the connection between silent reading, phonological awareness, and reading comprehension. The results demonstrated that silent reading fosters the development of phonological awareness, which in turn supports text comprehension, particularly among individuals with hearing impairments. In another study, Shad et al. (2024) investigated how nursery rhymes influence the phonological awareness of preschool children in Pakistan. The research concluded that engaging with poetry in an interactive way positively enhances phonological skills in a multilingual setting.

A study conducted by Ghafoor et al. (2024) focused on the analysis of vowels in Pakistani English. The results showed that Pakistani English is emerging as a unique linguistic variety that has characteristic features that are partly similar to British English. Mankash et al. (2023) examined how vocabulary was taught and learned in Karachi universities. The focus was on the use of vocabulary learning strategies to assess the language proficiency of English as a second language learners. The sample consisted of learners whose mother tongue was Urdu and whose instruction was in English. The results showed that, despite the fact that the learners had studied English for a long period of time, their phonological awareness skills were insufficient.

Ali and Subiyanto (2023) analysed the influence of the mother tongue (Sindhi) on English pronunciation and found a significant role of phonological differences in accent formation. The study analysed the pronunciation of 30 students with Sindhi accents. The results showed that phonological differences between the native and second languages have a significant impact on pronunciation. The study by Akram et al. (2024) examined the effect of socioeconomic status on learners' phonemic articulation. The study involved 30 learners from different

socioeconomic backgrounds and found significant differences in pronunciation depending on parental education and social environment.

Previous studies have examined the interaction between phonological awareness and pronunciation, but have not covered all aspects of the impact of socioeconomic status on the development of pronunciation skills. The aim of the present study was to determine the role of phonological awareness in the development of pronunciation skills of students studying IGCSE programmes, with an emphasis on the use of targeted learning strategies in the process of acquiring pronunciation skills. The objectives of the study were to analyse the levels of students' phonological awareness and pronunciation before and after the application of special teaching methods aimed at improving phonological competence and to evaluate the effectiveness of these methods using quantitative and qualitative indicators.

Materials and Methods

The study was conducted using a quasi-experimental method (as the groups of students were already formed), from 2 September to 30 November 2024 at the Future World School in Islamabad, Pakistan, which was chosen for its academic reputation and diverse student body. This ensured a representative sample, reflecting the diverse levels of English proficiency and socio-cultural backgrounds of the students. Schools were selected based on academic performance, language skills and availability of resources for the study. A research design was developed that included a clear sample allocation, the use of specific assessment tools, intervention implementation, and data analysis. Standardised English language tests such as the Cambridge English Placement Test and Oxford Quick Placement Test, which assess language proficiency in accordance with the Common European Framework of Reference for Languages (2020), were used to determine these characteristics.

The assessment methods included reviewing the results of the Common European Framework of Reference for Languages (2020) tests (A1-C2) and statistical processing of the questionnaire data (Appendix A). The testing was aimed at identifying key socio-cultural factors that can influence students' academic performance, including parents' education level, language environment in the family, access to educational resources, and socio-economic status of the family. The study involved 60 IGCSE students who were divided into two groups: experimental and control. Each group consisted of 30 students. The following inclusion criteria were used to select the sample: pupils' willingness to participate in the study, their English language level meeting the requirements of the IGCSE programme, and availability of time to participate in the intervention. Exclusion criteria included students with severe speech or hearing impairments, as well as those who were unable to participate in the study due to time constraints.

The intervention lasted two months and was aimed at improving pronunciation skills. After testing, the results were assessed using two main

instruments: the Comprehensive Test of Phonological Processing (CTOPP) (2021) and SpeechAce. The CTOPP assessed phonological memory and the ability to recognise and manipulate sounds, while the SpeechAce assessed the general pronunciation of English sounds and words. These instruments were chosen based on their validity and reliability for assessing the language skills of non-native English speakers. The students in the experimental group attended private lessons several times a week to practice sound recognition and correct pronunciation of English words.

The lessons included phonological exercises on recognising sounds in words, correct pronunciation, syllable segmentation, syllable manipulation, and quick memorisation of symbols. Methods used included phonological training, repetition with models, and quick memorisation of the International Phonetic Alphabet. Lessons were adapted to the level of knowledge of the students and their individual needs.

At the same time, students in the control group continued their studies according to the standard curriculum without additional classes. The ethical aspects of the study were observed in accordance with the principles of confidentiality and voluntary participation. All students and their parents/guardians received a written explanation of the purpose of the study and confirmed their consent to participate in the research. All personal information of the students was kept confidential, and the results of the study were used only in an anonymous form. The study was conducted in compliance with the principles of biomedical ethics in accordance with the Declaration of Helsinki (1964).

Data collection took place in three stages. The first stage lasted one day, during which participants were pre-assessed for their baseline phonological awareness and pronunciation using the CTOPP and SpeechAce tools. The tasks required oral responses. The tests were administered individually to ensure the accuracy of each student's results. Speaking tasks included pronunciation exercises and rapid word and sound recognition practice. The assessment was also conducted individually, and participants had to answer questions orally.

The second stage lasted four weeks, during which the experimental group participated in regular classes aimed at improving pronunciation and phonological awareness. Classes were held 2-3 times a week and included pronunciation practice, word repetition, rhythmic speech training, and manipulation of sounds and syllables. Audio tools and visual materials were used to ensure better learning. Testing and training were conducted individually, but group practice was also possible, which facilitated interaction and exchange of experience between participants. Training and test results were recorded manually, but digital recordings were also used to record pronunciation. Learners' progress was tracked during each lesson. The third stage lasted one day and included a re-assessment of the participants using the same tools as in the first stage. This made it possible to compare changes in students' phonological awareness and pronunciation after the test.

Descriptive statistics methods were used to analyse the collected data, including the calculation of means, standard deviations and determination of the significance of changes using sample t-tests. The t-test for independent samples was used to assess the effectiveness of testing, and the statistical significance of changes in mean values was analysed by the p-value ($p<0.05$). The main focus was on comparing the mean scores of the two groups before and after the test. For this purpose, changes in phonological awareness and pronunciation levels recorded by CTOPP and SpeechAce were analysed. In addition, to visualise the results, the data were presented in the form of tables.

Results

Descriptive Statistics for Pre-Test Phonological Awareness

Phonological awareness involves the ability to identify, analyse and manipulate speech sounds, leading to improved text comprehension and academic performance. Research has confirmed that poor phonological awareness limits the ability to decode texts, while fluency improves as phonological awareness develops (Alfadeed, 2025). Phonological awareness skills play an important role not only in reading comprehension, but also affect other areas of learning (Lytvyn et al., 2018). They are directly related to success in mathematics. This is because phonemic awareness exercises develop cognitive processes that are the basis for understanding mathematical concepts, such as analysis, logical thinking, and the ability to classify and structure information. The study by Ziyayiquchanatiqe et al. (2025) showed that students who used phonological awareness techniques not only had better language skills but also performed better in mathematical tasks compared to those who did not. This indicated a strong link between phonemic awareness and mathematical ability, which could serve as a basis for future research in integrated learning. Early development of language and phonological competence is essential for later cognitive and academic success (Aliyeva, 2025; Mizin & Petrov, 2021).

Early language development is associated with higher levels of cognitive flexibility and facilitates the acquisition and application of phonological skills in a variety of learning contexts (McNeill et al., 2025). Morphological skills, such as knowledge of inflectional and derivational morphology, also contribute to language fluency. Phonological awareness skills are intermediate between morphological and reading skills and help children achieve fluency by using available phonological and semantic resources (Giazitzidou et al., 2024; Dagnev, 2025).

The study analysed the participants' cognitive performance before the test, which made it possible to assess the initial level of their phonological skills. This is an extremely important step, as the initial differences between the control and experimental groups may affect the results after the test. The analysis of descriptive statistics helped to identify the level of phonological awareness, memory, rapid

symbolic naming, and alternative phonological awareness in both groups before the training intervention. Below are summarised the results of the assessment of the participants' cognitive performance. The descriptive statistics demonstrate the comparative state of phonological awareness between the control and experimental groups before the start of the training methods (Table 1).

Table 1

Descriptive Statistics of Participants' Cognitive Performance Before the Test (N = 30 in each Group, Test Scores, Maximum Possible Score -150)

Indicators	Control group			Experimental group			t-test (p-values)
	Mean value	Standard deviation	Standard error of the average	Average value	Standard deviation	Standard error of the average	
Phonological awareness	112.8	3.524	0.644	74.2	10.987	2.006	0.003
Phonological memory	118.2	5.921	1.081	57.6	15.784	2.882	0.002
Rapid symbolic naming	97.2	2.342	0.428	66.2	21.567	3.936	0.001
Alternative phonological awareness	101.6	2.114	0.386	52.6	7.849	1.433	0.004

Source: created by the authors. Notes: The study was based on a quasi-experimental design with non-equivalent groups, which involved measuring cognitive performance before the intervention.

Phonological awareness serves as a key metric for evaluating participants' capacity to identify and manipulate the sound components of words. In this study, the control group demonstrated an average score of 112.8, whereas the experimental group showed a significantly lower mean of 74.2. This notable disparity suggests a pre-existing imbalance between the groups, which could potentially influence the outcomes of the experiment. The control group exhibited a standard deviation of 3.524, reflecting minimal variability in scores among its participants. Conversely, the experimental group showed a higher standard deviation of 1.987, indicating greater inconsistency in phonological awareness levels. Additionally, the standard error of the mean was 0.644 for the control group and 2.006 for the experimental group, with the larger value in the latter suggesting greater result instability and a higher likelihood of influence from random variables.

Phonological memory plays a crucial role in the processing, storage, and reproduction of auditory language input (Skliarenko et al., 2019; Dagnev &

Chervenkova, 2024). In the current analysis, the control group recorded a significantly higher average score of 118.2 compared to 57.6 in the experimental group, suggesting a notably stronger baseline in phonological memory for the control participants. The control group also displayed a relatively consistent performance, as reflected by a standard deviation of 5.921. In contrast, the experimental group exhibited much higher variability, with a standard deviation of 15.784. The standard error of the mean further emphasizes this difference: 1.081 in the control group versus 2.882 in the experimental group, indicating greater instability and potential influence of random factors in the latter. Rapid naming of familiar symbols – an essential component of language proficiency – also showed marked group differences. The control group had a mean score of 97.2, while the experimental group averaged only 66.2. The standard deviation for the control group was low (2.342), suggesting minimal participant variability. However, the experimental group's standard deviation reached 21.567, indicating a wide range of naming speed abilities. The standard error of the mean was 0.428 in the control group and 3.936 in the experimental group, again highlighting a greater degree of inconsistency in the experimental sample.

Alternative phonological awareness, which reflects the flexibility in applying phonological skills, further underscored the gap between the two groups. The control group achieved an average score of 101.6, while the experimental group averaged just 52.6. Standard errors of the mean were 0.386 for the control group and 1.433 for the experimental group, reinforcing the finding of greater variability and lower performance in the experimental group. Results from the t-test revealed statistically significant differences across all variables between the control and experimental groups prior to the intervention, with all p-values falling below the 0.05 threshold. The most pronounced gap was observed in phonological awareness, where the control group outperformed the experimental group by a substantial margin. This suggests that even before the experimental treatment, the control group held a significant advantage in phonological competence.

In sum, the descriptive statistical analysis confirmed that the control group started with higher baseline scores across all four phonological indicators – phonological awareness, phonological memory, rapid naming, and alternative phonological awareness. These initial disparities suggest that the control group possessed stronger foundational language and cognitive skills, which could influence post-test results. Additionally, the elevated standard deviations and standard errors in the experimental group point to a broader range of individual differences, likely stemming from socio-cultural variations such as social status, parental education level, and the home language environment. These factors, identified during the initial assessment, appear to hinder the early development of phonological awareness in students with limited exposure to English outside the classroom, resulting in lower baseline scores and higher variability prior to intervention.

Descriptive Statistics for Phonological Awareness after the Test

The development of phonological awareness is an important aspect of learning a foreign language, as it directly affects pronunciation and speaking skills. Phonological awareness allows learners to perceive and reproduce the sound system of a language, which contributes to more accurate articulation and more natural speech.

Studies have shown that the use of technology in language teaching can significantly improve students' pronunciation, as interactive methods contribute to better learning of the sound features of language. Theoretically, these digital tools enhance phonological skills by providing immediate, corrective feedback and multimodal stimulation, which are critical for bridging the gap between sound recognition and production (Abdimomunova & Samsaliev, 2024; Hossain & Younus, 2025). By integrating visual cues, such as diagrams of speech organ movements, with auditory recordings, these platforms reinforce the cognitive link between hearing a sound and understanding its articulation.

One such effective tool was the CAKE (2026) mobile app, which offered users interactive exercises, audio and video materials to help improve pronunciation and develop speaking skills. With the ability to imitate authentic native speaker speech and practice dialogues in a real-world context, learners can gradually improve their pronunciation (Sujana et al., 2024). The app also uses modern teaching methods, such as gamification and adaptive algorithms, to make the process of learning a foreign language more effective and engaging.

In addition to digital feedback, the theoretical mechanism of "imitation" or "shadowing" plays a pivotal role in this process. According to a study by Suyadi (2024), the imitation method is extremely effective in developing correct pronunciation. Students who actively imitated the pronunciation of native speakers by listening and repeating phrases showed significant improvements in the accuracy of sound articulation and naturalness of speech. Thus, a combination of technology and traditional teaching methods, such as imitation, can achieve the best results in the development of phonological hearing and pronunciation.

The effectiveness of this combined approach is supported by cognitive learning theory and awareness theories. Cognitive learning theory suggests that learning is optimised when information is presented through multiple modalities (auditory, visual, and interactive), thereby reducing cognitive load and enhancing retention. The use of mobile applications leverages this by providing dual-coding opportunities (visualising sound waves or mouth positions while hearing sounds). Simultaneously, Awareness Theories, particularly the Noticing Hypothesis, posit that learners must consciously "notice" the gap between their interlanguage and the target language to correct errors. The immediate feedback from digital tools facilitates this noticing, while traditional phonological exercises provide the explicit structural knowledge necessary to understand how to close that gap. By integrating these methods, the intervention addresses both the cognitive processing of new sounds and the conscious awareness required for articulatory modification. The introduction of interactive platforms and mobile applications

into the learning process contributes to more effective learning of language skills, which is confirmed by numerous studies.

Therefore, given the importance of phonemic awareness and the power of modern technologies in improving it, it is important to critically assess the impact of different teaching strategies on the development of students' phonemic awareness. Interactive technologies and copying methods have a positive effect on improving pronunciation and general language abilities (Isenalieva et al., 2023; Shaikh, 2026). However, this study focused on classical and innovative teaching methods using mobile applications. The main focus was to analyse the effectiveness of the impact on education in the two groups, in particular, comparing the results of the control and test groups after the relevant training. Innovative methods included online testing, adaptive digital platforms for developing phonological awareness, and specialised mobile applications that provide an interactive approach to learning materials (Binkley et al., 2025). The use of modern technologies has increased the level of individualisation of learning, adapted tasks to the level of knowledge of each student, and improved the results of mastering phonological skills.

Online testing has proven to be highly effective in determining the level of phonological awareness and its development, and the use of a specialised platform such as Quizizz has allowed teachers to quickly assess students' achievements and adjust the curriculum according to the results. This made the learning process more personalised, which had a positive impact on its effectiveness. The CAKE mobile application was used to develop phonetic skills in real time, providing learners with instant feedback and the opportunity to improve their pronunciation through interactive exercises.

The results of the study confirmed the effectiveness of these methods, as the experimental group that used mobile apps and tools, such as CTOPP and SpeechAce, demonstrated a significantly higher level of phonological skills acquisition compared to the control group. Another important aspect is the preparation of teachers to work with digital platforms, which involves training sessions and workshops. For this purpose, descriptive statistics were analysed to assess the level of phonemic awareness, phonemic memory, rapid character naming and alternative phonemic awareness of the participants after the test. The results of this analysis are presented in Table 2.

Table 2

Descriptive Statistics of Post-Test Indicators (N = 30 in Each Group, Test Scores, Maximum Possible Score -150)

Indicators	Control group			Experimental group			t-test (p-values)
	Mean value	Standard deviation	Standard error of the average	Average value	Standard deviation	Standard error of the average	
Phonological awareness	112.8	3.114	0.569	135.8	10.756	1.963	0.003
Phonological memory	116.8	5.215	0.952	129.6	0.548	0.1	0.002
Rapid symbolic naming	98	1.414	0.258	137.0	6.708	1.224	0.001
Alternative phonological awareness	101	1	0.183	133.6	3.13	0.571	0.004

Source: created by the authors.

The data analysis from Table 2 reveals statistically significant improvements in the experimental group compared to the control group following the intervention. When examining the post-test scores across four key indicators – phonological awareness, phonological memory, rapid symbolic naming, and alternative phonological awareness – it becomes evident that the targeted instructional methodology applied to the experimental group yielded more effective outcomes. In terms of phonological memory, the experimental group achieved a mean score of 129.6, surpassing the control group's average. Moreover, the control group exhibited a higher standard deviation (5.215) compared to the experimental group (0.548), indicating more variability among its participants. The standard error of the mean further supports this finding: 0.952 in the control group versus a notably lower 0.1 in the experimental group, suggesting a higher level of precision and consistency in the experimental group's results. Rapid symbolic naming results also demonstrated marked group differences.

While the control group averaged a score of 98, the experimental group outperformed it with an average of 137. The control group's standard deviation was 1.414, whereas the experimental group's was 6.708 – reflecting a slightly broader range of post-test performance. Corresponding standard errors of 0.258 for the control group and 1.224 for the experimental group suggest that the variation in the latter may be due to individual differences in how participants engaged with or responded to the instructional content. Regarding alternative phonological awareness, the experimental group again showed a notable advantage, scoring an average of 133.6 compared to 101 in the control group. The control group had a standard deviation of 1, while the experimental group's was slightly higher at 3.13, indicating minor variability among participants. The standard error of the mean was 0.183 for the control group and 0.571 for the experimental group, both of which support the reliability of the data.

Overall, these results suggest that the specialized teaching methods implemented in the experimental group were more effective in enhancing phonological competencies across multiple dimensions. The relatively low variability and standard error values in the experimental group also reinforce the robustness and consistency of the intervention's impact.

In general, the analysis of the data showed that the experimental group significantly improved their phonological awareness, phonological memory, rapid symbolic naming, and alternative phonological awareness after the test. The high mean values for this group, accompanied by standard deviations and acceptable standard errors of the mean, confirm the reliability of the results. The results of the independent t-test (post-test control group and experimental group) showed that there were statistically significant differences between the groups for all four indicators ($p<0.05$). The lowest p-value (0.001) was recorded for the index of rapid character naming, which showed the most significant difference between the groups. Significant differences were also found in phonological awareness ($p=0.003$), phonological memory ($p=0.002$) and alternative phonological awareness ($p=0.004$), which confirmed the effectiveness of the test. These results indicate that the experimental methodology has a positive impact on the development of participants' phonological competence.

It is worth noting that the standard deviation values were slightly higher in the experimental group, which may be due to individual differences in the pace of learning after the test. However, such variations are expected in the context of educational research, as each student demonstrates a different level of recognition and assimilation of new knowledge. Thus, the results of this study confirm the effectiveness of the intervention, which had a positive impact on the development of phonological competence in the experimental group. No significant changes were observed in the control group, which indicates that the level of phonological awareness and related skills remained stable without any special testing.

Pronunciation Skills Before and After the Test

Pronunciation skills have a significant impact on the quality of speech and the perception of speech by native speakers. Problems with pronunciation, especially among learners of English as a foreign language, are widespread due to the differences between the sound systems of native and foreign languages (Ahmad et al., 2021). Current research focuses on the use of innovative methods and techniques to help improve pronunciation. For example, the study by Arif and Kleden (2025) demonstrated the effectiveness of pronunciation training using the mobile application "Cake". Interactive elements such as speech recognition, quizzes, and video tutorials help to increase learner motivation and pronunciation accuracy, but the use of such technologies is limited by technological barriers such as internet access. Another tool for improving pronunciation is the use of English pop songs, as highlighted in the study by Qazi et al. (2025). Music that motivates learners and helps them to remember the correct words is effective

in improving the speaking skills of English language learners. A study by Fatima (2024) highlighted the potential of technology in language teaching. The integration of digital tools into the curriculum improves aspects of speaking such as accent, structure, vocabulary, and confidence. These technologies also allow learners to practice pronunciation independently, which is especially important for multilingual learners. However, pronunciation problems are often caused by differences between the mother tongue and the foreign language, lack of motivation, and a lack of appropriate learning resources (Younas et al., 2020).

In order to successfully improve pronunciation skills, a number of factors should be taken into account that influence the process of mastering correct articulation and intonation. One of the key challenges for learners of English as a foreign language is the large differences between the sound systems of their native language and English (Doszhan, 2023). Modern approaches to teaching pronunciation aim to overcome these difficulties by introducing innovative methods that combine traditional pedagogical strategies with digital technologies. For example, the use of mobile apps, interactive platforms, video tutorials, speech recognition and even musical elements help to make the learning process more interesting and effective. Given the significant impact of these factors, a study was conducted to assess the effectiveness of implementing modern pronunciation improvement techniques. The analysis compared the results of the participants before and after the use of the respective pedagogical strategies. Appendix A contains detailed results of the study, which help to trace changes in the students' pronunciation level. The data presented in the table illustrates how successful the selected methods were in improving pronunciation skills and also confirms the importance of integrating innovative approaches into the teaching process.

The study's findings show the participants' pronunciation scores before and after the test, providing an opportunity to assess the impact of the teaching methods used. In the control group of 30 participants, the results of the pre- and post-test pronunciation assessment mostly show little change. The vast majority of students, with the exception of a few, did not experience significant changes in their scores. For example, Student 1's score remained at 5.9 (unchanged), indicating that there were no significant changes within this group in the development of pronunciation skills. Similarly, student No. 4 did not change, as his post-test score also remained at 5.4. The scores of such students as No. 5, No. 7, No. 8 show changes in the range of 0.1-0.3 points, which indicates a certain stability, but without any pronounced progress. These minor changes are due to the absence of specialised training activities or interventions in the control group. As the participants in this group did not receive any additional learning materials or exercises to improve their pronunciation skills, this may have resulted in limited skill development. Therefore, the results of the control group mostly show stability, although it cannot be said that the learners did not improve their skills as a result of regular teaching.

The experimental group, which also consisted of 30 students, showed much greater progress than the control group. In this group, the participants

underwent a special programme of training exercises aimed at developing pronunciation skills. This intervention included the use of specific techniques and teaching materials designed to improve children's pronunciation. The test results after the intervention showed a marked improvement in the children's grades. For example, student No. 2 increased his score from 5.3 to 5.8, which is a significant improvement, and student No. 3 increased his score from 5.3 to 5.8. Other students in the experimental group also showed similar positive changes, increasing their grades by 0.4-0.6 points.

These changes indicate the effectiveness of the methods used and are considered significant for the development of pronunciation skills. Each participant, even if they did not achieve the maximum result, still showed a marked improvement compared to the initial assessments. These results can be explained by the fact that the participants in this group received specialised help that was aimed specifically at improving their pronunciation skills. Special exercises, training on phonological awareness, memory, and pronunciation exercises were probably an effective tool for this process. As can be seen from the results, the experimental group showed significantly more progress than the control group. Most of the students in the experimental group improved their scores by 0.4-0.6 points, while the changes in the control group were minimal or non-existent. This gives an opportunity to conclude that the specialised intervention in the experimental group had a positive impact on the development of pronunciation skills. At the same time, in the control group, where no additional teaching methods were used, the changes were insignificant, indicating a limited effect of conventional teaching practices.

Thus, specialised methods and training contributed to the improvement of students' language skills. The differences between the groups highlighted the importance of using specialised curricula to achieve greater progress in pronunciation skills. Overall, the analysis of the pre- and post-test pronunciation assessment results showed that the experimental group achieved significant improvements in pronunciation skills through specialised training, while the control group showed minimal or no changes. This confirmed the effectiveness of special techniques aimed at developing students' speaking skills. For further research, it is important to focus on the study of specific methods and approaches that can ensure even greater progress in the development of children's speech skills at different ages.

Discussion

At the conclusion of the intervention, participants in the experimental group demonstrated significant improvements in two key areas: phonological awareness and pronunciation. The post-intervention results confirmed the effectiveness of the implemented methods, which substantially enhanced learners' skills in these domains. A detailed analysis of the changes revealed that the introduced practices and methodologies genuinely contributed to the development of phonological

skills, as measured by CTOPP and SpeechAce assessments. The CTOPP results indicated that the experimental group's level of phonological awareness improved significantly. During the pre-test phase, participants struggled considerably with recognising and manipulating sound positions in words, particularly at word-initial and word-final positions. They also frequently confused sounds that are uncommon in their native language. However, post-testing showed participants could accurately identify these sounds in words regardless of their position. Their phoneme manipulation skills also improved.

This is fundamentally important for language development, as the ability to modify, rearrange and combine sounds within words constitutes a crucial aspect of phonological development. Thus, through exercises targeting auditory memory and phoneme manipulation, participants became more effective at recognising sounds and syllables. These findings align with research by Awadh et al. (2024), which confirmed the effectiveness of phonics instruction in improving English proficiency among Yemeni students. Their study demonstrated that incorporating phonological techniques significantly improved learners' articulation skills – an observation mirrored in the current study. However, it should be noted that while the present research focused on improving phonological awareness and pronunciation, it employed different methodologies, particularly sound recognition exercises using tools like CTOPP and SpeechAce, rather than specific phonological techniques.

Researchers Kiss and Csapó (2024) highlighted how digital technologies create favourable conditions for developing phonological skills through flexible pacing and opportunities for repeated practice. This proves particularly valuable for younger learners who benefit from varied, interactive learning experiences. The online platforms used in their study to assess phonological awareness could differentiate tasks by difficulty level, facilitating deeper learning. However, the authors also noted the need for methodological support for teachers, especially those with limited digital literacy, which may hinder implementation of innovative teaching methods. The current study, by contrast, specifically examined the effectiveness of interactive technologies in language learning.

The study by Sastrawati et al. (2023) reinforced the importance of phonological awareness in developing language skills, particularly pronunciation. The authors emphasised that awareness of phonological structure significantly impacts spoken English acquisition – a finding that correlates with these results. Inter-group analysis revealed that experimental group participants showed markedly greater improvement compared to the control group who received no intervention. This aligns with the current study where experimental group participants demonstrated substantial gains relative to controls.

These findings are consistent with research by Lothian et al. (2020) analysing the impact of an interactive learning tool on developing students' phonological processing skills. Their results similarly showed significant improvement in phonological processing, corroborating authors' findings and further validating such approaches. This highlights the potential of technological tools in education

– an area warranting further investigation. These results are in line with research that has shown the effectiveness of interactive approaches such as SpeechAce in improving learners' pronunciation. Furthermore, the study highlights the critical role of the language environment and parental education in the development of phonological awareness. The substantial progress of the experimental group indicates that targeted interventions can effectively compensate for the lack of a supportive socio-cultural environment, which often impedes the natural acquisition of pronunciation skills. Technological tools provide the opportunity to provide feedback and correct pronunciation in real time, which contributes to a more effective development of phonological awareness.

Modern linguistic and pedagogical research pays special attention to phonological hearing as an important aspect of the development of learners' language competence, especially in the context of pronunciation. Phonological awareness, defined as the ability to be aware of, recognise and manipulate the sounds of language, is essential for the correct acquisition of language, especially the pronunciation of individual sounds and phrases. The work of Pardayeva (2025) highlighted the importance of using online resources to improve learners' pronunciation, especially those learning English as a foreign language. The author argued that online tools make learning more accessible and flexible, especially for learners whose mother tongue is not English. They emphasise the need for effective approaches to teaching pronunciation, including conscious control of speech movements and sound effects, but the study used a more traditional approach to teaching pronunciation through testing, which includes individual lessons to improve phonological awareness.

Instead, the study by Fauziah et al. (2024) evaluated the effectiveness of the ELSA Speak programme in improving learners' pronunciation. The results of the study showed that most learners showed improvement after using the programme, which confirms its effectiveness in improving the pronunciation of English as a foreign language learner, while the study also had a clear focus on improving pronunciation but used more traditional methods such as CTOPP and the SpeechAce tool. Study by Dumanggas et al. (2024) examined the effect of using the International Phonetic Alphabet symbols on learners' pronunciation skills. Instead, the study focused on the development of phonological awareness, sound recognition and manipulation, which emphasised a different approach to pronunciation correction.

An assessment of Pakistani English language learners' accent by Javed and Ahmad (2014) showed that Pakistani secondary school students have problems with the pronunciation of multisyllabic words, double vowels, deaf sounds, intonation, and stress. However, their pronunciation of monosyllabic and disyllabic words is correct. There were no significant differences in pronunciation between urban and rural students, or between students from public and private schools. The study of pronunciation using statistical analysis comparing students' average scores showed that the main difficulties arose in pronouncing more complex words and phonological structures. Comparing this study to the

current study, it is similar in that it uses a specialised test to assess pronunciation, but unlike the current study, which focused on intervention through private lessons to improve phonological awareness, this study focused only on assessing pronunciation without testing.

The study by Morales Pilatuña and Parra (2024) highlighted the importance of phonological awareness in reading for 10- to 12-year-olds learning English as a second language in Ecuador. The study confirmed that phonological awareness plays an important role in improving reading comprehension, as many students have difficulty recognising English words. This suggests that there are effective teaching strategies, especially for phonological awareness. Compared to the present study, there is a similarity in the focus on phonological awareness as an important factor for improving pronunciation. Ghouri et al. (2025) focused on pedagogical approaches to improving English language proficiency among secondary school students. The authors analysed secondary school teachers' views on pronunciation teaching and their methods of teaching pronunciation. The focus was on effective teaching methods, such as providing feedback, correcting errors, and using repetition and basic practice to improve students' pronunciation skills.

However, the study showed that despite a solid methodological framework, these strategies are not always effectively applied in the classroom. If the study by Ghouri et al. (2025) focused on analysing existing teaching practices and challenges in pronunciation teaching, the present study is more focused on the impact of targeted interventions on pronunciation skills development. The authors Mir and Afsar (2024) investigated the pronunciation of English language learners in Pakistan. They explored the limitations by focusing on the influence of the mother tongue (L1) on English pronunciation. The authors pointed to problems with stress and articulation associated with the Kashmiri accent. They noted that the main problems are stress epenthesis and mislabelling. In comparison to the present study, although similar in terms of considering language barriers, the present study focused on the role of phonological awareness in improving pronunciation among IGCSE learners.

The study by Farooqui et al. (2024) examined the conflict between traditional and modern methods of teaching English in Pakistan. It was noted that traditional methods, which focus on grammatical translation and memorisation, do not meet the requirements of modern approaches that emphasise communication and orientation. According to the study, the mismatch between these methods leads to ineffective language acquisition, as teachers find it difficult to combine memorisation methods with communicative methods, while the study that focused on phonological awareness investigated language competences and conducted tests using various instruments. In the study by Amin et al. (2024) found significant differences in sound intensity and pitch compared to standard English pronunciation. The study emphasised the importance of providing individualised correction for learners with different phonological patterns. In the context of this study's focus on phonological awareness, this research approach

is important for understanding how different phonological models affect learners' pronunciation. In addition, the use of specific instruments to measure phonological awareness and pronunciation helps to identify similar phonological variations in learners with different language backgrounds, but the present study focuses more on adapting pronunciation teaching methods to learners' cognitive characteristics and using multimodal strategies.

The study conducted by Mir et al. (2024) analysed the problems with the pronunciation of English syllables in multilingual learners of English for professional purposes in Pakistan. Participants in the study faced difficulties in pronouncing complex English syllable structures, such as consonant-vowel-consonant and consonant-consonant (Jafarova, 2021). The study showed that multilingual learners often had problems due to the lack of specific phonological models in their native language, while the research focused on developing educational approaches to overcome these difficulties, such as the introduction of multimodal strategies and individualised learning. The study of Hafiza et al. (2024) focused on improving the pronunciation of learners of English as a foreign language. According to this study, learners who received phonological instruction showed better results in improving their pronunciation compared to the control group. The study also focused on improving pronunciation through phonological awareness, which correlates with these results.

Thus, the results of a number of studies confirm the importance of developing phonological awareness skills to improve learners' pronunciation, especially those learning English as a second or foreign language. Unlike online resources that provide automatic pronunciation correction, traditional one-to-one approaches allow for more detailed and accurate tracking of learner progress, taking into account individual needs and phonological features. The diversity of approaches means that each is effective in a particular learning environment, and their combination can be the key to achieving maximum results in the development of students' phonological skills.

Conclusions

The study focused on the role of phonological awareness in improving IGCSE students' pronunciation skills and produced some important research and practical results. Using a quasi-experimental design and the use of assessment tools such as CTOPP and SpeechAce, the effectiveness of the developed intervention was evaluated. The results of the study showed that phonological awareness has a significant impact on the development of pronunciation of IGCSE English learners. After a month of testing, students in the experimental group showed an increase in both quantitative (improved CTOPP and SpeechAce scores) and qualitative indicators (improved pronunciation accuracy and ability to manipulate speech sounds). At the same time, students in the control group who did not participate in special classes did not show significant changes in their language skills.

The study showed that the experimental group showed a significant improvement in phonological awareness after the test. In particular, the average phonological awareness score in the experimental group increased from 74.2 to 135.8, while the control group showed no change (112.8). Similar improvements were found for phonological memory: the mean value increased from 57.6 to 129.6 in the experimental group, while in the control group it remained at 116.8. Symbolic quick naming also showed a significant improvement in the experimental group, with the mean value increasing from 66.2 to 137, while in the control group this figure remained almost unchanged at 98. Statistical analysis using the t-test showed that all these changes were statistically significant (p-values for all indicators were no more than 05 or less).

The results of the study also emphasise that the use of multimodal strategies, in particular the integration of visual and auditory materials, significantly contributed to the improvement of pronunciation learning. For example, students who used visual cues (diagrams of the movement of speech organs) in combination with audio recordings of native speakers performed significantly better than those who used standard teaching methods alone. In addition, it was observed that the use of individualised tasks adapted to the specific problems of the learners significantly improves learning efficiency. The results of the study also showed that phonological awareness directly affects the quality of pronunciation and contributes to the development of phonological memory and the ability to manipulate sounds. This was confirmed by statistically significant changes in the pronunciation of the participants in the experimental group after two months of testing: t-test analysis showed significant improvements in sound recognition, word segmentation, and overall pronunciation.

The observed changes in phonological awareness and pronunciation can be explained by the fact that the intervention, using individualised lessons, allowed each student to focus on specific problems, which led to more effective learning of correct sound patterns. Along with methods such as pronunciation training and sound recognition and manipulation exercises, such tests allowed to focus on the most problematic aspects of pronunciation, in particular on specific English sounds that are difficult for non-native speakers. The need for an individual approach to each student was emphasised to achieve maximum effect.

A limitation of the study is the relatively small sample of students, which may affect the generalisability of the findings. Further research could focus on assessing the effectiveness of modern technologies for automatic pronunciation analysis, the impact of socio-cultural factors on language development, and expanding the sample of learners to improve the quality and accessibility of learning.

DATA AVAILABILITY STATEMENT: The authors confirm that the data supporting the findings of this study are available in the article.

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Submission date: 11/09/2025
Acceptance date: 13/02/2026
Editor: Roberta Pires de Oliveira

Appendix A

Results of the Common European Framework of Reference for Languages tests

Group	Student number	Before testing	After testing
Control	1	5.9	No changes (5.9)
	2	5.3	5.4
	3	5.4	5.5
	4	5.4	5.4
	5	5.3	5.3
	6	5.5	5.6
	7	5.2	5.3
	8	5.6	5.7
	9	5.4	5.5
	10	5.3	5.3
	11	5.5	5.6
	12	5.3	5.4
	13	5.4	5.5
	14	5.2	5.3
	15	5.6	5.7
	16	5.4	5.5
	17	5.3	5.3
	18	5.5	5.6
	19	5.2	5.3
	20	5.3	5.4
	21	5.5	5.6
	22	5.4	5.5
	23	5.4	5.6
	24	5.3	5.4
	25	5.3	5.5
	26	5.5	5.7
	27	5.2	5.3
	28	5.3	5.4
	29	5.4	5.6
	30	5.5	5.7
Experimental	1	5.4	No changes (5.4)
	2	5.3	5.8
	3	5.3	5.8
	4	5.5	5.9
	5	5.4	5.7
	6	5.2	5.6
	7	5.3	5.7
	8	5.4	5.8
	9	5.5	6.0

10	5.3	5.9
11	5.6	5.8
12	5.4	5.7
13	5.5	5.8
14	5.3	5.7
15	5.4	5.9
16	5.5	5.8
17	5.4	5.6
18	5.6	5.9
19	5.5	6.0
20	5.3	5.8
21	5.5	5.8
22	5.4	5.7
23	5.6	5.9
24	5.3	5.6
25	5.3	5.7
26	5.4	5.8
27	5.2	5.5
28	5.4	5.7
29	5.3	5.6
30	5.2	5.4

Note: skills are rated on a 6-point scale. Source: created by the authors.