The Effectiveness of the Academic Program "A-I-U-E-O Vocal Adventure" as an Innovation in Oral Language Learning on the Vocal Production Skills of Students with Hearing Impairments at SLB PGRI KAMAL

Yasmin Firdausi[1], Watini[1], Khofidotur Rofiah[1]

Special Education, Universitas Negeri Surabaya, Indonesia[1].
Email: jasminefirdausi94@gmail.com

Abstract

Oral language development, particularly vowel production, is a fundamental component of early communication and poses challenges for students with hearing impairments due to limited auditory input. Students with mild hearing impairment retain residual hearing that can be optimized through structured and multisensory instructional approaches. This study aimed to examine the effectiveness of the Academic Program of Vocal Sound Adventure A–I–U–E–O in improving vowel production skills in a student with mild hearing impairment at SLB PGRI Kamal. A Single Subject Research (SSR) method with an A–B design was employed, consisting of a baseline phase and an intervention phase. The participant was a second-grade student with mild hearing impairment and typical cognitive functioning. Data were collected through structured vowel production assessments and systematic observations of learning behaviors, focusing on sound perception, articulation, vocal clarity, and learning engagement. The findings demonstrated a clear improvement in vowel production abilities following the intervention, indicated by a stable baseline, a marked level change, and a consistent upward trend during the intervention phase. These results suggest that multisensory oral language instruction through the Vocal Sound Adventure A–I–U–E–O program is effective in supporting vowel production development in students with mild hearing impairment, despite limitations related to the single-subject design.

Keywords: *hearing impairment; vowel production; multisensory learning; single subject research*

Manuscript History

Received: 06 January 2026 Revised: 21 January 2026 Accepted: 28 January 2026

How to cite:

Firdausi, Y., Watini, W., & Rofiah, K. (2026). The effectiveness of the academic program "A-I-U-E-O vocal adventure" as an innovation in oral language learning on the vocal production skills of students with hearing impairments at SLB PGRI Kamal. *GRAB KIDS: Journal of Special Education Need*, 6(1), 1–6.

INTRODUCTION

Oral language ability is a fundamental foundation in children's communication development, as it plays a crucial role in social interaction, symbolic thinking, and academic success. From a phonetic and phonological perspective, vowel sound production constitutes a basic component of the oral language system that emerges at a very early age and serves as the foundation for the articulation of more complex words and sentences. Phonological development research indicates that young children gradually acquire the vowel sounds /a/, /i/, /u/, /e/, and /o/ as part of the normal stages of phonological acquisition. This process reflects phonological regularity influenced by the maturation of speech motor control and linguistic input from the child's language environment (Fitrianti & Yefrizon, 2025).

In children with hearing impairment, limitations in auditory access have a significant impact on the development

of speech production. Insufficient auditory feedback disrupts speech motor control and articulatory accuracy,

causing children with hearing disabilities to exhibit deviations in vowel and consonant production compared to their normally hearing peers. Empirical findings show that children with hearing loss demonstrate distinct vocal characteristics, particularly narrower vowel spaces and differences in forman distribution, which reflec constraints in articulatory control due to inadequate auditory feedback. The role of auditory feedback in sound learning is therefore critical, as it enables children to adjust articulatory output toward accurate phonetic targets. Studies involving typically hearing children further demonstrate that disruptions or manipulations of auditory feedback affect speech production and speech motor adaptation, underscoring the strong relationship between auditory experience and phonetic acquisition.

Children with mild hearing impairment possess residual hearing that can be optimized through assistive technologies such as hearing aids and through structured instructional strategies. This residual auditory capacity allows for more effective auditory stimulation than in cases of profound hearing loss, thereby providing opportunities to improve vowel production through appropriate learning approaches. Intensive and integrated instructional models that combine auditory, visual (e.g., graphic representations of vowel sounds, teacher's facial cues and lip movements), and kinesthetic inputs (e.g., structured articulation exercises) have been shown to enhance phoneme understanding and articulatory skills in children with special needs. Based on the limitations of traditional, single-modality instruction, the multisensory-based academic program "Vowel Sound Adventure A-I-U-E-O" was developed as an innovative pedagogical intervention for students with mild hearing impairment in early grades. This program employs engaging, thematic, and participatory activities to support students in recognizing, discriminating, and accurately producing vowel sounds. This study aims to analyze the effectiveness of implementing the "Vowel Sound Adventure A-I-U-E-O" program in improving vowel production abilities among students with hearing disabilities at SLB PGRI Kamal, with the expectation of contributing empirical evidence to inclusive and evidence-based oral language education practices for children with mild hearing impairment.

METHOD

This study employed a Single Subject Research (SSR) method with an A–B design to examine the effectiveness of a vowel production intervention for a student with hearing impairment. The design consisted of a baseline phase (A), during which the student's initial vowel production abilities were measured repeatedly without treatment to establish data stability, followed by an intervention phase (B) implementing the "Vowel Sound Adventure A-I-U-E-O" program within the BKPBI (Sound Perception and Rhythm Communication Development) instructional context. The SSR A–B design is widely regarded as appropriate in special education research because it allows the participant to serve as their own control and provides high sensitivity in detecting individual changes resulting from the intervention (Ward et al., 2023; Byiers et al., 2020).

The participant was a second-grade student with mild hearing impairment and typical cognitive functioning, selected based on the need for early oral language intervention and readiness for structured learning, consistent with recommendations emphasizing early language access for children with hearing impairment (Antia et al., 2020). Data were collected using a structured vowel production assessment covering sound perception, articulatory accuracy, and vocal clarity, supported by systematic observation of learning activities. Data analysis involved descriptive qualitative and simple quantitative comparisons between baseline and intervention phases, with effectiveness determined by improvements in vowel production performance and observable learning behaviors, in line with contemporary SSR analytic practices that focus on changes in data level and trend across phases (Ward et al., 2023).

RESULTS AND DISCUSSION

The findings of the study indicate that the *Vowel Sound Adventure A-I-U-E-O* Academic Program was effective in enhancing the vowel production abilities of a student with mild hearing impairment. Based on systematic observations and structured assessment records, the student demonstrated improved recognition and production of the vowel sounds A-I-U-E-O, characterized by clearer articulatory output and more accurate lip positioning following participation in the program.

Table 1. Assessment Results of Vowel Production Ability during the Baseline (A) and Intervention (B) Phases

Assessment Aspect	Observation Indicators	Phase A Score (Baseline)	Phase B Score (Intervention)	Change
Sound perception	Ability to recognize the presented vowel sounds A–I–U–E–O	2 (fair)	4 (excellent)	↑ improved
Vowel articulation	Ability to form mouth and lip positions according to vowel characteristics	1 (needs guidance)	3 (good)	↑ improved
Vocal vibration awareness	Awareness and perception of vocal vibration during vowel production	1 (needs guidance)	3 (good)	↑ improved
Rhythm and clarity	Ability to produce vowels with appropriate tempo and intonation	2 (fair)	3 (good)	↑ improved
Learning enthusiasm	Demonstrates interest, focus, and active engagement during learning activities	2 (fair)	4 (excellent)	↑ improved

Note:
Score 4 = excellent | 3 = good | 2 = fair | 1 = needs guidance

Table 2. Comparison of the Average Scores of Vocal Ability in Phase A and Phase B

Research Phase	Average Vocal Ability Score
Phase A (Baseline)	1,6
Phase B (Intervention)	3,4

Interpretation:
There was an increase in the average score of +1.8 points, indicating a change in the level of vocal production ability after the intervention was implemented.

Table 3. Summary of Changes in Students' Learning Behavior (Qualitative SSR Analysis)

Behavioral Aspect	Phase A (Baseline)	Phase B (Intervention)
Engagement	Passive, requires extensive guidance	Active, follows instructions independently
Enthusiasm	Easily distracted	Enthusiastic in using media (mirror, cards, puppets)
Instructional Response	Requires repeated instructions	Quick and consistent responses
Sensory Awareness	Not yet aware of sound vibrations	Begins to perceive vibrations during vocalization

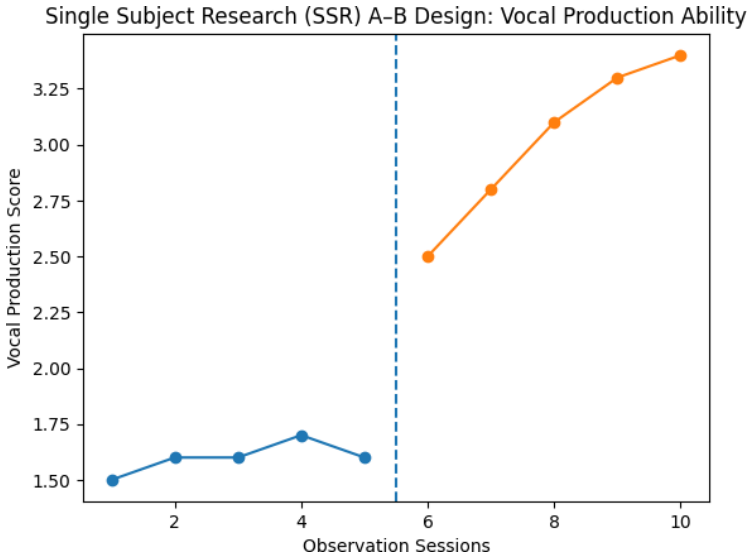

Figure 1. Single Subject Research (SSR) A–B design showing changes in vocal production ability across observation sessions. Phase A (baseline) indicates low and stable scores, while Phase B (intervention) demonstrates a
clear level increase and a positive upward trend following the implementation of the *Vowel Sound Adventure A–I–U–E–O* program.

The findings indicate an improvement in the vocal production abilities of a student with mild hearing impairment following participation in the *Academic Program of Vocal Sound Adventure A–I–U–E–O*. As presented in Table 1, a comparison between the baseline phase (A) and the intervention phase (B) across five assessment domains—sound perception, vocal articulation, awareness of sound vibration, rhythm and clarity, and learning engagement—shows that baseline performance was predominantly categorized as *fair* to *needs guidance*, reflecting limited initial vowel recognition and production skills. Following the intervention, all domains improved to the *good* and *very good* levels, with the most pronounced gains observed in sound perception and learning engagement. These outcomes suggest that multisensory instruction integrating visual, auditory, and kinesthetic cues effectively supports vocal development in learners with mild hearing loss, consistent with evidence from special education and speech-language intervention research (Antia et al., 2020).

This pattern is further supported by Table 2, which shows an increase in the mean vocal production score from 1.6 during the baseline phase to 3.4 during the intervention phase, representing a level change of 1.8 points. Within the framework of Single Subject Research (SSR), such a substantial level change between phases is a key indicator of intervention effectiveness, particularly when the baseline data demonstrate stability (Ward et al., 2023). Similar conclusions have been reported in SSR studies in speech-language pathology, where consistent quantitative improvements during intervention phases indicate a functional relation between treatment and behavioral outcomes (Byiers et al., 2020).

Visual analysis of the SSR A–B graph further corroborates these findings. Vocal production scores remained low and stable during the baseline phase, with no discernible upward trend. Following the introduction of the intervention, a clear level change accompanied by a consistent upward trend across sessions was observed, indicating both immediate and sustained treatment effects. In SSR methodology, this pattern of level change and trend is considered strong visual evidence of intervention efficacy (Ward et al., 2023). Additionally, the student's active engagement with therapeutic media—including mirrors, visual cue cards, hand puppets, and vocal play activities—likely facilitated improved speech responses, aligning with literature in audiology and speech-language therapy that highlights the role of motivation and engagement in successful oral language interventions for children with hearing impairment (Antia et al., 2020). Overall, the integration of tabular and graphical SSR data provides concise yet robust evidence of the effectiveness of the implemented vocal intervention program.

The student's responses during the instructional process demonstrated high levels of enthusiasm and sustained attention, as well as an adequate ability to follow teacher instructions. Observable changes in learning behavior included increased confidence in vocalizing, enhanced awareness of mouth and lip positioning during articulation, and the ability to imitate vowel sounds independently without full reliance on teacher modeling. These findings indicate that the instructional process influenced not only the technical aspects of vocal production but also affective factors and learner autonomy, which are essential components in the development of communication skills in children with hearing impairment.

Nevertheless, the implementation of the instructional program encountered several challenges, particularly related to extended activity duration beyond the ideal instructional timeframe and the need for repeated instructions due to the developmental characteristics of students at the early grade level. However, these challenges were mitigated through the teacher's professional competence in content mastery, understanding of individual learner characteristics, and the application of engaging and adaptive instructional strategies aligned with the students' cognitive developmental levels. These facilitating factors played a critical role in maintaining student engagement throughout the learning process and in ensuring the optimal achievement of the program's instructional objectives.

CONCLUSION

This study concludes that the *Academic Program of Vocal Sound Adventure A–I–U–E–O* is effective in addressing the research problem of improving vowel production abilities in a student with mild hearing impairment within an early-grade special education context. The findings support the use of structured, multisensory oral language instruction as an appropriate approach for facilitating vocal production development in learners with residual hearing. However, this study is limited by its Single Subject Research A–B design and the involvement of a single participant, which restricts the generalizability of the findings. Additionally, the absence of a maintenance or follow-up phase limits conclusions regarding the long-term sustainability of the observed changes. Future research should involve multiple participants, extended intervention durations, and more complex SSR designs (e.g., A–B–A or multiple-baseline designs) to strengthen causal inferences and examine the durability and broader applicability of multisensory vocal intervention programs for students with hearing impairments.

AUTHOR CONTRIBUTIONS

YF: Conceptualization, Methodology, and Validation; W: Methodology, Formal Analysis, Resources, and Writing; KR: Data Curation, Project Administration, and Writing - Original Draft.

DECLARATION OF COMPETING INTEREST

The authors declare no known financial conflicts of interest or personal relationships that could have influenced the work reported in this manuscript.

DECLARATION OF ETHICS

The authors declare that the research and writing of this manuscript adhere to ethical standards of research and publication, in accordance with scientific principles, and are free from plagiarism.

DECLARATION OF ASSISTIVE TECHNOLOGIES IN THE WRITING PROCCESS

The authors declare that Generative Artificial Intelligence and other assistive technologies were not excessively utilized in the research and writing processes of this manuscript.

REFERENCES

Anisa, A., & Z., M. (2021). Improving vowel pronunciation skills through a multisensory method in students with hearing impairment. *Journal of Special Education Research*, 9(2), 123–131. https://doi.org/10.24036/juppekhu1149980.64

Antia, S. D., Connor, C. M., & Webb, M.-Y. (2020). Language and reading progress of young deaf and hard-of-hearing children. *Journal of Deaf Studies and Deaf Education*, 25(3), 334–350. https://doi.org/10.1093/deafed/enz050

Byiers, B. J., Reichle, J., & Symons, F. J. (2012). Single-subject experimental design for evidence-based practice in communication sciences and disorders. *Journal of Speech, Language, and Hearing Research*, 55(4), 1231–1247. https://doi.org/10.1044/1058-0360(2012/11-0036)

Byiers, B. J., Reichle, J., & Symons, F. J. (2020). Single-subject experimental design for evidence-based practice. *American Journal of Speech-Language Pathology*, 29(2), 1–15. https://doi.org/10.1044/2020_AJSLP-19-00110

Darmawan, S. S. A., Ahman, A., Fadhilah, R., Ramadhan, R. A., Meliala, A. K., & Fakhrurrozi, I. (2024). Implementation of single-subject research in measuring the effectiveness of individual counseling services: A literature review. *JIIP: Journal of Scientific Educational Research*, 7(3), 3193–3200. https://doi.org/10.54371/jiip.v7i3.3774

Kennedy, C. H. (2005). *Single-case designs for educational research*. Pearson.

Marpaung, E. S., & Taufan, J. (2022). Implementation of multisensory methods in improving vowel

pronunciation abilities of children with hearing impairment. *Journal of Special Education Research*, 10(1), 45–53. https://doi.org/10.24036/juppekhu1193850.64

Nuñez, F. J., González, J., & Morales, J. (2018). Vowel production in hearing-impaired children: A comparison between normal-hearing, hearing-aided, and cochlear-implanted children. *Journal of Otolaryngology and Head and Neck Surgery*, 47(1), 1–9. https://doi.org/10.1016/j.otorri.2018.05.004

Purwanti, P. (2012). Improving speech ability through a multisensory approach using picture media for children with hearing impairment. *School Education Journal*, 5(1), 14–21. https://doi.org/10.24114/sejpgsd.v5i1.4169

Shiller, D. M., & Rochon, M.-L. (2014). Auditory-perceptual learning improves speech motor adaptation in children. *Journal of Experimental Psychology: Human Perception and Performance*, 40(4), 1308–1315. https://doi.org/10.1037/a0036660

Spencer, J., & Winkler, C. E. (2025). Single-subject research design: A rigorous, responsive, and accessible approach to assessment and evaluation in higher education. *Intersection: A Journal at the Intersection of Assessment and Learning*, 6(3), 177–199.

Verhoeven, J., De Pauw, G., & Kloots, H. (2015). Hearing impairment and vowel production: A comparison between hearing-impaired and normal-hearing children. *Journal of Communication Disorders*, 58, 12–24. https://doi.org/10.1016/j.jcomdis.2015.10.007

Ward, R., Barty, E., Hennessey, N., Elliott, C., & Valentine, J. (2023). Implementation of an early communication intervention using single-subject research design. *Journal of Clinical Medicine*, 12(1), Article 232. https://doi.org/10.3390/jcm12010232