



Enhancing Letter Recognition in Students with Mild Hearing Impairment through Flashcard-Based Phonics: A Single Subject Intervention Study

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Abstract: This study aimed to examine the effectiveness of a flashcard-based phonics method in improving letter recognition among students with mild hearing impairment. A Single Subject Research (SSR) design with an A-B-A pattern was applied to one second-grade student at SLBN A Citeureup, Cimahi City. Data were collected through repeated written tests and practical tasks during baseline-1, intervention, and baseline-2 phases, then analyzed using within and between-condition visual analysis. The findings showed that the student's letter recognition score increased from 50% in baseline-1 to 68.9% during the intervention, and further rose to 84.5% in baseline-2. An overlap percentage of 0% indicated a strong intervention effect. These results suggest that flashcard-based phonics is effective for enhancing early literacy skills in learners with mild hearing impairment. Practically, the combination of flashcards and phonics supports visual learning characteristics and helps strengthen the relationship between letter symbols and sounds in more structured literacy instruction. It also offers a simple alternative for special education classrooms.

Abstrak: Penelitian ini bertujuan menguji efektivitas metode fonik berbantuan flashcard dalam meningkatkan kemampuan mengenal huruf pada siswa dengan hambatan pendengaran ringan. Penelitian menggunakan Single Subject Research (SSR) dengan desain A-B-A pada satu siswa kelas II di SLBN A Citeureup, Kota Cimahi. Data dikumpulkan melalui tes tertulis dan praktik pada fase baseline-1, intervensi, dan baseline-2, kemudian dianalisis menggunakan analisis visual dalam dan antar kondisi. Hasil penelitian menunjukkan peningkatan kemampuan mengenal huruf dari 50% pada baseline-1 menjadi 68,9% pada fase intervensi, dan meningkat lagi menjadi 84,5% pada baseline-2. Persentase overlap sebesar 0% menunjukkan adanya pengaruh intervensi yang kuat. Temuan ini mengindikasikan bahwa metode fonik berbantuan flashcard efektif untuk meningkatkan literasi awal pada peserta didik dengan hambatan pendengaran ringan. Secara praktis, kombinasi flashcard dan fonik dapat menjadi strategi pembelajaran yang sesuai dengan karakteristik belajar visual siswa tunarungu. Intervensi ini juga membantu memperkuat hubungan antara simbol huruf dan bunyi secara bertahap, sehingga mendukung pembelajaran literasi dasar yang lebih terstruktur dan bermakna.

A. Introduction

Deaf children experience hearing loss that limits their access to auditory information and may significantly affect language development, communication skills, and early literacy acquisition (Wang et al., 2022). Somad (1996) explains that hearing impairment reduces children's ability to receive auditory stimuli, while Somantri (2007) states that this condition may hinder language development due to limited exposure to spoken language. As a consequence, deaf children tend to rely more heavily on visual input to process information and understand their surroundings. This reliance on visual learning influences the way deaf learners acquire literacy skills, particularly during the early stages of reading development. Therefore, instructional approaches for deaf students should be designed to accommodate their visual learning characteristics and communication needs.

In early literacy development, letter recognition is considered one of the most fundamental skills because it serves as the basis for reading and writing acquisition. Piasta (2016) defines letter recognition as the ability to identify written symbols and connect them with corresponding sounds and meanings. Similarly, Treiman (2018) emphasizes that effective instruction in letter recognition should include activities such as identifying letter shapes, naming letters, distinguishing vowels and consonants, and recognizing letter-sound relationships (Roberts et al., 2018; Roberts et al., 2020). These skills are essential because they enable children to decode words, understand language patterns, and develop reading fluency (Roberts, 2021). Without adequate mastery of letter recognition, students may encounter difficulties in progressing toward more advanced literacy skills.

Reading instruction for beginning learners is generally divided into early reading and advanced reading stages. During the early reading stage, students are expected to develop the ability to recognize letters, identify sounds, and connect symbols with spoken language. At the elementary school level, this stage becomes an important foundation for future academic achievement because reading skills influence students' ability to access knowledge across subjects. However, for deaf learners, the process of learning to read is often more challenging due to limited auditory access and reduced exposure to phonological information. Deaf students may experience difficulties distinguishing letter forms, identifying sound-symbol relationships, and understanding word patterns. Consequently, they often require specialized instructional strategies that emphasize visual representation, repetition, and multisensory learning experiences.

The use of appropriate instructional media plays an important role in supporting literacy learning for deaf students. O'Brien et al (2022) argue that inappropriate learning media may reduce the effectiveness of instruction, whereas visually supported media can enhance engagement, comprehension, and retention. In the context of early literacy learning, flashcards are considered practical visual media because they present information clearly through images, symbols, colors, and text. Flashcards may help students focus attention on letter forms and improve memory retention through repeated exposure. In addition, flashcards are flexible instructional tools that can be adapted to various literacy activities, including identifying letters, matching sounds, and recognizing words. Therefore,

flashcards have the potential to support literacy instruction for deaf learners who rely strongly on visual information processing.

Another instructional approach frequently associated with early literacy development is phonics instruction. Phonics is a teaching approach that emphasizes the relationship between letters and sounds to help students decode words systematically (Castles et al., 2018). Through phonics instruction, students learn how individual letters or combinations of letters correspond to particular sounds, which later supports reading fluency and comprehension. Although deaf children experience limitations in auditory perception, previous studies suggest that phonics instruction can still support literacy development when adapted to visual and articulatory learning approaches. Visual phonics, mouth movements, gestures, and repeated visual demonstrations may assist deaf students in understanding the relationship between symbols and speech patterns. Thus, phonics instruction can provide structured support for developing foundational literacy skills among learners with hearing impairment.

Recent studies indicate that literacy instruction for deaf children still faces several limitations, particularly regarding the use of effective and systematic teaching strategies. Kang et al (2022) found that research on reading and spelling instruction for deaf students remains limited, and phonics-based instruction has not yet been optimally implemented in educational practice. Other studies have demonstrated that visual media such as flashcards can improve vocabulary acquisition, engagement, and learning motivation among deaf learners because visual elements attract attention and facilitate understanding (Pratiwi et al., 2025). Furthermore, image- and color-based instructional media have been reported to strengthen memory retention and improve students' understanding of letter sounds (Amarah et al., 2025). Nevertheless, most previous studies have examined flashcards and phonics separately, focusing either on vocabulary development or general literacy instruction. Only a limited number of studies have systematically integrated flashcards and phonics specifically for improving letter recognition skills in children with hearing impairment (Sopiah et al., 2022).

In addition, previous studies have rarely employed research designs capable of capturing detailed behavioral changes throughout the intervention process. Most literacy intervention studies involving deaf learners use group-based experimental designs that focus primarily on post-intervention outcomes rather than continuous progress monitoring. Consequently, there is still limited empirical evidence regarding how individual deaf learners respond to structured phonics-based interventions over time. This condition highlights a research gap concerning the integration of visual instructional media and phonics instruction within a systematic framework capable of monitoring gradual learning changes in deaf students.

To address this gap, the present study introduces a flashcard-based phonics intervention implemented through a Single Subject Research (SSR) design using an A-B-A pattern. The novelty of this study lies in the integration of flashcards and phonics within a structured intervention specifically designed for a student with mild hearing impairment.

Unlike previous studies that tended to investigate phonics instruction or flashcards independently, this study combines both approaches in a way that aligns with the visual learning strengths of deaf learners. Moreover, the use of an SSR A-B-A design allows detailed observation of behavioral and learning changes across baseline and intervention phases, thereby providing a more comprehensive understanding of the intervention's effectiveness.

This study was conducted at SLBN A Citeureup, Cimahi City, where preliminary observations revealed that a second-grade student with mild hearing impairment experienced difficulties recognizing alphabet letters, naming consonants, and distinguishing letter forms. The student also demonstrated challenges in identifying letters within words and connecting symbols with sounds. Based on these conditions, the researcher implemented a flashcard-based phonics intervention to support the student's letter recognition ability and early literacy development.

Accordingly, this study addresses the following research questions: (1) Does a flashcard-based phonics intervention improve letter recognition skills in a student with mild hearing impairment? (2) To what extent does the intervention change the student's performance across the baseline and intervention phases? and (3) How effective is the intervention in supporting the student's early literacy development? Through these questions, this study aims to provide empirical evidence regarding the effectiveness of combining flashcards and phonics instruction for teaching letter recognition to deaf learners in special education settings.

B. Method

The type of research used was an experimental study employing a Single Subject Research (SSR) approach (Ledford & Gast, 2018). According to Arikunto (2002), experimental research aims to determine the existence of a cause-and-effect relationship resulting from a treatment administered to a subject. This study utilized an A-B-A design, consisting of a baseline phase (A1), an intervention phase (B), and a second baseline phase (A2).

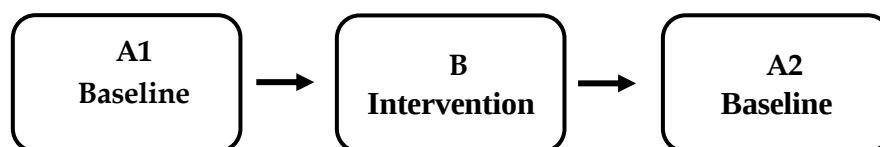


Figure 1. Research Flow

The baseline phase (A1) aims to assess the subjects' initial ability to recognize letters before the intervention is administered. The intervention phase (B) involves the application of a phonics-based flashcard method. Subsequently, the second baseline phase (A2) aims to assess changes in the subjects' abilities after the intervention has ended, thereby

allowing for the identification of a cause-and-effect relationship between the independent and dependent variables.

The subject of this study was a second-grade student at SLBN A Citeureup who falls into the category of mild hearing loss, with a hearing loss range of 15–30 dB. The subject, a male student, exhibited learning difficulties in recognizing letters, particularly in distinguishing and naming certain consonants.

Table 1. Research Subject Profile

Aspect	Description
Strengths	1. The subject is able to recognize and pronounce vowel letters (A, I, U, E, O). 2. The subject can recognize several consonants, including M, S, L, W, and C. 3. The subject is able to write basic letter symbols.
Difficulties	1. The subject has difficulty distinguishing visually similar consonants such as B and P. 2. The subject demonstrates limited recognition of several consonants, including D, N, T, R, J, Y, Z, V, and H. 3. The subject experiences challenges in identifying letters within words and connecting letter symbols with their corresponding sounds.
Educational Needs	The subject requires a structured phonics-based intervention supported by visual media, particularly flashcards, to strengthen letter recognition skills, improve sound-symbol association, and support early literacy development.

The instruments used in this study consisted of written and practical tests developed by the researcher to measure the student's letter recognition ability. The development of these instruments was grounded in the concept that letter recognition is an essential component of early literacy development. According to Ehri and McCormick, as cited in Seefeldt & Wasik (2008), children need to recognize, understand, and identify alphabet letters in order to become independent and fluent readers and writers. Children who are able to recognize and name alphabet letters generally experience fewer difficulties in early reading development compared to those who have limited letter knowledge.

In addition, letter recognition instruction aims to develop students' ability to identify letter symbols, associate them with sounds, and read simple words. Therefore, the instruments in this study were designed to assess several aspects of letter recognition ability, including recognizing vowel and consonant letters, identifying letter sounds, distinguishing uppercase and lowercase letters, and writing letter symbols. Based on these indicators, the researcher developed the following letter recognition instrument grid.

Table 2. Letter Recognition Instrument Grid

Variable	Indicators	Description of Skills Assessed	Number of Items
Letter Recognition Ability	Recognizing vowel letters	Identifying and pronouncing vowel letters (A, I, U, E, O)	2
	Recognizing consonant letters	Identifying and pronouncing consonant letters	7

Variable	Indicators	Description of Skills Assessed	Number of Items
	Identifying letter sounds in words	Recognizing specific letter sounds within simple words	5
	Identifying letters in objects or pictures	Matching letter sounds with familiar objects or images	5
	Identifying uppercase and lowercase letters	Distinguishing uppercase and lowercase letter forms	2
	Writing letter symbols	Writing vowel and consonant letter symbols correctly	7

Note: The instrument was developed based on early literacy indicators adapted from Ehri and McCormick (as cited in Seefeldt & Wasik, 2008) and the learning outcomes of the Independent Curriculum for Special Education Phase A.

This research procedure consists of three stages: the preparation stage, the implementation stage, and the final stage. During the preparation stage, the researcher conducted observations and interviews to identify the problem, determine the research subjects, draft a proposal, present the proposal at a seminar, obtain the necessary permits, develop research instruments, and conduct a validity test using expert judgment. The implementation stage was conducted using a Single Subject Research (SSR) design with an A-B-A pattern, which included a baseline-1 (A1) phase to assess the subjects' initial abilities, an intervention phase (B) involving the application of a phonics method aided by flashcards over several sessions, and a baseline-2 (A2) phase to assess the subjects' abilities after the intervention was discontinued. The final stage includes data processing, data analysis, and the preparation of the research report.

Data collection was conducted through written and practical tests administered at each session throughout the research phases, with scores consistently recorded using the same instrument. The data obtained were then analyzed using visual descriptive analysis in SSR through graphical presentation. The analysis was conducted in two stages: within-condition analysis and between-condition analysis. Intra-condition analysis included condition duration, directional trends, data stability, data traces, range, and level changes. Meanwhile, inter-condition analysis included changes in directional trends and their impacts, changes in stability, changes in levels, and the percentage of overlap. This analysis aimed to determine the effect of the intervention on the subjects' ability to recognize letters comprehensively.

C. Result

The subject in this study was a child with mild hearing impairment. According to Boothroyd, as cited in Dénoyelle et al (2022), mild hearing loss refers to a hearing loss ranging from 15–30 dB, which affects the ability to perceive normal speech sounds.

Based on the results of observations and interviews, the researcher developed an intervention program aimed at improving the student's ability to recognize alphabet letters. The program consisted of a flashcard-based phonics intervention designed to support letter

recognition skills. The intervention was conducted over seven intervention sessions within a total of thirteen research sessions, which included baseline-1, intervention, and baseline-2 phases.

The measurement of the subject's letter recognition ability was carried out across thirteen sessions divided into three phases. The first phase was Baseline-1 (A1), which consisted of three sessions to assess the subject's initial ability before the intervention. The second phase was the Intervention phase (B), consisting of seven sessions during which the flashcard-based phonics method was implemented. The third phase was Baseline-2 (A2), consisting of three sessions conducted after the intervention to evaluate changes in the subject's letter recognition ability.

Table 3. Baseline-1 Results of Letter Recognition Ability

Session	Score Obtained	Maximum Score	Percentage (%)	Interpretation
1	29	58	50.0	Low
2	29	58	50.0	Low
3	29	58	50.0	Low

The results of the Baseline-1 (A1) phase indicate that the subject's letter recognition ability remained stable at 50% across the three sessions. This finding suggests that the subject experienced difficulties in recognizing and distinguishing several alphabet letters prior to the intervention. The baseline data served as the initial measurement of the subject's letter recognition ability before the implementation of the flashcard-based phonics intervention.

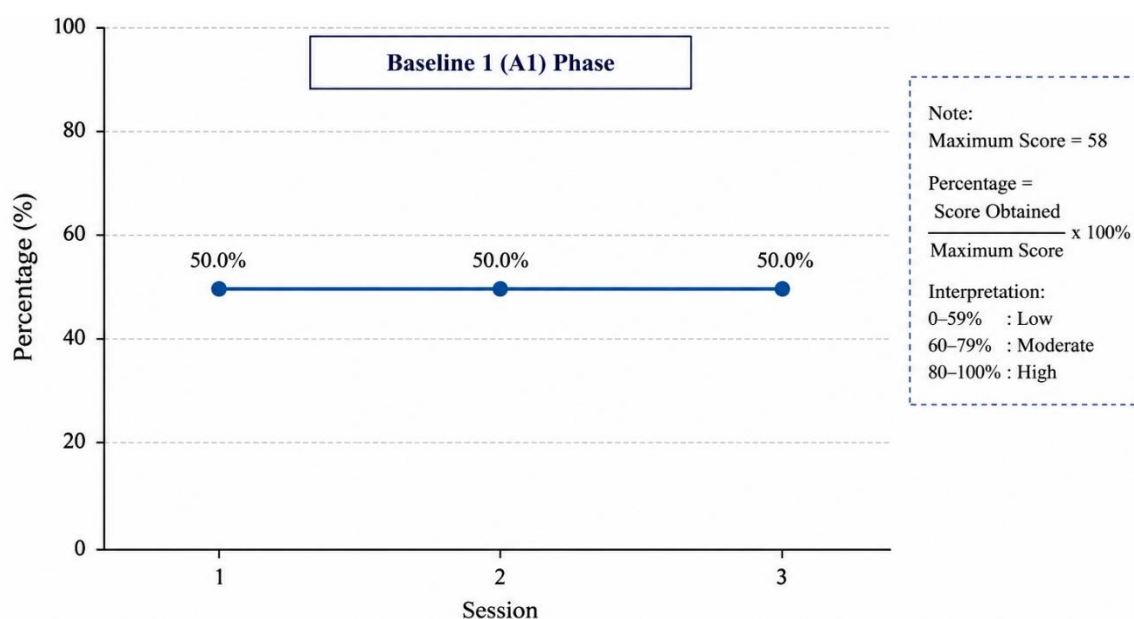


Figure 2. Letter Recognition Scores in the Baseline-1 Phase

The results of the measurement in the Baseline 1 phase of the subjects received a score of 29 out of 58 or if the percentage was 50%. The instrument items that have been

mastered by the subject since the Baseline 1 phase are related to pronouncing vowels, showing vowels or looking for certain letters in a word and looking for the view of letters.

Table 4. Intervention Phase Results of Letter Recognition Ability

Session	Score Obtained	Maximum Score	Percentage (%)	Interpretation
1	30	58	51.7	Moderate
2	34	58	58.6	Moderate
3	34	58	58.6	Moderate
4	36	58	62.1	Moderate
5	38	58	65.5	Moderate
6	40	58	68.9	Moderate
7	40	58	68.9	Moderate

The results of the intervention phase (B) demonstrated a gradual improvement in the subject's letter recognition ability across the seven intervention sessions. The subject's score increased from 51.7% in the first intervention session to 68.9% in the final sessions, indicating a positive effect of the flashcard-based phonics intervention. The improvement suggests that the intervention supported the subject in recognizing letter symbols, identifying letter sounds, and distinguishing consonant letters more effectively compared to the baseline phase.

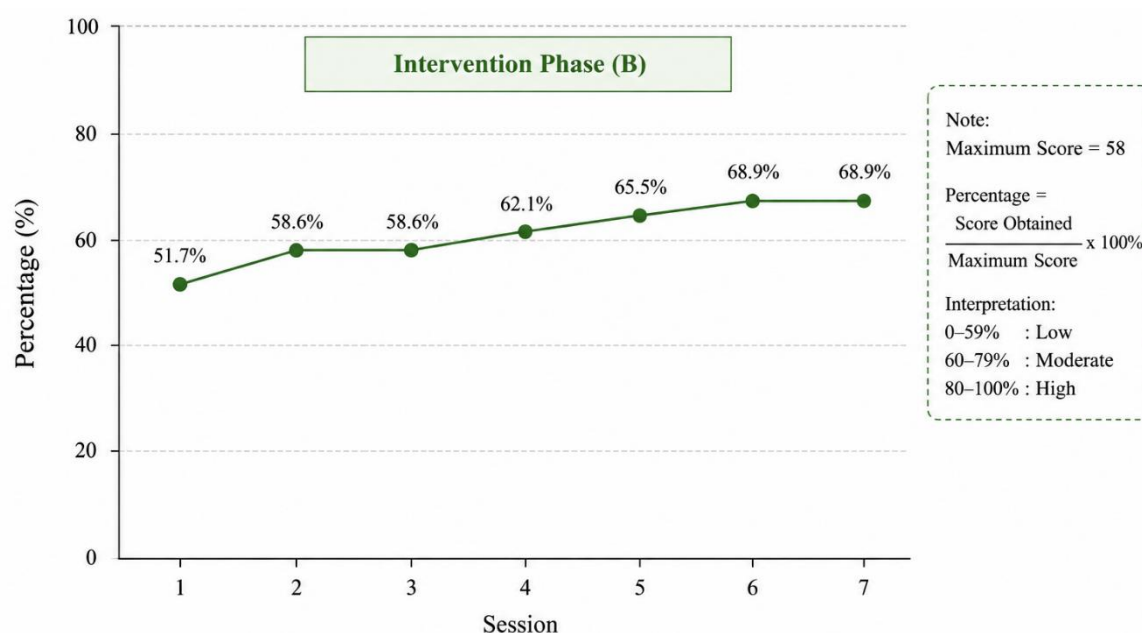


Figure 3. Intervention Phase Performance

Then in the Intervention phase, a significant increase was seen. It can be seen that session 1 shows a score of 30 out of 58 which when presented the result is 51.7%. Then in sessions 2 and 3 showed a score of 34 out of 58 which means an increase of 6.9% from session 1. Then in session 4 the subjects obtained a score of 36 with a percentage of 62.1%, in session

5 there was another increase with a score of 38 with a percentage of 65.5%. Then in the last 2 sessions the subjects scored 40 with a percentage of 68.9%. If calculated, there is an increase of 17.2%. The instrument items that have increased are the items of the instrument to pronounce the letters in groups 2, 3 and 5 or the letters M, S, B, P, L, D, N, T, W, S, R and H, then the instrument items look for certain letters in a word and the instrument items look for the view of the letters and write letter symbols.

Table 5. Baseline-2 Results of Letter Recognition Ability

Session	Score Obtained	Maximum Score	Percentage (%)	Interpretation
1	46	58	79.3	High
2	49	58	84.5	High
3	49	58	84.5	High

The results of the Baseline-2 (A2) phase indicate a substantial improvement in the subject's letter recognition ability after the intervention was implemented. The subject's score increased from 79.3% in the first session to 84.5% in the second and third sessions. These findings demonstrate that the subject was able to maintain improved performance even after the intervention phase had ended. The results suggest that the flashcard-based phonics intervention had a positive and sustained effect on the subject's ability to recognize alphabet letters.

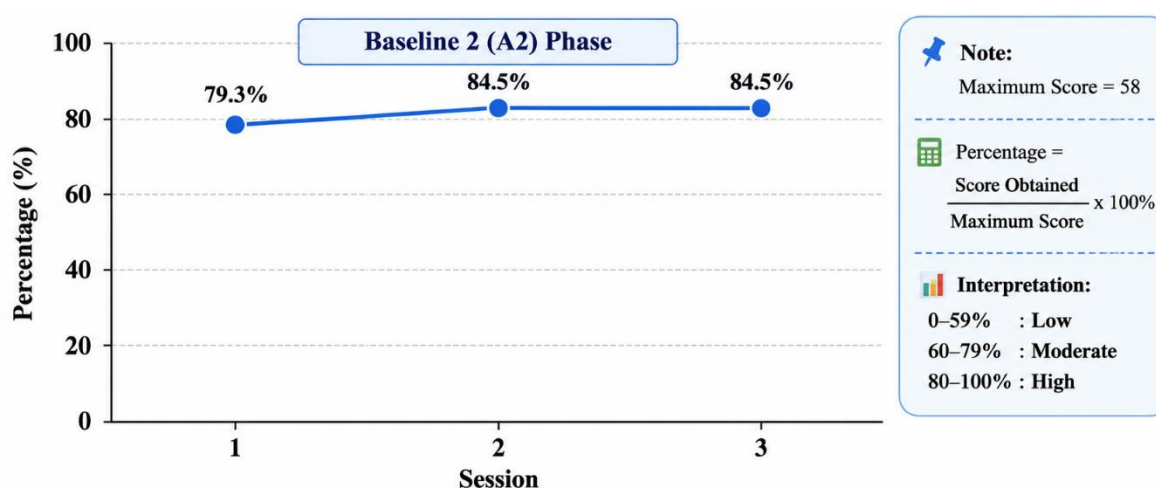


Figure 4. Letter Recognition Scores in Baseline-2

Based on the graph that has been presented above, it can be seen that the tendency in the direction of the ability to recognize letters in the baseline phase 1 shows an upward direction (+), then in the intervention phase it shows an upward direction (+), then in the baseline phase 2 also shows an upward direction (+). An overview of directional bias can be seen in the following table:

Table 6. Directional Tendency of Letter Recognition in All Phases

Condition	Directional Trend	Interpretation
Baseline-1 (A1)	Stable (→)	The subject's performance remained constant across sessions before the intervention.
Intervention (B)	Increasing (+)	The subject demonstrated gradual improvement during the implementation of the flashcard-based phonics intervention.
Baseline-2 (A2)	Increasing (+)	The subject maintained improved performance after the intervention phase ended.

The directional tendency analysis indicates that the subject's letter recognition ability remained stable during the Baseline-1 phase, increased progressively during the Intervention phase, and continued to show improvement in the Baseline-2 phase. These findings suggest that the flashcard-based phonics intervention contributed positively to the development of the subject's letter recognition skills.

Table 7. Changes in Stability Trends

Comparison Between Conditions	Stability Change	Interpretation
Baseline-1 (A1) to Intervention (B)	Stable to Increasing	The subject's performance changed from a stable condition to an improving trend after the intervention was introduced.
Intervention (B) to Baseline-2 (A2)	Increasing to Stable	The subject maintained improved performance consistently after the intervention phase ended.

The analysis of stability trends indicates that the subject's letter recognition ability changed positively following the implementation of the flashcard-based phonics intervention. The transition from a stable baseline condition to an increasing trend during the intervention phase suggests that the intervention contributed to gradual improvement in the subject's performance. Furthermore, the stable performance observed during the Baseline-2 phase indicates that the improvement was maintained after the intervention was withdrawn.

Table 8. Changes in Level Across Conditions

Comparison Between Conditions	Level Change	Direction	Interpretation
Baseline-1 (A1) to Intervention (B)	50.0% - 51.7%	Increasing (+)	The subject showed an initial improvement in letter recognition ability after the intervention was introduced.
Intervention (B) to Baseline-2 (A2)	68.9% - 79.3%	Increasing (+)	The subject demonstrated continued improvement and maintained higher performance after the intervention phase ended.

The analysis of level changes across conditions demonstrates a positive increase in the subject's letter recognition ability following the implementation of the flashcard-based phonics intervention. The increase from Baseline-1 to the Intervention phase indicates the initial effect of the intervention, while the higher increase from the Intervention phase to Baseline-2 suggests that the subject was able to maintain improved performance even after the intervention was withdrawn.

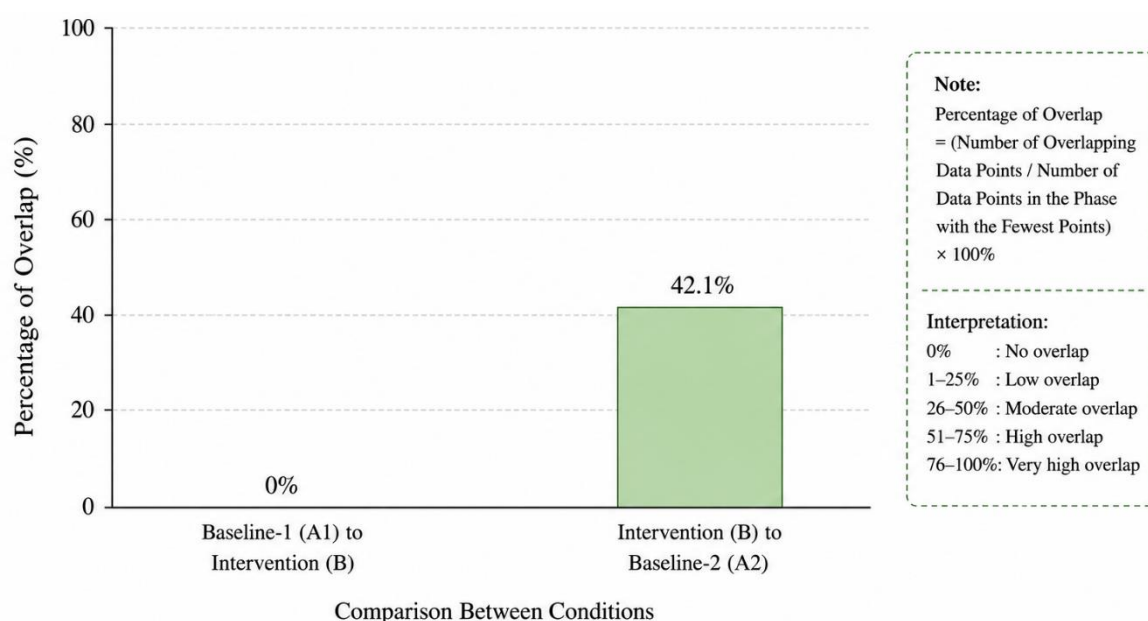


Figure 5. Percentage of Overlap Across Conditions

In the analysis of the overlap percentage from the Baseline 1 phase to the Intervention phase, there is a result of 0% and the percentage of overlap of the Intervention to Baseline 2 does not need to be calculated because Baseline 2 acts as a control. So it can be said that there is an influence in the intervention given because the percentage of overlap in the Baseline 1 phase to the intervention is 0%, where the smaller the percentage, the more influential the intervention that has been carried out. Based on the results of the discussion from the analysis in conditions and the analysis between conditions, it can be said that the application of the Flashcard-based Phonics Method has an effect on improving the ability to recognize letters for children with hearing impairments, this is characterized by a significant increase in ability after the subject is given intervention.

D. Discussion

This study aimed to examine whether a flashcard-based phonics intervention could improve letter recognition ability in a student with mild hearing impairment, to identify the extent of performance changes across research phases, and to determine the effectiveness of the intervention in supporting early literacy development. Based on the results of both within-condition and between-condition analyses, the findings indicate that the

intervention successfully improved the subject's letter recognition ability across the baseline, intervention, and post-intervention phases. The subject's performance increased progressively from 50% during the Baseline-1 phase to 68.9% during the Intervention phase and reached 84.5% during the Baseline-2 phase. Furthermore, the overlap percentage of 0% indicates a strong intervention effect and demonstrates a clear behavioral change following the implementation of the flashcard-based phonics method. These findings suggest that the intervention was effective in improving the subject's early literacy skills, particularly in recognizing and identifying alphabet letters.

The improvement observed in this study can be explained by the compatibility between the intervention and the learning characteristics of children with hearing impairment. Deaf learners rely heavily on visual information processing because auditory input is limited. Consequently, instructional methods that emphasize visual representation tend to be more effective for supporting literacy acquisition. In this study, flashcards functioned as visual learning media that presented letters in a concrete and repetitive manner, enabling the subject to focus attention on letter forms and strengthen memory retention. Repeated visual exposure also supported the subject's ability to distinguish consonant letters and recognize letter patterns more accurately. This finding supports the argument proposed by O'Brien et al (2022), who stated that visually supported learning media can enhance comprehension, engagement, and information retention among beginning readers. Similarly, Vadasy & Sanders (2023) found that visual learning support contributes significantly to attention and literacy development, particularly for learners who depend strongly on visual cues.

In relation to the first research question regarding the effectiveness of the intervention, the findings demonstrate that integrating flashcards with phonics instruction created a meaningful and structured literacy learning experience for the subject. Phonics instruction emphasizes the relationship between letter symbols and sounds, which is essential for developing early reading skills. Although children with hearing impairment experience limitations in auditory perception, phonics instruction supported by visual representation may still facilitate the understanding of sound-symbol relationships through articulatory and visual cues. The intervention enabled the subject to connect letter forms with corresponding sounds gradually and systematically. This result aligns with the findings of Daza Gonzalez et al (2023), who reported that phonics-based instruction improved phonological awareness and reading ability among deaf children through multisensory learning approaches. Likewise, Zussino et al (2022) found that structured phonics instruction supports language and literacy development by strengthening the connection between visual symbols and linguistic representation.

The second research question focused on the extent of performance changes across research phases. The findings revealed that the subject demonstrated gradual and consistent improvement throughout the intervention sessions. The stable trend observed during the Baseline-1 phase indicates that the subject's initial performance remained relatively unchanged before the intervention was introduced. However, after the implementation of

the flashcard-based phonics intervention, the subject showed a continuous upward trend during the Intervention phase and maintained improved performance during the Baseline-2 phase. This pattern suggests that the intervention did not merely produce temporary improvement but also contributed to sustained learning outcomes after the intervention was withdrawn. Within the context of Single Subject Research (SSR), stable baseline conditions followed by progressive intervention outcomes indicate a strong functional relationship between the intervention and behavioral change. Therefore, the findings provide empirical evidence that the flashcard-based phonics intervention contributed directly to improvements in letter recognition ability.

The effectiveness of the intervention may also be explained through cognitive processing theory and multisensory learning perspectives. Cognitive processing theory suggests that learning becomes more effective when information is delivered through multiple modalities that support memory encoding and retrieval. In this study, the integration of visual stimuli through flashcards and phonological instruction through phonics created a multisensory learning environment that facilitated literacy acquisition. For deaf learners, visual and kinesthetic modalities are particularly important because they compensate for limited auditory access. The subject was able to observe letter forms visually while simultaneously practicing articulatory patterns associated with letter sounds. This process strengthened cognitive associations between symbols and sounds, thereby improving recognition ability. The findings are consistent with Dilgard et al (2022), who emphasized that phonics instruction helps beginning readers understand the relationship between letters and sounds as a core component of literacy development. Furthermore, the findings support the theory proposed by Ehri and McCormick, which states that letter recognition is a foundational component of reading development because it enables children to decode written language effectively (Ehri, 2020).

Another important finding of this study is that the intervention appeared to increase the subject's engagement and participation during literacy instruction. The use of flashcards created a more interactive learning atmosphere compared to conventional teaching approaches that rely heavily on verbal explanation (Damsgaard et al., 2020). Visual materials attracted the subject's attention and encouraged active participation during learning activities such as identifying letters, matching symbols, and pronouncing sounds. Increased engagement may have contributed positively to learning motivation and reinforced the effectiveness of repeated practice throughout the intervention sessions. This finding supports previous studies indicating that visually engaging instructional media can improve motivation and classroom participation among deaf learners (Pratiwi et al., 2025; Amarah et al., 2025).

Overall, the findings of this study indicate that the integration of flashcards and phonics instruction constitutes an effective strategy for improving letter recognition skills in children with mild hearing impairment. The effectiveness of the intervention can be attributed to two primary factors: first, the use of visually supported learning media that aligns with the learning characteristics of deaf students, and second, the structured phonics

approach that facilitates the cognitive process of linking letter symbols with sounds. Unlike conventional literacy instruction that often separates visual and phonological elements, the present intervention systematically integrated both components into a structured learning process. Consequently, the intervention not only improved letter recognition ability but also supported the subject's early literacy development more comprehensively. These findings contribute to the growing body of research on literacy instruction for deaf learners and provide practical implications for the development of visually supported phonics instruction in special education settings.

E. Implication

The findings of this study have theoretical, practical, and policy implications for literacy instruction in special education. Theoretically, this study strengthens the concept of multimodal learning by demonstrating that the integration of visual media and phonics instruction can support cognitive processing in early literacy development among children with hearing impairment. The combination of visual and phonological elements appears to be effective for learners who rely heavily on visual input in the learning process. Practically, the results suggest that flashcard-based phonics can be used as an effective instructional strategy for teaching letter recognition in special schools (SLB). Through visual support and structured phonics activities, students can more easily connect letter symbols with their corresponding sounds, making the learning process more engaging, meaningful, and adaptive to the needs of deaf learners. In addition, this study has policy implications by emphasizing the importance of integrating visual-supported phonics instruction into special education curricula. Educational institutions and curriculum developers are encouraged to incorporate structured phonics programs supported by visual media to promote more inclusive and effective early literacy learning for students with hearing impairment.

F. Limitation and Suggestion for Further Research

This study has several limitations that should be considered when interpreting the findings. First, the study involved only a single subject, which limits the generalizability of the results to a broader population of students with hearing impairment. Second, the duration of the intervention was relatively short, so the study was unable to examine the long-term effects of the flashcard-based phonics intervention on students' literacy development. In addition, the study focused primarily on letter recognition ability and did not explore other aspects of literacy skills, such as reading comprehension or vocabulary development.

Based on these limitations, future research is recommended to involve larger participant samples and employ broader experimental or quasi-experimental designs to strengthen the generalizability of the findings. Further studies may also investigate the long-term effectiveness of phonics-based interventions in improving various aspects of literacy development among children with hearing impairment. Moreover, integrating technology-

based learning media, such as augmented reality (AR), interactive digital flashcards, or audio-visual applications, may provide more engaging and adaptive literacy instruction for deaf learners. Future researchers are also encouraged to examine the influence of multimodal learning approaches on students' motivation, engagement, and reading comprehension in special education settings.

G. Conclusion

In conclusion, this study demonstrates that the flashcard-based phonics intervention was effective in improving the letter recognition ability of a student with mild hearing impairment. The findings showed consistent improvement across the baseline, intervention, and post-intervention phases, indicating that the integration of visual media and structured phonics instruction can support early literacy development in deaf learners. The effectiveness of the intervention was influenced by the compatibility of flashcards and phonics with the visual learning characteristics of children with hearing impairment, enabling the subject to better recognize letter symbols and connect them with corresponding sounds. Therefore, flashcard-based phonics can be considered an effective and practical instructional strategy for enhancing early literacy skills in special education settings.

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