



Social Sciences & Humanity Research Review



The Effects of BIDMA Framework on Reading Comprehension and Morphological Skills in Students with Visual Impairment

Abdul Hamid^{1*}, Dr. Hafiz Tahir Jameel²

¹PhD Scholar Special Education, Allama Iqbal Open University, Islamabad.

²Assistant Professor, Department of Special Education Allama Iqbal Open University, Islamabad.

<https://doi.org/10.63468/sshr.389>

ARTICLE INFO

Keywords: morphological, reading comprehension skills, Students with Visual Impairment

Corresponding Author*:

Abdul Hamid

PhD Scholar Special Education,
Allama Iqbal Open University,
Islamabad

Email: a.hamid150gb@gmail.com

Article History

Received: 03-04-2026

Revised: 15-04-2026

Accepted: 24-04-2026

Published: 07-05-2026

ABSTRACT

This study investigated the effects of the Braille Instructional Design for Morphological Awareness (BIDMA) framework on increasing reading comprehension and morphological skills in SVIs by using an exploratory sequential mixed-methods design, the researcher collect qualitative data from braille instructors and Students with Visual Impairment for the development of structured morphological awareness in their writing tasks and also test their work quantitatively through pre- and post-intervention results. The study findings showed significant improvement in Students with Visual Impairments' ability to recognize morphemes, usage of bridging contractions, and construct grammatically accurate sentences. The study finding also revealed the need of morphology-focused instruction in Braille literacy to support language learning processing and academic success for Students with Visual Impairment.

INTRODUCTION

Braille learning is foundation for academic achievement, development of communication skills, and independence of Students with Visual Impairments (Siu et al., 2023). However, many braille learners continue to struggle with reading comprehension, vocabulary development, and grammatical accuracy in the presence of modern assistive technologies and inclusive educational facilities (Englebretson, Holbrook et al., 2023). Braille learning is a cornerstone for academic and functional success of SVIs. Proficiency in braille is associated with language development, reading comprehension, and academic independence (Holbrook & Koenig, 2020). SVIs who rely on braille face many difficulties in learning complex vocabulary and sentence structures. These challenges are related to the lack of systematic instructions about morphological awareness and the ability to recognize and manipulate morphemes in language tasks. It is difficult for SVIs because braille contractions represent morphemes, syllables, or entire words (Englebretson, Holbrook et al., 2023).



Teaching morphemes helps in improving decoding and comprehension outcomes for Students with Visual Impairments. In sighted learners, morphological awareness is a strong predictor of reading achievement, vocabulary growth, and syntactic fluency (Goodwin et al., 2020). Yet, teaching of morphology is not focused in the curriculum for SVIs, who may not benefit from the same learning opportunities as their sighted peers. SVIs try to connect orthographic patterns with morphological functions which identify a critical instructional gap (Tobin, M. J., & Hill, E. W. (2015). Explicit, structured teaching that aligns braille learning with morphological principles is necessary to bridge it. Previous research suggests that these challenges are not related to tactile decoding but also in insufficient teaching instructions in morphological awareness, the ability to identify, understand, and manipulate morphemes (Tsembelis, 2020).

Morphological awareness is a positive predictor of reading proficiency, spelling accuracy, and vocabulary development for sighted students (Nagy et al., 2014). Traditional braille teaching methods emphasized on orthographic decoding and fluency by neglecting explicit morphological instructions (Englebretson et al., 2023).

In Grade 2 Braille, many contractions represent common morphemes e.g. the contraction “:⠠” represents “-tion,” a common suffix indicating nouns, while “⠠” stands for “th.” When SVIs learnt to detect these patterns as morphemic units rather than as symbols, their ability for decoding complex words and constructing grammatically correct sentences improves. Without explicit teaching instruction, SVIs fail to recognize these patterns and show poor performance in reading and comprehension tasks (McCall et al., 2021). By connecting morphological principles into Braille instruction, BIDMA aims to improve SVIs' interaction with language through tactile modalities by improving decoding speed, reading comprehension, and writing fluency. Braille literacy equips learners with the skills to read, write, and comprehend content across various academic subjects without necessary morphemic insight to comprehend complex texts or construct syntactically correct sentences. Morphological awareness is important factor in addressing age-appropriate literacy challenges like reading comprehension, vocabulary development, and grammatical development faced by SVIs (Holbrook & Koenig, 2020; Siu, Presley, & Presley, 2023). Although the recognition and manipulation of morphemes in language is important for decoding, spelling, and learning complex words, but in braille education it not focused. As compared to sighted peers SVIs interpret linguistic structures with the help of tactile symbols in braille instead of morphemes.

For example, sometimes, a single braille symbol represents a prefix, suffix, or root that requires learning meaning rather than orthographic decoding. According to Englebretson, Holbrook et al. (2023) Grade 2 Braille needs metalinguistic processing. Conventional braille teaching methods focuses on fluency and orthographic accuracy by neglecting explicit teaching strategies for morphological awareness structures that is a strong predictor of reading abilities, vocabulary development, comprehension, and spelling accuracy in sighted students (Carlisle, 2010; Goodwin, Petscher, & Bishop, 2020). Teaching Morphological awareness is effective for teaching word meanings, identifying grammatical patterns, and improving comprehension of academic language in meaningful context for SVIs.

This method is effective for SVIs with reading difficulties for improving decoding abilities and comprehension skills (Tsesmeli, S., & Kariotaki, E. 2020). But research to braille remains limited in morphological domains. To bridge this gap, the Braille Instructional Design for Morphological Awareness (BIDMA) framework was developed by researcher. BIDMA a scaffolder instructional model based on linguistic patterns is designed to merge morphological-focused teaching strategies into braille literacy. It contains different tasks like as recognizing and identifying affixes, analyzing root in words, decoding morphemes, and constructing grammatically correct sentences with correct morphemic forms. All these activities offer a structured and accessible approach for SVIs by aligning tactile learning experiences and cognitive-linguistic principles.

The BIDMA framework suggests comprehension-driven teaching instruction by promoting meaningful involvement with language by memorization of braille contractions. Recent studies suggested that morphological teaching instruction will significantly increase literacy outcomes for struggling learners (Goodwin et al., 2020; Tsesmeli, 2020). Adaption of these strategies for braille improve morphological awareness, grammatical accuracy, and reading comprehension in SVIs. According to teacher's morphological tasks like analysis of affixes and correct sentence construction develop word formation and meaning skills to increase confidence in finding word parts and composing structurally accurate sentences.

The present study aims to assess the effectiveness of BIDMA framework for morphological awareness and reading comprehension skills among SVIs.

The researcher used exploratory sequential mixed-methods design, with qualitative exploration through interviews and focus group discussions to understand the instructional challenges and needs and also used quantitative intervention through BIDMA-based teaching instruction for assessing comprehension and morphological awareness through structured testing. The main aim of study is to determine effects of structured morphological teaching instruction based on the BIDMA framework for improving linguistic skills and academic performance among SVIs.

Objectives of the Study

The main objective of present study is to assess the effectiveness of the BIDMA framework in improvement of morphological awareness and reading comprehension among SVIs.

Specific Objectives

- To explore the current teaching practices and challenges faced by braille teachers and SVIs in teaching and learning of morphemes in braille.
- To implement BIDMA framework for teaching prefixes, suffixes, and root words in braille to SVIs.
- To evaluate the impact of the BIDMA framework on SVIs' morphological awareness skills in braille.
- To examine the effects of BIDMA-based teaching instructions on SVIs' reading comprehension abilities.

METHODOLOGY

Research Design

The present study used an Exploratory Sequential Mixed-Methods Design to analyze qualitative and quantitative data in two phases. The framework was implemented to examine its effect on reading comprehension and morphological awareness among SVIs.

The population of the study

The population of the present study comprised all experienced Braille teachers and students with visual impairments (SVIs) enrolled in grades 4 to 8 in elementary schools of Punjab, Pakistan, who have a working knowledge of Grade 2 Braille. The population included teachers involved in Braille and language instruction and SVIs studying in special education institutions, forming the basis for selection in an Exploratory Sequential Mixed-Methods Design.

The sample of the study

Phase I: Qualitative Phase

The sample of the present study consisted of 10 experienced Braille teachers and 35 students with visual impairments (SVIs) from grades 4 to 8, all of whom had a good command of Grade 2 Braille. The participants were selected using purposive sampling, where Braille teachers were chosen based on their expertise in Braille and language teaching experience, while SVIs were selected based on their willingness to participate in interviews, instructional sessions, and literacy tasks within an Exploratory Sequential Mixed-Methods Design. Additionally, selected Braille teachers participated in focus group discussions (FGDs) to share their collective experiences and to identify gaps and needs in current Braille teaching practices.

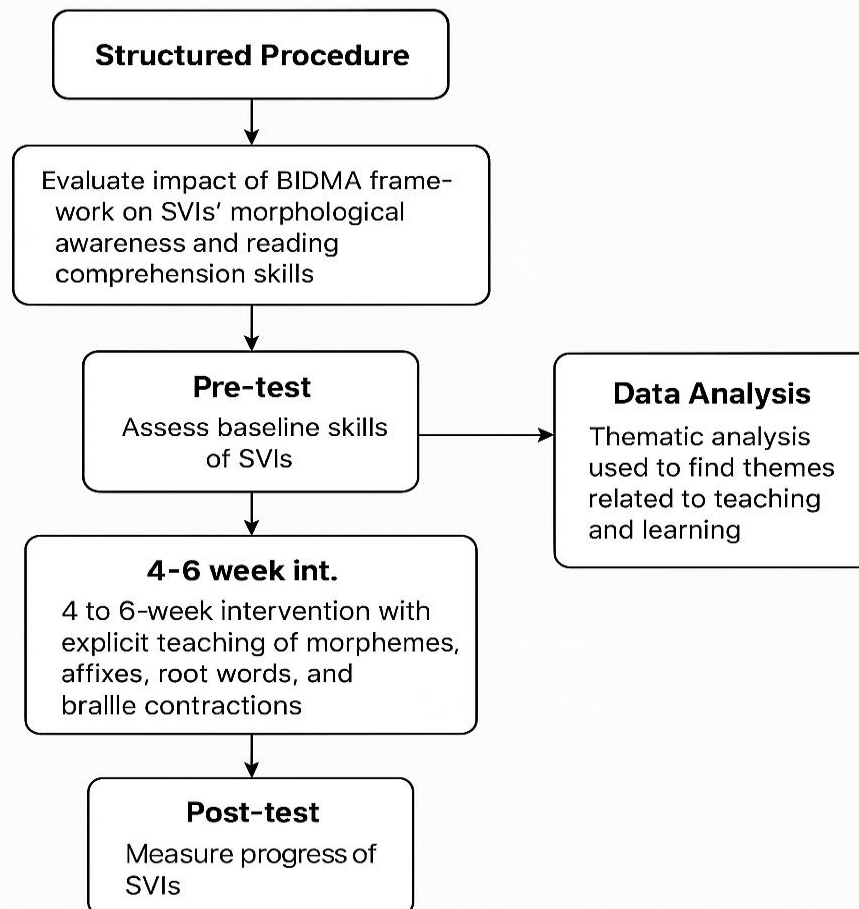
Phase II: Quantitative Phase

The sample for quantitative data was 35 students with visual impairments, all proficient in grade 2 braille according to inclusion criteria of research. The BIDMA Framework was implemented in a specific period for teaching morphological units (prefixes, suffixes, root words) and combining them into braille reading and writing tasks. All activities consisted on morphological decoding, affixes identification, application of bridging contractions, and writing tasks and reading comprehension exercises.

Data Collection Tools

- Qualitative data was collected through semi-structured Interviews of teachers and students to explore their perceptions, views and understanding of morphological awareness in braille.
- Focus Group Discussions among experienced braille teachers was conducting to identify gaps and needs in current teaching practices.
- Structured Morphological Awareness Test was specially designed in braille to assess the correct application of morphemes and contractions in sentence construction and writing tasks of SVI.
- Reading Comprehension Passages consisted on multiple-choice and short-answer questions were used to evaluate the reading comprehension skills among SVIs.

Data Collection Procedure



The present study followed a structured procedure to evaluate the impact of the framework on SVIs' morphological awareness and reading comprehension skills. A pre-test was used to assess the baseline skills of SVIs after a 4 to 6-weeks intervention including explicit teaching instructions about morphemes in a word, affixes, root words, and braille contractions. After completion of intervention post-test was

used to measure the progress and improvements of SVIs in same components. The results were compared to determine the effects of framework in improving SVIs' skills.

Data Analysis

Thematic Analysis was used to find themes related to teaching and learning challenges among teachers and students. Researcher will perform coding technique manually by using inductive approach. The credibility of the analysis was ensured by Member checking and peer debriefing.

RESULTS OF QUALITATIVE PHASE

Interview:

Understanding and experiences of braille teachers and SVIs about morphological awareness in braille literacy was explored through Semi-structured interviews. Thematic analysis was used to reviewing, coding, and categorizing the identified patterns and finding insights from qualitative data. Three main themes was identified at the base of this analysis

Limited Exposure of Morphological Teaching Instructions: Many teachers and SVIs participants reported that explicit teaching instruction about prefixes, suffixes, and root words was hardly combined into braille lessons. Teachers said that braille teaching instructions only emphasized decoding and fluency text, but morphological components in spelling are mostly overlooked.

Challenges in Recognition of Bridging Contractions and Morpheme in Spelling: Both teachers and SVIs stated that identification of bridging contractions in braille text is a major barrier in improving comprehension skills. SVIs do struggle to recognize the morphemic units in contracted forms of spelling in braille, which affect their ability to construct and interpret meaning of complex words negatively.

Positive Effects of Structured Morphological Teaching Strategies: Teachers and SVIs Participants showed positive response about the BIDMA-based teaching instructions. Teachers said that SVIs' engagement and understanding of word structure increased, while SVIs reported that they feel confident in decoding and sentence construction activities. The findings emphasize the importance of explicit morphological teaching instructions in braille literacy and also support the effect of framework in increasing literacy and comprehension skills among SVIs.

Focus Group Discussions

Data of Focus Group Discussions of experienced braille teachers highlighted three main themes: current teaching practices, gaps and challenges in teaching bridging contractions, and need of teaching morphological focused instructional design within braille literacy through thematic analysis.

Lack of Structured Morphological Curriculum in Current Teaching Practices: Teachers and SVIs participants reported braille learning programs prioritize decoding and fluency in reading and writing but teaching of morphemes (affixes and roots) and their link with braille contractions has limited support in curriculum with structured instructions.

Instructional Challenges in Teaching Bridging Contractions: Teachers reported that bridging contractions create misunderstandings in encoding morphemic elements in braille and make it difficult to interpret words without explicit morphological teaching instructions for SVIs. They also said that there is a lack of resources and trainings on connection between morphological awareness and contraction use.

Need for Morphology-Focused Instructional Design: Participants reported that structured frameworks like BIDMA should be introduced to fill the current instructional gaps and develop comprehension skills and improve SVIs outcomes in reading and writing braille. They appreciated BIDMA's contributions in improving linguistic principles, its scaffolding, and alignment with SVIs' cognitive and tactile experiences during braille learning. These themes identified the need of morphological teaching instructions in braille learning and confirm that BIDMA is a comprehensive and linguistic based instructional solution of those challenges.

RESULTS OF QUANTITATIVE PHASE

The second phase assessed the effects of BIDMA in improving SVIs' morphological awareness and reading comprehension skills. A total of 35 SVIs, proficient in grade 2 braille, willingly participated in pre-test and post-test assessments by using the Structured Morphological Awareness Test in braille.

Table .1

Mean Standard Deviation and t value of pre-test and post-test of SVIs

	N	Mean	SD	t value	P value
Pre-test	35	65.8	6.9	18.27	<0.001
Post-test	35	81.7	8.7		

The paired sample t-test results ($p < 0.001$) showed significant improvement in SVIs' post-test scores after BIDMA intervention. Pre-test scores of SVIs have mean 65.8 and standard deviation 6.9, and post-test scores of SVIs have mean 81.7 and standard deviation 8.7, and t value is 18.27 indicated that BIDMA based intervention have greater impact on SVIs performance in morphological awareness test to improve their morphological awareness skills and reading comprehension skills also indicated consistent performance of SVIs. These results strengthen the effectiveness of the BIDMA framework as a systematic and linguistic based approach to increasing braille literacy among SVIs.

Paired Samples Statistics(Comparison of Pre and Post-test Scores for measuring effects of BIDMA model)

Table .2 Mean and Standard Deviation and value of scores of all variables in pre and post-tests scores of students with visual impairment to evaluate the effects of BIDMA model.

Pre-Comprehension	35	11.2286	1.94158	-19.430	.000
Post-Comprehension	35	15.2857	1.99369		
Pre-Morphological Awareness	35	7.9714	1.50461	-15.827	.000
Post- Morphological Awareness	35	13.7143	1.80801		

a. The correlation and t cannot be computed because the standard error of the difference is 0.

This Table showed that there is a significant (Sig .000) difference between pre-test and post-test scores of students with visual impairment in all variables except bridging contraction in writing skills test. It highlighted that mean values of all variables' post-test scores are different from pre-tests' scores which show the effectiveness of BIDMA model for improving the writing skills of students with visual impairment with collaboration of bridging contractions in their writing activities.

Table.3 Paired Sample Correlation

		N	Correlation	Sig.
Pair 1	Pre-Comprehension & Post-Comprehension	35	.803	.001
Pair 2	Pre Morphological Awareness in Braille Spelling & Post-	35	.160	.358

Paired sample correlation table shows a significant (Sig .001) correlation in between groups of pre and post-tests of Morphological Awareness in Braille Spelling & Post of students with visual impairment which shows that most of the pairs of pre-test and post-test have an internal correlation between groups.

DISCUSSION

Qualitative phase: The present study used qualitative methods to explore current teaching practices, challenges, and gaps in learning morphological awareness in braille. Three main themes derived from data collected by interviews and focus groups discussions with braille teachers and SVIs. First, SVIs' understanding of word structure is limited due to lack of explicit teaching instructions in morphological awareness components prefixes, suffixes, and root words. Second, SVIs struggled with bridging contractions in grade 2 braille in disguised morphemic structures due to confusion. Lastly, participants

show positive response about BIDMA-based intervention, appreciating its structured instructional approach for improving SVIs' confidence and sentence construction skills in their reading and writing tasks. Findings also highlight the importance and gap in explicit morphological teaching instructions and effectiveness of the BIDMA framework for braille literacy curriculum.

These themes highlighted the need of intervention like BIDMA to connect morphological awareness knowledge with braille literacy and reading comprehension, and provide insights to develop Structured Morphological Awareness Test and content of intervention for Phase II.

Quantitative Phase: After implementation of framework 35 SVIs completed a pre-test and post-test assessment. This test evaluates the ability to identify, construct, and understand the meaning of morphemes and braille contractions in language contexts. The significant mean value 15.9 ($p < 0.001$) in post-test scores highlights that framework had a strong positive impact on understanding and application of morphemes in braille reading and sentence construction skills of SVIs. It indicates that SVIs improve their morphological recognition skills and accuracy in applying bridging contractions in text through framework instructions. The standard deviation value 6.9 indicated a consistency in performance of SVIs after the BIDMA based intervention. The results of quantitative data validate the qualitative findings and confirm the effectiveness of framework for filling instructional gaps through positive reception of structured morphological-based teaching practices identified in Phase I.

Integrated Discussion:

The present study used an exploratory sequential mixed-method approach to highlight the effect of framework for addressing gaps in braille literacy instructions. Qualitative findings of this study revealed challenges in teaching morphological awareness and bridging contractions to SVIs and highlighted the need for the development of the framework intervention for improving SVIs' braille learning. Quantitative results of this study confirmed the effects of framework to demonstrate significant learning outcomes. By integrating teachers' perceptions with empirical evidence, this study emphasizes the need of morphological awareness instructions in braille and specialized instructional tools like framework for SVIs.

CONCLUSION

It concludes that framework is a practical and effective approach for improving morphological awareness and reading comprehension in SVIs. Frameworks provide structured teaching instructions about morphemic components and bridging contractions for improving decoding and reading comprehension of SVIs. Qualitative findings exposed gaps in current braille teaching strategies and quantitative finding confirmed improvements in SVIs' progress which supports the integration of framework in special education curriculum as a linguistic based model for braille literacy. The BIDMA-based intervention demonstrates strong potential as a systematic, linguistically grounded framework for enhancing Braille writing. Its effects highlight its applicability in special education settings to support the development of morphological processing and overall academic skills in students with visual impairments.

Recommendations

- Integrate the BIDMA framework into Braille literacy curricula to enhance morphological awareness and reading comprehension among SVIs.
- Provide structured training for special education teachers on BIDMA-based instructional strategies.
- Develop standardized Braille instructional and assessment materials aligned with morphological awareness principles.
- Introduce BIDMA-based interventions at early educational stages to strengthen foundational literacy skills.
- Expand implementation across diverse educational settings to examine wider applicability.
- Incorporate assistive and digital Braille technologies to support BIDMA instruction.

- Conduct further research with larger samples and longitudinal designs to validate and extend the findings.

REFERENCES

- Berninger, V., & Nagy, W. (2022). Morphological instruction and its impact on literacy development. *Language and Literacy Studies*, 35(1), 45–67.
- Carlisle, J. F. (2010). Effects of instruction in morphological awareness on literacy achievement: An integrative review. *Reading Research Quarterly*, 45(4), 464–487. <https://doi.org/10.1598/RRQ.45.4.5>
- Emerson, R. W., Holbrook, M. C., & D'Andrea, F. M. (2009). Acquisition of literacy skills by children who are blind or have low vision. *Journal of Visual Impairment & Blindness*, 103(9), 532–545. <https://doi.org/10.1177/0145482X0910300904>
- Englebretson, R., Holbrook, M. C., & Fischer-Baum, S. (2023). A position paper on researching braille in the cognitive sciences: Decentering the sighted norm. *Applied Psycholinguistics*, 44(3), 400–415. <https://doi.org/10.1017/S0142716423000116>
- Englebretson, R., Holbrook, M. C., Smith, D. W., & D'Andrea, F. M. (2023). Braille, morphology, and meaning: Linguistic dimensions of braille literacy. *Journal of Visual Impairment & Blindness*, 117(1), 34–49. <https://doi.org/10.1177/0145482X221148422>
- Goodwin, A. P., Petscher, Y., & Bishop, M. (2020). The effectiveness of morphological instruction for students with reading difficulties: A meta-analysis. *Journal of Educational Psychology*, 112(6), 1170–1191. <https://doi.org/10.1037/edu0000421>
- Goodwin, A. P., Cho, S.-J., & D'Agostino, J. V. (2023). Teaching meaning through morphemes: A practical guide for literacy interventions. *Literacy Research and Instruction*, 62(1), 1–25. <https://doi.org/10.1080/19388071.2022.2153202>
- Goodwin, R. D., Weinberger, A. H., Kim, J. H., Wu, M., & Galea, S. (2020). Trends in anxiety among adults in the United States, 2008–2018: Rapid increases among young adults. *Journal of Psychiatric Research*, 130, 441–446. <https://doi.org/10.1016/j.jpsychires.2020.08.014>
- Holbrook, M. C. (2023). The ties that bind: Thirty-four years of focus on literacy for people who are blind or have low vision. *Journal of Visual Impairment & Blindness*, 117(6), 405–406. <https://doi.org/10.1177/0145482X231197473>
- Hoxhallari, L. (2019). Morphological awareness and reading comprehension: Implications for learners with special needs. *Journal of Special Education Research*, 11(2), 95–109.
- McCall, S., McLinden, M., & Douglas, G. (2021). Towards a literacy framework for tactile learners: Integrating morphology and metalinguistic instruction. *British Journal of Visual Impairment*, 39(3), 277–291. <https://doi.org/10.1177/0264619620968322>
- Tobin, M. J., & Hill, E. W. (2015). Is literacy for blind people under threat? Does braille have a future? *British Journal of Visual Impairment*, 33(3), 239–250. <https://doi.org/10.1177/0264619615591856>
- Tsesmeli, S., & Kariotaki, E. (2020). Training of spelling and meaning of compounds in primary school children in the school classroom. *Hellenic Journal of Psychology*, 17(3), 262–28
- Siu, B., Chowdhury, A. R., Yan, Z., Humphrey, S. M., & Hutter, T. (2023). Selective adsorption of volatile organic compounds in metal-organic frameworks (MOFs). *Coordination Chemistry Reviews*, 485, 215119. <https://doi.org/10.1016/j.ccr.2023.215119>