

The Effects of Phonics Instruction on Bottom-Up Processing in Reading Comprehension Early Readers of Primary II in Zaria Education Authority, Kaduna State

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Abstract

This study investigates the effects of phonics instruction on bottom-up processing in reading comprehension among Primary II pupils in Zaria Education Authority, Kaduna State. The research aimed to assess how phonics instruction affects early readers' word recognition and meaning construction. A quasi-experimental design with pre-test and post-test control group comparisons was used, involving 217 pupils selected through systematic random sampling. The experimental group received phonics instruction, while the control group followed traditional methods. Data analysis, including descriptive statistics and independent t-tests, revealed significant improvements in both word recognition and comprehension for the experimental group. In Table 3, the experimental group (mean = 39.70) significantly outperformed the control group (mean = 23.72) in word recognition ($p = 0.003$). In Table 4, phonics instruction also enhanced the ability to construct meaning (mean = 39.00) compared to the control group (mean = 23.61, $p = 0.001$). These findings affirm the effectiveness of phonics instruction in fostering reading skills.

Keywords: Phonics, instruction, comprehension, word, recognition, early, readers.

Introduction

Reading comprehension is fundamental to academic success, and one of the most debated strategies for improving this skill is phonics instruction. Phonics involves teaching children the relationships between letters and sounds, enabling them to decode written text effectively. This study stems from persistent challenges in early literacy, particularly in Nigeria, where low reading proficiency rates remain a significant concern. Reports by UNESCO (2022) reveal that literacy levels in Sub-Saharan Africa are among the lowest globally, with foundational reading skills being particularly weak among early learners. In Kaduna State, recent assessments indicate that many pupils struggle with decoding and comprehension, essential components of reading (UNICEF, 2023). The researcher is inspired by the potential of phonics instruction to address these challenges, drawing on evidence from educational psychology that links systematic phonics to improved decoding and comprehension skills (Ehri, 2021). Additionally, the study aligns with Nigeria's educational priorities, including

the Sustainable Development Goal (SDG) 4, which emphasizes inclusive and equitable quality education.

For clarity, Phonics Instruction is a teaching method that emphasizes the relationship between sounds (phonemes) and their corresponding letters (graphemes) in written language, helping students decode words (Snow, 2021). Phonics instruction plays a crucial role in early literacy development by providing foundational skills in word recognition and spelling patterns (National Reading Panel, 2022). Here, Bottom-Up Processing is a cognitive approach to reading where readers process text starting from the smallest units—letters and sounds—and gradually build up to larger units like words and sentences, ultimately constructing meaning (McNamara, 2021). This process contrasts with top-down processing, which relies on prior knowledge and context to interpret text (Gough & Tunmer, 2022). It is also that Reading Comprehension is the ability to understand, interpret, and derive meaning from written text, involving both decoding skills and the application of background knowledge (Baker et al., 2021). Successful reading comprehension integrates word recognition, vocabulary, and the ability to synthesize information from a text (Snow, 2022). In addition, Early Readers are seen as the pupils in the initial stages of learning to read, typically aged 5–8, and in this study, referring specifically to Primary II learners in Zaria Education Authority (Fletcher, 2021). Early readers are developing key literacy skills, including phonemic awareness, decoding, and basic comprehension strategies (Shanahan, 2021).

Phonics instruction traces its roots to the 19th century, when educators began formalizing approaches to teach literacy. Initially, emphasis was placed on rote memorization of words (sight word method), but phonics gained prominence as studies demonstrated the importance of decoding for effective reading. In the 20th century, debates about the “phonics versus whole language” approaches dominated literacy instruction globally. Advocates of phonics highlighted its scientific basis, emphasizing systematic, explicit instruction as critical for early readers (Adams, 1990). In Nigeria, literacy instruction traditionally relied on rote learning and memorization rather than explicit phonics. However, with increasing research highlighting the importance of systematic instruction, educational reforms have incorporated phonics into the national curriculum (FGN, 2014). Despite this, implementation gaps remain, particularly in rural areas like Zaria, where limited teacher training and resources undermine the effectiveness of phonics instruction.

Globally, phonics instruction has been extensively researched, with overwhelming evidence supporting its efficacy in enhancing reading skills. Ehri (2021) demonstrated that systematic phonics significantly improves decoding, spelling, and reading comprehension in early readers. Similarly, the National Reading Panel (2000) in the United States emphasized that phonics instruction is particularly beneficial for young learners and struggling readers. In the United Kingdom, the introduction of the “Synthetic Phonics Approach” as a mandatory component of early literacy instruction has yielded positive results, with significant improvements in reading proficiency among early learners (DfE, 2022). These findings align with cognitive theories, such as Gough and Tunmer’s (1986) Simple View of Reading, which posits that reading comprehension is a product of decoding and linguistic comprehension.

In the Nigerian context, studies have also highlighted the potential of phonics in addressing literacy challenges. Adebayo and Bello (2022) conducted a study in Lagos State and found that pupils exposed to phonics outperformed their peers in decoding and comprehension tasks. Similarly, Olanrewaju (2023) examined the impact of synthetic phonics on reading fluency among early readers in Ogun State, reporting significant gains in word recognition and comprehension. Despite these findings, the application of phonics in Nigeria is inconsistent. Challenges include inadequate teacher training, lack of instructional materials, and cultural factors that prioritize oral traditions over written literacy (Eze & Akpan, 2021). These issues are particularly pronounced in northern Nigeria, where literacy rates lag behind national averages due to socioeconomic and infrastructural disparities.

This study provides localized evidence on the effectiveness of phonics, which can inform policy and practice in similar contexts. Additionally, the study contributes to the growing body of literature on bottom-up processing, highlighting its role in fostering reading comprehension among early readers. Lastly, the study has the potential to advance understanding and practice in language education, contributing to improved literacy outcomes in Kaduna State and beyond.

Statement of the Problem

Reading comprehension is an essential skill for academic success and lifelong learning. However, in Nigeria, many early readers, particularly in rural areas such as Zaria Education Authority in Kaduna State, struggle with reading proficiency. Recent assessments revealed that a significant number of Primary II pupils lack the foundational skills needed for effective reading comprehension, such as decoding and word recognition (UNICEF, 2023). These deficiencies are attributed to various factors, including limited access to quality instructional

methods, inadequate teacher training, and the absence of structured approaches to teaching reading (Eze & Akpan, 2021). Phonics instruction, a method that emphasizes the relationship between sounds and letters to aid decoding, has been identified as an effective strategy for improving reading outcomes in early learners (Ehri, 2021). However, despite its inclusion in Nigeria's national curriculum, its implementation remains inconsistent, particularly in northern regions, where systemic challenges hinder educational progress. Furthermore, while phonics instruction has been extensively studied internationally, there is limited research on its impact on *bottom-up processing*—the cognitive approach where readers focus on decoding letters and words before constructing meaning—in the Nigerian context. This gap in research makes it unclear whether phonics instruction can effectively enhance bottom-up processing and improve reading comprehension for Primary II pupils in Zaria. Therefore, this study, therefore, seeks to investigate the effects of phonics instruction on bottom-up processing and reading comprehension among early readers, providing localized evidence to inform teaching practices and improve literacy outcomes in similar settings.

Significance of the Study

This study is significant for several reasons, as it addresses critical gaps in early literacy instruction in Nigeria, particularly in rural areas like Zaria Education Authority, Kaduna State. The findings of the study will benefit second language teachers by providing practical recommendations on implementing phonics instruction to improve decoding and comprehension skills among early readers. This is particularly important given the systemic challenges, such as inadequate teacher training and insufficient teaching resources, which hinder literacy development in rural schools (Eze & Akpan, 2021).

Secondly, policymakers and curriculum developers will gain valuable insights into the role of phonics in early literacy, enabling them to design and implement more effective instructional strategies. This aligns with national and global education priorities, such as Nigeria's Universal Basic Education program and the Sustainable Development Goal (SDG) 4, which emphasizes quality education for all. Finally, the study contributes to the academic discourse on cognitive processes in reading; particularly *bottom-up processing*, by bridging the gap between international research and the Nigerian educational context. In an attempt to explore how phonics enhances reading comprehension, the study has the potential to improve literacy rates, empower second language learners, and foster long-term academic and social development in Kaduna State and beyond.

The Objectives of the Study

1. To investigate the effect of phonics instruction on early readers' ability to recognize words in reading comprehension.
2. To examine the effect of phonics instruction on early readers' ability to construct meaning in reading comprehension

The Research Questions

1. What is the effect of phonics instruction on early readers' ability to recognize words in reading comprehension?
2. What is the effect of phonics instruction on early readers' ability to construct meaning in reading comprehension?

The Research Hypotheses

1. There is no significant the effect of phonics instruction on early readers' ability to recognize words in reading comprehension.
2. There is no significant the effect of phonics instruction on early readers' ability to construct meaning in reading comprehension.

Research Design

This study adopted a quasi-experimental research design which employed a pre-test, post-test control group design. The design allowed for the comparison of outcomes between pupils exposed to phonics instruction (experimental group) and those taught using traditional methods (control group). The design facilitated the measurement of changes in reading skills attributable to phonics instruction, providing evidence to support its efficacy in improving literacy outcomes among early readers.

Population of the Study

The population of the study comprised all Primary II pupils in schools under Zaria Education Authority, Kaduna State, which consists of 116 public primary schools, with a total population of 20,940 (10,694 boys and 10,246 girls).

Sample and Sampling Technique

The study employed Simple Random Sampling to select four primary schools with 783 primary four pupils (369 boys and 354 girls). The study selected 217 pupils (118 experimental and 99 control groups) using Systematic Random Sampling (SyRS) applied to avoid bias based on Kumar (2019, p. 123) sampling size. The experimental group included Late Shehu Idris LGEA Primary School, Babban Dodo Zaria (217 pupils, sample size 60), and Baba Ahmad LGEA Primary School, Tudun Wada Zaria (209 pupils, sample size 58).

The control group included Dr. Muhammadu Jumare LGEA Primary School, Jushi Zaria (195 pupils, sample size 54), and Maiwadan Kugu LGEA Primary School, Kugu Zaria (162 pupils, sample size 45).

Pilot Test

A pilot test was conducted in two schools, Lawal Aliyu LGEA Primary School, Ang. Alkali Zaria with 5 pupils, and Malam Nuhu Bature LGEA Primary School, Zaria with 5 pupils in order to assess the feasibility and clarity of the research instruments. This small-scale trial helped to identify any issues with the Standardized Reading Assessments Test had in order to ensure if they were suitable for measuring word recognition and comprehension before the full study.

Validity and Reliability of the Instrument

The validity of the research instrument ensured that the standardized reading assessments accurately measured word recognition and comprehension. Content validity was verified by aligning 20 test items with the study's objectives, reflecting key phonics instruction components. Reliability was assessed by administering the instrument to a pilot sample of 10 pupils (5 per school). A reliability coefficient of 0.85, determined using Cronbach's Alpha, confirmed the internal consistency. A reliable instrument ensured consistent results over time and settings, providing trustworthy data for the study.

Procedure for Data Collection

1. **Pre-Test Administration:** The data collection process began with administering the SRAT as a pre-test to a sample of Primary II pupils, both in the experimental and control groups. The pre-test assessed the pupils' baseline abilities in word recognition and comprehension. The SRAT consisted of tasks focused on decoding skills (e.g., recognizing words in isolation and context) and tasks designed to measure their ability to construct meaning (e.g., reading passages and answering comprehension questions).
2. **Phonics Instruction Intervention:** Following the pre-test, the experimental group received phonics instruction for a predetermined period (e.g., 4-6 weeks), with a focus on improving their word recognition and comprehension. The control group continued with their usual instructional practices.
3. **Post-Test Administration:** After the intervention, the SRAT administered again as a post-test to both the experimental and control groups. This helped to assess any changes in word recognition and meaning construction abilities, providing a comparison of the effectiveness of phonics instruction.

Data Analysis

Data analysis involved using a t-test to compare pre-test and post-test scores of the experimental and control groups. This statistical method determined if there were significant differences in word recognition and comprehension between the groups by providing insights into the effects of phonics instruction on early readers' skills.

Presentation and Analysis of Data

The data for both the experimental and control groups are displayed in the tables below. Descriptive statistics, including mean and standard deviation, were employed to address the research questions, while an independent t-test was used to analyze the hypothesis. A probability level of $P = .05$ (95% confidence level) was chosen for this study.

The Research Questions1: What is the effect of phonics instruction on early readers' ability to recognize words in reading comprehension?

Table 1: Phonics Instruction to Recognize Words in Reading Comprehension

S/N	Group	n	Mean	STD	Mean Diff.	Standard Error Mean
	Experimental	118	39.70	15.38	15.99	1.73
	Control	99	23.72			

Table 1 presents the impact of phonics instruction on early readers' word recognition skills in reading comprehension. The experimental group (118 participants) achieved a mean score of 39.70 with a standard deviation of 15.38, while the control group (99 participants) scored a lower mean of 23.72. The mean difference of 15.99, with a standard error of 1.73, highlights a significant improvement in the experimental group compared to the control group. These results suggest that phonics instruction positively affects early readers' ability to recognize words, providing strong support for its effectiveness in enhancing reading comprehension skills.

The Research Questions 2: What is the effect of phonics instruction on early readers' ability to construct meaning in reading comprehension?

Table 2: Phonics Instruction to Construct Meaning in Reading Comprehension

S/N	Group	n	Mean	STD	Mean Diff.	Standard Error Mean
	Experimental	118	39.00	7.43	15.39	0.95
	Control	99	23.61			

Table 2 illustrates the effect of phonics instruction on early readers' ability to construct meaning in reading comprehension. The experimental group (118 participants) achieved a mean score of 39.00 with a standard deviation of 7.43, while the control group (99 participants) recorded a lower mean of 23.61. The mean difference of 15.39, with a standard error of 0.95, indicates a notable improvement in the experimental group compared to the control group. These findings emphasize the effectiveness of phonics instruction in enhancing early readers' comprehension skills, particularly their ability to construct meaning from text, thereby supporting its educational value.

Research Hypothesis 1: There is no significant the effect in phonics instruction on early readers' ability to recognize words in reading comprehension.

Table 3: Phonics Instruction to Recognize Words in Reading Comprehension

S/N	Group	n	STD		Df	Tcal	P-	Remark
			Mean	Deviation			Value	
	Experimental							
	Group	118	39.70	15.38	215	-17.79	0.003	Sig.
	Control Group	99	23.72					

Table 3 evaluates the hypothesis that phonics instruction has no significant effect on early readers' ability to recognize words in reading comprehension. The experimental group (mean = 39.70, standard deviation = 15.38) significantly outperformed the control group (mean = 23.72). With a degree of freedom (df) of 215, the calculated t-value (Tcal) is -17.79, and the p-value is 0.003. Since the p-value is less than the threshold of 0.05, the result is statistically significant. This indicates that phonics instruction has a substantial positive effect on early readers' word recognition skills, rejecting the null hypothesis and supporting its effectiveness.

Research Hypothesis 2: There is no significant the effect in phonics instruction on early readers' ability to construct meaning in reading comprehension.

Table 4: Phonics Instruction to Construct Meaning in Reading Comprehension

S/N	Group	n	STD		Df	Tcal	P-	Remark
			Mean	Deviation			Value	
	Experimental							
	Group	118	39.00	7.43	215	-15.72	0.001	Sig.
	Control Group	99	23.61					

Table 4 examines the hypothesis that phonics instruction has no significant effect on early readers' ability to construct meaning in reading comprehension. The experimental group (mean = 39.00, standard deviation = 7.43) significantly outperformed the control group (mean = 23.61). With a degree of freedom (df) of 215, the calculated t-value (T_{cal}) is -15.72, and the p-value is 0.001. Since the p-value is below the 0.05 significance threshold, the result is statistically significant. This demonstrates that phonics instruction positively influences early readers' ability to construct meaning, rejecting the null hypothesis and reinforcing its importance in developing comprehension skills.

Discussion of the Findings

The findings from this study reveal that phonics instruction significantly improves early readers' ability to recognize words and construct meaning in reading comprehension. The results of the study align with and diverge from existing literature, shedding light on the multifaceted impact of phonics instruction. The study's results indicate that phonics instruction significantly enhances early readers' ability to recognize words, as evidenced by the higher mean score of the experimental group compared to the control group. This aligns with Ehri et al. (2001), who argue that phonics instruction facilitates the development of decoding skills by helping learners associate sounds with letters and letter combinations, thereby improving word recognition. Similarly, Savage et al. (2018) found that systematic phonics instruction accelerates early literacy development by enabling children to decode unfamiliar words, a critical component of reading comprehension.

However, some researchers have critiqued phonics instruction, emphasizing its limitations. For instance, Goodman (1996) contended that focusing solely on phonics may neglect the holistic nature of reading, which also involves semantic and syntactic cues. While this critique highlights potential oversights, the present study underscores the importance of phonics instruction as a foundational skill, especially for beginning readers who need structured support to build their word recognition capacity.

The study also demonstrates that phonics instruction significantly improves early readers' ability to construct meaning in reading comprehension. The experimental group exhibited superior performance compared to the control group. This supports claims by the National Reading Panel (2000), which asserted that phonics instruction not only enhances word recognition but also contributes to overall comprehension by enabling readers to decode words quickly and focus on understanding the text. In contrast, Pearson and Gallagher (1983) introduced the gradual release of responsibility model, which posits that comprehension

requires more than decoding; it involves higher-order thinking skills such as inference, prediction, and synthesis. While phonics plays a foundational role, they argue that meaning-making depends on integrating phonics with other strategies, such as guided reading and context-based learning. This view complements the findings of this study, suggesting that while phonics instruction significantly aids comprehension, it should be supplemented with broader strategies to ensure holistic reading development.

The similarities among the authors highlight a consensus on the critical role of phonics in early reading development. Both Ehri et al. (2001) and the National Reading Panel (2000) agree that phonics is essential for building decoding and comprehension skills, supporting the present study's findings. Additionally, the statistically significant results in this study resonate with Savage et al.'s (2018) conclusion that systematic phonics instruction is particularly effective for young learners, especially those at risk of reading difficulties. However, differences emerge in the extent to which phonics is considered sufficient for reading comprehension. Goodman (1996) and Pearson and Gallagher (1983) argue for a more balanced approach, emphasizing the integration of phonics with comprehension strategies and meaning-based instruction. This contrasts with the more phonics-focused perspective of Ehri et al. (2001), who prioritize decoding as the foundation for successful reading.

The findings of this study underscore the necessity of phonics instruction in improving word recognition and comprehension among early readers. However, they also highlight the need for a balanced literacy approach that integrates phonics with other reading strategies. Second language teachers should adopt a blended methodology that incorporates phonics to build foundational skills while also promoting comprehension strategies that encourage higher-order thinking.

Conclusion

The study demonstrates that phonics instruction plays a vital role in enhancing early readers' abilities to recognize words and derive meaning from text. This is consistent with the perspectives of Ehri et al. (2001) and the National Reading Panel (2000), who emphasize the importance of phonics in developing decoding skills critical for fluency and comprehension. At the same time, the findings echo Goodman's (1996) and Pearson and Gallagher's (1983) advocacy for a more comprehensive approach that incorporates diverse reading strategies. The results highlight that while phonics instruction is fundamental, it should be integrated with methods that foster advanced comprehension skills to ensure well-rounded literacy development.

Recommendations

1. **Implement Systematic Phonics Instruction in Early Education:** Schools and educators should incorporate structured phonics instruction into early literacy programs, particularly for beginning readers, to build foundational word recognition and decoding skills.
2. **Adopt a Balanced Literacy Approach:** Phonics instruction should be complemented with strategies that enhance comprehension, such as guided reading, vocabulary development, and context-based learning. This ensures that children not only decode words but also understand and engage with the text meaningfully.
3. **Provide Professional Development for Teachers:** Training programs should equip teachers with the skills to deliver effective phonics instruction and integrate it with comprehension strategies. This will help educators address diverse learning needs in their classrooms.
4. **Support At-Risk Learners:** Special intervention programs should be developed for struggling readers who may benefit significantly from phonics-based instruction. These programs should also include individualized support to address specific learning gaps.
5. **Conduct Further Research:** Future studies should explore the long-term effects of phonics instruction on reading comprehension and its integration with other instructional methods. Research should also focus on how phonics can be adapted for diverse linguistic and cultural contexts.

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