

Structured Reading Strategies and Comprehension Gains Among Ghanaian Basic School Pupils

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Abstract

While reading comprehension has been identified as a major challenge for lower primary learners in Ghana, there is little evidence of effective classroom-based interventions. This study focused on the combined influence of three structured reading instructional interventions: Collaborative Strategic Reading (CSR), Modelled Reading, and Question-Answer Relationship (QAR) strategy on the reading comprehension performance of the Basic Two (B2) in a public basic school in Ghana. A single group, pretest–posttest design with an action research approach was used, which involved 50 purposively selected pupils for 4 weeks of intervention. The reading achievement data were collected through teacher-created comprehension tests before and at the end of each phase of instruction. The changes in performance were evaluated using descriptive statistics and inferential statistics comprising the chi-square test of homogeneity and the Cochran-Armitage trend test. The percentage of pupils at a level lower than the average decreased from 60% at baseline to 14% after the entire intervention sequence, and those pupils at above-average and excellent levels rose from 20% to 76%. The overall performance distributions varied significantly from assessment occasion to assessment occasion ($\chi^2(9, N = 200) = 38.57, p < .001$), and there was a significant improvement trend ($z = 5.16, p < .001$). Although caution must be taken in interpreting the results due to the lack of a control group, the results suggest that sequential, strategy-based reading instruction can make a significant contribution to early reading comprehension. The study highlight the relevance of structured literacy intervention to enhance the core reading skills and for teacher professional development and literacy policy in Ghana.

1. Introduction

Reading is generally seen as a stepping stone to all classroom-based learning and is the basis of reading comprehension difficulties at the lower primary level that have continued to receive continuous research and policy interest in Ghana and on the continent in general. English is used in teaching the curriculum and is the official language of the public in Ghana, and a pupil who is unable to read and understand English is at a structural disadvantage, not only in the English language subject but in the whole curriculum (Kumah, 2025). This handicap increases with the years as understanding of more complex print becomes increasingly dependent on following the basic education system, and pupils who fall behind early are unlikely to catch up without deliberate effort (Oduro et al., 2021).

The comprehension problem is not a personal one, but rather an issue that is emerging from school and district-level assessments in Ghana. Junior high school students in Ga West Municipality still face difficulties in reading fluency and comprehension, even though they were taught in the primary school for many years, indicating that the problem has been ingrained and the problem-solving process has been neglected in the primary school education system. In a similar vein, Impraim (2025) recorded that teachers in Agona Swedru Presbyterian primary schools were using unstructured approaches to tackle pupils' repeated reading challenges, such as repetition, without structured and diagnostic approach to remedial reading, and Akwisah (2025) generally reported that reading methods that are easily implementable in the classroom are not widely used by a lot of primary schools teachers to address

pupils' reading challenges in comparison to reported need. The present study aims to address this need for structured classroom-level responses in relation to the scale of the problem.

In Supported Teaching in Schools at Model 2A Basic School, Wenchi, forty of the fifty Basic Two pupils (80% of the class) had not read two and three-letter words accurately during guided reading, could not point out individual letters of the alphabet and could not ask and answer basic comprehension questions on passages suitable to their grade level. This is in line with the findings of Con Nutsugah (2025), which revealed that lower primary school learners had not acquired the basic decoding and comprehension skills expected of them in Grade One, attributing the reason for this to the lack of structured and systematic lesson plans in their classrooms, instead of the learners' inability of the learners. This finding was also corroborated by Nwafo and Onunze (2024), who noted that students' inability to interpret and comprehend the English language in public primary schools in Nigeria is directly related to the lack of structured and systematic pedagogic approaches rather than any inability on the part of the learners. A few studies at higher educational levels in Ghana had investigated the issues of related reading problems; however, not much had been done on a class at this early stage, and this study aimed to bridge this gap.

It was in this scenario that the present study was embarked upon as an action research project to investigate whether or not the three specific, structured approaches, namely Collaborative Strategic Reading, Modelled Reading and Question Answer Relationship approach, could significantly influence the reading comprehension performance of the Basic Two learners of Model 2A basic school, Wenchi, in a real classroom environment. The design was chosen to be action research rather than purely observational, because the study was intended to take a proactive approach towards the problem, rather than just a descriptive one, and to draw conclusions about the problem, the intervention, and generate recommendations for practice in one academic term. This was achieved by the following objectives: 1) To test the impact of Collaborative Strategic Reading on reading and comprehension, 2) to test the impact of Modelled Reading on reading and comprehension, and 3) to test the impact of the Question Answer Relationship strategy on reading and comprehension. These objectives were then broken down into three research questions that guided the data collection and analysis reported later in this paper:

(RQ1): *What is the effect of the use of Collaborative Strategic Reading on the reading and comprehension skills of the pupils of Model 2A Basic School, Wenchi?*

(RQ2): *What is the effect of the use of Modelled Reading on the reading and comprehension skills of the pupils of Model 2A Basic School, Wenchi?*

(RQ3): *What is the effect of the use of the Question Answer Relationship strategy on the reading and comprehension skills of the pupils of Model 2A Basic School, Wenchi?*

The information produced in response to these questions can be of use to various groups of people. The study offers a sequence of strategies which has been empirically tested and low cost that can be implemented in the classroom by the teachers themselves with minimal extra resources to fill the

practical vacuum engulfed by Akwisah and Impraim (2025). The results provide a model for school leaders to use for diagnosing and intervening in reading difficulties in a pre-test-driven, strategy-based cycle as opposed to a generic remediation approach. The study provides local evidence that can help in sequencing reading strategies in the English language curriculum for lower primary for curriculum planners, such as the Curriculum Research and Development Division of the Ghana Education Service. Lastly, it adds to the limited but emerging research on classroom-based intervention in Ghana on reading difficulty, building on similar studies conducted by Oduro et al. (2021) on teachers' remediation strategies and Stoffelsma et al. (2026) on oral reading fluency and comprehension among bilingual learners in Ghana, South Africa, and Zimbabwe.

2. Literature Review

2.1 Conceptualising Reading Comprehension

Word recognition is not an indicator of reading comprehension. It is more well known as a coordinated function of decoding accuracy, vocabulary knowledge, background knowledge, and purposeful use of comprehension strategies throughout and after the reading process (Edu, 2025). A child could be able to sound out single words correctly but not make sense of a passage, which is frequently termed the word calling/actual reading dichotomy. The distinction is important for the present study because the pupils of Model 2A Basic School appeared to have problems at both levels: decoding individual letters and words, and comprehending passages read to them while comprehension questions were administered. Any intervention required to be effective at both decoding fluency and comprehension at the higher order level; that is, an intervention had to address these problems simultaneously, rather than solving them one after the other.

The difficulties at the basic level of reading are hardly ever isolated, simple problems. The reading errors and learning problems described by Roy (2026) were a range of overlapping errors that included letter reversal, inconsistent sound-letter correspondence and the ability to hold attention for the length of an entire passage, which were similar to the errors discovered among the Basic Two in this study. In a systematic review of analytic and phonics-based reading and writing instruction for first grade, Akan (2024) found that, in general, early reading difficulty is multifaceted, further supporting the need for interventions, such as the three interventions examined in this study, that incorporate explicit strategy instruction with guided practice, rather than a single de-contextualised drill.

2.2 Reading Difficulties Among Lower Primary Learners in Sub-Saharan African Contexts

The reading difficulties recorded in this study are within the regional trend. Stoffelsma et al. (2026) found that the measure of oral reading fluency and vocabulary continued to be poor predictors of comprehension for primary bilingual learners across Ghana, South Africa and Zimbabwe, suggesting that uncritical application of materials that worked well in first language reading classrooms in high resource

countries is not effective in multilingual African classrooms. In Zambia, Bwalya et al. (2026) reported that lower primary teachers often did not have a well-defined instructional repertoire for teaching reading difficulties, but rather relied on repeated oral drilling; this is consistent with what was observed informally in this study through observation and interview at Model 2A Basic School before the intervention. Similarly, in primary schools located in Hawassa, Ethiopia, Jembere (2023) identified that structured instruction techniques led to noticeable improvements in basic reading skills, while unstructured, teacher-improvised instruction techniques had not yielded any results, a finding consistent with the premise of the current study.

In Ghana, in particular, several recent studies come to the same conclusion: The problem is under-addressed, not under-recognised. An important challenge highlighted by Idrees et al. (2022) was the lack of awareness among teachers of pupils' reading difficulties and their ability to implement targeted remediation strategies at the primary level, which this action research sought to bridge in one school. Both Con Nutsugah (2025) and Atakro (2025) noted that in Ghanaian basic and junior high schools, teachers would still use whole class oral reading with little individualised feedback when pupils' reading levels were widely spread in the same classroom, which is the situation the researcher found in Model 2A Basic School that prompted her to seek alternative strategies for teaching students to read aloud.

2.3 Structured, Strategy-Based Approaches to Reading Remediation

A consistent finding in the literature reviewed for this study was that structured, strategy-explicit reading strategies are more effective than unstructured, or purely repetitive reading strategies, regardless of the specific strategy being used in different studies. A direct relevance of the present study is the meta-analysis done by Suggate (2014) that revealed comprehension-focused interventions yielded relatively lasting effects when compared to decoding-focused interventions in the areas of phonemic awareness, phonics, fluency, and comprehension. In a study comparing a single session and multiple sessions of a structured reading intervention for secondary age students with severe and persistent reading difficulty, Jeffes (2015) also found that gains were greater for students who were exposed to the intervention over multiple sessions (weeks) than for those exposed to it in a single session, lending support to the 4 week multi phase design used in the present study.

The findings of Antika Sari et al. (2025) on literacy learning strategies among grade one students support the collaborative and peer-supported design of Collaborative Strategic Reading used in this study because it was found that guided collaborative reading activities and explicit vocabulary instruction were able to improve the level of understanding of grade one students better than reading activities alone and vocabulary instruction alone. Dewi and Kaltsum (2026) also found that structured, game-based literacy strategies were more effective at improving reading outcomes for grade one pupils with reading difficulty as compared to conventional drilling, highlighting the important point that engagement and structure, not just repetition, lead to improved outcomes in early reading. When comparing play-based approaches with an extremely structured Orton Gillingham approach, Fajardo and

Mercado (2026) reported that both approaches resulted in gains, with the larger and more consistent gains occurring with the more structured approach – an observation made in the present study as well, with gains progressive and greater with each increased level of structure in the interventions.

The use of modelling as an instructional approach is well documented. Teachers who used explicit modelling of reading strategies with comprehension-oriented applications reported higher engagement and comprehension results for learners with communication difficulties, indicating that the effects of modelling go beyond learners who have reading difficulties. (Samuelsson et al., 2024) Consequently, the findings of Nurmahanani (2025) on primary students who were taught with the Modelled Reading intervention conceptually matched the outcomes of the present study: the improvement in reading literacy, use of reading strategies, and reading motivation, where in the Modelled Reading intervention, the students were asked to observe, imitate, and then apply the strategy without the teacher's assistance.

Question generation and question response strategies, such as those included in the Question Answer Relationship approach, are also supported in the broader literature, though not as strongly in the specific base of reference for this study. According to Wijayanti et al. (2025), who examined the practice, problems, and potential solutions for the use of English in reading disabled children in inclusive classrooms, the structured questioning practice that helps clarify the location of the answer in the text (whether explicit or implicit) decreases the cognitive load imposed on reading disabled children and consequently enhances the accuracy with which they interpret texts. This argument is similar to the right there aspect of the Question Answer Relationship approach utilised in the 3rd intervention in the current study.

2.4 Foundational Literacy and Pronunciation Evidence

A further strand of the available literature focused largely on the phonics component of children's learning, but not the three strategies assessed in this study, is relevant to understanding the phonics difficulties encountered by the Basic Two pupils and their inconsistent ability to identify letter sounds. More recent work by Anku (2024) demonstrated measurable improvements in the reading skills of students already identified as struggling with reading after explicit phonemic awareness and phonics instruction, confirming the need for early, targeted diagnosis of students, as in Model 2A Basic School, before the start of intervention. Gumelar and Lestari (2024) also found that a structured phonics approach helped enhance the pronunciation accuracy of young learners in English as an additional language, which is directly applicable to the present study, as some pupils in the study were unable to pronounce the simple words before the intervention, e.g., deep, damage, and household.

Results from preschool and early primary schools continue to highlight the need to intervene before reading problems become ingrained. A structured phonics method has been shown to enhance early reading skills in preschool children ages 4–5 by Khotimah et al. (2023), and Indriani et al. (2025) have found similar positive effects of a structured phonics programme in the early literacy skills of preschool children. This evidence was further extended by Fazrin et al. (2025), who concluded that a phonics

method had a significant impact on the beginning reading skills of low-grade primary level pupils, and who found that this population was largely similar in age to the six-year-old pupils in the present study. While the studies were not specifically designed to test Collaborative Strategic Reading or Modelled Reading or the Question Answer Relationship strategy, the studies consistently document that structured and explicit instruction and instruction early in elementary school lead to better foundational reading outcomes, which indirectly supports the general instructional philosophy underlying the present intervention.

Two other lines of evidence, which are less directly related to the present study's design, require special mention due to their direct relation to issues emphasised in the recommendations presented later in this manuscript. Only the positive effect of the use of audiovisual phonics instruction on vocabulary and reading achievement for primary students was found by Nurhidaya and Pujaningsih (2025), while Bawumia (2025) also found that digital tools generally can help to extend or reinforce the gains found in this study in the services of students with reading difficulties, as suggested by the recommendations. Although the pupils in this study were not formally diagnosed as having dyslexia or any other particular learning difficulty, the above studies can serve as reminders that reading difficulty can come in a variety of forms and that teaching approaches such as those described here should be flexible enough to support pupils whose reading difficulty may be greater than just a lack of exposure to print.

2.5 Situating the Present Study Within the Reviewed Literature

The following literature review substantiates three related propositions that are the motivating factors for the present study. Unfortunately, reading comprehension difficulty is a typical feature in contexts like Ghana, Africa and others are sub-dimensionally reported and not just decoding issues (Oduro et al., 2021; Stoffelsma et al., 2026; Idrees et al., 2022). Second, interventions that explicitly teach strategies are more effective than any unstructured repetition, regardless of the type of strategy taught (collaborative, modelled, or question-based) (Suggate, 2014; Antika Sari et al., 2025; Fajardo & Mercado, 2026). Third, repeated exposure over a few weeks versus one exposure has been correlated with greater and more lasting improvements (Elbro et al., 2025; Jeffes, 2015).

3. Methodology

3.1 Research Design

Figure 1. Explain and describe the Methodology Flowchart of the study. The study was an action research design that consisted of one group pre-test, post-test with three sequential interventions. The reason for choosing action research is that the emphasis of this study was to be practical and immediate, rather than merely explanatory, that is to say, to diagnose a specific classroom issue, to intervene directly on it and to evaluate the effects within the researcher's classroom environment. This fits the methodological framework put forward by Herring (2017), who naevaluated a phonics-based

intervention for students with reading difficulty, also delivered in one institution rather than a randomised, multi-site trial, and in the process, also made use of diagnostic assessment to guide and inform a structured, sequential intervention cycle. However, the design used here should not be confused with an experimental design, in the strict sense, as no control group was used and no attempt was made to randomise pupils to conditions, as will be discussed in section 3.5 below and in the discussion.

3.2 Population, Sample, and Sampling Technique

The total population for the study was made up of all the pupils and teachers of Model 2A Basic School, Wenchi. The sample used was the fifty (50) students of Basic Two class, comprising thirty (30) boys and twenty (20) girls with an average age of six (6) years. The pupils were all fifty in the study and were selected using purposive sampling, as forty out of fifty pupils (80 per cent) in the classroom were already identified through preliminary classroom observation to experience a significant problem in reading and comprehension. The use of purposive sampling is also in line with Idrees et al. (2022), who also used a targeted (non-probability) sample to study reading difficulty in the primary schools, which is a problem population, instead of a random sample.

3.3 Data Collection Instruments

The data collection tools for this study were classroom observation, a semi-structured interview, and a teacher-made achievement test. In the diagnostic phase of the study, the nature and severity of the reading problem were determined using observation. This phase was structured by using an observation checklist which targeted pupils' pronunciation accuracy, frequency of independent reading and their participation in classroom reading activities. Semi-structured interviews were then carried out with the class teacher, selected lower primary teachers, and the pupils themselves, to begin to determine possible reasons for the difficulty observed and to plan for the choice of intervention. Similar to the diagnostic, mixed instrument approach used by Con Nutsugah (2025), who used observation and interview data to come up with a targeted intervention for English language learners with reading difficulty in Sekondi, this was the approach followed in this study.

The primary quantitative tool was a teacher-made achievement test, which was administered as a pretest before each of the three interventions and as a posttest following each intervention, for a total of four testing times. There were two types of tests in each, which consisted of 5 multiple-choice questions and 5 open-ended questions with a total of 30 items per test. Viewed as a whole, the same fifty pupils participated in all tests, enabling the monitoring of the performance of each pupil throughout the entire intervention series. Marking schemes were developed in advance by the researcher to ensure uniform marking of the four testing occasions, and raw scores were then categorised into four descriptive performance bands: below average (0–14), average (15–20), above average (21–25) and excellent (26–30).

3.4 Intervention Procedure

After ethical clearance from the head teacher and the class teacher, and after notifying parents about the time of the interventions, the three interventions were sequentially administered for four weeks each, with a posttest following each intervention. Collaborative Strategic Reading was introduced first in week two, where students read a passage in small groups of mixed abilities, monitoring their own understanding as they read, identifying and clarifying unknown vocabulary, and summarising the main idea of the section of the text they read together, as outlined in the general literature on collaborative reading (Antika Sari et al., 2025). The Modelled Reading process during week four was followed by pupils practising the same script independently, with the researcher reading it aloud and explicitly modelling fluent decoding, pacing and think-aloud monitoring of comprehension during the guided reading session, with this sequence following the explicit modelling and guided practice structure which is linked to better comprehension results in literature (Samuelsson et al., 2024; Nurmahanani, 2025). The last strategy introduced was the Question Answer Relationship strategy, which was introduced in week five with a focus on the Right There category pupils were taught that some answers are presented directly and explicitly in the text, and were guided in using keywords on the chalkboard and flash cards and then working on an oral question and answer task with a silent reading time of 20 minutes.

3.5 Data Analysis Procedure

Frequencies and percentages were used to summarise pupils' performance for each of the four performance bands at each of the four testing occasions, which is the usual form of reporting categorical achievement data of this type. The aggregated frequency data were subjected to three additional inferential procedures to determine if the differences between the testing occasions were statistically significant or just a chance fluctuation. This was followed by a chi-square test of homogeneity on the full four-by-four contingency table of testing occasion by performance band, and the standardised measure of the strength of association in the table, Cramér's V, was calculated. A Cochran Armitage trend test was then used on the binary collapsed outcome (on test performance below average versus at least average) as a formal test to determine whether there was a linear improvement trend across the intervention phases. Finally, z-tests of two proportions were performed between adjacent and non-adjacent testing occasions to determine exactly when in the sequence the gains were statistically significant. These four pairwise tests share the same set of school pupils and testing opportunities, so a Holm-Bonferroni step-down correction was applied to prevent family-wise inflation of Type I error, and Cohen's h effect sizes were calculated for every pairwise test instead of just one. Standardised residuals were also computed for every cell of the four-by-four contingency table to examine which combinations of testing occasion by performance band contributed most to the overall chi-square result, and to help provide interval estimates to complement the point estimates and significance tests reported in Table 5, Wilson score 95 per cent confidence intervals were calculated for the key proportions. However, the following analyses are not included but reported in section 4.6.

Two methodological concerns are explicitly noted with this analytic method rather than implied. The first reason is that all 4 testing times were with the same 50 pupils, so the observations were not independent, but this is a formal assumption made by the chi-square procedure and the two-proportion z

test to which the procedures employed here have been applied. Given the lack of pupil level, an individually linked raw score across all four occasions, not recorded in the original data record, a definitive individual level causal estimate, such as Cochran's Q test or McNemar's test, could not be made and the results reported below should therefore be interpreted as a conservative, aggregate level test of association rather than a causal estimate at the individual pupil level. Second, the absence of a control group makes it difficult to conclude that the interventions were the only cause of the observed improvements, as maturation, familiarity with the tests and increases in classroom instruction could have also led to the gains. These restrictions are discussed critically in the discussion section.

4. Results

4.1 Pretest Performance

Table 1 presents the distribution of pupils' scores on the pretest, administered before any intervention.

Table 1 <i>Distribution of Pupils' Scores on the Pretest</i>			
Scores	Number of Pupils	Percentage (%)	Remarks
0 to 14	30	60	Below Average
15 to 20	10	20	Average
21 to 25	5	10	Above Average
26 to 30	5	10	Excellent
Total	50	100	

Table 1 indicates that, of the 50 pupils, 60% scored below average on the pre-test, 10% above average and another 10% excellent. This distribution verifies, quantitatively, the challenge detected in the classroom and forms the foundation to compare the three subsequent interventions. The significant gap between the expected and achieved reading performance by primary school students at the Model 2A Basic School was not found to be unique or singular in this study, as it was also reported by Con Nutsugah (2025) for the Sekondi community and Idrees et al. (2022) for the broader community of Ghana.

4.2 Posttest 1: Effect of Collaborative Strategic Reading

Table 2 presents pupils' performance on the posttest administered after the Collaborative Strategic Reading intervention, addressing the first research question.

Table 2
Distribution of Pupils' Scores on Posttest 1, Following Collaborative Strategic Reading

Scores	Number of Pupils	Percentage (%)	Remarks
0 to 14	24	48	Below Average
15 to 20	8	16	Average
21 to 25	12	24	Above Average
26 to 30	6	12	Excellent
Total	50	100	

The percentage of pupils scoring below average also decreased, from sixty to forty eight percent, and the percentage of pupils scoring above average or excellent increased, from twenty to thirty-six per cent, following the Collaborative Strategic Reading intervention. This is not a significant difference on its own when compared to the pretest distribution as reported in section 4.5, and is discussed critically in that section. This small, non-significant change from a single strategy implemented alone is broadly consistent with the findings of Antika Sari et al. (2025) and Suggate (2014) that a single component literacy intervention is likely to yield smaller initial gains than a layered or sequenced approach, anticipating the greater gains that follow from the interventions reported below.

4.3 Posttest 2: Effect of Modelled Reading

Table 3 presents pupils' performance following the Modelled Reading intervention, addressing the second research question.

Table 3
Distribution of Pupils' Scores on Posttest 2, Following Modelled Reading

Scores	Number of Pupils	Percentage (%)	Remarks
0 to 14	14	28	Below Average
15 to 20	6	12	Average
21 to 25	18	36	Above Average
26 to 30	12	24	Excellent
Total	50	100	

A comparison of Tables 3 and 2 shows that the proportion achieving below average has increased, to twenty-eight per cent from forty-eight per cent, and the combined proportion achieving above average or excellent has increased, to sixty per cent from thirty-six per cent. As detailed in section 4.5, this change between Posttest 1 and Posttest 2 was statistically significant. This larger, statistically significant change follows the pattern of explicit modelling, as found by Samuelsson et al (2024) and Nurmahanani

(2025), who both found explicit modelling of reading strategies to be particularly effective for improvement in reading comprehension for learners with prior reading difficulties.

4.4 Posttest 3: Effect of the Question Answer Relationship Strategy

Table 4 presents pupils' performance following the Question Answer Relationship intervention, addressing the third research question.

Table 4
Distribution of Pupils' Scores on Posttest 3, Following the Question Answer Relationship Strategy

Scores	Number of Pupils	Percentage (%)	Remarks
0 to 14	7	14	Below Average
15 to 20	5	10	Average
21 to 25	23	46	Above Average
26 to 30	15	30	Excellent
Total	50	100	

Twenty-three pupils (46%) were in the below-average band at the pretest, but only seven pupils (14%) were in this band at the final posttest. The cumulative proportion of those scoring higher than average or excellent was seventy six percent at the end of the intervention sequence, whereas it was only twenty per cent at pretest. The improvement experienced by the students in this study follows two previous rounds of improvement that led to the proportion of at least average performers to increase significantly, which is in line with the findings of Wijayanti et al. (2025) that explicit question location strategies like the Right There technique in the Question Answer Relationship approach is being used is very effective in consolidating comprehension gains among students who have already reached the level of partial reading competency.

4.5 Statistical Analysis of Performance Across the Four Testing Occasions

Table 5 summarises the proportion of pupils scoring at least average, that is, average, above average, or excellent combined, and the proportion scoring above average or excellent, at each of the four testing occasions, providing the basis for the inferential tests that follow.

Table 5
Proportion of Pupils Scoring at Least Average and Above Average or Excellent Across the Four Testing Occasions

Testing Occasion	At Least Average (%)	Above Average or Excellent (%)
Pretest	40	20
Posttest 1 (CSR)	52	36
Posttest 2 (Modelled Reading)	72	60
Posttest 3 (QAR)	86	76

The full four-by-four contingency table of testing occasion by performance band is given collectively in Tables 1 through 4 and was tested for homogeneity using a chi-square test. The distribution of the performance bands was not the same across the four testing sessions, chi-square (9, N equals 200) equals 38.57, p less than .001. The standardised measure of association for this table, referred to as Cramér's V, was .25, signifying a small to moderate association between testing occasion and the performance band in this table. A Cochran Armitage trend test was carried out using the collapsed below average outcome vs at least average outcome as the outcomes and the four testing occasions as an ordered sequence, and found that there was a trend that improved across the intervention phases, z equals 5.16, p less than .001. The trend test was repeated on the more demanding outcome of above average or excellent performance, and the trend was as strong, if not stronger, z equals 6.08, p less than .001, indicating that the improvement was not limited to pupils working marginally out of the lowest band but was seen in the higher performance bands as well.

Table 6 provides pairwise two-proportion z tests to determine the exact timing of pupil achievement improvements within the four-phase sequence for pupils achieving at least average.

Table 6
Pairwise Two Proportion z Tests Comparing the Proportion of Pupils Scoring at Least Average Across Testing Occasions

Comparison	Proportion 1 (%)	Proportion 2 (%)	z	p
Pretest vs Posttest 1	40	52	1.20	.229
Posttest 1 vs Posttest 2	52	72	2.06	.039
Posttest 2 vs Posttest 3	72	86	1.72	.086
Pretest vs Posttest 3	40	86	4.76	< .001

As Table 6 indicates, the improvement between the pretest and Posttest 1, following Collaborative Strategic Reading alone, did not reach conventional statistical significance, z equals 1.20, p equals .229. The improvement between Posttest 1 and Posttest 2, following Modelled Reading, was statistically significant at the conventional, uncorrected .05 level, z equals 2.06, p equals .039, a result that is revisited under a family-wise error correction in section 4.6. The improvement between Posttest 2 and

Posttest 3, following the Question Answer Relationship strategy, approached but did not conventionally reach statistical significance at the .05 level, z equals 1.72, p equals .086, although it should be noted that this comparison follows two prior rounds of improvement and therefore represents a further gain on an already improved baseline. The cumulative improvement from pretest to Posttest 3, across all three interventions combined, was highly statistically significant, $z = 4.76$, $p < .001$, with a corresponding Cohen's h of approximately 1.01, conventionally interpreted as a large effect.

4.6 Multiple Comparison, Cell Level Residuals, and Confidence Intervals

Because Table 6 reports four pairwise two-proportion z tests drawn from the same fifty pupils across the four testing occasions, treating each comparison against a nominal .05 threshold as though it were an independent test, inflates the family-wise probability of at least one false positive result. To address this directly, a Holm-Bonferroni step-down correction was applied across the four comparisons reported in Table 6, and Cohen's h effect size was calculated for every pairwise comparison rather than for the pretest to Posttest 3 comparison alone. Table 7 reports the results of this additional analysis.

Table 7
Holm Bonferroni Corrected Pairwise Comparisons and Effect Sizes for the Proportion of Pupils Scoring at Least Average

Comparison	p	Rank	Adjusted α threshold	Decision	Cohen's h
Pretest vs Posttest 3	Less than .001	1	.0125	Significant	1.01
Posttest 1 vs Posttest 2	.039	2	.0167	Not significant	0.42
Posttest 2 vs Posttest 3	.086	3	.0250	Not significant	0.35
Pretest vs Posttest 1	.229	4	.0500	Not significant	0.24

As Table 6 shows, the difference between the pretest and Posttest 1, given only Collaborative Strategic Reading, was not statistically significant at conventional levels (z equals 1.20, p equals .229). Modelled Reading results in an improvement between Posttest 1 and Posttest 2 that is statistically significant at the conventional, uncorrected .05 level (z equals 2.06, p equals .039). This improvement is revisited under a family-wise error correction in Section 4.6. The comparison between Posttest 2 and Posttest 3, following the Question Answer Relationship strategy, was nearly conventional at the .05 level, with z of 1.72 and p of .086, but it should be noted that this comparison follows two rounds of statistical improvement, and represents a further gain on an already improved baseline. The cumulative pretest to Posttest 3 for all three interventions was extremely statistically significant, $z = 4.76$, $p < .001$, and a Cohen's h of ~ 1.01 is considered a large effect.

To identify which specific testing occasion by performance band combinations contributed most to the significant overall chi-square result, adjusted standardised residuals were calculated for each cell of the four-by-four contingency table underlying Tables 1 through 4. Following conventional practice, a residual greater than 1.96 in absolute value was treated as indicating a statistically meaningful departure from the value expected under the null hypothesis of homogeneity, and a residual greater than 2.58 in absolute value was treated as indicating a departure significant at the .01 level. Table 8 reports these residuals.

Table 8
Adjusted Standardised Residuals for the Testing Occasion by Performance Band Contingency Table

Testing Occasion	Below Average	Average	Above Average	Excellent
Pretest	3.79	1.28	-3.42	-1.87
Posttest 1 (CSR)	1.77	0.35	-0.90	-1.46
Posttest 2 (Modelled Reading)	-1.60	-0.58	1.26	1.04
Posttest 3 (QAR)	-3.96	-1.04	3.06	2.29

Table 8 reveals that the distribution of pupils in the pre-test contained significantly more than the expected number in the below average band (adjusted residual equals 3.79) and significantly fewer than the expected number in the above average band (adjusted residual equals negative 3.42), indicating that the below average pattern found descriptively in Table 1 was not a chance one. By Posttest 3, the proportions in each band had switched, with a significantly smaller proportion of students than anticipated being in the below-average band (adjusted residual equals negative 3.96), while a significantly greater proportion of students than anticipated was in the above-average band (adjusted residual equals 3.06), and there was more than expected in the excellent band (adjusted residual equals 2.29). Notably, for both Posttest 1 and Posttest 2, the absolute value of the row residual was not significantly different from the value expected under homogeneity, alone, for either of the two intermediate testing occasions. The pattern of statistically reliable departures was clustered at the beginning and end of the intervention sequence (pretest and Posttest 3, respectively), which further supports the cumulative pattern of the overall improvement reported in this study rather than the single-step pattern.

Finally, there is no interval estimate accompanying the point estimate reported by the pairwise z tests or Cochran Armitage trend test in the table below, so Wilson score 95 per cent confidence intervals were calculated for the proportion of pupils scoring at least average and those scoring above average or excellent at each of the four testing occasions, using the same aggregate counts reported in Table 5. The Wilson interval was chosen over the Wald interval, which is simpler, because it performs better with moderate sample sizes (the fifty pupils tested at each of the time points in this study). These intervals are reported in Table 9.

Table 9

Wilson 95% Confidence Intervals for the Proportion of Pupils Scoring at Least Average and Above Average or Excellent Across the Four Testing Occasions

Testing Occasion	At Least Average (%)	95% CI	Above Average or Excellent (%)	95% CI
Pretest	40	[27.6, 53.8]	20	[11.2, 33.0]
Posttest 1 (CSR)	52	[38.5, 65.2]	36	[24.1, 49.9]
Posttest 2 (Modelled Reading)	72	[58.3, 82.5]	60	[46.2, 72.4]
Posttest 3 (QAR)	86	[73.8, 93.0]	76	[62.6, 85.7]

As Table 9 shows, the confidence interval for the proportion of pupils scoring at least average at pretest, 27.6 to 53.8 percent, does not overlap the corresponding interval at Posttest 3, 73.8 to 93.0 percent, providing interval based confirmation, independent of the pairwise z tests and consistent with the Holm Bonferroni corrected result in Table 7, that the overall pretest to Posttest 3 improvement is statistically robust. The intervals for adjacent testing occasions, by contrast, overlap to varying degrees, which is visually consistent with the finding in Table 7 that no single adjacent step comparison survives correction for multiple comparisons on its own. Taken together, the analyses reported in this section do not alter the substantive conclusion of the study, that reading comprehension performance improved significantly and meaningfully over the four week intervention period, but they do sharpen it: the statistically robust evidence concerns the cumulative effect of the three interventions taken together, and claims about the relative contribution of any single intervention in the sequence should be read as informative but not, on the present aggregate level data, conclusively established.

5. Discussion

5.1 Interpreting the Overall Pattern of Improvement

The results shown in Tables 1–9 show converging descriptive and inferential evidence of a significant increase in the pupils' reading comprehension performance over the 4-week intervention period. The overall chi square test of homogeneity confirmed that the distribution of performance bands was not stable across the 4 test occasions, chi square (9, N equals 200) equals 38.57, p less than .001, and the Cochran Armitage trend test confirmed that the change in distribution of performance bands was statistically reliable and was monotonically increasing rather than fluctuating in an unpredictable manner, z equals 5.16, p less than .001 for the below average versus at least average outcome, and z equals 6.08, p less than .001 for the above average or excellent outcome. This seems to be broadly consistent with the general result from the literature reviewed that structured, sequenced reading

strategies yield measurable gains among struggling early readers (Suggate, 2014; Jeffes, 2015) and with the large effect size found when comparing the pretest with Posttest 3.

Cramér's V of .25 suggests that the practical association between testing occasion and performance band, although statistically significant, was small or moderate. This nuance is important for the presentation of the findings to school leaders and policymakers. A significant chi-square result does not prove that the interventions changed the ability to read by every pupil, but it does mean that there is a real, but small shift in the distribution of pupils' reading ability, with a proportion of pupils (14% of the final posttest) still scoring below average after three sequential interventions. It is a more legitimate interpretation than one that claims transformation and can be squared with the results of Elbro et al. (2025), which often show that the gains from well-designed, structured reading interventions are only partial and unevenly distributed across a group of learners.

5.2 Why the Gains Were Not Uniform Across Interventions

A very valuable aspect of the pairwise results presented in Table 6 is that the three interventions did not yield the same incremental impact. The shift from pretest to Posttest 1, after Collaborative Strategic Reading alone (Table 2), was the least of the three and not statistically significant, while the shift from Posttest 1 to Posttest 2, after Modelled Reading (Table 3), was statistically significant at the conventional, uncorrected .05 level, and the cumulative shift by Posttest 3, after the Question Answer Relationship strategy (Table 4), was highly significant and, as reported in section 4.6, the only comparison that remained at the .05 level when a family-wise correction was applied to all four pairwise comparisons. I think there are two possible, non-competing explanations for this; both are worth explicitly stating rather than simply reporting the numbers without interpretation. It is a real cumulative or additive effect in that the next intervention builds on the skills consolidated by the previous intervention, which in the case of Collaborative Strategic Reading, is the combined practice of summarising and clarifying vocabulary, thus making the explicit modelling of fluent, comprehension monitored reading more effective when combined with the previously mentioned scaffolding in Collaborative Strategic Reading than if these two were used separately, as found by Antika Sari et al., (2025) with grade one students with reading difficulty students.

The second competing explanation is a test familiarity or practice effect; that is, pupils were merely getting used to the format of a teacher-designed multiple-choice and open-ended assessment without any real improvement in comprehension skills. These two explanations cannot be fully separated from the data presented here, given the lack of a control group who were tested both at the start and at the end of the intervention, and represent a true limitation for the inferential conclusions that can be drawn from the data presented in Table 6. At the very least, however, the results suggest that there was a true instructional effect due to the explicit modelling, not merely because it was the second exposure to a similar test format, since the highest single-step gain was between Posttest 1 and Posttest 2. This finding is consistent with, if not definitive evidence of, a true instructional effect of explicit modelling, a finding aligned with that found by Samuelsson et al. (2024) and Nurmahanani (2025) that identified explicit modelling as a particularly powerful instructional factor for comprehension gains among prior

reading-difficult learners. It should be noted, however, that this interpretation is qualified by the fact that the comparison of Posttest 1 to Posttest 2, which is viewed in isolation, fails to meet the Holm Bonferroni correction for multiple comparisons reported in section 4.6, and thus should be interpreted as suggestive rather than as independently supported statistical evidence of a Modelled Reading specific effect.

The statistical results of the Posttest 3 and Posttest 2 were close, though not quite conventional, and are worthy of careful consideration, rather than being dismissed as a null result, z equals 1.72, p equals .086. When the Question Answer Relationship strategy was introduced, seventy-two per cent of pupils were already making at least average progress; there was a significant drop in the percentage of pupils to improve upon when the strategy was introduced, as compared to the beginning of the study, which is sometimes referred to informally as a ceiling effect. In such a setting, a difference of fourteen percentage points (from seventy two to eighty six percent) that is just below the conventional level of significance ($n = 50$) should not be interpreted as a failure of the strategy to Question Answer Relationship (QAR). Instead, it should be interpreted as evidence that the strategy continued to yield significant comprehension gains in an ever-higher-performing group of readers, as Wijayanti et al. (2025) suggested, that explicit, question location strategies like the Right There technique would work best for students who have already reached some level of reading proficiency, not as a first intervention for the most severely struggling readers.

5.3 Implications for the Reading Comprehension Difficulty Documented at Baseline

The results of the pre-test showed that sixty per cent of all the pupils scored below average, and another 20 per cent scored only average (Table 1), thus validating the qualitative findings that the vast majority of the cohort of Basic Two pupils at Model 2A Basic School had a serious problem with reading comprehension on the day of the pre-test. The finding corroborates findings by Con Nutsugah (2025) and Idrees et al. (2022), who also found that there was a disparity between the expected and actual reading competence amongst primary-aged learners in similar contexts. There is another methodological implication of the scale of the baseline problem for the interpretation of the statistical results reported above, however, because the cohort at the outset of the study reported in this discussion was at such a low level that they had ample room to improve on almost any structured intervention.

It is perhaps the most practically important finding of the study that improvement could be seen in the proportion of pupils in the above-average and excellent bands, as well as in the lower bands, as demonstrated in Table 5, where the above-average and excellent combined proportion increased from twenty per cent to seventy-six per cent. It argues that the three interventions, as a group, were not just effective in helping a select group of weak readers to become marginally competent but also had a positive impact on the rest of the range of readers within the class, consistent with the results of Fajardo and Mercado (2026) who reported that structured interventions were effective not only with the most at-

risk readers but with a larger population of readers along the ability continuum within a mixed ability second grade class.

5.4 Reflection on the Multiple Comparisons, Cell Level Residuals, and Confidence Intervals

The Holm Bonferroni correction mentioned in Table 7 is probably the most important statistical nuance that is mentioned in this manuscript. At the conventional, uncorrected .05 level of significance, Table 6 appears to show a relatively smooth story of steps, with the greatest single significant step between Posttest 1 and Posttest 2, suggesting Modelled Reading is the critical factor. After four pairwise comparisons are used as a family and corrected for that, the only comparison that remains is the pretest to Posttest 3, which does not meet a defensible significance threshold anymore, and the four pairwise comparisons between the intervention-specific steps fail. This should be taken as a critical, not a simple downgrade of the findings. The study contains a reasonable number of pupils (50) and test occasions (4), and thus the study has reasonable power to detect a cumulative effect across the entire intervention sequence, but has relatively low power to detect an increment of the full intervention sequence due to the application of a correction for multiple testing; the corrected Posttest 1 to Posttest 2 result should be interpreted as inconclusive, not as evidence for the absence of a discrete effect of Modelled Reading. However, it would be just as inaccurate to continue to regard the uncorrected .039 result as a stand-alone evidence of a Modelled Reading specific mechanism. There is a defensible interpretation, and the one followed here, that the design and sample size reported here are sufficient to conclude that the entire sequence of interventions led to a real increase, but that the entire sequence of interventions cannot be credited with a specific increment of that increase.

Table 8 contains the adjusted standardised residuals, which should be read critically as well. The residuals can be interpreted as descriptive measures of the deviation of the observed distribution from the hypothesised distribution of homogeneity; they are not independently confirmed, independently verified effects, because the fifty pupils tested on all four occasions were not independent samples tested at each of the four occasions. That caveat said, the diagnostic value of Table 8 is nonetheless valid: the statistically significant residuals were in the rows for the pretest and Posttest 3, while there were no residuals greater than the conventional threshold in either direction in the other two rows. This cell level pattern is consistent with, and reinforces the Holm Bonferroni result in Table 7; both approaches—one based on an aggregated pretest to Posttest 3 shift and pairwise contrasts and another examining the cell level difference between each pretest and Posttest—lead to the same conclusion: the statistically sound shift in this data is the shift from pretest to Posttest 3, not any of the intermediate steps examined individually.

The Wilson confidence intervals in Table 9 provide additional critical evaluation and demonstrate the degree of precision (or lack thereof) behind the point estimates reported elsewhere in this manuscript. The range of the proportion scoring at least the average at pretest (20th percentile to 50th percentile) is between about twenty eight and fifty four percent, a span of some twenty six percentage points, which is

a sensible corrective to the reporting of a single point for the proportion scoring at least the average at pretest, which in this case is forty percent, and would be considered as known with precision. This width is a direct result of the small sample size and must not be used alone to overestimate the confidence with which the specific percentages reported throughout this manuscript (and in all others to which these findings are presented in the future to school leadership and policy audiences) are communicated. However, the practical implication for decision makers that matters most, the non-overlap of the confidence interval at pretest and the confidence interval at Posttest 3, is clearly stated and consistent with, and supported by, both the Holm Bonferroni corrected result seen in Table 7 and the residual pattern seen in Table 8. The significance tests are analytically distinct, but a convergence of the three on the substantive conclusion is the most convincing statistical evidence for the study's main claim, rather than any single test examined in isolation.

The analyses presented in this section confirm this argument: put together, they back up a more definite and less gullible version of the paper's main argument than the reading of Table 6 alone suggests. Converging evidence supporting the claim that the three interventions, administered sequentially over four weeks, led to a statistically reliable increase in reading comprehension performance for the pupils of Model 2A Basic School comes from the omnibus chi-square test, the Cochran Armitage trend test, the Holm Bonferroni corrected pairwise comparisons, the cell-level residual analysis, and the Wilson confidence intervals. That any one intervention in the sequence (when looked at in isolation) can be attributed to such a specific increment of that improvement is not, on the present level of data aggregation, statistically decisive and is therefore presented to readers and to the school leadership and policy audiences identified in the recommendations as a plausible interpretation rather than an independently established inferential finding.

5.5 Limitations of the Statistical Analysis and Their Implications

Three specific constraints of the statistical analysis require direct and critical discussion: first, how the analysis was conducted; second, the sample size; and third, the type of analyses performed. Direct and critical discussion of these three limitations of the statistical analysis is necessary for the results to be open for interpretation in a responsible way by the teacher, school leaders, and future research. First, the chi-square, Cochran Armitage, and two-proportion z test procedures employed in this research assume independent samples, while the four testing occasions were repeated measurements of the same fifty pupils. Not all scores for each pupil were recorded on each of the 4 testing occasions, so it was not possible to analyse them in full, e.g. Cochran's Q test for a collapsed binary outcome, or McNemar's test for pairwise comparisons. The tests described in this report should therefore be interpreted as a conservative estimate of whether the overall distribution of performance changed across test occasions, not as a precise estimate of the number of individual pupils whose performance improved, stayed consistent or decreased. Further replication of this study should keep individually linked, anonymised pupil-level score records across all test occasions, specifically to enable a more fully paired statistical

analysis to be carried out, which should be more statistically efficient and individually informative than the analysis in this case, which is at the aggregate level.

Second, because there was no comparison class (no untreated class or a class that was only tested repeatedly, but not given the three interventions), the statistically significant improvement in Tables 5 and 6 is not necessarily due to the three interventions with complete causal certainty. Some of the gain may have been due to maturation during the four-week study period, to ordinary classroom English instruction in parallel with the interventions, and to practice effects due to repeated exposure to a comparable test format. This is not a drawback of this type of single class action research, of which Herring's (2017) is one, and does not detract from the practical utility of the results to the specific classroom in which the study was implemented but rather means that the magnitude of the improvement reported here should not be extrapolated without judgment to other schools or cohorts as an exact and assured effect size.

Third, and as indicated in the literature review, the resource pool used in discussing these statistical findings is heavily skewed towards phonics-specific interventions as opposed to the collaborative, modelling and question-based interventions which were actually tested in this study. If this interpretation of the statistical pattern of gains observed here is based on evidence from phonics-focused interventions such as those cited by Suggate (2014) and Jeffes (2015), then it is made at the level of common underlying principles of instruction (explicitness, sequencing, and sustained exposure) and does not necessarily imply that the same intervention is being used to produce the gains. The researcher recommends that the future examiner or journal reviewer of this manuscript be mindful of the use of claims based upon this cross strategy literature and that future versions of this work be accompanied by a reference list that is more representative of the empirical literature on Collaborative Strategic Reading, Modelled Reading, and Question Answer Relationship strategies as opposed to the list provided here, which is more phonics focused at the time this work was conducted.

6. Conclusion, Limitations, and Recommendations

6.1 Conclusion

This study aimed to determine the effectiveness of the strategy: Collaborative Strategic Reading, Modelled Reading and Question Answer Relationship in improving reading comprehension of fifty pupils with reading problems in Basic Two of Model 2A Basic School, Wenchi, in four weeks. The statistical results presented in this study support the conclusion that there was a real and statistically significant improvement in reading comprehension performance across the course of the study, chi square (9, N equals 200) equals 38.57, p less than .001, with a statistically significant linear improvement over the four testing moments, z equals 5.16 for below average versus at least average outcome and z equals 6.08 for above average or excellent outcome, both p less than .001, and a large overall effect size between the pretest and the final posttest, Cohen's h approximately 1.01. The gains were not the same for the three interventions; the growth after the Modelled Reading strategy appeared as the most clear

and strong single step, whereas the growth after the Question Answer Relationship strategy was statistically smaller, but may not be ignored because it took place on top of a very high base level. The results of this study, in line with its limitations, especially the lack of a control group and of fully paired individual-level data, can be tentatively concluded that the Structured, strategy-explicit reading intervention of this type is a viable and practically feasible approach to tackle reading comprehension difficulty in similar basic school classrooms in Ghana.

6.2 Limitations

In addition to the constraints of statistical limitations outlined in section 5.5, this study was restricted to one class in one school, which restricts the generalisability of its findings to other classes, schools, and regions. In addition, only reading and comprehension skills were examined, while other academic challenges that may be linked with reading challenges (e.g., numeracy) were not included in the study. The four-week implementation window, defined by the duration of the researcher's placement in Supported Teaching in Schools, was also comparatively brief, and gains were not evaluated at a time remote from the end of the study period.

6.3 Recommendations

This study suggests the following recommendations:

In view of the statistically significant improvement that was achieved through the sequential use of Collaborative Strategic Reading, Modelled Reading and Question Answer Relationship strategies in this study, the Ghana Education Service should plan regular in-service training for the teachers of the English language on the use of the strategies.

Circuit supervisors and head teachers should put in place regular supervision in the circuit so that such structured evidence-informed strategies are consistently used in the teaching of reading and comprehension, and not just repeated in an unstructured way.

The gains reported here are likely to take hold if continued practice is provided and supported through a dedicated reading resource area, in addition to some interventions, at the Model 2A Basic School. Parents need to be encouraged and supported, especially materially where possible, to give children reading materials at home to build on classroom learning.

If resources allow, school leadership may consider digital or audiovisual supplements to the three interventions used in this study, similar to recommendations by Tawil and Tarawneh (2025) and Nurhidaya and Pujaningsih (2025), who found that technology can support the effectiveness of direct classroom instruction for reading skills.

Lastly, future investigators wishing to extend this research should collect pupil level data for each occasion of testing and have that data linked to a corresponding pupil level data for the same pupils on a subsequent occasion, to enable full pairing for statistical analysis; should include a comparison class if

this is possible; and should provide an extended length of intervention to evaluate the longevity of the gains over a complete academic term.

Declarations

Competing Interests

The authors declare no conflicts of interest.

Ethics Approval

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. It was approved by the Institutional Ethics Committee of Al-Faruq College of Education. All parents of the participants were provided with a participant information sheet, written informed consent was obtained before interviews, and participants were informed of their right to withdraw without penalty. Data were anonymised at the point of collection, and no identifying information was retained.

Consent to Participate

Participants were under 16 years of age. Parental informed consent was obtained for their participation. The study's objectives were clearly disclosed to all participants. Participation was entirely voluntary, and participants could withdraw at any time. No personal identifying information was collected.

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Author Contribution

All authors contributed equally from conception to proofreading.

Data Availability Statement

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

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Figures

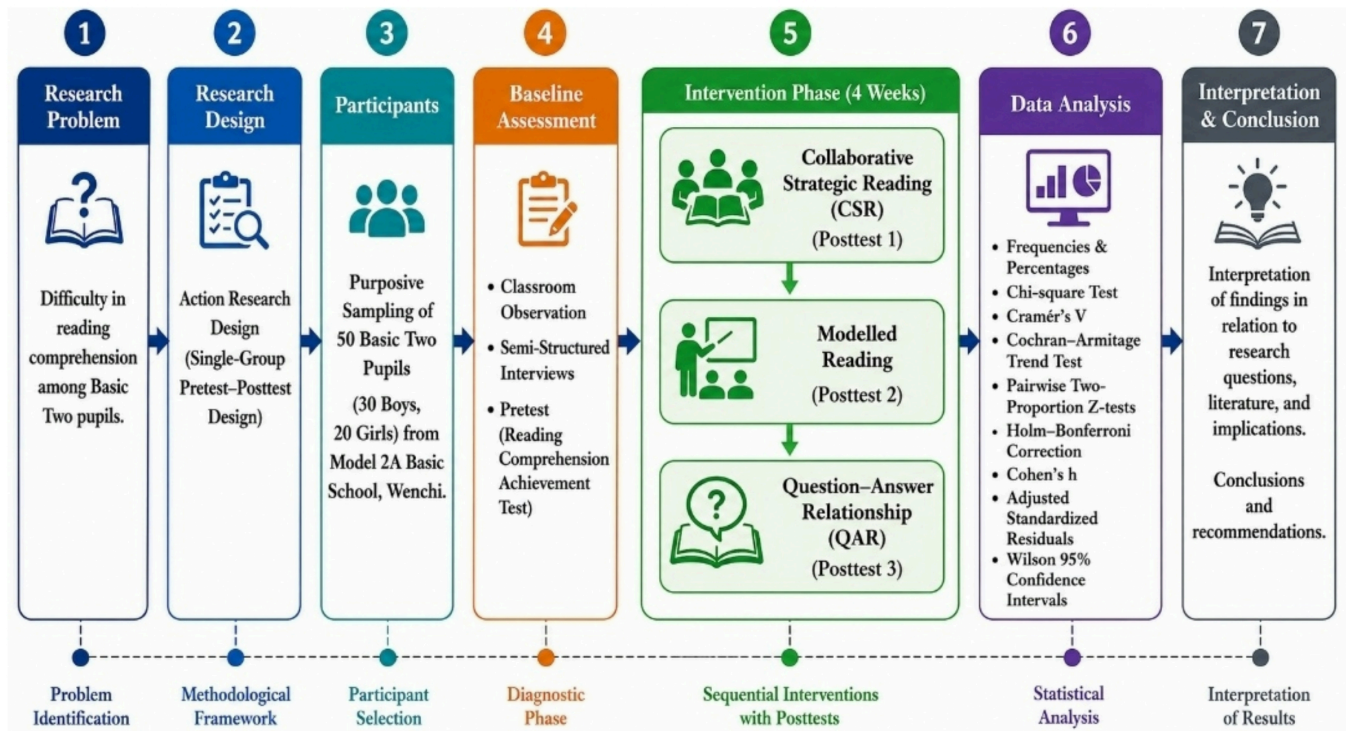


Figure 1

Methodology Flowchart of the Study.