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A Proposed Framework for Employing Generative Artificial Intelligence Applications in Developing Reading Comprehension Skills among Elementary School Pupils in Light of Digital Education Requirements: Teachers' Perspectives

Dr. Yasser Saud Al-Mutairi

Ministry of Education, Kingdom of Saudi Arabia, y2030y9@gmail.com

ABSTRACT: This study aimed to develop a proposed procedural framework for employing generative artificial intelligence (GenAI) applications in fostering reading comprehension skills among elementary school pupils, in light of digital education requirements and from the perspective of teachers themselves. Specifically, the study examined three dimensions: the actual level of employing GenAI applications in classroom practice, the requirements for activating their use, and the principal obstacles hindering this. A descriptive-analytical approach was adopted, and a purpose-built questionnaire was administered to a random sample of 50 elementary school teachers.

The findings indicated that the actual level of employing GenAI applications was low, rated as "disagree" (M = 2.54), whereas the requirements for employment were rated favorably (M = 4.08), as were the obstacles (M = 3.72). The proposed framework itself received a favorable overall rating (M = 4.06), reflecting sound readiness for field implementation. Statistically significant differences were also found across several axes according to gender, academic qualification, years of experience, and prior training.

Based on these results, the study formulated an integrated procedural framework comprising clear implementation phases, success requirements, and practical proposals for overcoming key obstacles, together with a set of recommendations and directions for future research aimed at narrowing the gap between available technological capacity and its actual classroom use.

INTRODUCTION

The world is experiencing rapid digital transformation across all aspects of life, particularly within the educational sector. The field is increasingly called upon to adapt by rethinking its roles, methods, and strategies to meet the needs of a generation raised in interactive digital environments. Among the most prominent manifestations of this shift is the emergence of Generative Artificial Intelligence (GenAI), capable of producing new text, audio, and visual content based on vast training datasets. This technology represents a qualitative leap in digital education tools by offering extensive possibilities for content generation, personalization, and real-time support for learners.

Reading comprehension skills serve as the cornerstone of academic achievement across subjects, functioning as the primary gateway to acquiring knowledge. Several regional studies suggest that employing GenAI tools in reading instruction enhances pupils' comprehension abilities. For instance, Ramadan (2024) observed statistically significant differences between pre- and post-tests in cognitive achievement and reading comprehension performance favoring the post-test. Similarly, Al-Muflih and

Abu El-Enein (2025) confirmed the effectiveness of AI-driven educational applications in improving reading fluency among elementary school pupils.

Despite these encouraging indicators, literature suggests that integrating GenAI into daily teaching practices remains limited. A study by Cheah et al. (2025) involving 89 teachers revealed that fewer than half actively use these applications in direct classroom instruction, with the majority feeling underprepared to integrate them. Additionally, a report by Picton & Clark (2024) from the National Literacy Trust highlighted that three out of four teachers felt they needed further training and support to effectively use these tools to bolster reading and writing skills. Hence, there is a clear need for a field study to examine the reality, requirements, and challenges of employing these applications from teachers' perspectives, paving the way for a proposed procedural framework to enhance reading comprehension skills in elementary pupils.

Research Problem and Questions While Generative AI applications offer promising potential to support reading comprehension, current educational literature reveals a distinct gap between these capabilities and their practical implementation in classrooms. A review by Al-Omari and Al-Harbi (2025) noted that studies addressing the deployment of these applications in general education remain sparse relative to the rapid pace of technological development. Direct interaction with the field reveals clear discrepancies in how teachers utilize these applications when teaching reading comprehension, alongside varying levels of awareness regarding operational requirements and obstacles.

Consequently, the core research problem centers on the following main question: "What is the proposed framework for employing Generative Artificial Intelligence applications in developing reading comprehension skills among elementary school pupils in light of digital education requirements, from the perspective of teachers?"

This primary question yields the following sub-questions:

1. What is the current status of elementary school teachers' employment of GenAI applications in fostering reading comprehension skills?
2. What are the requirements for employing GenAI applications to build reading comprehension skills under the demands of digital education?
3. What obstacles hinder the employment of GenAI applications in developing reading comprehension?
4. Are there statistically significant differences in participants' responses based on demographic variables (gender, academic qualification, years of experience, grade level taught, prior training)?
5. What proposed procedural framework can effectively activate GenAI applications to enhance reading comprehension in elementary school pupils?

Objectives of the Study This study aims to achieve the following:

1. Assess the current reality of elementary school teachers' use of GenAI applications in developing reading comprehension skills.
2. Identify the requirements for using GenAI applications to build reading comprehension in alignment with digital education needs.
3. Uncover the primary obstacles to utilizing GenAI tools in reading instruction.
4. Determine statistically significant differences among participants' responses based on demographic parameters.
5. Formulate an actionable, proposed procedural framework to operationalize GenAI applications in elementary reading comprehension instruction.

Significance of the Study

Theoretical Significance This study adds to the educational literature on integrating GenAI into reading instruction, an area that remains under-researched regionally compared to the pace of technological advancement (Al-Omari & Al-Harbi, 2025). Furthermore, it provides a theoretical base bridging digital education requirements with the specific demands of applying GenAI to reading comprehension in elementary schools.

Practical Significance

- Provides educational decision-makers with empirical data detailing the current status, requirements, and challenges of adopting these tools.
- Delivers an actionable procedural framework suitable for guiding teacher training programs and technical support plans.
- Supports institutional digital transformation initiatives, aligning with national digital education benchmarks (National Center for e-Learning, 2025).
- Lays the groundwork for future empirical research evaluating the direct impact of these applications on student learning outcomes.

Delimitations of the Study

- Objective Delimitations: Focused exclusively on evaluating the current status, requirements, and obstacles regarding GenAI employment in elementary reading comprehension, alongside establishing a proposed framework.
- Population Delimitations: Restricted to a sample of 50 male and female elementary school teachers.
- Temporal Delimitations: Field research was conducted during the current academic year.
- Methodological Delimitations: Limited to a descriptive-analytical approach utilizing a structured questionnaire.

Definition of Terms

Generative Artificial Intelligence (GenAI) Defined theoretically as advanced AI systems capable of producing original text, image, or audio content by recognizing patterns within large existing datasets (Feuerriegel et al., 2024), employing large language models to mirror human language generation and processing. Operationally, it refers to applications built on generative language models (such as ChatGPT and similar tools) that teachers leverage to create reading passages, comprehension questions, and enrichment activities tailored to elementary pupils.

Reading Comprehension Skills Cognitive capacities enabling a pupil to process explicit and implicit textual meaning, infer logical connections between ideas, and engage critically and analytically with written material. Operationally, it is measured by pupil achievement scores on reading tasks involving texts supported by GenAI applications.

Digital Education Requirements The combination of technological, human, and organizational prerequisites necessary for effective digital instruction, including digital learning environments, qualified digital educators, digital curricula, and supportive leadership (Rwaq, 2024). Operationally, it signifies the technical, training, structural, and ethical conditions required to deploy GenAI tools in reading instruction as evaluated by the study sample.

Proposed Framework Operationally defined as a structured series of practical strategies and mechanisms formulated by the researcher—informed by field findings and relevant literature—to systematically integrate GenAI tools into elementary reading comprehension instruction.

Theoretical Framework

1. Generative Artificial Intelligence and its Educational Applications Generative AI refers to computational tools capable of generating new text, audio, or visual content that appears authentic, building upon patterns identified during model training (Feuerriegel et al., 2024). Driven by advancements in Large Language Models (LLMs), these tools are reshaping learning environments. Teachers can now produce multiple differentiated versions of a lesson to accommodate varied learner abilities, while students can generate instant summaries, concept maps, and simplified explanations (Al Jazeera Net, 2025).

In education, systematic reviews demonstrate that GenAI applications effectively support language processing, reading comprehension, text structure, and immediate feedback (Frontiers, 2025). These systems can analyze readability levels, simplify complex texts, build graded comprehension questions, and deliver real-time evaluations of pupil performance.

2. Reading Comprehension Skills in Elementary Education Reading comprehension is the fundamental objective of reading—a cognitive process where the reader interacts with text to construct meaning, moving from literal

understanding to inferential and critical analysis. This skill is vital in elementary school, marking the shift from "learning to read" to "reading to learn," a transition that heavily influences long-term academic growth. Empirical work demonstrates that incorporating AI tools into reading instruction enhances comprehension (Ramadan, 2024) and builds reading fluency among elementary students (Al-Muflih & Abu El-Enein, 2025).

3. Digital Education Requirements and AI Integration Achieving digital transformation in education requires key elements: functional digital learning environments, digital curricula, skilled digital educators, digitally engaged students, and supportive leadership (Rwaq, 2024). National indicators measure performance across trust, capability, and innovation—framing AI integration not as an optional luxury, but as a central pillar of institutional digital growth (National Center for e-Learning, 2025).

However, international data indicates that teacher readiness requires further development. Cheah et al. (2025) found that educators frequently use these tools for administrative preparation (such as lesson planning and assessment design) rather than direct classroom instruction. Their findings highlight the need for targeted training and equitable infrastructure to support effective and ethical integration.

Literature Review Prior studies have explored AI integration in education from various perspectives, examining teacher training needs, measuring impacts on language acquisition and achievement, and assessing field adoption challenges. Reviewing this literature helps map current research trends and identify gaps addressed by this study.

Al-Talhi (2023) evaluated the impact of AI platforms in an e-learning environment among 30 elementary pupils in Qatar, demonstrating positive outcomes for Arabic language instruction. Expanding beyond reading, Al-Abbadi (2024) showed that GenAI tools (such as ChatGPT and Sahihly) improved written expression and self-regulated learning among 55 middle school students, recording a large effect size for the experimental group.

Survey research has evaluated stakeholder readiness and literature trends. Al-Ghamdi and Jado (2024) surveyed students at Al-Sharq Arab Colleges, finding moderate usage levels and varied assessments across demographic variables. Ramadan (2024) evaluated GenAI tools in reading classes with 30 middle-stage female students using a single-group pre/post-test design, observing statistically significant improvements on post-tests. In the UK, a national survey by Picton & Clark (2024) involving hundreds of teachers found that three-quarters expressed a need for additional training, while raising concerns regarding over-reliance on technology over independent thinking.

Haji (2025) proposed a training program framework to build GenAI skills for secondary school Arabic language teachers. Surveying 108 teachers, the study identified high training demands across targeted skill areas. Focusing on reading fluency, Al-Muflih and Abu El-Enein (2025) studied 628 elementary pupils in Riyadh, showing significant performance gains for students using AI-driven applications. Additionally, Al-Omari and Al-Harbi (2025) completed a systematic review on education in the era of GenAI, pointing out a shortage of specialized empirical studies relative to the rapid expansion of these tools.

Internationally, Cheah et al. (2025) utilized a mixed-methods approach to examine GenAI readiness among 89 K-12 teachers in the United States. Their study revealed that fewer than half actively integrated GenAI into direct teaching, pointing to a need for targeted professional development and institutional backing.

Commentary on Literature Review Existing literature largely confirms the positive impact of GenAI on language skills, including reading comprehension (Ramadan, 2024; Al-Muflih & Abu El-Enein, 2025). Simultaneously, studies highlight a gap between available technology and direct classroom implementation, alongside an ongoing need for teacher training (Cheah et al., 2025; Picton & Clark, 2024).

This study builds upon these findings to shape its theoretical base, structure questionnaire domains (reality, requirements, obstacles, proposed framework), and design practical mechanisms. It focuses specifically on elementary reading comprehension within digital education standards, addressing a key intersection in the literature.

Methodology and Procedures This study utilized a descriptive-analytical methodology to examine current practices, evaluate field data, and construct a practical framework based on the findings.

1. Statistical Analysis Methodology Data was gathered using a four-part questionnaire distributed to a sample of 50 teachers. Responses were processed using SPSS. Items were scored on a 5-point Likert scale (Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1). Evaluation criteria were categorized as follows:

Table 1: Scale for Interpreting Mean Scores

Mean Score Range	Level of Agreement
1.00 to less than 1.80	Strongly Disagree
1.80 to less than 2.60	Disagree
2.60 to less than 3.40	Neutral
3.40 to less than 4.20	Agree
4.20 to 5.00	Strongly Agree

Statistical tests included: frequencies and percentages for demographic profiles; Cronbach's Alpha for instrument reliability; means and standard deviations for main domains; independent samples t-tests for two-category variables (gender, grade level, prior training); One-Way ANOVA for multi-category variables (academic qualification, experience, training count); and Pearson correlation coefficients to assess relationships between domains.

2. Sample Characteristics The demographic distribution of the sample (N = 50) is presented below:

Table 2: Sample Demographic Characteristics

Variable	Category	Frequency	Percentage (%)
Gender	Female	30	60.0%
	Male	20	40.0%
Academic Qualification	Bachelor's Degree	32	64.0%
	Postgraduate Degree	10	20.0%
	Diploma	8	16.0%
Years of Experience	5 to less than 10 years	14	28.0%
	Less than 5 years	13	26.0%
	10 to less than 15 years	13	26.0%
	15 years and above	10	20.0%

Grade Level Taught	Upper Primary (Grades 4–6)	25	50.0%
	Lower Primary (Grades 1–3)	25	50.0%
Prior Training	No	29	58.0%
	Yes	21	42.0%
Number of Training Courses	None	29	58.0%
	1 Course	10	20.0%
	2 Courses	6	12.0%
	3 or more Courses	5	10.0%

Figure 1: Gender Distribution

Female: 60% [==========]

Male: 40% [==========]

Figure 2: Prior AI Training Distribution

No: 58% [==========]

Yes: 42% [==========]

Figure 3: Academic Qualification Distribution

Bachelor's: 64% [==========]

Postgraduate: 20% [======]

Diploma: 16% [=====]

Figure 4: Years of Experience Distribution

< 5 Years: 26% [========]

5–10 Years: 28% [=========]

10–15 Years: 26% [========]

15+ Years: 20% [======]

3. Reliability of the Instrument Internal consistency was evaluated using Cronbach's Alpha across all subscales and for the full instrument:

Table 3: Reliability Coefficients (Cronbach's Alpha)

Subscale / Domain	**Item Count**	**Cronbach's Alpha**
Domain 1: Actual Level of Employment	10	0.969

Domain 2: Employment Requirements	10	0.907
Domain 3: Employment Obstacles	10	0.696
Domain 4: Proposed Framework	12	0.944
Overall Instrument	**42**	**0.947**

Alpha values ranged between 0.696 and 0.969 across individual subscales, with an overall instrument reliability of 0.947. These values confirm high statistical reliability suitable for study objectives.

Overall Domain Results The overall mean response across all four main domains was 3.60 (SD = 0.43), corresponding to an "Agree" evaluation. Table 4 displays the domains ranked by mean scores:

Table 4: Ranked Means and Standard Deviations for Main Domains

Rank	Domain	Mean	SD	Level of Agreement
1	Requirements for Employing GenAI	4.08	0.49	Agree
2	Proposed Framework for Employing GenAI	4.06	0.51	Agree
3	Obstacles to Employing GenAI	3.72	0.30	Agree
4	Actual Level of Employing GenAI	2.54	0.97	Disagree

Figure 5: Comparison of Main Domain Means

Requirements: 4.08 [==========]

Proposed Model: 4.06 [==========]

Obstacles: 3.72 [==========]

Actual Use: 2.54 [==========]

The results highlight a gap between teachers' perceived needs and proposed solutions on one hand, and current classroom adoption rates on the other.

Domain 1: Actual Level of Employing GenAI Applications The overall mean for Domain 1 was 2.54 (SD = 0.97), falling within the "Disagree" range. Item-level results are ranked below:

Table 5: Ranked Item Analysis for Domain 1 (Actual Employment)

Rank	Item Statement	Mean	SD	Level
1	I use AI applications to generate enrichment activities for reading comprehension.	2.64	1.03	Neutral
2	I employ GenAI to produce reading texts tailored to pupils' levels.	2.62	1.09	Neutral

3	I use GenAI to formulate reading comprehension questions.	2.60	1.14	Neutral
4	I use AI applications to design assessments for reading comprehension.	2.58	1.09	Disagree
5	I use AI tools to generate stories and tales suited to pupils' interests.	2.56	0.99	Disagree
6	I employ GenAI to track individual pupil progress in reading skills.	2.54	1.18	Disagree
7	I use AI tools to simplify difficult reading passages for pupils.	2.52	1.15	Disagree
8	I utilize GenAI to diversify reading passage formats (audio, image, video).	2.50	1.15	Disagree
9	I use GenAI tools (e.g., ChatGPT) to prepare reading lessons.	2.46	1.07	Disagree
10	I employ GenAI to deliver immediate feedback on reading performance.	2.38	1.03	Disagree

Figure 6: Top 5 Items in Actual Employment

Generating Enrichment Activities: 2.64 [==========]

Generating Suitable Texts: 2.62 [==========]

Formulating Comprehension Questions:2.60 [==========]

Designing Assessments: 2.58 [==========]]

Generating Stories & Tales: 2.56 [==========]]

These ratings demonstrate limited overall classroom deployment, with no item scoring above the "Neutral" threshold.

Domain 2: Requirements for Employing GenAI Applications The overall mean for Domain 2 was 4.08 (SD = 0.49), corresponding to "Agree". Item rankings are listed below:

Table 6: Ranked Item Analysis for Domain 2 (Requirements)

Rank	**Item Statement**	**Mean**	**SD**	**Level**
1	Establishing ethical standards and guidelines for using GenAI with pupils.	4.32	0.55	Strongly Agree
2	Training teachers on how to utilize GenAI applications effectively.	4.30	0.65	Strongly Agree
3	Providing an instructional guide for employing AI in reading comprehension.	4.22	0.65	Strongly Agree
4	Supplying suitable technical infrastructure (internet, hardware) in schools.	4.16	0.71	Agree
5	Offering continuous technical support when technical issues arise.	4.14	0.70	Agree
6	Embedding GenAI-based activities into school curricula.	4.14	0.64	Agree

7	Updating educational policies to keep pace with digital requirements.	4.08	0.70	Agree
8	Securing support from school leadership and educational administration.	4.08	0.72	Agree
9	Allocating sufficient instructional time within class schedules.	3.78	0.68	Agree
10	Raising parent awareness regarding the value of AI in reading growth.	3.60	0.64	Agree

Figure 7: Top 5 Items in Requirements

Ethical Standards & Guidelines: 4.32 [==========]

Teacher Training Programs: 4.30 [==========]

Instructional User Guides: 4.22 [==========]

Technical Infrastructure: 4.16 [==========]

Ongoing Technical Support: 4.14 [==========]

Ethical guidelines and targeted training emerged as primary requirements for field implementation.

Domain 3: Obstacles to Employing GenAI Applications The overall mean for Domain 3 was 3.72 (SD = 0.30), falling within the "Agree" category. Item rankings are provided below:

Table 7: Ranked Item Analysis for Domain 3 (Obstacles)

Rank	Item Statement	Mean	SD	Level
1	Scarcity of specialized GenAI training programs for teachers.	4.12	0.59	Agree
2	Overcrowded curricula and constrained classroom session times.	4.02	0.59	Agree
3	High licensing costs for advanced GenAI tools.	3.82	0.56	Agree
4	Absence of clear criteria to evaluate AI-generated educational content.	3.70	0.54	Agree
5	Teacher concerns regarding technology replacing their instructional role.	3.68	0.47	Agree
6	Insufficient technical assistance provided by school management.	3.64	0.56	Agree
7	Suboptimal Arabic language capabilities in certain AI software.	3.62	0.60	Agree
8	Weak school infrastructure and hardware availability.	3.58	0.73	Agree
9	Limited awareness among some teachers regarding AI pedagogical value.	3.50	0.54	Agree

Figure 8: Top 5 Items in Obstacles

Lack of Specialized Training: 4.12 [==========]

Curriculum Overload & Time: 4.02 [==========]

High Application Costs: 3.82 [==========]

Lack of Evaluation Criteria: 3.70 [==========]

Fear of Role Replacement: 3.68 [==========]

The top reported challenges were a lack of specialized training and curriculum time constraints.

Domain 4: Proposed Framework for Employing GenAI Applications The overall mean for Domain 4 was 4.06 (SD = 0.51), corresponding to an "Agree" rating. Item results are ranked below:

Table 8: Ranked Item Analysis for Domain 4 (Proposed Framework)

Rank	Item Statement	Mean	SD	Level
1	Developing a step-by-step procedural guide for AI deployment in reading.	4.24	0.62	Strongly Agree
2	Using GenAI to offer differentiated learning pathways tailored to pupils.	4.20	0.70	Strongly Agree
3	Providing performance incentives for teachers excelling in AI integration.	4.17	0.75	Agree
4	Establishing mechanisms for periodic review and evaluation of the model.	4.14	0.61	Agree
5	Organizing continuous professional training on AI reading instruction.	4.10	0.71	Agree
6	Hosting orientation sessions for parents regarding AI-supported reading.	4.10	0.68	Agree
7	Involving pupils in supervised text generation and inquiry exercises.	4.04	0.57	Agree
8	Conducting regular reviews of AI outputs to ensure curriculum alignment.	4.02	0.59	Agree
9	Scheduling dedicated weekly class sessions for AI reading activities.	3.98	0.68	Agree
10	Building a school digital platform integrating GenAI into reading goals.	3.96	0.67	Agree
11	Forming an internal school technical team to assist teaching staff.	3.96	0.64	Agree
12	Creating a digital bank of AI-generated texts and questions by grade level.	3.92	0.70	Agree

Figure 9: Top 5 Items in Proposed Framework

Procedural User Guide: 4.24 [==========]

Differentiated Learning Paths: 4.20 [==========]

Teacher Incentives: 4.17 [==========]

Periodic Review Mechanisms: 4.14 [==========]

Continuous Professional Training: 4.10 [==========]

Participants expressed strong support for practical implementation guides and differentiated learning pathways.

Sub-Group Differences Analysis

Differences by Gender Independent samples t-tests were performed across gender groups (30 Females, 20 Males):

Table 9: T-Test Analysis by Gender

Domain	Female (M / SD)	Male (M / SD)	t-value	Significance
Domain 1: Actual Level	2.84 / 0.95	2.08 / 0.81	3.02	Significant (p = 0.004)
Domain 2: Requirements	4.28 / 0.44	3.78 / 0.42	4.02	Significant (p = 0.000)
Domain 3: Obstacles	3.63 / 0.29	3.87 / 0.26	-3.01	Significant (p = 0.004)
Domain 4: Proposed Framework	4.24 / 0.49	3.80 / 0.44	3.32	Significant (p = 0.002)

Female teachers reported higher means across Actual Level, Requirements, and the Proposed Framework, whereas male teachers recorded higher means in perceived Obstacles.

Differences by Prior Training Independent samples t-tests compared teachers with prior training (N = 21) against those without (N = 29):

Table 10: T-Test Analysis by Prior Training Status

Domain	No Training (M / SD)	Training (M / SD)	t-value	Significance
Domain 1: Actual Level	1.81 / 0.42	3.54 / 0.47	-13.50	Significant (p = 0.000)
Domain 2: Requirements	3.75 / 0.34	4.54 / 0.22	-10.10	Significant (p = 0.000)
Domain 3: Obstacles	3.89 / 0.21	3.50 / 0.25	5.67	Significant (p = 0.000)
Domain 4: Proposed Framework	3.70 / 0.30	4.56 / 0.27	-10.61	Significant (p = 0.000)

Teachers with prior training showed higher scores for Actual Level, Requirements, and Framework support, alongside lower perceived Obstacles.

Differences by Grade Level Taught Independent samples t-tests compared upper primary teachers (Grades 4–6, N = 25) with lower primary teachers (Grades 1–3, N = 25):

Table 11: T-Test Analysis by Grade Level Taught

Domain	Upper Grades (M / SD)	Lower Grades (M / SD)	t-value	Significance
Domain 1: Actual Level	2.96 / 0.91	2.12 / 0.83	3.43	Significant (p = 0.001)
Domain 2: Requirements	4.34 / 0.38	3.82 / 0.46	4.34	Significant (p = 0.000)
Domain 3: Obstacles	3.66 / 0.31	3.79 / 0.28	-1.64	Non-Significant (p = 0.108)
Domain 4: Proposed Framework	4.30 / 0.44	3.82 / 0.46	3.77	Significant (p = 0.000)

Upper primary teachers scored significantly higher across Actual Level, Requirements, and Framework support, while differences in perceived Obstacles were not statistically significant.

Differences by Academic Qualification One-Way ANOVA was calculated across qualification levels:

Table 12: ANOVA Results for Academic Qualification

Domain	F-value	Significance
Domain 1: Actual Level	47.96	Significant (p = 0.000)
Domain 2: Requirements	63.77	Significant (p = 0.000)
Domain 3: Obstacles	25.05	Significant (p = 0.000)
Domain 4: Proposed Framework	76.10	Significant (p = 0.000)

Table 13: Group Means by Academic Qualification

Domain	Bachelor's (N = 32)	Postgraduate (N = 10)	Diploma (N = 8)
Domain 1: Actual Level	2.39	3.93	1.39
Domain 2: Requirements	4.06	4.74	3.35
Domain 3: Obstacles	3.78	3.33	4.00
Domain 4: Proposed Framework	4.01	4.81	3.35

Postgraduate degree holders reported higher means for Actual Level, Requirements, and Framework support, while Diploma holders reported higher perceived Obstacles.

Differences by Years of Experience One-Way ANOVA was conducted across experience categories:

Table 14: ANOVA Results for Years of Experience

Domain	**F-value**	**Significance**
Domain 1: Actual Level	5.15	Significant (p = 0.004)
Domain 2: Requirements	5.04	Significant (p = 0.004)
Domain 3: Obstacles	4.06	Significant (p = 0.012)
Domain 4: Proposed Framework	5.50	Significant (p = 0.003)

Table 15: Group Means by Years of Experience

Domain	**< 5 Yrs (N = 13)**	**5–10 Yrs (N = 14)**	**10–15 Yrs (N = 13)**	**15+ Yrs (N = 10)**
Domain 1: Actual Level	2.41	2.64	3.16	1.76
Domain 2: Requirements	4.07	4.17	4.34	3.64
Domain 3: Obstacles	3.69	3.66	3.62	3.99
Domain 4: Proposed Framework	4.03	4.13	4.37	3.61

Teachers with 10 to 15 years of experience showed higher levels of adoption and support for the framework, whereas those with 15+ years of experience reported lower adoption scores and higher perceived obstacles.

Differences by Number of Training Courses One-Way ANOVA assessed responses relative to the volume of training completed:

Table 16: ANOVA Results for Training Course Count

Domain	**F-value**	**Significance**
Domain 1: Actual Level	102.80	Significant (p = 0.000)
Domain 2: Requirements	35.93	Significant (p = 0.000)
Domain 3: Obstacles	18.80	Significant (p = 0.000)
Domain 4: Proposed Framework	48.32	Significant (p = 0.000)

Table 17: Group Means by Number of Training Courses

Domain	None (N = 29)	1 Course (N = 10)	2 Courses (N = 6)	3+ Courses (N = 5)
Domain 1: Actual Level	1.81	3.26	3.43	4.24
Domain 2: Requirements	3.75	4.43	4.48	4.84
Domain 3: Obstacles	3.89	3.59	3.60	3.20
Domain 4: Proposed Framework	3.70	4.43	4.47	4.91

Increased training participation correlated with higher mean scores across adoption, requirements, and framework subscales, alongside lower obstacle ratings.

Correlation Matrix Pearson correlation coefficients were calculated to evaluate relationships across main domains:

Table 18: Pearson Correlation Matrix Across Study Domains

Domain	Domain 1 (Actual)	Domain 2 (Requirements)	Domain 3 (Obstacles)	Domain 4 (Proposed Framework)
Domain 1: Actual Level	1.00	0.935	-0.807	0.961
Domain 2: Requirements	0.935	1.00	-0.780	0.969
Domain 3: Obstacles	-0.807	-0.780	1.00	-0.782
Domain 4: Proposed Framework	0.961	0.969	-0.782	1.00

Strong positive correlations exist between actual deployment, requirements, and support for the proposed framework. Conversely, perceived obstacles correlate negatively with these three dimensions.

Proposed Framework for Employing Generative AI Derived from field data, literature review, and high participant agreement on Domain 4 (M = 4.06), the proposed framework is structured as follows:

1. Underlying Philosophy GenAI is positioned as a supportive instructional tool rather than a replacement for educators. Its integration into reading comprehension should follow a balanced pedagogical structure, prioritizing student development and ethics in alignment with established best practices (Cheah et al., 2025).

2. Core Objectives

- Build elementary school teacher competencies in using GenAI tools for reading comprehension instruction.
- Address the gap between low field adoption and high perceived requirements/support.
- Establish a reliable technical and organizational foundation for AI integration in schools.
- Provide a practical workflow adapted to classroom resources and operational constraints.

3. Foundational Pillars

- Empirical Base: Supported by study findings and literature establishing the utility of AI in building reading comprehension and fluency (Ramadan, 2024; Al-Muflih & Abu El-Enein, 2025).
- Pedagogical Base: Formulated around cognitive and language development needs of elementary pupils under direct teacher supervision.
- Institutional Base: Aligned with national digital education standards (National Center for e-Learning, 2025).
- Ethical Base: Guided by privacy standards and content verification protocols suitable for young learners.

4. Implementation Stages and Action Plan

Table 19: Implementation Stages and Key Actions

Implementation Phase	Action Steps	Responsible Body
Phase 1: Preparation & Readiness	Form a school technical committee; audit existing IT infrastructure; host orientation workshops for teachers and parents.	School Leadership / Educational Supervision
Phase 2: Capacity Building	Run structured professional training programs on GenAI for reading classes; release a step-by-step procedural implementation guide.	Training Departments
Phase 3: Gradual Classroom Integration	Allocate weekly class periods for GenAI reading activities; involve pupils in supervised text generation and question exercises.	Classroom Teacher
Phase 4: Digital Infrastructure Support	Build a centralized school digital platform housing a categorized bank of AI-generated reading materials and assessments.	IT / Technical Department
Phase 5: Evaluation & Monitoring	Monitor AI output quality against learning standards; implement regular reviews to refine integration processes.	Evaluation & Monitoring Committee

5. Requirements for Successful Implementation Reflecting the findings of Domain 2 (M = 4.08), critical success factors include:

- Securing reliable internet connectivity and modern hardware in elementary schools.
- Providing targeted training modules focused on GenAI applications.
- Securing administrative backing from school leaders and educational districts.
- Establishing formal ethical guidelines for classroom deployment.
- Maintaining accessible technical support channels for teachers.

6. Overcoming Key Obstacles

Table 20: Proposed Solutions for Key Field Obstacles

Identified Obstacle	**Proposed Solution**
Weak school technical infrastructure	Develop a phased hardware allocation plan prioritized by district need.
Scarcity of specialized AI training	Embed dedicated GenAI modules into ongoing teacher professional development programs.
Overcrowded curricula and time limits	Integrate AI activities directly into existing lesson plans rather than adding separate requirements.
Teacher concerns over role replacement	Conduct orientation sessions demonstrating AI as a supportive tool for educators.
Lack of clear content evaluation criteria	Publish a unified rubric to evaluate AI-generated content before classroom use.

7. Evaluation Strategies

- Monthly formative reviews assessing teacher adherence to procedural guidelines.
- Term-end summative evaluations tracking pupil reading comprehension outcomes via criterion-referenced tests.
- Periodic feedback surveys gathering teacher and parent input for continuous improvement.
- Technical reports detailing platform utilization rates and system performance.

Summary of Findings

- Field usage of GenAI in elementary reading comprehension remains low, receiving a mean score of 2.54 ("Disagree").
- Operational requirements scored high (M = 4.08, "Agree"), led by demands for specialized training, infrastructure, and technical support.
- Perceived obstacles received an overall "Agree" rating (M = 3.72), dominated by training shortages and curriculum time constraints.
- Participants expressed strong support for the proposed framework (M = 4.06, "Agree").
- Subgroup analysis indicated statistically significant differences based on gender, qualification level, experience, and training participation.
- Instrument reliability was confirmed across subscales, recording an overall Cronbach's Alpha of 0.947.

Recommendations

- Implement specialized training programs focused on applying GenAI within reading comprehension instruction.
- Upgrade hardware, internet stability, and software licensing across elementary schools.
- Publish a simplified teacher's handbook outlining step-by-step GenAI reading strategies.

- Pilot the proposed framework in elementary schools, backed by structured monitoring processes.
- Conduct empirical research to measure the direct impact of GenAI integration on pupil reading performance.

Suggestions for Future Research

- Conduct experimental studies evaluating the proposed framework's impact on elementary reading comprehension performance.
- Replicate the study across middle/secondary school levels and other language competencies (e.g., written expression, listening skills).
- Investigate pupil and parent attitudes toward GenAI deployment in learning.
- Perform comparative studies evaluating GenAI tools against conventional digital learning applications in reading development.

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