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# Editorial Note

The Interdisciplinary Research Review (IRR) was established with academic cooperation by The Royal Society of Thailand Committee of Interdisciplinary Research and Development, Rajabhat University (Western Group), and Rajamangala University of Technology Rattanakosin. This Issue, Volume 21, No. 1, January – February 2026. This issue contains of four interesting articles in multidisciplinary fields: (1) Online Quiz and Pre-Service Teachers' Writing Proficiency,(2) Physical Education in Seventh-day Adventist Schools and Institutions: A Review of Health, Wellness, and Spiritual Integration , (3) Effects of Ya Khao, a Thai traditional herbal formula extract, on hyperglycemia and associated biochemical and histopathological changes in streptozotocin-induced diabetic rats,(4) Pedagogical Approaches in Social Studies in the Philippine Basic Education.

The Editorial Board of the IRR encourages anyone to submit articles for evaluation and review. The processes of submission, review and publication of articles are described on the journal's website, https://www.tci-thaijo.org/index.php/jtir. The Editorial Board and Committees of the IRR sincerely thank all peer reviewers who have sacrificed their time to help us produce a better journal, and also wish to thank all teachers, researchers and other academicians for submitting their valuable research to this journal. Finally, we thank readers of our journal who help to spread the knowledge and benefits gained to others. With your feedback and suggestions, we will strive to improve the quality and relevance of the IRR.

Yongyudh Vajaradul
Editor
Interdisciplinary Research Review

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# Online Quiz and Pre-Service Teachers' Writing Proficiency

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**Abstract**

Writing proficiency, particularly in grammar, coherence, and vocabulary, remains a key challenge for pre-service teachers, emphasizing the need for technology-supported learning. This quasi-experimental study examined the impact of online quizzes on the writing proficiency of the pre-service teachers. The participants' writing proficiency in grammar, coherence, and vocabulary was assessed before and after an online quiz intervention administered via Google Forms. Before the intervention, participants completed a written task evaluated using a rubric and answered seven sets of 20-item grammar quizzes uploaded online. The intervention involved answering online quizzes three times a week, and retaken up until a perfect score was achieved. After three months, participants completed another writing task evaluated using the same rubric. Data were analyzed using descriptive and inferential statistics, including the Wilcoxon and Kruskal-Wallis tests. Results showed significant improvement in overall writing proficiency, with grammar and coherence showing the highest gains, while vocabulary remained the weakest area, requiring further instructional support. Year-level comparisons revealed first-year students progressed from developing to proficient levels, particularly in grammar, while second-year students exhibited the greatest improvement in vocabulary. Common grammar errors, particularly in subject-verb agreement and verb usage, were significantly reduced after the intervention. The study concludes that online quizzes effectively enhanced grammar proficiency and reduced frequent grammatical errors but recommends additional strategies to improve coherence and vocabulary, especially among first-year students.

**Keywords:** Online quiz, Pre-service, Proficiency, Teachers, Writing

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## 1. Introduction

Developing language skills, particularly writing, has long been a central concern among language educators. Writing is a complex skill that requires mastery of grammar, vocabulary, organization, and critical thinking. Many students, however, struggle with structuring ideas logically, selecting precise words, and producing grammatically correct sentences, highlighting the need for effective instructional interventions. For the pre-service teachers, strong writing proficiency is especially essential, as it not only supports academic achievement but also enhances communication and critical thinking skills vital for their future professional roles. To address challenges in writing development, technology-assisted learning has emerged as an important approach.

Among these tools, online quizzes and AI-powered platforms such as ChatGPT provide interactive and accessible means of reinforcing grammar, expanding vocabulary, and improving sentence construction. Their key advantage lies in the provision of instant feedback, which enables students to identify and correct errors in real time while engaging in continuous practice. Empirical studies have highlighted the effectiveness of online quizzes in supporting writing development. For instance, [1] found that online quizzes with guided feedback significantly improved student performance and satisfaction. Similarly, [2] reported that EFL learners expressed positive perceptions of quiz applications, emphasizing their role in enhancing motivation, grammar

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learning, and overall engagement. In the same vein, [3] observed that online quizzes increased student enthusiasm, making the learning process more enjoyable and effective. ChatGPT shows great potential as an effective tool for enhancing classroom engagement and supporting enriched language learning experiences [4], offering valuable support even as pre-service teachers experience difficulty in critical areas such as identifying relevant resources, structuring learning activities, and facilitating effective student engagement [5]. Mayer's Cognitive Theory of Multimedia Learning [6] supports these findings, highlighting that digital technologies enhance learning by actively engaging cognitive processes. Interactive, self-paced online quizzes improve writing skills by promoting active processing, reducing cognitive overload, and fostering meaningful learning experience [7]. Furthermore, Skill Acquisition Theory [8] explains how students develop skills through practice and feedback. Language learning is similar to the acquisition of other abilities, requiring repeated practice to improve, with skilled behaviors becoming routinized and even automatic under particular conditions. Together, these perspectives underscore the potential of systematic, technology-based interventions to enhance writing proficiency [9].

Building on these insights, this study investigates the effectiveness of online quizzes as an intervention for improving students' writing skills, with specific attention to grammar accuracy, coherence, and vocabulary development. It aims to contribute to a deeper understanding of technology-based instructional practices in language education, particularly the role of online quizzes in enhancing writing proficiency.

### 1.1. Problem statement

The study examined the effectiveness of online quiz in improving the pre-service teachers' writing proficiency in the areas of grammar, coherence, and vocabulary. Specifically, it sought answers to the following questions:

1. What is the writing proficiency of pre-service teachers as an entire group and in terms of grammar, coherence, and vocabulary, before and after exposure to online quizzes?
2. What is the writing proficiency of pre-service teachers as to year level in terms of grammar, coherence, and vocabulary, before and after exposure to online quizzes?
3. What are the most common grammar errors made by pre-service teachers, and which specific aspects of grammar have improved after exposure to online quizzes?
4. Is there a significant difference in pre-service teachers' writing proficiency in terms of grammar, coherence, and vocabulary before and after exposure to online quizzes?
5. Is there a significant difference in pre-service teachers' writing proficiency as to year level, in terms of grammar, coherence, and vocabulary before and after exposure to online quizzes?

### 1.2 Framework of the Study

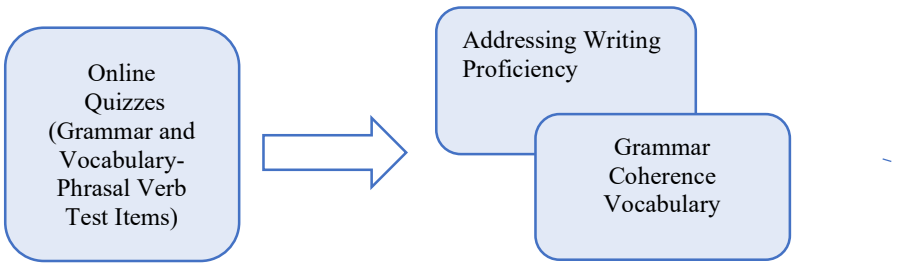


**Figure 1.** Concept Map of the Study

The study employed the Input-Process-Output (IPO) Model to investigate the impact of online quizzes on pre-service teachers' writing skills. During the input phase, it evaluated their basic writing abilities, including grammar, coherence and vocabulary, and introduced online tests as a kind of intervention. Pre-service instructors practiced grammar with online tests that provided real-time feedback during the process phase. The goal of this interactive, self-paced method was to improve writing abilities. The study assessed grammar, coherence, and vocabulary; identified common errors; and collected students' self-assessments of their development during the output phase (Figure 1). Several theories support the study, including Skill Acquisition Theory and the Cognitive Theory of Multimedia Learning. Skill Acquisition Theory explains how humans develop skills, progressing from initial learning to advanced expertise. According to [8], language learning resembles the acquisition of other skills in that it requires practice and feedback for improvement. Skill acquisition involves learning processes in which "skilled behaviors can become routinized and even automatic under certain conditions" [9]. Online quizzes support this process by reinforcing writing skills through self-correction and repeated practice. The Cognitive Theory of Multimedia Learning [6] explains how interactive features and digital technologies enhance learning by actively engaging cognitive processes. This theory supports the use of interactive, self-paced online quizzes to improve writing abilities. It further explains how students learn from the combination of words and images, making it highly relevant to multimedia use in higher education. The theory emphasizes instructional strategies that guide cognitive processes and promote the meaningful integration of new information [7].

## 2. Materials and Methods

### 2.1 Research design

Using a quasi-experimental design, this study determined the effects of online quizzes on writing proficiency of pre-service teachers, major in English. Participants' writing proficiency assessing the grammar, coherence, and vocabulary was explored before and after exposure to online quizzes through a pretest-posttest approach. This design allowed the researcher to evaluate the impact of online quizzes on those categories, even without full experimental control [10].

### 2.2 The participants

The study involved seventy-two purposively selected pre-service teachers majoring in English, enrolled under the Bachelor of Secondary Education (BSEd) curriculum. These participants were distributed across three sections, spanning first- to third-year levels. All participants were on the verge of being deployed as student teachers or practice teachers, making the development of strong writing skills particularly essential. While the BSEd program includes other majors such as Filipino, Mathematics, Science, and Social Sciences, only English majors were selected as participants, given the essential role of writing proficiency in their future teaching responsibilities. All selected participants were exposed to the online quiz intervention designed to enhance their grammar, vocabulary, and overall writing competence in preparation for their student teaching experiences.

### 2.3 Data instrument and gathering procedure

The study employed 140 online test items developed to identify various categories of errors and administered using Google Forms. Students selected the correct option from a set of five answer choices for each item. The items were compiled into seven sets of 20-item grammar and vocabulary-phrasal verb tests, sourced from reputable online grammar websites and submitted for online quiz administration. The exams focused on grammar and vocabulary, with particular emphasis on two-word phrasal verbs that convey precise lexical meanings. The test items were validated by English faculty to ensure content accuracy and appropriateness. These online quizzes, which provided immediate feedback, were implemented as an intervention, and students were allowed to take each quiz up to three times within one week or more to improve their performance and achieve better or perfect scores. The intervention aimed to ascertain the quizzes' impact on participants' writing proficiency in terms of vocabulary, coherence, and grammar. The pre- and post-intervention essays of the participants were evaluated using a validated writing rubric. This rubric utilized a

4-point scoring guide to evaluate grammar, coherence, and vocabulary usage. Mastery and performance that exceeded expectations were indicated by the score of Excellent, while writing that failed to meet fundamental standards was denoted by the score of Needs Improvement. Grammar assessed the precision, appropriateness, and range of word choice, while coherence assessed the clarity of ideas, logical organization, and efficacy of transitions. This method enabled an objective and systematic evaluation of the effect of the online questionnaire intervention on the writing proficiency of students.

**2.4 Pre-Intervention**

The participants completed a written task assessed using the writing rubric. Additionally, seven sets of 20-item or a total 140 grammar and vocabulary test items sourced from online grammar websites were uploaded to Google Forms for online quiz administration. During the pre- intervention, the participants answered 20-item online quizzes three times a week. Each quiz could be retaken up to three times until a perfect score was achieved, allowing students to review incorrect answers and reinforce learning. As post-intervention, the participants completed a second or post writing task. Their written work was assessed using the same writing rubric to measure improvements in grammar, coherence, and vocabulary.

**2.5 Data analysis**

Descriptive statistics, mean and standard deviation, frequency and rank were used to analyze participants' writing proficiency levels. Inferential tests, including the Kruskal-Wallis test and Wilcoxon were employed to determine significant differences in writing proficiency before and after the intervention.

**3. Results and discussion**

Table 1 presents the pretest and posttest writing proficiency of the participants, assessing their skills in grammar, coherence, and vocabulary.

**Table 1**. Pre-service teachers' writing proficiency as an entire group and in terms of grammar, coherence, and vocabulary, before and after exposure to online quizzes

| Skills | Pretest (Mean) | Description | Posttest (Mean) | Description |
|---|---|---|---|---|
| Grammar | 2.89 (.640) | Proficient | 3.61 (.545) | Excellent |
| Coherence | 2.81 (.642) | Proficient | 3.54 (.580) | Excellent |
| Vocabulary | 2.58 (.622) | Proficient | 3.38 (.542) | Proficient |
| Total | 2.76 (.634) | Proficient | 3.51 (.555) | Excellent |

The results show that prior to the online quiz intervention, pre-service teachers demonstrated a proficient level of writing (M=2.76; SD=.634); with vocabulary (M=2.58; SD=0.622), as the weakest area. After the intervention, overall writing proficiency improved to an excellent level (M=3.51; SD=.555), particularly in grammar (M=3.61; SD=0.545) and coherence (M=3.54; SD=0.580), indicating stronger sentence accuracy and organization. Vocabulary also improved (M=3.38; SD=0.542), though the progress was more moderate, suggesting a continued need for vocabulary development. These findings indicated that online quizzes had a significant impact on writing proficiency, especially in grammar and coherence. However, vocabulary development required further emphasis to achieve well-rounded writing skills. This aligned with [2], who found that online quizzes enhanced motivation and grammar learning, with students expressing positive perceptions of quiz apps as engaging and improved learning outcomes. Similarly, [3] affirmed that online quizzes foster enthusiasm and encourage participation while strengthening comprehension through immediate feedback.

**Table 2**. Pre-service teachers' writing proficiency as to year level in terms of grammar, coherence, and vocabulary, before and after exposure to online quizzes.

| Skills | Pretest (Mean) | Description | Posttest (Mean) | Description |
|---|---|---|---|---|
| Writing Proficiency | 2.72 (.524) | Proficient | 3.56 (.516) | Excellent |
| First Year | | | | |
| Grammar | 2.40 (.503) | Developing | 3.50 (.513) | Excellent |
| Coherence | 2.35 (.489) | Developing | 3.15 (.366) | Proficient |
| Vocabulary | 2.05 (.224) | Developing | 3.10 (.308) | Proficient |
| Total | 2.26 (.414) | Developing | 3.25 (.395) | Proficient |
| Second Year | | | | |
| Grammar | 3.06 (.669) | Proficient | 3.75 (.560) | Excellent |
| Coherence | 2.94 (.669) | Proficient | 3.70 (.592) | Excellent |
| Vocabulary | 2.78 (.659) | Proficient | 3.93 (.504) | Excellent |
| Total | 2.92 (.665) | Proficient | 3.79 (.552) | Excellent |
| Third Year | | | | |
| Grammar | 3.10 (.447) | Proficient | 3.75 (.5500 | Excellent |
| Coherence | 3.05 (.510) | Proficient | 3.70 (.571) | Excellent |
| Vocabulary | 2.80 (.523) | Proficient | 3.55 (.686) | Excellent |
| Total | 2.98 (.493) | Proficient | 3.66 (.602) | Excellent |

Prior to the online quiz intervention, first-year students demonstrated a developing level of writing across grammar (M=2.40; SD=.503), coherence (M=2.35; SD=.489), and vocabulary (M=2.05; SD=.224). Second-year students performed at a proficient level in grammar (M=3.06; SD=.669), coherence (M=2.94; SD=.669), and vocabulary (M=2.78; SD=.659). Similarly, third-year students also showed proficiency: grammar (M=3.10; SD=.447), coherence (M=3.05; SD=.510), and vocabulary (M=2.80; SD=.523) (Table 2). Across all year levels, vocabulary consistently emerged as the weakest area compared with grammar and coherence. The results also suggest that pre-service teachers' writing proficiency improves naturally with academic progression. These findings indicate that before the intervention, pre-service teachers still had considerable room for improvement, particularly in vocabulary. As English majors, strengthening this area alongside grammar and coherence is essential for advanced writing competence. Prior research supports the effectiveness of online quizzes in addressing such needs. According to [8], language learning requires practice and feedback for improvement [9]. Posttest results in Table 3 showed improvements across all areas for first-year students: grammar (M=3.50; SD=.513), coherence (M=3.15; SD=.366), and vocabulary (M=3.10; SD=.308). Second-year pre-service teachers reached an excellent level of writing proficiency in grammar (M=3.75; SD=.560), coherence (M=3.70; SD=.592), and vocabulary (M=3.93; SD=.504). Similarly, third-year participants also excelled, with grammar (M=3.75; SD=.550), coherence (M=3.70; SD=.571), and vocabulary (M=3.55; SD=.686). Among the categories, grammar showed the strongest gains for first- and third-year students, while vocabulary improvement was most notable among second-year students. These findings suggest that online quizzes are an effective tool for enhancing writing proficiency, particularly in grammar. However, additional instructional support—such as structured writing tasks or interactive discussions—may be necessary to further strengthen coherence and vocabulary, especially for first-year learners. [11] similarly found that online quizzes, when paired with guided feedback, significantly increased student motivation and satisfaction, leading to improved academic performance.

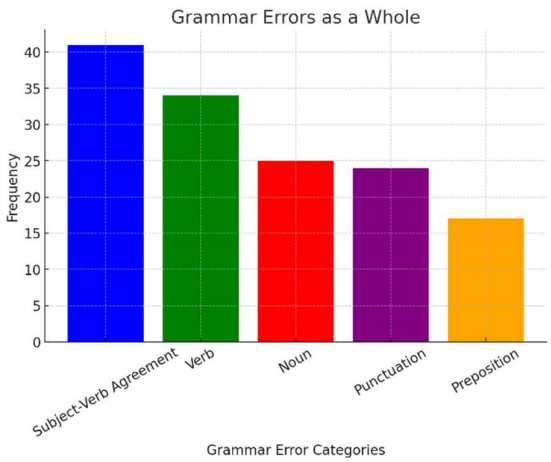


**Figure 2.** Pre-service teachers' most common grammar errors before exposure to online quizzes

Figure 2 shows that the most frequent grammar errors among pre-service teachers occurred in subject–verb agreement (f=41), verb usage (f=34), noun errors (f=25), punctuation (f=24), and prepositions (f=17). These findings suggest that students struggled most with parts of speech and agreement rules, which are fundamental to sentence structure and clarity. Such difficulties were evident across all year levels, though errors decreased by the third year, indicating gradual progress in grammar proficiency. Nonetheless, targeted reinforcement of agreement rules and sentence construction remains necessary, particularly for lower-year students.

Post-test results revealed a significant reduction in grammar errors, especially in subject–verb agreement, verb usage, and nouns. First-year students improved subject–verb agreement errors by 94.7% (19 to 1) and verb errors by 85.7% (21 to 3). Second-year students reduced subject–verb agreement errors by 64.3% (42 to 15) and verb errors by 68.2% (22 to 7). Third-year students eliminated 100% of noun errors (6 to 0) and reduced subject–verb agreement errors by 53.3% (15 to 7). While punctuation errors decreased among first-year students (60% reduction) ( Figure 3 ) , they slightly increased among third-year students. Overall, the results confirm that online quizzes were effective in enhancing grammar proficiency, particularly in subject–verb agreement and verb usage. However, punctuation remains an area requiring further instructional reinforcement to ensure consistent improvement. This finding affirmed [12] found that online quizzes improved overall academic performance. Similarly, [13] reported that the Quizizz platform enhanced student achievement and language learning, further reinforcing the effectiveness of online quiz tools across diverse educational settings.

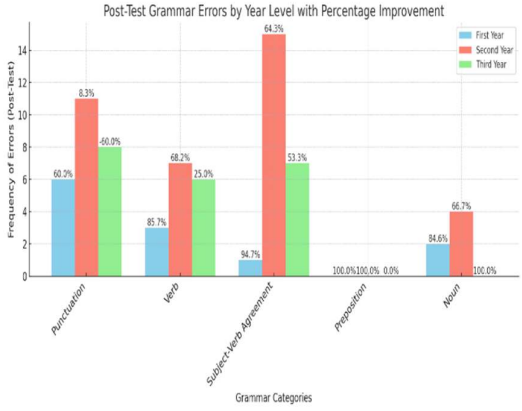


**Figure 3.** Pre-service teachers' most common grammar errors after exposure to online quizzes

**Table 3.** Differences in the Participants' Writing Proficiency in terms of Grammar, Coherence, and Vocabulary after Exposure to Online Quizzes.

| Skills | Mean | W | *p*-value |
|---|---|---|---|
| Grammar | | -5.85 | .000 |
| Pre-test | 2.89 | | |
| Post-test | 3.61 | | |
| Coherence | | -6.128 | .000 |
| Pre-test | 2.81 | | |
| Post-test | 3.54 | | |
| Vocabulary | | -6.503 | .000 |
| Pre-test | 2.58 | | |
| Post-test | 3.38 | | |

The table revealed significant differences in participants' writing proficiency across grammar (w = -5.85, p=.000), coherence (w =–6.128, p=.000), and vocabulary (w =–6.503, p=.000). This indicates that exposure to online quizzes played a key role in enhancing writing proficiency. The findings suggest that integrating interactive learning methods, such as online quizzes and structured writing activities, can effectively strengthen grammar, coherence, and vocabulary. These results support Mayer's Cognitive Theory of Multimedia Learning which stressed that interactive, self-paced online quizzes improve writing skills by promoting active processing, reducing cognitive overload, and fostering meaningful learning experiences [7].

**Table 4.** Differences in the Participants' Writing Proficiency in terms of Grammar, Coherence, and Vocabulary as to Year Level after Exposure to Online Quizzes.

| Skills | Mean | df | H | *p*-value |
|---|---|---|---|---|
| Grammar | | 2 | 7.065 | .029 |
| Pre-test | 2.89 | | | |
| Post-test | 3.61 | | | |
| Coherence | | 2 | .760 | .684 |
| Pre-test | 2.81 | | | |
| Post-test | 3.54 | | | |
| Vocabulary | | 2 | 5.717 | .057 |
| Pre-test | 2.58 | | | |
| Post-test | 3.38 | | | |

Table 4 presents the Kruskal–Wallis test results on writing proficiency differences among year levels after exposure to online quizzes. A statistically significant difference was found in grammar (H(2) = 7.065, p = .029), indicating that the intervention had varying effects on grammar improvement across year levels. For coherence (H(2) = .760, p = .684) and vocabulary (H(2) = 5.717, p = .057), no significant differences were observed, suggesting that the impact of online quizzes on these areas was relatively consistent across groups. These results imply that while online quizzes were particularly effective in enhancing grammar, additional strategies may be needed to strengthen coherence and vocabulary. Supporting this, [14] found Quizizz to be highly effective as a formative assessment tool. It not only enhanced self-regulated learning—a core element of formative assessment—but also increased student engagement. Learners with low to moderate English proficiency showed notable score improvements, with many describing the activity as "relaxing" and

identifying it as the most effective part of their class. Quantitative findings further confirmed substantial gains in English proficiency, underscoring the value of online quizzes in language learning.

## 4. Conclusion

Online quiz as an intervention is an effective strategy for improving pre-service teachers' writing proficiency. The intervention particularly enhances grammar and coherence skills. First- and third-year students showed greater improvement in grammar, while second-year students demonstrated stronger gains in vocabulary. Significant reductions were observed in subject–verb agreement, verb usage, and noun errors, though punctuation still required reinforcement. Overall, grammar showed the most improvement, but additional interventions are necessary to further strengthen coherence and vocabulary, especially for first-year students who began at a developing level. To build on these findings, vocabulary-enrichment activities should be incorporated alongside targeted exercises on punctuation and sentence structure. First-year students, in particular, would benefit from writing workshops, peer reviews, and guided practice to accelerate their development. Online quizzes should be integrated with interactive learning strategies such as discussions, writing prompts, and feedback-driven assessments to reinforce grammar and coherence retention. Since subject–verb agreement and verb usage errors were more common among lower-year students, structured drills and real-life writing applications are recommended. Finally, regular assessments and tracking of student performance will help identify persistent weaknesses and ensure sustained growth in grammar, coherence, and vocabulary. Additionally, research on Skill Acquisition Theory underscores that grammatical accuracy is enhanced by timely feedback and repeated practice. Consequently, in order to enhance the retention of grammar and coherence, it is recommended that online evaluations be implemented in conjunction with interactive learning strategies, including guided discussions, contextualized writing prompts, and feedback-driven assessments.

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# Physical Education in Seventh-day Adventist Schools and Institutions: A Review of Health, Wellness, and Spiritual Integration

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**Abstract**

This study examines the role of physical education within the Seventh-day Adventist Church, with particular attention to its contribution to health, wellness, and spiritual integration. The research employs a literature-based review design, analyzing peer-reviewed journal articles, theological writings, denominational publications, and official documents related to Adventist health philosophy and education. Sources included in this review were selected based on their relevance to faith-based health promotion, physical education within Adventist institutions, and discussions of spiritual or holistic well-being. The review primarily draws from studies addressing Adventist educational settings, community health initiatives, and lifestyle research within Adventist populations. The findings of the reviewed literature indicate that physical education aligns closely with the Church's holistic health principles, which integrate physical, mental, and spiritual dimensions of life. Existing studies suggest that structured physical activity supports not only physical fitness but also stress management, character development, social cohesion, and spiritual growth. However, the literature also reveals that physical activity has historically received less systematic emphasis compared to other aspects of Adventist health reform, particularly dietary practices. Overall, the review demonstrates that physical education functions as a meaningful component of the Adventist holistic health framework. Strengthening its integration within schools and church-affiliated institutions may further support the Church's commitment to balanced living and comprehensive well-being.

**Keywords:** Seventh-day Adventist, Health Principles, Physical Education, Wellness, Spirituality

**Article history:** Received 26 January 2026, Revised 23 February 2026, Accepted 23 February 2026

## 1. Introduction

The Seventh-day Adventist Church is widely recognized for its strong emphasis on health and holistic well-being, integrating physical, mental, and spiritual dimensions of life [1]. This health emphasis is grounded in biblical principles and significantly shaped by the writings of Ellen G. White, who promoted balanced living, proper nutrition, regular exercise, and self-discipline as essential components of Christian life and service [2]. Within this framework, physical education (PE) may be understood as one practical expression of the Church's holistic health philosophy. Rather than being limited to physical fitness alone, PE can function as a structured means of supporting balanced lifestyle development consistent with Adventist values [3].

The primary objective of this study is to examine the role of physical education within the Seventh-day Adventist Church and its contribution to health, wellness, and spiritual integration [5]. This research is designed as a literature-based study that analyzes theological writings, official Church documents, and scholarly sources related to health and education within the Adventist tradition. By reviewing these sources, the study seeks to clarify how physical education conceptually aligns with the Church's commitment to holistic well-being [6]. Through this focused examination, the study aims to contribute to ongoing academic discussion regarding the integration of faith, health, and education within the Adventist context [10, 11].

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### 1.1 Research Questions

1. How do physical education programs within Seventh-day Adventist schools and institutions align with the Church's holistic health principles, and what impact do they have on the physical and spiritual well-being of participants?
2. What are the attitudes of the Seventh-day Adventist community toward physical education and its role in promoting health and wellness in accordance with the Church's doctrines?
3. In what ways do physical education activities contribute to the development of a sense of community, stress management, and spiritual growth within the Seventh-day Adventist Church?

### 1.2 Significance of the Study

The significance of this study lies in its potential to deepen understanding of the relationship between physical education, health, and spirituality within the Seventh-day Adventist (SDA) Church. Although the SDA Church has long emphasized health as part of its holistic doctrine, the specific role of physical education in supporting these principles has received limited focused attention. This research seeks to address this gap by examining how physical education programs are implemented and perceived within the SDA community, as well as their influence on physical, mental, and spiritual well-being.

This study highlights the importance of integrating physical education into religious and educational practices. By exploring how physical education supports the Church's health message, the research demonstrates how physical activity contributes not only to physical fitness but also to spiritual growth, stress management, and community building. Such integration reinforces the SDA commitment to holistic living by caring for the body, mind, and spirit, and provides practical evidence of physical education as a tool for promoting overall well-being [12].

Additionally, the study examines the attitudes and beliefs of church members toward physical education. Understanding these perspectives can help SDA institutions develop health and educational programs that align with the values and needs of the community. The findings may also identify challenges or barriers to fully integrating physical education into church life, offering guidance for future program improvement [13].

Beyond the SDA context, this research contributes to the broader field of faith-based health promotion. By investigating the effects of physical education on spiritual growth, social cohesion, and well-being, the study may encourage other religious communities to consider physical education as part of holistic health initiatives [14]. Ultimately, this research underscores the value of physical education as a means of fostering comprehensive health and strengthening faith-based communities [15].

### 1.3 Research Method

This study utilizes a qualitative integrative literature review design to examine the role of physical education within the Seventh-day Adventist Church in relation to health, wellness, and spiritual integration. The review adopts a thematic content analysis framework to systematically synthesize theological, denominational, and peer-reviewed academic sources. The study follows a structured narrative synthesis approach grounded in qualitative thematic analysis. No primary empirical data were collected. Instead, existing literature was critically analyzed to identify conceptual patterns, recurring arguments, and thematic relationships concerning physical education in Adventist educational and institutional contexts. Data sources included peer-reviewed journal articles, books, theological writings (including works by Ellen G. White), and official denominational publications addressing Adventist health philosophy, faith-based health promotion, and educational practice. Sources were selected based on relevance to physical activity, holistic health, and spiritual development within Adventist settings.

The analytical procedure involved three stages: 1) systematic identification and screening of relevant texts; 2) open coding of key concepts and repeated themes; and 3) axial categorization to group related codes into broader thematic constructs. The final synthesis generated five principal themes: theological foundations of health, educational implementation of physical education,

community-based health promotion, spiritual and psychosocial outcomes, and institutional challenges and opportunities ( Table 1) . This methodological framework ensures analytical rigor, transparency, and coherence in the interpretation of the reviewed literature.

**Table 1.** Thematic categories were identified in the literature review.

| Theme | Description | Representative Sources |
|---|---|---|
| Theological Foundations of Health | Biblical and doctrinal basis for health as stewardship; influence of Ellen G. White | [2], [8], [9] |
| Physical Education in Educational Institutions | Integration of PE in SDA schools; character development; lifestyle education | [4], [16] |
| Community Health Promotion | Church-based health initiatives; lifestyle practices; longevity research | [7], [10], [14] |
| Spiritual and Psychosocial Benefits | Stress reduction, emotional resilience, spiritual engagement through physical activity | [6], [11], [13] |
| Challenges and Opportunities | Limited emphasis on exercise, resource constraints, need for program development | [1], [8], [17] |

## 2. Literature Review

The Seventh-day Adventist (SDA) Church has long emphasized the importance of health and wellness, viewing them as integral to spiritual well-being. Central to this philosophy is the belief in holistic health, which incorporates physical, mental, and spiritual dimensions. Physical education (PE) plays a crucial role in this framework, serving as a means of fostering not only physical fitness but also spiritual development, stress management, and community engagement [1].

This literature review synthesizes scholarly discussions on the integration of physical education within the SDA Church, with a focus on its theological foundations, health implications, and its role in the Church's educational and community structures. The analysis draws from historical perspectives, theological writings, and contemporary research on faith-based health promotion.

### 2.1 The Theological Foundations of Physical Education in the SDA Church

The SDA Church's emphasis on health is rooted in its theological framework, which views the body as the "temple of the Holy Spirit" (1 Corinthians 6:19-20). This perspective underscores the responsibility of believers to maintain their physical well-being as an act of worship and devotion to God. Ellen G. White, one of the Church's foundational figures, strongly advocated for a lifestyle that included regular exercise, proper nutrition, and avoidance of harmful substances [2]. Her writings highlight the belief that physical health is directly linked to moral and spiritual clarity.

The SDA doctrine of "present truth" includes a call to physical purity and discipline as part of preparing for Christ's second coming. Consequently, physical education is seen not merely as a recreational activity but as a spiritual discipline that enhances one's ability to serve God effectively [3]. Moreover, the Adventist philosophy of health extends beyond individual well-being to communal responsibility. Physical education programs in SDA institutions are designed to promote not only personal health but also social cohesion, reinforcing the biblical principle of collective stewardship over one's body and community.

### 2.2 The Role of Physical Education in SDA Educational Institutions

Education has always been a cornerstone of Adventist mission work, and SDA schools and universities incorporate health education as a fundamental component of their curricula. The Church's commitment to education is evident in its global network of schools and universities, which integrate faith-based learning with principles of health and wellness [4]. SDA educational institutions emphasize a balanced lifestyle that includes

physical activity as part of their broader health message. Many Adventist schools have well-established physical education programs that align with the Church's principles of holistic health. These programs are designed not only to promote fitness but also to instill values such as discipline, teamwork, and self-control.

SDA educational institutions often frame physical education within the context of stewardship—teaching students that caring for their bodies is an act of gratitude toward God. This approach differentiates Adventist physical education from secular fitness programs by embedding spiritual principles into physical activity. Another unique aspect of physical education in SDA schools is its emphasis on lifestyle habits.

Unlike conventional PE programs that focus primarily on sports performance, SDA schools prioritize lifelong fitness, encouraging students to adopt healthy habits that extend beyond their academic years. This aligns with the SDA Church's broader health initiatives, which advocate for plant-based diets, regular exercise, and abstinence from harmful substances [1].

### 2.3 Physical Education and Health Promotion in the SDA Community

Beyond educational institutions, physical education is integrated into Seventh-day Adventist (SDA) community programs as part of the Church's broader health and wellness efforts. Numerous SDA health initiatives promote physical activity as a means of disease prevention and overall well-being.

SDA churches and community centers frequently organize fitness activities including walking clubs, aerobics, and recreational sports. These programs serve both health and community-building purposes and often include spiritual elements such as prayer or devotionals. Studies show that Adventists who follow the Church's health guidelines, including regular physical activity, experience better health outcomes.

The Blue Zones research by Buettner (2008) identified Adventists in Loma Linda, California, as one of the world's longest-living populations, partly due to active lifestyles [10]. However, some scholars note that physical activity receives less emphasis than dietary practices in SDA teachings, presenting opportunities for stronger promotion of physical education.

### 2.4 Spiritual Benefits of Physical Education in the SDA Church

Physical education within the Seventh-day Adventist (SDA) context extends beyond physical fitness to support mental and spiritual well-being. Research indicates that regular physical activity reduces stress, enhances emotional health, and promotes deeper spiritual engagement [6]. Exercise improves cognitive function and emotional resilience, both of which contribute to spiritual development. Many SDA leaders emphasize that physical health supports mental clarity and self-discipline, enabling a more focused spiritual life. Physical education also fosters spiritual connection through nature-based activities.

The Adventist emphasis on outdoor recreation reflects the belief that time spent in nature strengthens one's relationship with God. As a result, SDA schools and institutions often incorporate activities such as hiking, gardening, and nature walks into their physical education programs to promote holistic renewal. Additionally, group-based physical activities strengthen community bonds within the Church [4].

### 2.5 Challenges and Opportunities for Enhancing Physical Education in the SDA Church

Despite the acknowledged benefits of physical education within the Seventh-day Adventist (SDA) Church, several challenges remain. One major issue is the perception that exercise is secondary to other spiritual practices. Although health is emphasized in SDA teachings, physical activity often receives less attention than dietary reforms or medical care. Limited resources further hinder the development of effective physical education programs, particularly in developing regions where schools and churches may lack facilities or trained instructors [8].

Cultural attitudes toward exercise also pose difficulties, especially in urban SDA communities where sedentary lifestyles are increasingly common due to modern work environments and technology. Encouraging active living in such contexts requires creative strategies, including integrating physical

activities into church programs and organizing congregation-wide fitness initiatives [1].

Despite these challenges, opportunities exist to strengthen physical education by increasing awareness of its link to spiritual well-being and fostering collaboration among Adventist health institutions, schools, and churches to promote holistic health practices [17].

## 3. Results and Discussion

The thematic analysis of the reviewed literature reveals that physical education (PE) is conceptually and practically aligned with the holistic health philosophy of the Seventh-day Adventist Church. Central to Adventist theology is the understanding of health as stewardship, where physical well-being is regarded as an expression of spiritual responsibility [12, 13]. The writings of Ellen G. White further reinforce the connection between physical vitality, moral discipline, and spiritual clarity [9, 10]. Within this theological framework, physical activity is interpreted not merely as recreation but as a supportive discipline that enhances one's capacity for spiritual growth and service.

The literature also indicates that Adventist educational institutions integrate physical education within a broader philosophy of harmonious development [4]. Structured physical activities in schools are associated with character formation, discipline, teamwork, and the cultivation of lifelong healthy habits [16]. However, scholarly discussions suggest that structured exercise has historically received less systematic emphasis compared to dietary reform and medical missionary initiatives within Adventist health teachings [11]. This imbalance may contribute to uneven development of physical education programs across institutional contexts.

Beyond formal educational settings, physical activity is promoted through church-based health initiatives and community wellness programs. Research on Adventist populations demonstrates positive health outcomes linked to adherence to lifestyle principles that include regular physical activity [7, 10]. Community-based exercise programs further serve to strengthen social cohesion and shared identity among church members [17], reflecting the communal dimension of Adventist health philosophy.

From a psychosocial and spiritual perspective, existing literature associates regular physical activity with reduced stress, improved emotional regulation, and enhanced cognitive clarity [13]. These outcomes support spiritual practices by fostering mental focus and resilience [14]. Nature-based activities and group exercise programs are likewise described as facilitating spiritual reflection and relational bonding, reinforcing the integrative role of physical education in supporting both individual spiritual formation and communal well-being [15].

Despite these benefits, several challenges emerge from the literature, including cultural attitudes that prioritize other aspects of health reform, limited institutional resources, and competing educational demands [12,16]. Nevertheless, opportunities remain for strengthening physical education through clearer theological articulation, intentional curriculum integration, leadership advocacy, and collaboration among Adventist schools, churches, and health institutions [17]. Strengthening these areas would more fully align institutional practice with the Church's holistic commitment to the unity of physical, mental, and spiritual well-being.

The literature also indicates that Adventist educational institutions integrate physical education within a broader philosophy of harmonious development [4]. Structured physical activities in schools are associated with character formation, discipline, teamwork, and the cultivation of lifelong healthy habits [16]. In contrast to many secular physical education models that primarily emphasize athletic performance or physical fitness outcomes, institutions affiliated with the Seventh-day Adventist Church intentionally frame physical activity within a theology of stewardship and holistic formation. Physical education is therefore presented not merely as skill development, but as preparation for responsible living and effective spiritual service.

While this integrative orientation distinguishes Adventist physical education philosophically, claims regarding its superiority in producing long-term healthy lifestyles must be approached with academic caution. Research on Adventist populations, including longevity findings associated with the Loma Linda community, suggests that adherence to

faith-based lifestyle principles such as regular physical activity, plant-based nutrition, and abstinence from harmful substances is associated with favorable long-term health outcomes [7,10]. However, the current body of literature does not provide sufficient comparative empirical evidence directly demonstrating that SDA physical education programs are more effective than secular PE models in producing sustained behavioral outcomes. It is therefore more precise to state that the Adventist model offers a distinctive integrative framework that intentionally connects physical activity, spiritual formation, and lifelong health stewardship, rather than asserting demonstrable programmatic superiority.

### 3.1 Proposed Operational Model for Integrative Physical Education

To strengthen the practical implications of this review, a Proposed Operational Model is advanced to guide institutions affiliated with the Seventh-day Adventist Church in implementing integrative physical education. While the preceding discussion establishes theological and conceptual foundations, translating these principles into structured practice is essential for ecclesiastical and educational leadership.

The proposed model consists of three interrelated components: 1) Curriculum Integration, 2) Spiritual-Physical Formation Practices, and 3) Community Wellness Engagement.

First, Curriculum Integration involves the development of a specialized physical education curriculum that intentionally incorporates biblical principles of stewardship, self-discipline, and holistic well-being. This may include short devotional reflections linked to themes such as perseverance, teamwork, and respect for the body as the temple of the Holy Spirit, alongside instruction in lifelong fitness habits rather than performance-centered athletics.

Second, Spiritual-Physical Formation Practices encourage structured activities that combine movement with reflection. Examples include nature-based activities (e.g., walking programs with guided spiritual reflection), journaling components connected to personal health goals, and character-based assessment criteria emphasizing responsibility, cooperation, and integrity.

Third, Community Wellness Engagement extends physical education beyond the classroom through initiatives such as a congregation-wide “Wellness Challenge” protocol. This may include time-bound health campaigns integrating physical activity goals, plant-based nutrition awareness, accountability groups, and periodic spiritual encouragement sessions. Such initiatives reinforce collective identity and lifestyle sustainability.

This operational framework provides actionable direction while remaining consistent with Adventist theology of stewardship and holistic formation. By embedding spiritual intentionality within structured physical education programming, institutions may more effectively align practice with doctrine.

## 4. Conclusion

This review demonstrates that physical education is conceptually consistent with the holistic health philosophy of the Seventh-day Adventist Church. Rooted in a theology of stewardship and the unity of body, mind, and spirit, Adventist health principles provide a strong foundation for understanding physical activity as an expression of spiritual responsibility. The writings of Ellen G. White further support this integrative perspective by emphasizing the relationship between physical vitality, moral clarity, and effective service.

The literature indicates that physical education contributes meaningfully to character development, psychosocial well-being, and spiritual engagement within Adventist educational and community contexts. Structured physical activities promote discipline, teamwork, resilience, and social cohesion, while also supporting mental clarity and stress management—factors that enhance spiritual life. Community-based health initiatives further reinforce the collective dimension of Adventist health practice.

At the same time, the review identifies ongoing challenges, including limited institutional emphasis on structured exercise, cultural perceptions that prioritize other health reforms, and resource constraints in certain regions. Addressing these challenges requires clearer theological articulation of the spiritual value of physical activity, stronger curricular integration, and closer collaboration among

Adventist schools, churches, and health ministries.

Overall, strengthening physical education within Adventist institutions would more fully reflect the Church's longstanding commitment to holistic well-being and affirm its role as an essential component of its health and educational mission.

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# Effects of Ya Khao, a Thai traditional herbal formula extract, on hyperglycemia and associated biochemical and histopathological changes in streptozotocin-induced diabetic rats

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**Abstract**

Diabetes mellitus (DM) was a chronic metabolic disorder marked by hyperglycemia and affected millions of individuals globally. Ya Khao (YK) was a Thai traditional herbal formula inscribed on the stone slabs of Wat Pho. It consisted of 15 different herbs in equal proportions and had been traditionally used to treat various fevers for a long time. This study aimed to evaluate the anti-hyperglycemic, biochemical, and histopathological effects of Ya Khao formula extract (YKFE) in streptozotocin (STZ)-induced diabetic rats. Forty male Sprague-Dawley rats were classified into 5 groups (n = 8): NDM (non-diabetic), DM, DM+GB (glibenclamide), DM+YKFE250, and DM+YKFE500. Rats in the DM groups were induced to develop the disease by receiving an intraperitoneal injection of STZ (65 mg/kg BW), whereas rats in the NDM group were injected with citrate buffer solution. All rats were administered orally once daily for 2 weeks. Body weights were monitored daily, and fasting blood glucose (FBG) levels were assessed weekly. At the end of the treatment, all rats were euthanized, and their blood samples were collected for FBG and biochemical analyses. Vital organs (pancreas, liver, and kidneys) were removed and weighed, and the pancreas was fixed in 10% formalin for histopathological evaluation. Treatment with both doses of YKFE for 2 weeks significantly decreased FBG levels in diabetic rats (* $P < 0.05$, ** $P < 0.01$ compared with the DM group) and ameliorated pancreatic histopathological changes. However, there were no differences in body weight gain and relative organ weight among the groups. Besides, the treatment duration was insufficient to normalize hepatic and renal functions to levels comparable to the NDM group. Collectively, the results suggested that YKFE exhibited anti-hyperglycemic and pancreatic protective effects in STZ-induced diabetic rats and showed potential for further development as a therapeutic agent for DM.

**Keywords:** Ya Khao formula extract, Diabetes mellitus, Anti-hyperglycemic effect, Pancreatic protective effect, Streptozotocin

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## 1. Introduction

Diabetes mellitus (DM) was recognized as a chronic metabolic disorder characterized by elevated blood glucose levels (hyperglycemia) due to the body's inability to produce or utilize insulin effectively [1]. DM was classified into 2 types: type 1 and type 2. Type 1 DM resulted

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from the autoimmune-mediated destruction of pancreatic β-cells in the islets of Langerhans, leading to insulin deficiency. In contrast, type 2 DM was marked by a diminished or ineffective response to insulin, commonly described as insulin resistance [2]. Insulin deficiency in patients with type 1 DM developed several complications, including cardiovascular diseases, neuropathologic diseases, and renal damage [3-5]. Notably, DM-related complications were significant contributors to morbidity and mortality in individuals with DM [6]. In 2016, the International Diabetes Federation (IDF) reported that 415 million people worldwide were living with DM, and the number was expected to increase to 642 million by 2040 [7]. Even though anti-diabetic agents such as glibenclamide were administered to patients with DM, serious adverse effects were documented, particularly hypoglycemia and increased cardiovascular mortality [8, 9]. Several previous investigations explored the potential of herbal formulations or plant extracts to lower blood glucose levels in diabetic animal models. It was reported that oral administration of Madhurameha formula extract at doses of 12.5, 25, and 50 mg/kg body weight (BW) for 2 weeks reduced 2-hour postprandial plasma glucose levels in streptozotocin (STZ)-nicotinamide-induced diabetic rats [10]. Similarly, oral administration of *Caesalpinia bonduc* (L.) Roxb. leaf extract at doses of 150, 200, and 400 mg/kg BW for 2 weeks decreased blood glucose levels in STZ-induced diabetic rats [11]. Moreover, a rhinacanthins-rich extract derived from *Rhinacanthus nasutus* (L.) Kurz. leaves, given orally at 15 mg/kg BW for 4 weeks, lowered fasting blood glucose (FBG) levels in STZ-nicotinamide-induced [12]. Considering previous research demonstrating the anti-hyperglycemic effect of herbal formulations in diabetic animal models, such as STZ-induced type 1 diabetic rats and STZ-nicotinamide-induced type 2 diabetic rats, this study selected the STZ-induced type 1 diabetic rat model. The model was chosen to specifically evaluate the blood glucose-lowering effect of the herbal formula while minimizing confounding variables and comparing its therapeutic efficacy with glibenclamide, a standard antidiabetic drug.

Ya Khao (YK) was known as a Thai traditional herbal formula inscribed on the stone slabs of Wat Phra Chetuphon Wimon Mangkhalaram Ratchaworamahawihan (Wat Pho) in the Phra Nakhon district, Bangkok, Thailand. It had long been used in Thai traditional medicine to treat various types of fever, such as scrub typhus, black fever, red fever, Mahamekh fever, and Mahanil fever, and so on [13]. The formula was composed root and stem of 15 medicinal plants in equal proportions, including *Hydnophytum formicarum* Jack., *Donax arundastrum* Lour., *Rhinacanthus nasutus* (L.) Kurz., *Camellia sinensis* (L.) O. Kuntze., *Dregea volubilis* (L.f.) Hook.f., *Glochidion lutescens* Blume. *Diospyros wallichii* King & Gamble. *Merremia umbellata* (L.) Hallier f., *Caesalpinia bonduc* (L.) Roxb., *Combretum quadrangulare* Kurz., *Citrus aurantiifolia* (Christm.) Swingle., *Tiliacora triandra* (Colebr.) Diels., *Momordica cochinchinensis* (Lour.) Spreng., *Adenia viridiflora* Craib., and *Sauropus androgynus* (L.) Merr. An earlier study indicated that a 1-week administration of YK in combination with *Andrographis paniculata* (Burm.f.) Nees., Ammaruekhawathi cough syrup, and Makhampom cough syrup effectively treated COVID-19 patients in the sample population [14]. Moreover, a 12-week administration of 500 mg/kg BW of YK formula extract (YKFE) to adult male Sprague-Dawley rats did not cause any toxicological damage and was considered safe for use [15]. Furthermore, research on individual herbal constituents of YK formula indicated that extracts of *Camellia sinensis* (L.) O. Kuntze. and *Caesalpinia bonduc* (L.) Roxb. lowered blood glucose levels in type 1 diabetic rats [11, 16], while the active compound of *Rhinacanthus nasutus* (L.) Kurz. produced comparable effects in type 2 diabetic rats [12, 17]. In addition, *Hydnophytum formicarum* Jack. extract demonstrated inhibitory activity against α-amylase and α-glucosidase, an important mechanism in type 2 DM management [18]. These studies emphasized the importance of further evaluating the anti-hyperglycemic efficacy of this formula.

Although the Ya Khao formula had long been used in Thai traditional medicine and some of its therapeutic effects had been investigated in both humans and animals, research on its ability to reduce blood glucose levels was still limited. Therefore, this study aimed to investigate the anti-hyperglycemic,

biochemical and histopathological effects of YKFE in STZ-induced type 1 DM rats.

## 2. Methodology

### 2.1 Chemicals and drugs

Streptozotocin (STZ) was purchased from Sigma-Aldrich (St. Louis, MO, USA), and glibenclamide (GB) was sourced from Siam Bheasach Co., ltd. (Bangkok, Thailand).

### 2.2 Preparation of Ya Khao formula extract (YKFE)

Ya Khao formula was supplied by the Department of Thai Traditional and Alternative Medicine and extracted at the Center for Research and Development of Herbal Health Products (CRD-HHP), Faculty of Pharmaceutical Sciences, Khon Kaen University. Approximately 5 kg of dried Ya Khao formula powder was macerated in 50% ethanol at a 1:5 (w/v) ratio and stirred intermittently at room temperature for 7 days. The extract was then filtered and concentrated to dryness at 50 °C using a rotary evaporator, followed by lyophilization with a freeze dryer. The dried crude extract was stored at 0 °C until further use, with an extraction yield of 10.80% (w/w, dry-weight basis).

### 2.3 Experimental animals and treatment

Six-week-old male Sprague-Dawley rats were obtained from Nomura Siam International Co., Ltd. (Bangkok, Thailand). All rats were housed at the Northeast Laboratory Animal Center, Khon Kaen University, under standard laboratory conditions (temperature 23 ± 2 °C, 12/12 h light-dark cycle, and relative humidity 30-60%). The rats were allowed free access to food and water throughout the experimental period. All experimental procedures were performed in accordance with the Guide for the Care and Use of Laboratory Animals under the supervision of the Northeast Laboratory Animal Center, Khon Kaen University, Thailand. Ethical approval for the study was granted by the Institutional Animal Care and Use Committee of Khon Kaen University (Approval No. ACUC-KKU-63/61).

Forty rats with an average fasting blood glucose (FBG) level of 99.17±10.22 mg/dl were divided into 5 groups (n = 8 per group), with comparable baseline FBG levels. Group I (NDM) consisted of non-diabetic rats receiving distilled water as the vehicle. Group II (DM) included diabetic rats receiving the vehicle. Group III (DM+GB; positive control group) comprised diabetic rats administered glibenclamide at a dose of 0.5 mg/kg BW [19]. Group IV (DM+YKFE250) and Group V (DM+YKFE500) consisted of diabetic rats treated with Ya Khao formula extract at doses of 250 and 500 mg/kg BW, respectively.

After 1 week of acclimatization, all rats were fasted overnight for 16 h [20]. Type 1 DM was induced in rats by intraperitoneal injection of freshly prepared streptozotocin (STZ; 65 mg/kg BW) dissolved in 0.1 M citrate buffer (pH 4.5) [21], while non-diabetic rats were injected with an equivalent volume of citrate buffer. Subsequently, diabetic rats were provided with a 5% glucose solution via feeding bottles to prevent early hypoglycemia and were allowed to stabilize for 2 weeks [22]. Two weeks after STZ injection, FBG levels were reassessed, and rats with FBG levels greater than 300 mg/dl were considered diabetic and included in the study [19].

After diabetes was confirmed in the rats, the entire substances were administered orally once daily for 2 weeks. All rats were weighed once a day, and their FBG levels were monitored once a week. At the end of the study, all rats were completely anesthetized by intraperitoneal injection of thiopental sodium (120 mg/kg BW; Jagsonpal Pharmaceuticals Ltd., India). The abdominal and thoracic cavities were then opened to collect blood samples from the abdominal vein for biochemical investigations. Thereafter, the rats were euthanized by transcardial perfusion with 0.9% normal saline. Vital organs, including the pancreas, liver, and kidneys, were removed and weighed. Only the pancreas was fixed in a 10% formalin solution for subsequent histopathological examination.

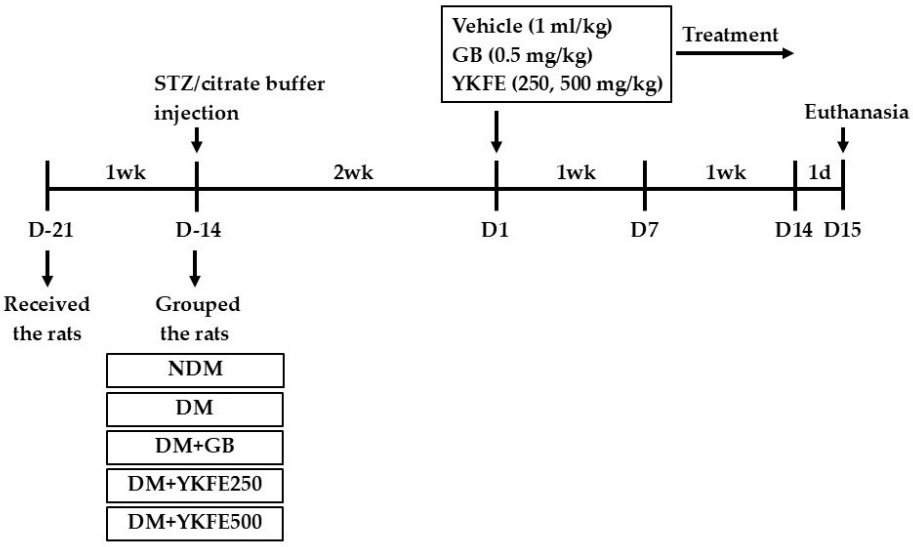


**Figure 1.** Schematic diagram of experimental animals and drug treatment. DM: Diabetic; GB: glibenclamide; NDM: Nondiabetic; STZ: streptozotocin; YKFE: Ya Khao formula extract.

### 2.4 Measurement of body and organ weights

The body weight of all rats was tracked and reported as an average every two days. The weights of vital organs (pancreas, liver, and kidneys) for each rat, along with the final body weight obtained on the last day of the study, were used to determine the relative organ weight (%) using the following calculation:

Relative organ weight (%) = [Organ weight (g) / Body weight (g)] x 100

### 2.5 Assessment of FBG levels

FBG levels were determined 4 times: before STZ injection, before treatment, 1 week after treatment, and before euthanasia. After the rats were fasted overnight [20], blood samples were collected from the tail vein and analyzed using a glucometer (Apex Biotechnology Corp., Hsinchu, Taiwan), and the values were expressed in mg/dl [23].

### 2.6 Biochemical investigations

Blood samples collected from the abdominal veins were centrifuged at 3,000 rpm for 10 minutes at 4 °C to isolate serum. The serum samples were then submitted to the Kaen Nakhon Laboratory (Khon Kaen, Thailand) for analysis of albumin (A), globulin (G), alanine aminotransferase (ALT), aspartate aminotransferase (AST), blood urea nitrogen (BUN), and creatinine (Cr) levels.

### 2.7 Histopathological examination

Fixed tissues were paraffin-embedded and sectioned at a thickness of 5 µm using a microtome. The sections were stained with hematoxylin and eosin (H&E), and histopathological changes were examined under a light microscope (Nikon ECLIPSE E200 MVR microscope) at magnifications of 10X and 40X.

### 2.8 Statistical analysis

Data were presented as mean ± standard deviation (SD). All statistical analyses were performed using a one-way analysis of variance (ANOVA) followed by a Tukey post-hoc test for multiple comparisons. A level of $P < 0.05$ was considered statistically significant.

## 3. Results and Discussion

### 3.1 Effects of YKFE on average body weight and relative organ weight changes in STZ-induced diabetic rats.

Figure 2 and Table 1 showed the changes in average body weight and relative organ weights in STZ-induced diabetic rats over the study period. Initially, the average body weight was similar among all experimental groups. During the 2-week treatment period, all groups demonstrated a progressive increase in average body weight. The NDM group exhibited a relatively higher average body weight than all diabetic groups; however, this difference was not statistically significant (Figure 2). The result suggested that diabetic rats had a lower growth rate than normal rats. It was possible that the slower weight gain in diabetic rats was due to insulin deficiency caused by the pancreas's inability to produce insulin, which impaired glucose utilization for energy production. Therefore, they relied on the breakdown of fat and muscle protein for energy, resulting in reduced growth [24]. This was consistent with the study published by Huang et al. in 2022 [25].

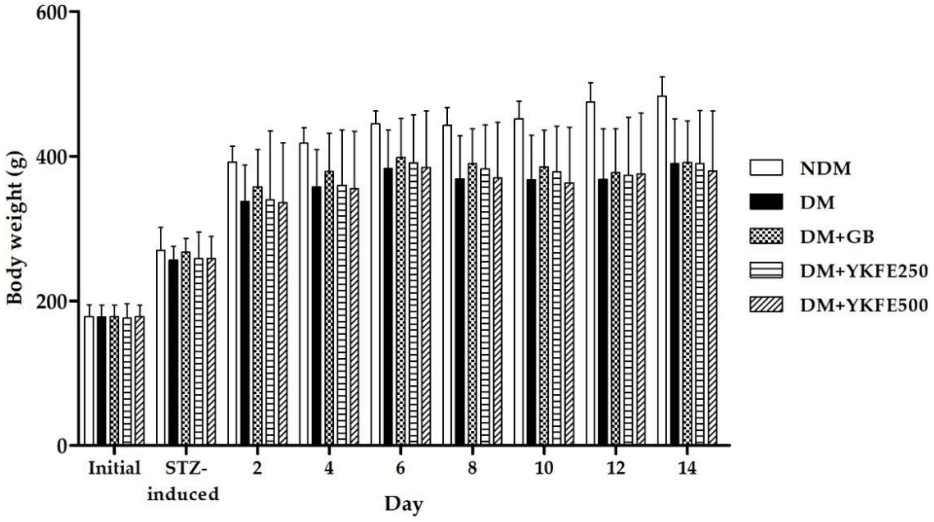


**Figure 2.** Effects of YKFE on average body weight changes in STZ-induced diabetic rats for 2 weeks of treatment. Groups included non-diabetic control (NDM), diabetic control (DM), diabetic rats treated with the positive control (DM + GB), and diabetic rats treated with the herbal formula (DM + YKFE250 and DM + YKFE500). Data were presented as mean ± SD (n = 8).

**Table 1.** Effects of YKFE on relative organ weight changes in STZ-induced diabetic rats after 2 weeks of treatment Groups included non-diabetic control (NDM), diabetic control (DM), diabetic rats treated with the positive control (DM + GB), and diabetic rats treated with the herbal formula (DM + YKFE250 and DM + YKFE500). Data were presented as mean ± SD (n = 8).

| Groups | Relative organ weight (%) | | |
|---|---|---|---|
| | Pancreas | Liver | Kidney |
| NDM | 0.48±0.13 | 4.21±0.31 | 0.78±0.06 |
| DM | 0.59±0.10 | 4.05±0.37 | 1.10±0.16 |
| DM+GB | 0.49±0.08 | 3.86±0.27 | 1.11±0.14 |
| DM+YKFE250 | 0.53±0.07 | 4.14±0.43 | 1.11±0.19 |
| DM+YKFE500 | 0.50±0.10 | 4.16±0.46 | 1.08±0.19 |

Moreover, the relative organ weights of the pancreas, liver, and kidneys in all diabetic groups were not significantly different from those of the NDM group (Table 1). This might have been because, under normal conditions, the body possessed a tightly regulated system for distributing energy to preserve vital organs. When it lacked energy derived from glucose, it first broke down fat and muscle protein to generate energy. Therefore, the weights of these organs remained unchanged during a short experimental period (e.g., 14-28 days), although overall body weight decreased [24].

### 3.2 Effects of YKFE on fasting blood glucose levels in STZ-induced diabetic rats.

Figure 3 showed the fasting blood glucose (FBG) levels in STZ-induced diabetic rats over the study period. Before treatment initiation, FBG levels in all diabetic groups were significantly higher than those in the NDM group. This study revealed that type 1 DM could be successfully induced in rats by a single intraperitoneal injection of STZ (65 mg/kg BW), in agreement with the report by Huang et al. in 2022 [25]. Interestingly, administration of YKFE (250 and 500 mg/kg BW) for 2 weeks significantly decreased FBG levels compared with the DM group. The effect was similar to those observed with glibenclamide. The finding indicated that both doses of YKFE might have exerted antihyperglycemic effect in diabetic rats similar to those observed with glibenclamide, an antidiabetic drug. This effect was possibly attributed to the pharmacological properties of several herbal components contained in the formula. Previous studies supported this assumption by showing that extracts of *Camellia sinensis* (L.) O. Kuntze. and *Caesalpinia bonduc* (L.) Roxb. effectively reduced blood glucose levels in type 1 diabetic rats [11, 16, 26], while the active constituent of *Rhinacanthus nasutus* (L.) Kurz. displayed similar effect in type 2 diabetic rats [12, 17]. Additionally, *Hydnophytum formicarum* Jack. extract presented anti-α-amylase and anti-glucosidase activities, a key mechanism underlying type 2 DM therapy. [18]. These findings appeared to support the anti-hyperglycemic effect of YKFE.

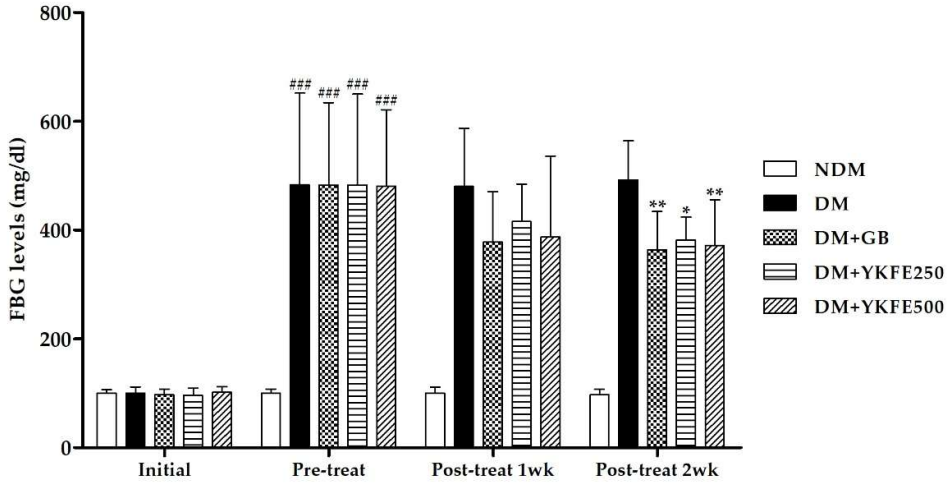


**Figure 3.** Effects of YKFE on FBG levels in STZ-induced diabetic rats for 2 weeks of treatment. Groups included non-diabetic control (NDM), diabetic control (DM), diabetic rats treated with the positive control (DM + GB), and diabetic rats treated with the herbal formula (DM + YKFE250 and DM + YKFE500). Data were presented as mean ± SD (n = 8). ### $P < 0.001$ compared with NDM, * $P < 0.05$, ** $P < 0.01$ compared with DM.

### 3.3 Effects of YKFE on serum biochemical parameters in STZ-induced diabetic rats.

Table 2 showed the serum biochemical parameters in STZ-induced diabetic rats after 2 weeks of treatment. The diabetic groups treated with YKFE (250 and 500 mg/kg body weight) had significantly elevated hepatic function parameters, particularly globulin levels, compared with the NDM group. Similarly, the DM group as well as the diabetic groups treated with YKFE at both doses displayed significant increases in renal function parameters, notably creatinine levels, compared with the NDM group. These study results clearly demonstrated that higher creatinine and globulin levels in diabetic rats and in those treated with YKFE compared with normal rats, consistent with previous studies. Their research reported that inducing type 1 DM with STZ might have been associated with nephrotoxicity [27] and enhanced muscle protein breakdown for energy production due to insulin deficiency [24], which contributed to impaired excretory function. Furthermore, elevated globulin levels may have suggested an immune response associated with chronic inflammation in diabetic rats [28]. Although YKFE could possibly have been associated with protective effects in vital organ tissues, the 2-week treatment period was unlikely to have been long enough to achieve full restoration of hepatic and renal functions to the same level as the NDM group.

**Table 2.** Effects of YKFE on serum biochemical parameters in STZ-induced diabetic rats after 2 weeks of treatment. Groups included non-diabetic control (NDM), diabetic control (DM), diabetic rats treated with the positive control (DM + GB), and diabetic rats treated with the herbal formula (DM + YKFE250 and DM + YKFE500). Data were presented as mean ± SD (n = 8). $^{\#}$ $P < 0.05$, $^{\#\#}$ $P < 0.01$, $^{\#\#\#}$ $P < 0.001$ compared with NDM.

| Groups | Hepatic functions | | | | Renal functions | |
|---|---|---|---|---|---|---|
| | Albumin (g/dl) | Globulin (g/dl) | ALT (U/l) | AST (U/l) | BUN (mg/dl) | Creatinine (mg/dl) |
| NDM | 3.29±0.24 | 1.98±0.50 | 127.79±64.69 | 196.00±59.47 | 23.77±5.19 | 0.46±0.14 |
| DM | 3.19±0.11 | 2.26±0.30 | 125.71±101.78 | 200.00±50.01 | 32.64±3.87 | 0.75±0.09$^{\#}$ |
| DM+GB | 3.20±0.08 | 2.13±0.26 | 131.86±88.24 | 198.86±75.48 | 32.67±1.77 | 0.46±0.07 |
| DM+YKFE 250 | 3.57±0.35 | 2.88±0.30$^{\#\#}$ | 89.43±29.42 | 211.71±44.75 | 34.16±11.48 | 0.80±0.23$^{\#\#}$ |
| DM+YKFE 500 | 3.51±0.34 | 2.82±0.21$^{\#\#}$ | 108.57±49.81 | 212.57±72.85 | 34.61±9.50 | 0.88±0.12$^{\#\#\#}$ |

### 3.4 Effects of YKFE on pancreatic histopathology in STZ-induced diabetic rats.

Figure 4 showed the pancreatic histopathology, particularly the islets of Langerhans, in STZ-induced diabetic rats after 2 weeks of treatment. No histopathological abnormalities were observed in the pancreatic tissue of the NDM group. In the DM group, markedly smaller islets of Langerhans and fewer islet cells were found compared with the NDM group. The affected cells demonstrated structural damage, poorly defined boundaries, and nuclear degeneration in some cells. Treatment with YKFE (250 and 500 mg/kg BW) and glibenclamide improved these histological features of diabetic groups, as evidenced by larger islets of Langerhans, increased cell numbers, and more distinct cellular boundaries. However, no statistically significant differences in the islets of Langerhans area were detected among the

experimental groups (data not shown). These observations revealed that administration of YKFE for 2 weeks might have contributed to certain improvements in pancreatic histopathology in diabetic rats, in a manner similar to that observed with glibenclamide. These effects could possibly have been correlated with the pharmacological properties of various herbal constituents in the formula. Earlier studies reported that extracts of *Caesalpinia bonduc* (L.) Roxb. and *Rhinacanthus nasutus* (L.) Kurz. restored damaged pancreatic tissue and islets of Langerhans in diabetic rats [11, 12]. In addition, the active constituent of *Rhinacanthus nasutus* (L.) Kurz., especially rhinacanthin-C, enhanced the levels of antioxidant enzymes, including superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx), while suppressing malondialdehyde (MDA), TNF-α, and caspase-3 levels in the pancreatic tissue of diabetic rats [17]. This evidence suggested that the pancreatic protective effects of YKFE might have been linked to its antioxidant, anti-inflammatory, and anti-apoptotic properties.

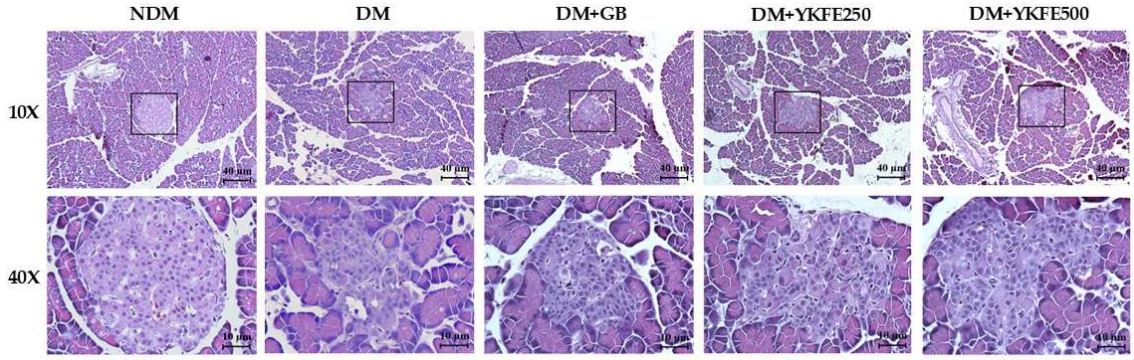


**Figure 4.** Effects of YKFE on pancreatic histopathology in STZ-induced diabetic rats after 2 weeks of treatment. Groups included non-diabetic control (NDM), diabetic control (DM), diabetic rats treated with the positive control (DM + GB), and diabetic rats treated with the herbal formula (DM + YKFE250 and DM + YKFE500).

## 4. Conclusion and Recommendations

The findings demonstrated that 2-week treatment with YKFE at both doses produced anti-hyperglycemic and pancreatic protective effects in STZ-induced diabetic rats. Nevertheless, this treatment period was not sufficient to return hepatic and renal functions to normal levels comparable to the NDM group. Accordingly, future studies were recommended to increase the treatment duration, and YKFE was proposed as a promising candidate for future antidiabetic drug development.

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# Pedagogical Approaches in Social Studies in the Philippine Basic Education

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**Abstract**

This study explores pedagogical approaches (e.g., constructivist, inquiry-based, reflective, collaborative, and integrative learning) in Philippine Social Studies (Araling Panlipunan) education, aligning with legal mandates and the curriculum. The review highlights how Philippine policies and curricula mandate constructivist, inquiry-based, collaborative, and interdisciplinary pedagogies in Social Studies. The study adopted a policy and curricular review design, examining nine (9) purposively selected relevant documents (i.e., relevant laws, orders, curricula, and syllabi) in the basic and higher education sectors to determine the prescribed pedagogical approaches to be implemented for Social Studies in basic education. These approaches, supported by teacher education programs, aim to foster critical thinking, active learning, and civic readiness, aligning with SDG 4 for quality education. The results indicate that the pedagogical approaches in Social Studies within the Philippine basic education system are designed to nurture critical, socially conscious, and well-rounded individuals. By combining active learning, collaboration, reflection, and real-world application, these methods empower Filipino learners to understand and engage with the complexities of society and history. This holistic approach ensures a meaningful educational experience, preparing students for lifelong engagement and responsible citizenship. Higher Education Institutions (HEIs) and the Commission on Higher Education (CHEd) in the Philippines may align further Social Studies teacher training with current standards and evolving needs, while future research should explore how Teacher Education Institutions (TEIs) integrate pedagogical approaches in both campus and field-based practices to enhance curricula and teaching quality.

**Keywords:** Pedagogical Approaches, Social Studies, Basic Education, K to 12 Curriculum

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## 1. Introduction

### 1.1. Background of the Study

Social Studies is crucial for educating individuals about civics, politics, governance, economics, geography, history, and social issues. This discipline examines social relationships and societal functioning, typically including courses in history, government, economics, civics, sociology, geography, and anthropology [1]. Likewise, the National Council for the Social Studies (NCSS) defines Social Studies as the study of individuals, communities, systems, and their interactions across time and place, preparing students for local, national, and global civic life [2].

In the Philippines, Social Studies (*Araling Panlipunan*) in the kindergarten, elementary level (Grades 1 to 6), and junior high school level (Grades 7 to 10), covers self, community, and local history, along with a deeper understanding of history, geography, politics, economy, and national development from a local to global perspective. At the senior high school level (Grades 11 and 12), students address current issues, propose solutions, and develop skills like critical thinking, creativity, research, communication, responsibility, and global vision [3, 4].

Nowadays, teaching Social Studies presents unique difficulties due to its interwoven sub-disciplines. Teachers face challenges with textbooks, inadequate physical conditions, and the integration of knowledge, skills, and values [5]. A piece of literature [6] also highlights that the availability of

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textbooks, teaching materials like projectors, tutors' research abilities, and varied teaching techniques significantly impact Social Studies education. A study [7] notes issues such as teachers' negative views of the curriculum, its vast and repetitive content, irrelevance to students' lives, and unsupportive school environments for modern teaching methods. Additionally, a study [8] points out that Social Studies learning often lacks focus on developing critical thinking and social analysis skills, with teachers more concerned with formal requirements than creative teaching. These challenges may stem from a lack of expertise and innovative practices, as teachers need support in implementing 21st-century pedagogical approaches [9].

Meanwhile, pedagogical approaches are mandated and enshrined in the implementation of any curriculum by schools and teachers. Teachers must be empowered with effective pedagogy to deliver instruction and educate learners. Significantly, as [10] attests, pedagogical approaches play a pivotal role in fostering innovation among K-12 learners. This may improve learners' 21st-century skills, specifically creative thinking, where most Filipino learners lag behind OECD countries in the PISA 2022 results [11].

Specifically, pedagogy encompasses the methods and practices educators use in teaching, from course design to content delivery, each grounded in distinct learning philosophies. Also, an effective pedagogical approach aligns with an educator's teaching beliefs and addresses the diverse needs of students [12, 13]. Pedagogy is the cornerstone of all teaching and learning, helping students develop higher-order thinking skills and understand the relevance of their learning in the broader world [14]. Its main aim is to build on students' previous learning, develop their skills and attitudes, and apply that knowledge in daily life [15].

In concept, pedagogical approaches span from teacher-centered to learner-centered. In teacher-centered pedagogy, educators lead the learning process through methods such as whole-class lectures, rote memorization, and choral responses. This approach is often criticized for confining students to lower-order tasks and fostering a fearful learning environment. Conversely, learner-centered pedagogy focuses on students' needs and interests, encouraging active participation and higher-order thinking. This approach emphasizes student engagement, critical thinking, and the application of knowledge in real-world contexts [16]. In the Philippines, teachers in basic education are mandated to apply student-centered pedagogy grounded on content knowledge and current research, as mentioned in DepEd Order (DO) No. 42, s. 2017 [17].

Indeed, teachers must continually adapt to emerging policies and practices, understanding how to effectively implement these approaches in dynamic classrooms. The Philippine Government has underscored the significance of pedagogical approaches by integrating them into the enactment of Republic Act (RA) No. 10533 [18], which institutionalized the K to 12 curriculum in the country. The Enhanced Basic Education Act of 2013 (Republic Act No. 10533) [18] mandates the use of constructivist, inquiry-based, reflective, collaborative, and integrative pedagogical approaches. This legislation is bolstered by DO No. 21, s. 2019 [19], which ensures that schools implement these learner-oriented approaches to support the K to 12 curriculum. Teachers are encouraged to adopt strategies that promote active learning, cooperative learning, collaboration, exploration, and contextualized, relevant learning [4].

### 1.2. Objective of the Study

The study examines the pedagogical approaches (e.g., constructivist learning, inquiry-based learning, reflective learning, collaborative learning, integrative learning, etc.) in Social Studies within the Philippine basic education system, aligning with legal mandates and the curriculum. The aim is to promote meaningful, reflective, and experiential learning through exemplary and innovative teaching practices, thereby contributing to achieving quality education as outlined in Sustainable Development Goal (SDG) No. 4, specifically on the provision of quality education, lifelong learning, and global citizenship education.

## 2. Method

This study conducts a policy and curricular review of Social Studies education in

the Philippines, with a focus on mandated pedagogical approaches in the laws, orders, curricula, and syllabi adopted in the basic and higher education sectors. Nine (9) documents were purposively selected based on the following criteria: (i) they explicitly and implicitly mentioned the prescribed pedagogical approaches for Social Studies in teaching basic education; (ii) they were promulgated either in the basic and higher education sectors in the Philippines; and (iii) they were utilized as sources in teaching courses among Teacher Education Institutions (TEIs).

Section 5 of Republic Act No. 10533 [18] requires Filipino teachers to employ constructivist, inquiry-based, reflective, collaborative, and integrative pedagogical approaches. Aside from the aforementioned five (5) mandated pedagogical approaches by RA No. 10533 [18], Domain 1: Content Knowledge and Pedagogy of DO No. 42, s. 2017 [17] underscores the importance of teachers' mastery of content, understanding of interconnected curricula, and application of educational theories and principles, along with proficiency in Mother Tongue, Filipino, and English, and the effective use of communication strategies and technologies to achieve high-quality learning outcomes. Under DO No. 21, s. 2019 [19], one of the key features of the K to 12 curriculum is the use of learner-centered, constructivist, inquiry-based, reflective, collaborative, differentiated, appropriate, relevant, and integrative pedagogical approaches. Meanwhile, the 2016 Curriculum Guide (*Gabay Pangkurikulum*) for Social Studies (*Araling Panlipunan*) [3] by the Department of Education (DepEd) further emphasizes constructivist learning, collaborative learning, experiential and contextual learning, thematic learning (chronological and conceptual), inquiry-based learning, and integrative learning (interdisciplinary and multidisciplinary). In the new MATATAG curriculum (Revised K to 12 Curriculum) [20], the prescribed approaches in Social Studies (*Araling Panlipunan*) include experiential learning, collaborative learning, social constructivism, inquiry-based approach, thematic-chronological approach, conceptual learning, research-based approach, and interdisciplinary approach (DO No. 10, s. 2024) [20]. More so, in the Bachelor of Secondary Education Social Studies specialization course entitled "Teaching Approaches in Teaching Secondary Social Studies," the specified teaching approaches include the discovery approach, process approach, inquiry approach, multimedia approach, value clarification approach, mastery learning, and eclectic approach [21]. Meanwhile, in the Elementary Education Special Courses entitled "Teaching Social Studies in the Primary Grades" and "Teaching Social Studies in the Intermediate Grades," teaching approaches are generalized rather than thoroughly specified [22]. These pedagogical approaches in Social Studies foster active student engagement, critical thinking, and a deeper understanding of complex social issues, aligning with the goals of quality education and preparing students for informed civic participation. Having this policy and curricular review resonates the importance of Social Studies as a cornerstone subject/discipline in basic education.

In analyzing the documents used in the study, content analysis was applied. A rigorous analysis of the documents was conducted to examine how they presented the prescribed pedagogical approaches and the extent to which they would be implemented in the curricula. After such analysis, a tabular presentation of the pedagogical approaches was prepared, highlighting their nature, the roles of teachers and students, and their application in Social Studies education.

## 3. Results and Discussion

### 3.1 Pedagogical Approaches in Social Studies in the Philippine Basic Education

At present, Filipino Social Studies teachers in the Philippine basic education system are effectively implementing the five pedagogical approaches mandated by RA No. 10533 [18]: constructivist, inquiry-based, reflective, collaborative, and integrative learning. Additionally, they are incorporating other innovative approaches, such as experiential learning, contextual learning, thematic learning (chronological and conceptual), discovery approach, process approach, multimedia approach, value clarification approach, mastery learning, eclectic approach, social constructivism,

conceptual learning, research-based approach, and differentiated learning, to enhance student engagement and understanding.

**Table 1.** Pedagogical approaches in Social Studies in the Philippine basic education

| Pedagogical Approach | Filipino Translation | Description | Role of Teachers | Role of Learners | Application in Social Studies |
|---|---|---|---|---|---|
| Constructivist Learning | *Pagkatutong Konstruktibo* | Constructivism views learners as active constructors of meaningful knowledge (DO No. 21, s. 2019 [19]).<br><br>Learners actively construct knowledge through experiences and prior understanding. | Facilitate learning by providing meaningful tasks and guiding exploration. | Actively engage in problem-solving, inquiry, and connecting prior knowledge to new information. | Encourages learners to analyze historical and social concepts through project-based learning and the analysis of primary sources. |
| Inquiry-based Learning | *Pagkatutong Pasiyasat* | Inquiry-based learning puts a premium on questioning, investigating, proving, probing, explaining, predicting, and establishing connections of evidence (DO No. 21, s. 2019 [19]).<br><br>Focuses on questioning, investigating, and problem-solving to foster critical thinking. | Encourage curiosity by posing questions and providing resources for inquiry. | Formulate questions, investigate issues, and present findings critically. | Promotes research, investigation of social issues, and presenting findings to understand historical and societal events. |
| Reflective Learning | *Pagkatutong Pampagninilay* | Reflective learning provides opportunities for learners to reflect on what and why they need to learn and how to go about it (DO No. 21, s. 2019 [19]).<br><br>Encourages deep thinking and self-awareness through reflection on | Guide learners in analyzing their thoughts and experiences to derive insights. | Reflect on past experiences and societal issues to draw meaningful conclusions. | Learners reflect on the relevance of historical events and societal changes via journaling or discussions. |

| Pedagogical Approach | Filipino Translation | Description | Role of Teachers | Role of Learners | Application in Social Studies |
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| | | experiences and ideas. | | | |
| Collaborative Learning | *Magkatuwang na Pagkatutubo* | A collaborative approach allows learners to share ideas among themselves, thereby fostering cooperation, respect, camaraderie, and tolerance (DO No. 21, s. 2019 [19]). | Facilitate group activities, encourage collaboration, and mediate conflicts. | Work in teams, share ideas, and take responsibility for group outcomes. | Uses group projects, discussions, and simulations to analyze social issues and build teamwork skills. |
| | | Learning through group collaboration to achieve shared goals. | | | |
| Integrative Learning | *Pagkatutong Integratibo* | Integrative pedagogy espouses the importance of connections and relationships among ideas and concepts across disciplines (DO No. 21, s. 2019 [19]). | Design interdisciplinary activities that connect concepts across subjects. | Synthesize ideas from multiple disciplines to gain a comprehensive understanding. | Integrates history, geography, economics, and civics to explore issues such as globalization and social justice. |
| | | Combines various disciplines and perspectives for a holistic understanding. | | | |
| - Interdisciplinary Learning | *Interdisiplinaryo* | Links insights and methods from multiple disciplines to explore topics. | Encourage cross-disciplinary connections by posing integrative questions. | Analyze and apply knowledge from different fields to understand complex issues. | Analyzes complex phenomena like urbanization and poverty using methods from history, geography, and sociology. |
| - Multidisciplinary Learning | *Multidisiplinaryo* | Examines topics using diverse disciplinary perspectives side by side. | Provide diverse resources and frameworks from multiple fields. | Compare and contrast different disciplinary approaches to examine issues. | Studies social issues such as climate change, drawing on political science, economics, and environmental studies. |
| Experiential Learning | *Pagkatutong Pangkaranasan* | Involves learning through direct experience. | Organize hands-on activities, fieldwork, or | Participate actively in real-world tasks and | Includes fieldwork, community projects, and |

| Pedagogical Approach | Filipino Translation | Description | Role of Teachers | Role of Learners | Application in Social Studies |
|---|---|---|---|---|---|
| | | | real-world projects. | reflect on their experiences. | hands-on activities that connect concepts to real-life contexts. |
| Contextual Learning | *Pagkatutong Pangkonteksto* | Relates learning to real-life situations and contexts for deeper understanding. | Connect lessons to real-world scenarios and learners' environments. | Relate learning to personal experiences and local contexts. | Uses case studies and local examples to link social concepts to learners' everyday experiences. |
| Thematic Learning | *Tematikong Pagkatuto* | Focuses on big ideas or overarching themes across topics. | Design lessons around themes or big ideas and guide thematic exploration. | Explore and synthesize themes to find patterns and connections. | Examines themes like justice and cultural diversity to connect Social Studies topics meaningfully. |
| - Chronological | - *Kronolohikal* | Organizes content by time sequence for better understanding of historical progression. | Plan lessons in sequential order to highlight historical progression. | Analyze and interpret events in their chronological context to identify cause-and-effect relationships. | Arranges lessons in historical order to contextualize themes like revolutions or societal reforms. |
| - Conceptual | - *Konseptwal* | Focuses on understanding key concepts or big ideas across disciplines. | Highlight key concepts and encourage conceptual analysis across topics. | Identify and explore overarching concepts to deepen understanding. | Explores concepts such as nationalism and human rights to analyze historical and social issues in depth. |
| Discovery Approach | *Pamamaraang Patuklas* | Encourages learners to explore and uncover knowledge through inquiry and experimentation. | Facilitates learning by providing guidance and resources for exploration. | Actively engages in problem-solving, questioning, and discovering new knowledge. | Students investigate historical events or social issues through inquiry-based activities. |
| Process Approach | *Pamamaraang Proseso* | Focuses on the steps and methods used to achieve learning outcomes. | Guides learners through systematic processes and provides feedback. | Follows structured steps to achieve understanding and mastery of skills. | Students analyze historical processes, such as the evolution of governance or economic systems. |
| Multimedia Approach | *Pamamaraang Multimedia* | Utilizes various media (videos, audio, images) to enhance learning experiences. | Integrates multimedia tools to present content in engaging and accessible ways. | Interacts with multimedia materials to deepen understanding and engagement. | Students use videos, infographics, and interactive maps to study geographical and historical data. |

| Pedagogical Approach | Filipino Translation | Description | Role of Teachers | Role of Learners | Application in Social Studies |
|---|---|---|---|---|---|
| Value Clarification Approach | *Pamamaraang Paglilinaw ng Halaga* | Helps learners identify and reflect on their values and beliefs. | Facilitates discussions and activities that encourage self-reflection and critical thinking. | Engages in activities that clarify personal and societal values. | Students explore ethical dilemmas, cultural values, and civic responsibilities in society. |
| Mastery Learning | *Pagkatutong Pagdadalubhasa* | Ensures learners achieve a high level of understanding before progressing. | Provides targeted instruction and assessments to ensure mastery of content. | Works at their own pace to achieve mastery through practice and feedback. | Students study historical events or social concepts until they achieve a deep understanding. |
| Eclectic Approach | *Pamamaraang Eklektiko* | Combines multiple teaching methods to address diverse learning needs. | Adapts teaching strategies to suit the needs and preferences of learners. | Engages with varied methods to enhance learning and address individual strengths. | Teachers use a mix of lectures, group work, and multimedia to teach social studies concepts. |
| Social Constructivism | *Panlipunang Konstruktibismo* | Emphasizes collaborative learning and knowledge construction through social interaction. | Acts as a facilitator, encouraging collaboration and discussion among learners. | Collaborates with peers to construct knowledge and solve problems collectively. | Students work in groups to analyze historical events or societal issues from multiple perspectives. |
| Conceptual Learning | *Pagkatutong Konseptwal* | Focuses on understanding broad concepts rather than memorizing facts. | Helps learners connect ideas and apply concepts to different contexts. | Engages in critical thinking to understand and apply conceptual knowledge. | Students explore overarching themes such as democracy, globalization, and cultural identity. |
| Research-Based Approach | *Pamamaraang Pampananaliksik* | Encourages learners to use research methods to explore topics deeply. | Guides learners in developing research skills and analyzing data. | Conducts research, analyzes findings, and presents conclusions. | Students investigate historical events or social phenomena through research projects. |
| Differentiated Learning | *Magkakaibang Pagkatuto* | Tailors instruction to meet the diverse needs, interests, and abilities of learners.<br><br>Differentiation takes into great consideration the different learning styles and multiple intelligences of the learners, which are | Designs varied activities and assessments to address individual learning needs. | Engages in activities that align with their learning preferences and abilities. | Teachers provide a variety of resources and tasks to help students explore social studies topics. |

| Pedagogical Approach | Filipino Translation | Description | Role of Teachers | Role of Learners | Application in Social Studies |
|---|---|---|---|---|---|
| | | significant aspects of their individual differences not only as learners but also as individuals (DO No. 21, s. 2019 [19]). | | | |

The pedagogical approaches in Social Studies within the Philippine basic education system reflect a dynamic and learner-centered philosophy, emphasizing active engagement, critical thinking, and the holistic development of students. These approaches are designed to cultivate not only academic knowledge but also essential life skills, values, and a deep understanding of societal and historical contexts.

**Constructivist and Inquiry-Based Learning**

At the heart of modern Social Studies education in the Philippines are constructivist and inquiry-based approaches. Constructivism, or *Pagkatutong Konstruktibo*, positions learners as active constructors of knowledge, drawing from their experiences and prior understanding. Teachers act as facilitators, guiding students through meaningful tasks and exploration, while learners engage in problem-solving and inquiry. This approach is particularly effective in Social Studies, where students analyze historical and social concepts through project-based learning and primary source analysis.

Inquiry-based learning, or *Pagkatutong Pasiyasat*, complements constructivism by fostering critical thinking through questioning, investigation, and evidence-based reasoning. Teachers encourage curiosity and provide resources, while students formulate questions, investigate issues, and present findings. This method is invaluable for researching social issues and understanding historical events, as it promotes a deeper, evidence-based comprehension of societal dynamics.

**Reflective and Collaborative Learning**

Reflective learning (*Pagkatutong Pampagninilay*) encourages students to reflect on their learning processes, experiences, and societal issues. Teachers guide learners in analyzing their thoughts, while students draw meaningful conclusions through journaling or discussions. This approach helps students connect historical events to their personal lives and societal changes, fostering self-awareness and critical reflection.

Collaborative learning (*Magkatuwang na Pagkatutubo*) emphasizes teamwork, respect, and cooperation. Teachers facilitate group activities and mediate conflicts, while students work in teams to achieve shared goals. In Social Studies, collaborative projects and discussions enable students to analyze social issues, build teamwork skills, and appreciate diverse perspectives.

**Integrative Approach (Interdisciplinary and Multidisciplinary)**

The integrative (*Pagkatutong Integratibo*) and interdisciplinary approaches highlight the importance of connecting ideas across disciplines. Teachers design activities that link concepts from history, geography, economics, and civics, helping students gain a holistic understanding of complex issues such as globalization and social justice. These approaches encourage students to synthesize knowledge across multiple fields, fostering a comprehensive, interconnected worldview.

Interdisciplinary learning (*Interdisiplinaryo*) deepens this by actively linking insights and methods from different

disciplines, encouraging teachers to pose integrative questions and students to analyze phenomena like urbanization using combined perspectives from history, geography, and sociology.

Multidisciplinary learning (*Multidisiplinaryo*) examines topics using diverse disciplinary perspectives side by side. Teachers provide resources from various fields, and students compare and contrast different approaches to analyzing issues such as climate change and urbanization. This method broadens students' understanding by exposing them to multiple lenses for viewing societal challenges.

**Experiential and Contextual Learning**

Experiential learning (*Pagkatutong Pangkaranasan*) involves direct, hands-on experiences such as fieldwork, community projects, and real-world tasks. Teachers organize these activities, and students actively participate and reflect on their experiences. This approach bridges theoretical knowledge with practical application, making Social Studies more relevant and engaging.

Contextual learning (*Pagkatutong Pangkonteksto*) relates lessons to real-life situations and local contexts. Teachers connect lessons to students' environments, and learners relate concepts to their personal experiences. For example, case studies and local examples help students understand social concepts in the context of their everyday lives, making learning more meaningful and relatable.

**Thematic Approach (Chronological and Conceptual)**

The thematic approach (*Tematikong Pagkatuto*) focuses on overarching themes such as justice, cultural diversity, and democracy. Teachers design lessons around these themes, and students explore patterns and connections across topics. This method helps students see the "big picture" and understand how different Social Studies concepts are interrelated.

The chronological approach (*Kronolohikal*) organizes content by time sequence, helping students understand historical progression and cause-and-effect relationships. Teachers plan lessons sequentially, and students analyze events in their historical context, which is crucial for understanding themes such as revolutions or societal reforms.

The conceptual approach (*Konseptwal*) emphasizes understanding key concepts rather than memorizing facts. Teachers highlight overarching ideas, and students engage in critical thinking to apply these concepts to various contexts. This approach is essential for analyzing complex issues such as nationalism and human rights.

**Discovery, Process, and Multimedia Approaches**

The discovery approach (Pamamaraang Patuklas) encourages students to explore and uncover knowledge through inquiry and experimentation. Teachers provide guidance and resources, while students actively engage in problem-solving and discovery. This method is particularly effective in Social Studies, where students investigate historical events or social issues through hands-on activities.

The process approach (Pamamaraang Proseso) focuses on the steps and methods used to achieve learning outcomes. Teachers guide students through systematic processes, and learners follow structured steps to master skills. In Social Studies, this approach helps students analyze historical processes, such as the evolution of governance or economic systems.

The multimedia approach (*Pamamaraang Multimedia*) utilizes videos, audio, images, and interactive tools to enhance learning. Teachers integrate multimedia to present content in engaging ways, and students interact with these materials to deepen their understanding. For example, videos, infographics, and interactive maps can bring geographical and historical data to life, making complex concepts more accessible.

**Value Clarification, Mastery, and Eclectic Approaches**

The value clarification approach (*Pamamaraang Paglilinaw ng Halaga*) helps students identify and reflect on their values and

beliefs. Teachers facilitate discussions and activities that encourage self-reflection, while students explore ethical dilemmas, cultural values, and civic responsibilities. This approach is vital for developing socially responsible and morally aware citizens.

Mastery learning (*Pagkatutong Pagdadalubhasa*) ensures that students achieve a high level of understanding before progressing. Teachers provide targeted instruction and assessments, and students work at their own pace to master content. In Social Studies, this approach ensures that students deeply understand historical events or social concepts before moving on to new topics.

The eclectic approach (*Pamamaraang Eklektiko*) combines multiple teaching methods to address diverse learning needs. Teachers adapt strategies to suit individual learners, and students engage with a variety of methods to enhance their understanding. This flexibility allows teachers to use lectures, group work, multimedia, and other techniques to teach Social Studies concepts effectively.

**Social Constructivism, Conceptual Learning, and Research-Based Approaches**

Social constructivism (*Panlipunang Konstruktibismo*) emphasizes collaborative knowledge construction through social interaction. Teachers act as facilitators, encouraging discussion and cooperation, while students work in groups to analyze historical events or societal issues. This approach fosters a sense of community and shared understanding.

Conceptual learning (*Pagkatutong Konseptwal*) focuses on understanding broad concepts rather than rote memorization. Teachers help students connect ideas and apply concepts to different contexts, fostering critical thinking and deeper comprehension. This approach is essential for exploring themes such as democracy, globalization, and cultural identity.

The research-based approach (*Pamamaraang Pampananaliksik*) encourages students to use research methods to explore topics deeply. Teachers guide students in developing research skills, and learners conduct investigations, analyze findings, and present conclusions. This method is invaluable for studying historical events or social phenomena, as it promotes evidence-based learning and analytical skills.

**Differentiated Learning**

Differentiated learning (*Magkakaibang Pagkatuto*) tailors instruction to meet the diverse needs, interests, and abilities of learners. Teachers design varied activities and assessments, and students engage in tasks that align with their learning preferences. This approach ensures that all students, regardless of their individual differences, can access and benefit from Social Studies education.

In general, the pedagogical approaches in Social Studies within the Philippine basic education system are designed to create well-rounded, critical, and socially aware individuals. By integrating active learning, collaboration, reflection, and real-world application, these methods prepare students to understand and engage with the complexities of society and history. Each approach offers unique benefits, and their combined use ensures a comprehensive and meaningful educational experience for Filipino learners.

The results of the study align with the reviewed literature by underscoring the importance of learner-centered pedagogical approaches, such as active learning, collaboration, reflection, and real-world application, in fostering critical thinking, social awareness, and innovation among Filipino learners. These approaches address the challenges highlighted in the literature, including the need to move beyond traditional, teacher-centered methods that often focus on rote memorization and lower-order tasks [16]. Revised pieces of literature also emphasize the difficulties posed by inadequate resources, unsupportive environments, and a lack of focus on critical thinking, which can be mitigated by integrating 21st-century pedagogical strategies [5, 6]. Furthermore, the literature highlights the

pivotal role of innovative pedagogical approaches in enhancing creative thinking skills—a critical area where Filipino learners have lagged, as evidenced by PISA 2022 results [10, 11]. The Department of Education (DepEd) also mandates student-centered pedagogy, underscoring the need to align teaching practices with modern, research-backed methods to empower both teachers and learners [17]. This holistic integration of pedagogy not only addresses the gaps in traditional teaching but also ensures that students develop higher-order thinking skills and apply knowledge meaningfully in real-life contexts [4, 14, 15] aligned with the goal of developing 21st-century skills considering the varying needs, situations, and diversities of learners [23, 24, 25] through contextualized instruction [26, 27, 28].

It is also noticeable that the prescribed and mandated pedagogical approaches in laws, orders, and curricula for Social Studies in basic education were not clearly reflected in the syllabi, which were mainly promulgated by Teacher Education Institutions (TEIs) in higher education. With this, the CHEd needs to ensure that TEIs are continuously recalibrating their courses and syllabi to adapt to the changing educational landscape and better prepare teacher education students for the evolving Social Studies curricula, where the integration of pedagogical approaches through instructional design frameworks (IDFs) is the norm. Moreover, they need to be trained to effectively integrate design thinking or design-based thinking into lesson planning, instructional material development, lesson delivery, and assessment, to better contextualize the learning experience [29] and innovate instruction through highly impactful learning resources [30]. A design-thinking framework further enhances this integration by empowering teachers and students to tackle sustainability issues through empathy, creative brainstorming, and iterative problem-solving [34, 35, 36, 37].

## 4. Conclusion

The pedagogical approaches in Social Studies within the Philippine basic education system are thoughtfully designed to nurture well-rounded, critical, and socially conscious individuals. By blending active learning, collaboration, reflection, and real-world application, these methods empower Filipino learners to navigate and contribute meaningfully to the complexities of society and history. The diversity of these approaches ensures a holistic and enriching educational journey, equipping students with the skills and perspectives needed for lifelong engagement and responsible citizenship. More so, Higher Education Institutions (HEIs), under the guidance of the Commission on Higher Education (CHEd), must ensure that the syllabi and course content for future Social Studies teachers align with both current curricular standards and the evolving demands of the educational landscape.

Future studies on how Teacher Education Institutions (TEIs) contextualize and reinforce the integration of prescribed pedagogical approaches in Social Studies through their in-campus and off-campus practices may be explored further to improve the in-service practices provided to them and enrich the curricula and syllabi.

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