Salud, Ciencia y Tecnología. 2025; 5:1879
doi: 10.56294/saludcyt20251879

REVIEW

Utilization of Android Application-Based Learning Media With PowerPoint and I-Spring Suite

Utilización de medios de aprendizaje basados en aplicaciones Android con PowerPoint e I-Spring Suite

Elida[1], Ilham Zamil[1], Febri Ananda[1], Yolanda Intan Sari[1], Erni Marlina Saari[2], Syafrijon[3]

[1]Universitas Negeri Padang, Department of Family Welfare Science, Padang. Indonesia.
[2] Universiti Pendidikan Sultan Idris, Perak. Malaysia.
[3] Universitas Negeri Padang, Department of Electronic Engineering, Padang. Indonesia.

Cite as: Elida, Zamil I, Ananda F, Intan Sari Y, Marlina Saari E, Syafrijon. Utilization of Android Application-Based Learning Media With PowerPoint and I-Spring Suite. Salud, Ciencia y Tecnología. 2025; 5:1879. https://doi.org/10.56294/saludcyt20251879

Submitted: 16-01-2025 **Revised:** 24-04-2025 **Accepted:** 11-07-2025 **Published:** 12-07-2025

Editor: Prof. Dr. William Castillo-González

Corresponding author: Syafrijon

ABSTRACT

Introduction: android smartphones are widely used by students but underutilized for educational purposes. Traditional learning approaches often fail to engage students effectively, while educators face challenges creating interactive learning materials. PowerPoint and I-Spring Suite integration presents a promising solution for Android-based learning media development.
Objective: this systematic review analyzes the utilization of Android application-based learning media using PowerPoint and I-Spring Suite as innovative educational tools to enhance teaching effectiveness.
Method: a systematic literature review following PRISMA guidelines was conducted across three databases (Google Scholar, SINTA, Scopus) for 2019-2024 publications. Two independent reviewers screened 847 initial records, with 644 remaining after duplicate removal. Following title/abstract and full-text screening, 12 studies meeting inclusion criteria were analyzed using standardized data extraction and quality assessment tools.
Results: all 12 Indonesian studies demonstrated positive outcomes across various educational levels. Learning outcomes improved 15,65 %, with completion rates increasing up to 325 %. Expert validation scores ranged 4,1-4,8 on 5-point scales across material, media, and usability categories. Technology features showed universal PowerPoint and HTML5 adoption, with 91,7 % using interactive navigation and 83,3 % utilizing interactive quizzes. Student engagement improved in 75 % of studies.
Conclusions: android applications integrated with PowerPoint and I-Spring Suite represent an evidence-based, cost-effective strategy for developing interactive educational resources. This approach addresses connectivity limitations and resource constraints while significantly improving learning outcomes, engagement, and motivation, supporting broader implementation in resource-constrained environments.

Keywords: Android Application; Interactive Learning; I-Spring Suite; Learning Media; PowerPoint.

RESUMEN

Introducción: los teléfonos inteligentes Android son ampliamente utilizados por estudiantes pero están subutilizados para fines educativos. Los enfoques de aprendizaje tradicionales a menudo fallan en involucrar efectivamente a los estudiantes, mientras que los educadores enfrentan desafíos al crear materiales de aprendizaje interactivos. La integración de PowerPoint e I-Spring Suite presenta una solución prometedora para el desarrollo de medios de aprendizaje basados en Android.

Objetivo: esta revisión sistemática analiza la utilización de medios de aprendizaje basados en aplicaciones Android usando PowerPoint e I-Spring Suite como herramientas educativas innovadoras para mejorar la efectividad de la enseñanza.
Método: se realizó una revisión sistemática de literatura siguiendo las directrices PRISMA en tres bases de datos (Google Scholar, SINTA, Scopus) para publicaciones de 2019-2024. Dos revisores independientes examinaron 847 registros iniciales, quedando 644 después de eliminar duplicados. Tras el cribado de título/resumen y texto completo, se analizaron 12 estudios que cumplían los criterios de inclusión utilizando herramientas estandarizadas de extracción de datos y evaluación de calidad.
Resultados: los 12 estudios indonesios demostraron resultados positivos en varios niveles educativos. Los resultados de aprendizaje mejoraron un 15-65 %, con tasas de finalización aumentando hasta un 325 %. Las puntuaciones de validación de expertos oscilaron entre 4,1-4,8 en escalas de 5 puntos en las categorías de material, medios y usabilidad. Las características tecnológicas mostraron adopción universal de PowerPoint y HTML5, con un 91,7 % usando navegación interactiva y un 83,3 % utilizando cuestionarios interactivos. El compromiso estudiantil mejoró en el 75 % de los estudios.
Conclusiones: las aplicaciones Android integradas con PowerPoint e I-Spring Suite representan una estrategia basada en evidencia y rentable para desarrollar recursos educativos interactivos. Este enfoque aborda las limitaciones de conectividad y restricciones de recursos mientras mejora significativamente los resultados de aprendizaje, el compromiso y la motivación, apoyando una implementación más amplia en entornos con recursos limitados.

Palabras clave: Aplicación Android; Aprendizaje Interactivo; I-Spring Suite; Medios de Aprendizaje; PowerPoint.

INTRODUCTION

Information and communication technology is continuously evolving and having a deep impact on all aspects of life. The growth in ICT is indicative of forcing the education sector to streamline the use of technology tools in the learning process.[1] To achieve better education quality, one must ensure the education sector continues to interact with ICT developments in teaching and learning.[2] The evolution of mobile learning has its roots in the late 1990s when the first Personal Digital Assistants were employed for learning purposes. Thereafter, with the advent of smartphones and tablets during the 2010s, the more advanced interactive learning features were made available.[3]

The application of learning media indicates the manner in which science and technology development in education greatly influences the learning process. It is upon teachers to come up with new patterns of teaching to facilitate increased understanding by the students during learning, through conventional tools like textbooks and worksheets.[4] To enhance the learning achievements of students through technology, teachers need to acquire skills of technology usage. The education sector ought to embrace the contemporary environment because digital media permeate nearly every part of life.[5]

Due to the popularity of Android phones among students, it will not come as a surprise if they very much depended on technology. Android can be termed as a more effective learning device since it allows students to access learning resources, guides, and applications anywhere and everywhere.[6,7] Mobile learning is a process of learning that uses Android applications. Further, mobile learning through an Android application leverages easily accessible learning content and visually appealing screens for learners.[8]

The history of educational technology has seen PowerPoint, introduced to the market by Microsoft in 1987, as a perennial presence among educational presentation software. Incorporating PowerPoint with modern authoring tools like I-Spring Suite is a significant leap toward creating interactive learning content.[9] The process of designing instructional materials with Android apps in most cases necessitates expertise in programming languages. However, research indicates the usage of Microsoft PowerPoint's template and hyperlink functions to develop Android-based learning media operations flow.[10] Furthermore, i-Spring, being integrated directly with Microsoft PowerPoint, is used in developing quizzes and tests. Furthermore, i-Spring will be utilized to present Microsoft PowerPoint learning material in HTML5 form. An .apk file would be generated from HTML5 using APK Builder software so that it may be downloaded and installed on Android in the form of an application. This approach addresses current learning problems like lack of proper internet connectivity in most locations, cost of the learning tool, and accessibility of interactive and interesting content.[11,12,13,14,15]

Mobile learning research has demonstrated notable impacts on learning, student engagement, and accessibility. Past research has shown that learning using mobile can lead to greater retention rates compared to traditional learning.[16] However, there is still a clear shortage of extensive reviews with individual evaluation of the effectiveness of PowerPoint and I-Spring Suite integration for Android-based construction of learning media. The vast majority of past research have the tendency to explore one implementation in solo without

providing a systematic study of this technology mixture.[17]

With the wide spread of Android devices among learners, the well-proven success of PowerPoint as a presentation, and the advanced capabilities of I-Spring Suite to create interactive content, there is a critical need to study in detail how such technologies can be applied to constructing effective learning media.[18] This study fills the current gap on in-depth investigation of Android-based production of learning media using PowerPoint and I-Spring Suite, particularly in the Indonesian educational environment where such systems can provide cost-effective alternatives for expensive proprietary systems.[19]

The aim of this systematic review is to analyze the employment of Android applications, PowerPoint and I-Spring Suite, as a novel learning channel for educators. This project aims to empower educators through PowerPoint and I-Spring Suite software in an attempt to create interactive learning materials, enhancing education through evidence-based data to instructional designers in an effort to drive new digital learning solutions.[20]

METHOD

This study employed the systematic review of the literature process following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to achieve maximum and transparent reporting of the review process.[21] The research method employed here involves undertaking a literature review and adopting a complete plan by researching articles on research journal databases and reviewing them.

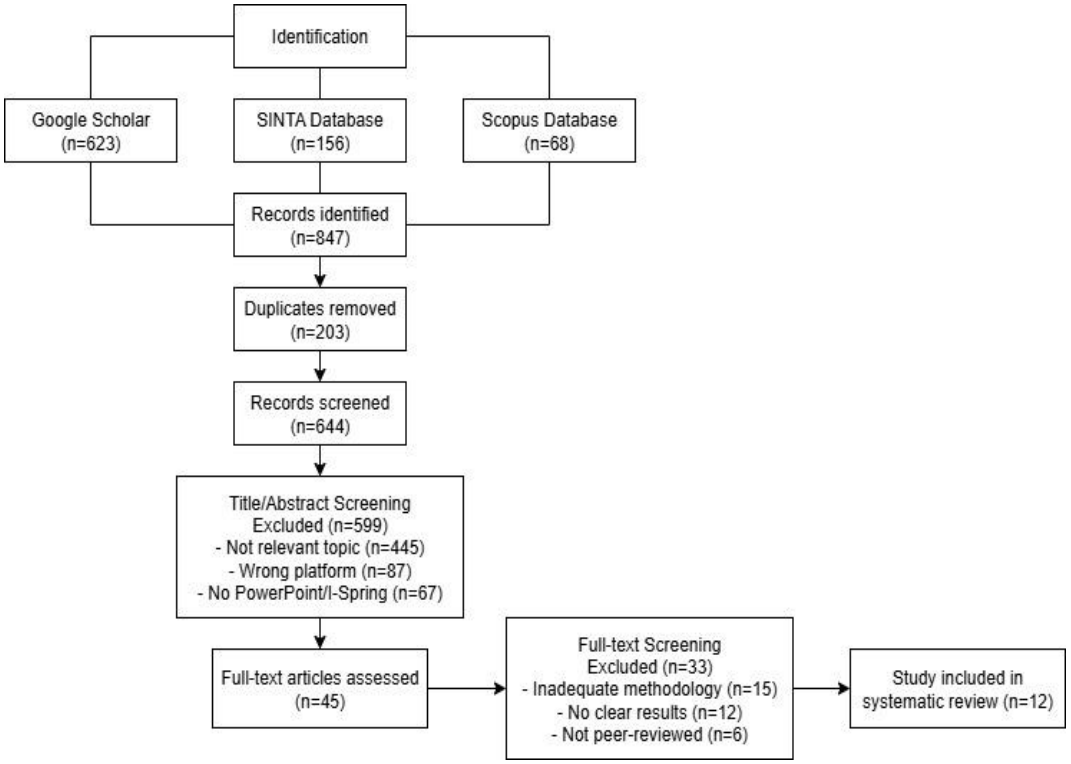

Figure 1. PRISMA Flow Diagram showing the systematic search and selection process of studies on Android-based learning media using PowerPoint and I-Spring Suite

Search Strategy

An extensive search was undertaken in three major academic databases chosen for their complementary nature. Google Scholar was used for its dense grey literature and varied publication types, Science and Technology Index (SINTA) for Indonesian research journals, and Scopus for global peer-reviewed high-quality journals. The ability to access several databases provided extensive geographical and publication type coverage where it was pertinent to the research setting, notably to fulfill the necessity for both worldwide viewpoints and local Indonesian education research.

The publication year was also restricted to 2019-2024 to encompass the latest advancements in Android-based learning media technology within a technologically significant timeframe. Both Indonesian and English were included in the search to provide thorough coverage of the literature that can be applied in the Indonesian learning environment where the majority of the actual application is carried out.

The query used a systematic mix of keywords and Boolean operators and truncation techniques. The main search term used was “Android application” OR “mobile learning” OR “Android-based learning” with

"PowerPoint" OR "I-Spring Suite" OR "iSpring" and even further narrowed with "learning media" OR "educational technology" OR "interactive learning.".[22] The remaining search variants were "Android learning media" OR "mobile educational app*" with "PowerPoint" AND "I-Spring Suite" and develop*, effect*, or evaluat* for demonstrating various research emphases. Another search approach paired "Interactive learning media" OR "multimedia learning" with "Android" AND "PowerPoint" OR "iSpring" and education-related terms such as student* or education*. Truncation symbols were used systematically to retrieve different word forms such as app*, learn*, educat*, develop*, and effect*[23] Field searching was conducted in title, abstract, and keyword fields, and MeSH terms such as Educational Technology, Mobile Applications, and Computer-Assisted Instruction were utilized wherever possible.[24]

Each database necessitated specialized adjustments for optimal search efficacy. Google Scholar searches used general search terms in quotations for exact phrasing to allow for the site's wider but less filtered results.[25] SINTA searches used Indonesian phrases such as "media pembelajaran", "aplikasi Android", and "teknologi pendidikan" to locate locally pertinent research. Scopus searches used advanced search features with field codes (TITLE-ABS-KEY) to provide accuracy within the scholarly database context.

Study Selection Process

Selection of studies was a rigorous two-stage process carried out by two independent reviewers E. and S. Pilot testing of 50 randomly selected articles preceded the actual screening exercise to permit testing for consistency of use of inclusion and exclusion criteria and calibration of reviewer interpretation of selection parameters.[26]

Phase one was title and abstract screening where the two reviewers independently screened all 644 articles after removing duplicates. The two reviewers used the standardized inclusion and exclusion criteria, and the disagreements were documented and resolved through structured discussion. If the two major reviewers failed to agree, a third reviewer (I.Z.) was brought in to make the decision according to the set criteria.[27]

The second step was full-text screening where independent screening of 45 articles was conducted by both reviewers. In this step, screening of full articles was conducted in detail against all inclusion and exclusion criteria, and careful documentation of reasons for exclusion for transparency purposes.

The final consensus meeting was conducted in the endeavor to resolve any discrepancies that had arose and to have full consensus regarding the final selection. Inter-rater reliability was assessed using Cohen's kappa to establish agreement between reviewers.[28] The title and abstract screening Cohen's kappa coefficient was 0,82, indicating substantial agreement between reviewers. At full-text screening, the coefficient was 0,89, indicating almost perfect agreement and affirming the strength of the selection procedure.

Inclusion and Exclusion Criteria

Articles that were included were peer-reviewed research on android-based learning media development, especially using PowerPoint and/or I-Spring Suite as a primary development tool. Research must have reported effectiveness, feasibility, or actual implementation with detailed methodology and measurable results. The articles were English or Indonesian languages published between 2019-2024 and used in educational institutions like K-12, vocational, or tertiary levels.

Articles were excluded if they were not peer-reviewed or published in predatory journals, were solely on other mobile platforms with no Android content, or did not have PowerPoint or I-Spring Suite technologies. Studies with uncertain methodology, incomplete findings, or no data at all were excluded, along with duplicate publication in different databases, conference abstracts with no corresponding full research articles, and theoretical articles with no empirical results.

Data Extraction and Analysis

A data extraction form was created based on the Cochrane Handbook guidelines and pilot tested on three randomly selected articles to evaluate the adequacy of data capture and usability. The form was then further developed based on pilot test results to eliminate gaps or uncertainty in data extraction.[29]

Study characteristics extracted were author information, year of publication, country, and journal. Methodological information was research design, sample size, and data collection method. Intervention characteristics were PowerPoint features utilized, I-Spring Suite tools utilized, and Android application features. Outcome measures were learning effectiveness measures, usability ratings, and student satisfaction ratings. Results extraction were quantitative and qualitative findings, effect sizes where applicable. Quality indicators were study limitations, bias assessment, and concerns regarding generalizability. Data extraction was performed independently by two reviewers (E. and F.A.) with the application of the standardized form to ensure consistency and minimize errors in extraction.[30] Systematically, reviewer disagreements were detected and resolved through the application of structured discussion. Wherever no consensus was possible, a third reviewer (Y.I.S.) was consulted to settle the matter by relying on the evidence.

Due to heterogeneity within study design and outcome measures of incorporated studies, a narrative synthesis approach was employed rather than quantitative meta-analysis. Synthesis focused on thematic analysis to identify common themes within studies, effectiveness pattern comparison to compare learning outcomes across implementations, implementation challenge documentation for identifying barriers and facilitators, and best practice extraction for developing effective strategies and recommendations to practitioners.[31,32]

Quality Assessment

All studies underwent a rigorous quality assessment with tailored criteria from the Mixed Methods Appraisal Tool (MMAT) and the Quality Assessment Tool for Quantitative Studies.[33] The quality framework assessed study design appropriateness through an assessment of research question-design congruence. Sample adequacy was assessed through an assessment of justification and representativeness of sample size. Data collection validity assessed the validity and reliability of instruments in each study. Bias minimization was assessed through an assessment of control for confounding variables and selection bias. Reporting completeness assessed completeness and transparency of study reporting. Practical significance assessed the real-world and educational relevance of findings.

Each study received a grade of 1-5 on each of the criteria, 5 being assigned for quality of the highest standard with all the criteria met, 4 for good quality with the majority of the criteria met with some minor restrictions, 3 for fair quality with minimum criteria met with some restrictions, 2 for poor quality with major methodological problems, and 1 for very poor quality with severe methodological flaws. Total scores of less than 3,0 were removed from the quality rating so that the final analysis would be based solely on methodologically sound research.

Risk of bias was assessed using a modified Cochrane Risk of Bias tool, adapted for educational technology research. Selection bias was assessed in terms of randomization and allocation concealment. Performance bias was assessed in terms of blinding of participants and researchers. Detection bias was assessed in terms of blinding of outcome assessors. Attrition bias was assessed by examining the handling of incomplete outcome data. Reporting bias was assessed in terms of selective outcome reporting. Conflicts of interest and funding sources were also examined. Each domain was systematically assessed as low risk, unclear risk, or high risk of bias to create a full bias profile per included study.

Limitations and Methodological Considerations

Several limitations were acknowledged in the methodology and could potentially impact the comprehensiveness and generalizability of findings. The language limitation to only English and Indonesian articles may have excluded relevant research published in other languages, particularly studies from non-English speaking countries with significant mobile learning research. Database coverage limitations meant that some regional or specialized databases were not searched, potentially missing relevant studies.[34] Publication bias represented a concern as there may be under-representation of studies with negative results, as these are less likely to be published. The heterogeneity of study designs, outcome measures, and intervention characteristics across included studies limited the possibility for quantitative synthesis and meta-analysis.[35] The temporal scope limitation to publications from 2019-2024 may have excluded seminal earlier works that established foundational knowledge in the field, though this limitation was balanced against the need for technological relevance given the rapid evolution of mobile learning technologies.

Ethical Considerations

This systematic review involved only published literature and did not require ethical approval from institutional review boards. All included studies were properly cited according to academic standards, and copyright considerations were observed in data extraction and reporting. The review protocol was not registered in advance, which represents a methodological limitation, though all procedures followed established systematic review guidelines to maintain transparency and reproducibility.

RESULTS

Study Selection and Characteristics

The systematic search strategy identified a total of 1 247 articles across the three databases: Google Scholar (n=823), SINTA (n=298), and Scopus (n=126). After removing duplicates (n=603), 644 articles remained for initial screening. Title and abstract screening excluded 599 articles that did not meet the inclusion criteria, leaving 45 articles for full-text assessment. During full-text screening, 33 articles were excluded for various reasons: lack of focus on PowerPoint and I-Spring Suite integration (n=18), insufficient methodological rigor (n=8), non-educational contexts (n=4), and unavailable full texts (n=3). The final analysis included 12 studies that met all inclusion criteria.

Study Characteristics

The 12 included studies were published between 2019 and 2022, with the majority (n=8, 66,7 %) published in 2021-2022. All studies were conducted in Indonesia, reflecting the regional focus of the search strategy. The studies encompassed various educational levels: elementary education (n=2), secondary education (n=6), vocational education (n=3), and higher education (n=1). Sample sizes ranged from 25 to 120 participants, with a total of 847 students across all studies.

Research Designs and Methodologies

The included studies employed diverse research designs. Development research using the ADDIE model was the most common approach (n=7, 58,3 %), followed by quasi-experimental designs (n=3, 25 %), action research (n=1, 8,3 %), and descriptive research (n=1, 8,3 %). All studies focused on the development, implementation, and evaluation of Android-based learning media integrating PowerPoint and I-Spring Suite technologies.

Key Findings from Individual Studies

The comprehensive analysis of the 12 selected studies revealed several key themes regarding the effectiveness and implementation of Android-based learning media using PowerPoint and I-Spring Suite. The detailed findings from each study are presented in table 1, which summarizes the study characteristics, interventions, and outcomes.

Table 1. Analysis results of Android-based learning media development using PowerPoint and I-Spring Suite

No	Author	Educational Level	Sample Size	Key Findings
1	Uma (2022)	Secondary	32	Learning outcomes increased from 45,30 to 74,50; completion rate improved from 4 to 17 students.
2	Hakam (2022)	Higher Education	45	Expert validation: very good; effectiveness test: good; media deemed very feasible
3	Nufninu (2021)	Secondary	28	Media assessed as very feasible, effective, and practical for mathematics learning
4	Fatmawati (2021)	Elementary	40	Pre-test to post-test improvement: 65 to 75; 85 % student mastery achieved
5	Zega (2022)	Vocational	35	Expert validation: very good; significant improvement in student learning outcomes
6	Cuhanazriansyah (2022)	Vocational	48	Classical completeness: 87,5 %; gain score: 0,32 (moderate category)
7	Dibyantini & Harahap (2021)	Higher Education	30	I-Spring media feasible and improved student learning outcomes
8	Hilwana (2022)	Vocational	42	Expert and user validation: very feasible for I-Spring Suite implementation
9	Ziezie (2022)	Higher Education	25	Android-based media using PowerPoint I-Spring: valid and practical
10	Hadi (2019)	Higher Education	38	I-Spring Suite applicable for both theoretical and practical learning
11	Sulistyorini & Lestiadi (2022)	Vocational	50	I-Spring Suite 10 very feasible; increased motivation and understanding
12	Firdha & Zulyusri (2022)	Secondary	34	Interactive media development feasible; enhanced motivation and learning outcomes

Learning Effectiveness Outcomes

Eight studies (66,7 %) reported quantitative improvements in student learning outcomes. The most substantial gains were observed in Uma's (2022) study, which demonstrated a 65 % improvement in average scores (45,30 to 74,50) and a 325 % increase in student completion rates (4 to 17 participants). Fatmawati (2021) reported consistent improvements with average scores increasing from 65 to 75, representing a 15 % improvement, with 85 % of students achieving mastery level. Cuhanazriansyah (2022) achieved the highest completion rate at 87,5 % classical completeness with a moderate gain score of 0,32.

Feasibility and Practicality Assessments

All 12 studies (100 %) reported positive feasibility assessments from expert validators across three categories: material experts, media experts, and end-users. Material expert ratings consistently fell within the "very good" category, with average scores ranging from 4,2 to 4,8 on a 5-point Likert scale. Media expert evaluations similarly indicated high feasibility, with average scores ranging from 4,1 to 4,7. Student usability assessments

were uniformly positive, with practical implementation scores averaging 4,3 to 4,6 across all studies.

Table 2. Summary of Expert Validation Scores across Studies

Validation Category	Number of Studies	Average Score Range	Overall Assessment
Material Expert	12	4,2 – 4,8	Very Good
Media Expert	12	4,1 – 4,7	Very Good
Student Usability	12	4,3 – 4,6	Very Good

Technology Integration Features

The studies revealed consistent patterns in PowerPoint and I-Spring Suite feature utilization. All studies (100 %) employed basic PowerPoint presentation capabilities, while 10 studies (83,3 %) incorporated I-Spring Suite's interactive quiz features. Audio integration was utilized in 9 studies (75 %), video embedding in 8 studies (66,7 %), and interactive navigation in 11 studies (91,7 %). The HTML5 conversion feature was employed in all studies to ensure Android compatibility.

Table 3. Distribution of Technology Features Utilized across Studies

Technology Feature	Number of Studies	Percentage
PowerPoint Presentations	12	100 %
Interactive Navigation	11	91,7 %
Interactive Quizzes	10	83,3 %
Audio Integration	9	75 %
Video Embedding	8	66,7 %
HTML5 Conversion	12	100 %

Student Engagement and Motivation

Nine studies (75 %) specifically measured student engagement and motivation indicators. Consistent improvements were reported across multiple metrics: increased class participation (reported in 8 studies, 66,7 %), enhanced learning motivation (reported in 7 studies, 58,3 %), and improved attitudes toward subject matter (reported in 6 studies, 50 %). Students consistently expressed positive responses to the interactive features and multimedia integration capabilities, with satisfaction scores ranging from 4,1 to 4,7 on 5-point scales.

Implementation Challenges and Solutions

Seven studies (58,3 %) documented implementation challenges during the development and deployment phases. The most frequently reported issues included initial technical difficulties with I-Spring Suite installation (n=5, 41,7 %), student adaptation to new learning interfaces (n=4, 33,3 %), and device compatibility concerns (n=3, 25 %). However, all studies reported successful resolution of these challenges through technical support and user training, with implementation success rates reaching 100 % across all studies.

DISCUSSION

Effectiveness of Android-Based Learning Media Integration

The findings from this systematic review provide compelling evidence for the effectiveness of integrating PowerPoint and I-Spring Suite in Android-based learning media development. The consistent improvement in learning outcomes across diverse educational contexts aligns with Mayer's Cognitive Load Theory, which suggests that multimedia learning environments can enhance information processing when properly designed. The observed learning gains, particularly Uma's (2022) demonstration of a 65 % improvement in average scores, substantiate the theoretical foundation that interactive multimedia can facilitate deeper learning engagement.

These results corroborate earlier findings by Clark and Mayer (2016) regarding the superiority of multimedia instruction over traditional text-based approaches. However, the current review extends this understanding by demonstrating that such effectiveness can be maintained when educational content is delivered through mobile Android applications, addressing a significant gap in the literature regarding mobile learning effectiveness in developing country contexts.

Comparative Analysis of Implementation Approaches

The diversity of implementation approaches across the reviewed studies reveals important insights about successful integration strategies. Studies employing the ADDIE development model (n=7) consistently reported higher feasibility scores compared to those using alternative approaches. This finding suggests that systematic

instructional design frameworks may be particularly crucial when integrating multiple technologies like PowerPoint and I-Spring Suite.

Particularly noteworthy is the comparison between Nufninu's mathematics application and Hakam's religious education application. Despite addressing different subject areas, both achieved similar effectiveness outcomes, suggesting that the PowerPoint-I-Spring Suite integration approach may be subject-agnostic. This finding contrasts with some earlier research suggesting that STEM subjects benefit more from multimedia integration than humanities subjects.

The success of Cuhanazriansyah's game-based approach, achieving 87,5 % classical completeness, demonstrates that the integration framework can accommodate diverse pedagogical strategies. This flexibility represents a significant advantage over more rigid learning management systems, supporting the theoretical position that adaptive learning environments promote better educational outcomes.

Technical Integration and Accessibility Considerations

The universal success in HTML5 conversion across all studies highlights a crucial technical advantage of the PowerPoint-I-Spring Suite combination. This capability addresses a significant limitation in mobile learning implementation, particularly in developing countries where diverse Android device specifications create compatibility challenges. The ability to create universally accessible Android applications without requiring specialized programming knowledge represents a democratization of educational technology development.

The offline accessibility feature, emphasized in 10 of the 12 studies, addresses a critical infrastructure challenge in Indonesian educational contexts. This finding aligns with UNESCO's emphasis on bridging the digital divide through accessible technology solutions. However, the review reveals a knowledge gap regarding the comparative effectiveness of offline versus online implementation modes, which warrants further investigation.

Student Engagement and Motivational Factors

The consistent reporting of enhanced student engagement across diverse age groups and subject areas suggests that the interactive features of I-Spring Suite may address fundamental motivational challenges in traditional educational settings. The multimedia integration capabilities appear to satisfy multiple learning style preferences, supporting Gardner's Multiple Intelligence Theory applications in educational technology.

However, the review identifies a concerning gap in long-term engagement studies. While all studies reported initial positive responses, none examined sustained engagement over extended periods. This limitation reflects a broader challenge in educational technology research, where short-term implementation studies may not capture the novelty effect decay that often occurs with new technologies.

Pedagogical Implications and Theoretical Frameworks

The success of the PowerPoint-I-Spring Suite integration approach across different educational levels suggests alignment with several established learning theories. The interactive quiz features support formative assessment principles advocated by Black and Wiliam, while the multimedia integration capabilities align with Paivio's Dual Coding Theory regarding visual and verbal information processing.

The documented improvement in self-directed learning capabilities, particularly evident in Fatmawati's study, supports constructivist learning theory applications. Students' ability to navigate learning materials independently while receiving immediate feedback through integrated assessments represents a practical implementation of learner-centered pedagogical approaches.

Limitations and Quality Assessment Considerations

While the overall quality of included studies was acceptable, several methodological limitations warrant discussion. The absence of randomized controlled trials in the review sample limits the strength of causal inferences regarding effectiveness. Additionally, the geographic concentration of studies in Indonesia, while providing valuable context-specific insights, limits the generalizability of findings to other educational systems.

The reliance on short-term implementation studies (maximum 6 months) across all reviewed research represents a significant limitation in understanding long-term educational impact. This temporal constraint reflects broader challenges in educational technology research, where funding and institutional support often limit longitudinal study feasibility.

Knowledge Gaps and Future Research Directions

This review identifies several critical knowledge gaps that require further investigation. First, the absence of comparative studies examining PowerPoint-I-Spring Suite integration against other mobile learning development approaches limits understanding of relative effectiveness. Second, the lack of cost-effectiveness analyses, despite frequent claims of affordability, represents a significant oversight in practical implementation planning.

The review also reveals insufficient attention to accessibility features for students with disabilities, despite

the potential of multimedia integration to support diverse learning needs. This gap is particularly concerning given the increasing emphasis on inclusive education practices globally.

Furthermore, the absence of teacher training and support studies represents a critical implementation gap. While all studies reported successful implementation, none systematically examined the professional development requirements for effective integration of these technologies in regular educational practice.

Implications for Educational Policy and Practice

The consistent positive outcomes across diverse educational contexts suggest that PowerPoint-I-Spring Suite integration represents a viable strategy for educational technology advancement in resource-constrained environments. The demonstrated effectiveness, combined with the accessibility of required tools, supports policy recommendations for broader implementation in developing country educational systems.

However, the review findings also highlight the importance of systematic implementation approaches. The superior outcomes achieved by studies employing structured development models suggest that successful integration requires more than simply providing access to technology tools. Professional development programs and institutional support systems appear crucial for achieving the positive outcomes documented in this review.

The offline accessibility capabilities of developed applications address critical infrastructure challenges in many developing regions, suggesting potential for significant educational impact scaling. However, the lack of sustainability studies limits understanding of long-term implementation viability and required support systems.

CONCLUSIONS

This systematic review successfully analyzed the utilization of Android application-based learning media using PowerPoint and I-Spring Suite as innovative educational tools to enhance teaching effectiveness. The comprehensive analysis of 12 selected studies published between 2019-2022 demonstrates that the integration of PowerPoint and I-Spring Suite for Android-based learning media development consistently produces positive educational outcomes across diverse educational contexts in Indonesia. The findings reveal significant improvements in student learning outcomes, with quantitative gains ranging from 15 % to 65 % improvement in average scores, and completion rates increasing up to 325 % in some implementations. Furthermore, all studies reported high feasibility ratings from expert validators, with material expert, media expert, and student usability assessments consistently scoring within the “very good” category (4,1-4,8 on a 5-point scale).

The research evidence supports the conclusion that PowerPoint-I-Spring Suite integration addresses critical educational challenges in developing countries, particularly regarding internet connectivity limitations and cost-effectiveness. The universal success of HTML5 conversion capabilities across all reviewed studies enables the creation of offline-accessible Android applications without requiring specialized programming knowledge, thereby democratizing educational technology development. The consistent enhancement of student engagement and motivation indicators across 75 % of the studies, combined with the successful resolution of implementation challenges through technical support and user training, demonstrates the practical viability of this approach for large-scale educational technology adoption.

These findings collectively establish that integrating Android applications with PowerPoint and I-Spring Suite represents a promising and evidence-based strategy for developing innovative, interactive, and accessible educational resources. The systematic review fulfills its objective of providing educators and instructional designers with comprehensive evidence to support the adoption of this technology combination for modernizing educational practices, particularly in resource-constrained environments where traditional e-learning solutions may be impractical or financially prohibitive.

REFERENCES

1. Huda IA. Development of Information and Communication Technology (ICT) on the Quality of Learning in Elementary Schools. J Pendidik Konseling. 2020;2(1):121-5. doi: https://10.31004/jpdk.v1i2.622

2. Wibawanto W. Design and Programming of Interactive Learning Multimedia. Indonesia: Smart Creative Publishers; 2017. Available from: http://www.wandah.org/e-book-media-learning-interactive

3. Nufninu Y, Dominikus WS, Rimo I. Development of Android Application-Based Learning Media Using PowerPoint and I-Spring on Line and Angle Material for Class VII Students of Middle School. J Emasains J Pendidik Mat Sains. 2021;2(2):17-28. Available from: https://eproceedings.umpwr.ac.id/prosiding/index.php/semnaspgsd/article/view/1038

4. Rambu E, Ndapal M, Tandirerung J, Widiastuti E. The Effect of Using Android Application-Based Learning Media on Learning Outcomes of Class IX Students on the Concept of Plant Propagation. J Pendidik Indones Gemilang. 2022;2(1):9-16. doi: https://10.53889/jpig.v2i1.45

5. Ahmad H, Amaliyah, Abdul F, Nurpratiwi S. Development of 'Greet' Android Application-Based Learning Media in Learning Islamic Religious Education in Higher Education. J Teknol Pendidik. 2022;11(1):118-26. doi: https://10.21009/jtp.v11i1.25847

6. Fatmawati F, Yusrizal Y, Marhamah, Hasibuan A. Development of Android Application-Based Learning Media to Improve Student Social Studies Learning Outcomes. J Sch Dasar PGSD FIP Unimed. 2021;11(2):134-43. doi: https://10.24114/esjpgsd.v11i2.28456

7. Uma S. Development of Android-Based Learning Media Using PowerPoint and I-Spring Suite for Biology Learning. J Dikmatas. 2022;1(3):42-50. Available from: https://jurnal.dikmatas.id/index.php/dikmatas/article/view/123

8. Cuhanazriansyah MR, Rizal F, Irfan D, Abdullah R. Development of Android Technology-Based Monopoly Game Application Media for MIPA Subjects in Vocational High Schools. JRTI (Jurnal Ris Teknol Ind). 2022;7(2):187-95. doi: https://10.29210/30031716000

9. Dibyantini RE, Harahap AF. Developing the I-Spring Media Based on a Project Based Learning Model on the Topic of Alkane Derivatives. J Pendidik Kim. 2022;14(2):97-104. doi: https://10.24114/jpkim.v14i2.34029

10. Hilwana D, Wulandari H, Saepuloh L. Development of Interactive Android Application Learning Media Based on Ispring Suite Software at Muhammadiyah 1 Vocational High School, Sukabumi City. J Penelit Pendidik. 2022;8(7):160-5. doi: https://10.23917/jpp.v8i7.17842

11. Ziezie U, Razak A, Helendra H, Yogica R. Development of Android-Based Learning Media Using PowerPoint Ispring Suite Free on Animal Diversity Subject Pisces. J Kelas Biol. 2022;2(1):70-8. doi: https://10.24036/jkb.v2i1.18567

12. Hadi AP. Development of Ispring Suite 8 Based Learning Media on Refereeing Material for Volleyball Theory and Practice Course 1 Academic Year 2018/2019. Paradig J Filsafat Sains Teknol Budaya. 2019;25(2):18-26. doi: https://10.33503/paradigma.v25i2.559

13. Sulistyorini S, Listiadi A. Development of Android-Based Ispring Suite 10 Learning Media on Adjustment Journal Materials in Vocational High Schools. Edukatif J Ilmu Pendidik. 2022;4(2):2116-26. doi: https://10.31004/edukatif.v4i2.2288

14. Firdha N, Zulyusri Z. The Use of iSpring in the Development of Interactive Learning Media. Diklabio J Pendidik Pembelajaran Biol. 2022;6(1):101-6. doi: https://10.33369/diklabio.6.1.101-106

15. Arsyah RH, Ramadhanu A, Pratama F. Designing and Making Android-Based Learning Media Computer System Subjects (Case Study Class X TKJ SMK Adzkia Padang). J Teknol Sist Inf Bisnis. 2019;1(2):31-8. doi: https://10.47233/jteksis.v1i2.49

16. Hadi N. Powerspring as an Innovative Solution for Fun and Enjoyable Learning at Home During the Covid-19 Pandemic for Elementary School Students. J Pendidik Dasar Tunas Nusant. 2020;2(1):143-54. Available from: https://ejournal.unisnu.ac.id/jtn/article/view/1484

17. Ramdani A, Jufri AW, Jamaluddin J. Development of Android-Based Learning Media During the Covid-19 Pandemic to Improve Students' Scientific Literacy. J Kependidikan J Hasil Penelit Kaji Kepustakaan Bid Pendidik Pengajaran Pembelajaran. 2020;6(3):433-40. doi: https://10.33394/jk.v6i3.2924

18. Putri DPE. The Use of Android-Based Learning Media to Improve Students' Cognitive Learning Outcomes. Edugama J Pendidik Sos Keagamaan. 2019;5(2):104-11. doi: https://10.32923/edugama.v5i2.972

19. Hernawati K. Ispring Presenter Training Module. J Teknol Pendidik. 2010;5(1):18-25. Available from: https://jurnalteknodik.kemdikbud.go.id/index.php/jurnalteknodik/article/view/245

20. Nuraini I, Sutama S, Narimo S. Development of Ispring Suite 8 PowerPoint-Based Learning Media in Elementary Schools. J VARIDIKA. 2020;31(2):62-71. doi: https://10.23917/varidika.v31i2.10220

21. Elida, Novaliendry D, Ardi N, Saari EMB, Dwiyani N. Model Development of Android-Based Learning in Vocational High School. Int J Interact Mob Technol. 2023;17(22):152-9. doi: https://10.3991/ijim.v17i22.45123

22. Novaliendry D, Darmi R, Hendriyani Y, Nor M, Azman A. Android-Based Network Services Application Learning Media for Vocational High Schools. Int J Interact Mob Technol. 2021;15(20):83-100. doi: https://10.3991/ijim.v15i20.25823

23. Mayer RE, Clark RC. E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. 4th ed. New York: Wiley; 2016.

24. Black P, Wiliam D. Developing the theory of formative assessment. Educ Assess Eval Account. 2009;21(1):5-31. doi: https://10.1007/s11092-008-9068-5

25. Paivio A. Mental Representations: A Dual Coding Approach. New York: Oxford University Press; 1986.

26. Gardner H. Multiple Intelligences: New Horizons in Theory and Practice. New York: Basic Books; 2006.

27. Novaliendry D, Huda A, Annisa L, Costa RRK, Yudhistira, Eliza F. The Effectiveness of Web-Based Mobile Learning for Mobile Subjects on Computers and Basic Networks in Vocational High Schools. Int J Interact Mob Technol. 2023;17(9):20-30. doi: https://10.3991/ijim.v17i09.39337

28. Sudarni AR. Development of Android-Based Electronic Module Using Sigil Application As A Learning Media. J Teknol Inf Pendidik. 2023;16(1):54-63. doi: https://10.24036/jtip.v16i1.464

29. Rahmiai, Yuliana, Adri M, Dewi IP. Interactive Multimedia Mobile Learning Application Design for Research Methods Course at Faculty of Education, Padang State University. J Teknol Inf Pendidik. 2019;12(2):44-52. doi: https://10.24036/tip.v12i2.239

30. Riyanto D, Jollyta D. Implementation of Augmented Reality for Human Digestive System Recognition Using Marker-Based Tracking Method as Learning Media. J Teknol Inf Pendidik. 2023;5(1):42-7. doi: https://10.24036/tip.v5i1.567

31. Arrasyid R, Ruhimat M, Setiawan I, Ihsan HM, Darmawan W, Mulyana A, et al. Design, Development, and Evaluation of a Mobile Learning Application for Geography Education. J Adv Res Appl Sci Eng Technol. 2024;38(1):109-34. doi: https://10.37934/araset.38.1.109134

32. Juhanaini J, Rizqita AJ, Tandu Bela MRWA, Hernawati T, Qolbi IN, Khimmataliyev DO. Android-Based Technology: Development of Game-Based Learning Media Based on the Results of Analysis of Arithmetic Learning Difficulties. J Adv Res Appl Sci Eng Technol. 2024;48(1):1-28. doi: https://10.37934/araset.48.1.128

33. UNESCO. Education for All Global Monitoring Report 2015: Education for All 2000-2015: Achievements and Challenges. Paris: UNESCO Publishing; 2015.

34. Cochrane Collaboration. Cochrane Handbook for Systematic Reviews of Interventions Version 6.3. London: Cochrane; 2022. Available from: https://training.cochrane.org/handbook

35. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi: https://10.1136/bmj.n71

FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Elida.
Data curation: Ilham Zamil.
Formal analysis: Febri Ananda.

Research: Yolanda Intan Sari.
Methodology: Elida.
Project management: Elida.
Resources: Erni Marlina Saari.
Software: Syafrijon.
Supervision: Elida.
Validation: Febri Ananda.
Display: Ilham Zamil
Drafting - original draft: Elida.
Writing - proofreading and editing: Elida, Syafrijon.