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DEVELOPMENT OF AN INTERACTIVE ANDROID-BASED LEARNING APPLICATION INTEGRATING HIGHER-ORDER THINKING SKILLS FOR ECONOMICS EDUCATION TO SUPPORT SUSTAINABLE DEVELOPMENT GOALS (SDGS)

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Abstract

This study presents the development of an interactive Android-based learning application that integrates higher-order thinking skills (HOTS) to support economics education and contribute to the Sustainable Development Goals (SDGs). The study employed a research and development (R&D) approach using the ADDIE framework to guide system analysis, application design, development, implementation, and evaluation. The application was developed using interactive multimedia authoring tools and implemented as a client-based Android system featuring structured learning modules, HOTS-oriented tasks, simulations, and self-assessment components. System feasibility and usability were evaluated through expert validation and user response analysis, while system effectiveness was assessed using a pretest-posttest experimental design. The results indicate that the application demonstrates high feasibility in terms of interface design, navigation, and content integration, and significantly improves learners' HOTS-based understanding of economic concepts. These findings suggest that the developed application functions effectively as a technology-driven learning system capable of supporting scalable, interactive, and HOTS-oriented learning, aligning educational technology innovation with sustainable development objectives.

Keywords: Economics, Higher-order thinking skills, Learning media, Thinkomi application, Senior high school.

1. Introduction

The rapid advancement of digital technology has driven the development of interactive learning systems that support scalable, flexible, and technology-driven knowledge delivery, particularly in Southeast Asia [1, 2]. In this context, learning applications are no longer limited to content delivery but are increasingly designed as interactive systems that facilitate cognitive processing, user engagement, and adaptive learning experiences [3]. One of the important subjects is economics education [4-8]. For this subject, the integration of higher-order thinking skills (HOTS) has become a critical requirement to address the complexity of socio-economic problem-solving and the demands of the digital era [8-10]. However, many existing digital learning media remain content-centred and lack systematic integration of HOTS-oriented interaction, simulation, and evaluation features [11, 12]. Previous studies have developed digital economics learning applications and interactive platforms, yet most focus primarily on pedagogical outcomes without emphasizing system architecture, interactivity design, or technological integration [13-18]. This gap highlights the need for a technology-oriented learning application that integrates HOTS within an interactive Android-based system.

This study aims to design and develop an interactive Android-based learning application that integrates HOTS-oriented learning components for economics education. The novelty of this study lies in (i) the integration of HOTS into an interactive Android learning system, (ii) the transformation of abstract economic concepts into system-driven interactive simulations and assessments, and (iii) the alignment of educational technology development with Sustainable Development Goals (SDGs) [19-23], through scalable and technology-enabled learning solutions.

2. Literature Review

The application of digital technology in learning increasingly emphasizes interactivity, system responsiveness, and user-centred design to enhance learning effectiveness and cognitive engagement [25, 26]. Interactive multimedia platforms such as Articulate Storyline and Nearpod support structured content delivery, real-time interaction, and integrated assessment, transforming learning media into interactive systems [1, 27]. In economics education, HOTS integration is essential, yet many digital applications remain content-oriented and lack system-level interactive features [28-31]. Mobile-based learning systems offer flexibility and scalability across learning contexts [32, 33]. Addressing these limitations, the Thinkomi application integrates HOTS-oriented processes within an interactive Android-based system architecture (Fig. 1), enabling dynamic content processing, user interaction, and real-time feedback in a unified learning platform [34, 35].

3. Method

This study employed a Research and Development (R&D) approach using the ADDIE framework, comprising analysis, design, development, implementation, and evaluation stages. Learning requirements were identified through interviews. The Thinkomi application was developed using Articulate Storyline and Smart Apps Creator and validated by media and subject-matter experts. System effectiveness was evaluated using a pretest-posttest design with experimental and control groups, supported by t-test analysis and user response questionnaires. Detailed procedures are reported elsewhere [36].

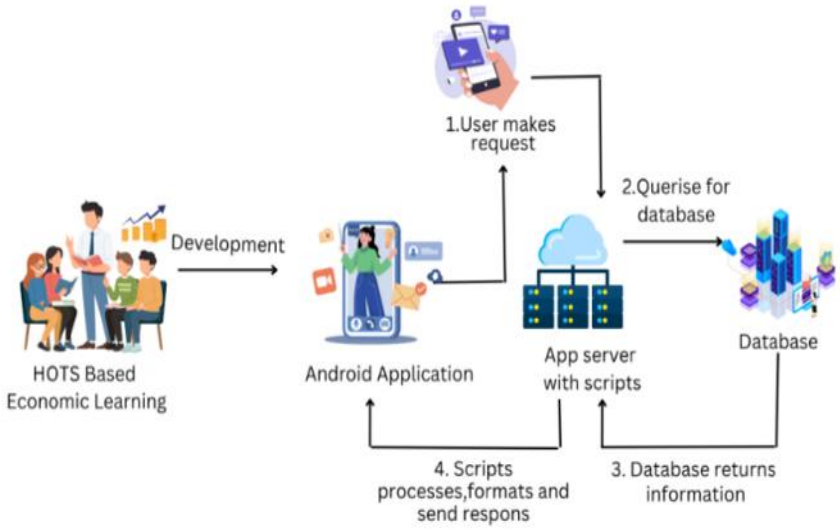

Fig. 1. A client-server system based on the Android platform.

4. Results and Discussion

Figure 2 presents the ADDIE-based development process of the Thinkomi application, designed to address students' difficulties in understanding abstract economic concepts through HOTS-oriented, contextual digital content aligned with the Merdeka Curriculum [37, 38]. Technologically, Thinkomi is an Android-based interactive learning application developed using Articulate Storyline and Smart Apps Creator, integrating multimedia materials, interactive navigation, simulations, and system-driven assessments within a unified learning environment.

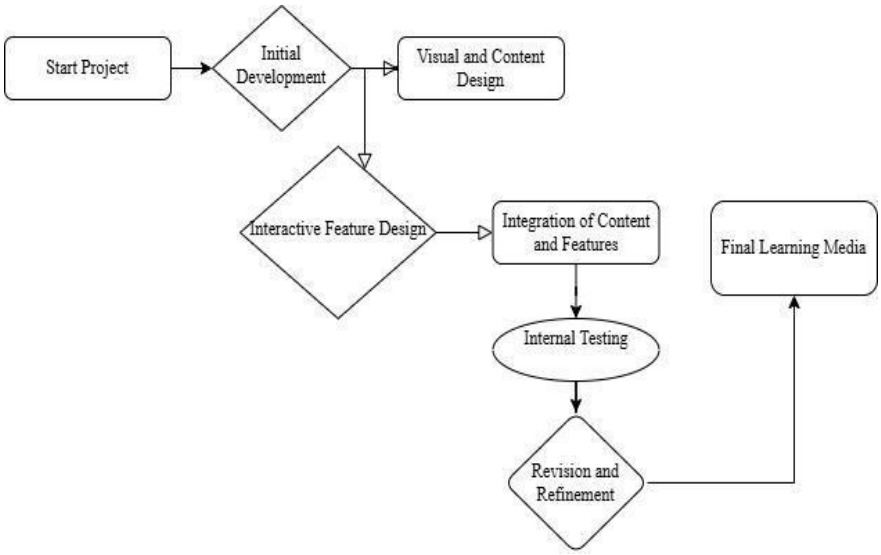

Fig. 2. Flowchart of Thinkomi applications.

Expert validation results indicate high system feasibility and usability, with average scores of 4.3 from media experts and 4.2 from subject-matter experts, reflecting strong interface design, navigation, and content-system alignment. Experimental results show that the experimental group achieved significantly higher learning gains than the control group, with scores increasing from 60.1 to 84.5 and confirmed by paired and independent sample t-tests ($p < 0.05$). Figure 3 presents the main interface and functional components of the Thinkomi application, supporting a structured learning process from conceptual interpretation to contextual application through interactive features [26]. These findings reinforce previous studies on HOTS-oriented digital learning effectiveness [39] and highlight Thinkomi's contribution to sustainable, technology-driven education aligned with SDG 4 [40-42].

Fig. 3. Thinkomi application product, appearing (a) Main menu, (b) Competence, (c) Learning materials, (d) Learning video, (e) AI Assistant, (f) Evaluation.

5. Conclusion

This study has successfully developed an interactive Android-based learning application that integrates HOTS for economics education. The system demonstrates high feasibility in terms of interface design, functional integration, and usability, and shows significant effectiveness in improving learners' HOTS-

based understanding of economic concepts. The integration of interactive modules, simulations, and system-driven assessments enables structured cognitive processing beyond procedural learning. From a technological perspective, the application offers a scalable and adaptable learning system that supports digital transformation in education. Furthermore, its implementation aligns with the SDGs, particularly SDG 4, by providing technology-enabled access to quality learning and fostering higher-order cognitive skills essential for sustainable human capital development.

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