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Development and Usability Evaluation of the PoultryXpert Mobile Application for Learning Poultry Production Issues in Agricultural Science Education

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ABSTRACT

This study aims to develop an instructional material, specifically a mobile application module named PoultryXpert, which focuses on issues and challenges in poultry production, identified as one of the most difficult subtopics for students to master in Agricultural Science. Secondary school students enrolled in Agricultural Science are introduced to fundamental agricultural concepts, theories, and practical skills particularly in poultry farming. However, students often encounter difficulties in mastering poultry production topics due to limited learning resources and heavy reliance on textbooks as the primary source of information. In addition, low student engagement in seeking current and relevant information further limits their understanding of the subject matter. Therefore, this study was conducted to determine the need for the development of the PoultryXpert application and to evaluate its usability as a digital learning tool among students. A quantitative research design was employed, guided by the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation). The study involved 19 Form Four Agricultural Science students from Sekolah Menengah Kebangsaan Kuala Krai, who participated in an online survey. Data were analyzed using the Statistical Package for Social Science (SPSS), focusing on descriptive statistics, namely mean and standard deviation. Content validity was established through expert evaluation involving Agricultural Science lecturers and teachers. The findings show that the PoultryXpert application demonstrates a very high level of usability. The content component recorded a mean score of 4.85 (SD = 0.289), while the interactive elements obtained a mean of 4.81 (SD = 0.336). The multimedia suitability component achieved a mean of 4.82 (SD = 0.362), indicating consistently high usability across all dimensions. Overall, the results suggest that the mobile application has strong potential as an interactive learning tool that can enhance students' understanding and academic performance by providing relevant and accessible knowledge related to challenges in poultry production within the agricultural sector.

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1. Introduction

Agriculture remains one of the strategic sectors contributing to national food security, economic sustainability and rural development. Consequently, agricultural education plays a vital role in equipping future generations with the knowledge, practical competencies and problem-solving skills required to address the evolving challenges faced by the agricultural industry. In Malaysia, Agricultural Science is offered at the secondary school level to provide students with fundamental knowledge and practical exposure to crop production, livestock management, agricultural technology and agribusiness. The subject serves as an important foundation for students who intend to pursue further studies or careers in agriculture and related industries.

Within the Agricultural Science curriculum, the topic of Issues and Challenges in Poultry Production forms an important component of poultry production studies for Form Four students. This topic introduces students to various contemporary issues affecting the poultry industry, including disease outbreaks, increasing feed costs, biosecurity management, market fluctuations, environmental sustainability and food security. Understanding these issues enables students to appreciate the complexity of modern poultry production and develop analytical thinking skills that are essential for future agricultural professionals.

Despite its importance, this topic has consistently been regarded as one of the most challenging areas for students to master. Classroom observations indicate that many students rely heavily on textbooks and teacher-centered instruction, resulting in limited opportunities to explore authentic industry issues beyond the prescribed curriculum [13, 14]. Conventional teaching approaches often provide only basic explanations, which may not sufficiently support students in understanding the dynamic and multidisciplinary nature of poultry production challenges [5, 11].

In addition, many students demonstrate limited motivation to independently seek current agricultural information from external sources. This may reduce their awareness of the relevance of poultry production issues to contemporary food systems and sustainable agricultural development, thereby encouraging greater interest in agricultural education and related career [7, 8, 16]. Therefore, innovative digital learning resources that encourage active learning and self-directed exploration are increasingly needed to improve students' engagement and conceptual understanding.

The rapid advancement of educational technology has transformed the way teaching and learning activities are delivered. Mobile learning applications have become increasingly popular because they provide flexible, accessible and interactive learning experiences that extend beyond the traditional classroom environment [3, 6]. Through multimedia integration, interactive assessments and self-paced learning opportunities, mobile learning has been shown to enhance students' motivation, engagement and learning outcomes [4, 10].

In response to these educational needs, this study developed an interactive mobile learning application known as PoultryXpert, specifically designed to facilitate students' understanding of issues and challenges in poultry production. The application integrates multimedia learning materials, interactive quizzes, videos and supplementary resources into a single learning platform that supports both classroom instruction and independent learning.

Accordingly, this study was conducted to achieve the following objectives:

1. To develop the PoultryXpert mobile learning application focusing on issues and challenges in poultry production.
2. To evaluate the usability of the PoultryXpert mobile learning application among secondary school students in digital learning environments.

2. Literature Review

The integration of mobile learning into agricultural education has gained increasing attention due to its potential to enhance students' engagement, accessibility to learning resources, and independent learning [12, 17]. Mobile applications provide flexible learning opportunities by integrating multimedia elements, interactive assessments and self-paced learning, enabling students to access educational content anytime and anywhere. Previous studies have reported that mobile learning significantly improves students' motivation, learning engagement and academic performance across various educational settings [2, 15].

The development of digital learning materials should also be grounded in appropriate learning theories. The Cognitive Theory of Multimedia Learning (CTML) proposed by Mayer [9] suggested that meaningful learning occurs when learners actively process information presented through both verbal and visual channels. The integration of multimedia components, such as text, graphics, animations and videos, reduces cognitive overload and enhances knowledge construction. Therefore, multimedia-based instructional materials should be designed according to established multimedia principles to maximize learning effectiveness.

To ensure a systematic development process, this study adopted the ADDIE instructional design model, which consists of five sequential phases: Analysis, Design, Development, Implementation and Evaluation. The ADDIE model has been widely applied in the development of educational technologies because it provides a structured and learner-centered framework for designing, developing and evaluating instructional materials [1]. By integrating multimedia learning principles with a systematic instructional design model, the PoultryXpert mobile application was developed to provide an interactive learning environment that supports students' understanding of poultry production issues and challenges.

3. Methodology

3.1 Research Design

This study employed a quantitative Developmental Research Design (DDR) to develop and evaluate the usability of the PoultryXpert mobile learning application. The development process was guided by the ADDIE instructional design model, which comprises five phases: Analysis, Design, Development, Implementation, and Evaluation [1].

3.2 Application Development

During the analysis phase, students' learning needs and difficulties in understanding the topic 'Issues and Challenges in Poultry Production' were identified through curriculum review and classroom observations. Based on these findings, the application content, interface, multimedia elements, and interactive quizzes were designed and developed. The completed application was then implemented with the target students before its usability was evaluated using a structured questionnaire.

3.3 Participants and Instrument

The participants were 19 Form Four Agricultural Science students from Sekolah Menengah Kebangsaan Kuala Krai, Kelantan, selected through purposive sampling. Data was collected using a validated questionnaire consisting of demographic items and three usability constructs: content

quality, interactive features, and multimedia suitability. Responses were measured using a five-point Likert scale.

3.4 Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including mean and standard deviation, were used to evaluate the usability of the PoultryXpert application. Higher mean scores indicated higher levels of perceived usability.

4. Results and Discussion

4.1 Development of the PoultryXpert Mobile Learning Application

The PoultryXpert mobile learning application was successfully developed using the ADDIE instructional design model, which consists of five phases: Analysis, Design, Development, Implementation, and Evaluation. The application was specifically designed to facilitate the teaching and learning of the topic “Issues and Challenges in Poultry Production” among Form Four Agricultural Science students. Figure 1 presents the PoultryXpert logo and home screen.



Fig. 1. PoultryXpert Logo and Home Screen

The application integrates various multimedia learning components, including structured learning notes, graphics, instructional videos, interactive quizzes, and user-friendly navigation features. These components were developed to promote active learning while providing students with flexible access to learning materials beyond the classroom environment. The application also incorporates formative assessments that allow students to evaluate their understanding immediately after completing each learning section.

The overall interface was designed with emphasis on simplicity, accessibility, and ease of navigation to encourage independent learning. Figure 2 illustrates the main interface of the PoultryXpert application.



Fig. 2. Main interface

4.2 Usability Evaluation of the PoultryXpert Mobile Learning Application

The usability of the PoultryXpert application was evaluated using three constructs: content quality, interactive features, and multimedia suitability. Descriptive statistics, including the mean and standard deviation, were calculated to determine students' perceptions of the developed application.

Overall, the findings demonstrate that the PoultryXpert application achieved an excellent level of usability across all evaluated constructs, with mean scores exceeding 4.80 as shown in Table 1. These findings indicate that the application was well accepted by students and effectively supported digital learning in Agricultural Science.

Table 1

Descriptive Statistics of the PoultryXpert Application Usability (n = 19)

Construct	Mean	SD	Interpretation
Content Quality	4.85	0.289	Excellent
Interactive Features	4.81	0.336	Excellent
Multimedia Suitability	4.82	0.362	Excellent

Among the evaluated constructs, content quality obtained the highest mean score ($M = 4.85$, $SD = 0.289$). This suggests that students perceived the instructional materials as accurate, relevant, and well organized. The structured presentation of learning objectives, current poultry production issues, supplementary explanations, and self-assessment activities likely contributed to students' positive perceptions. Well-designed instructional content enables learners to understand complex concepts more effectively while supporting meaningful knowledge construction [9].

The multimedia suitability construct recorded the second highest mean score ($M = 4.82$, $SD = 0.362$), indicating that students appreciated the application's visual design, graphics, typography, color selection, and embedded learning videos. This is consistent with the Cognitive Theory of Multimedia Learning, which proposes that learners process information more effectively when verbal and visual representations are presented simultaneously [9].

Similarly, the interactive features received a high usability rating ($M = 4.81$, $SD = 0.336$), suggesting that students valued the interactive quizzes, navigation functions, and immediate learning feedback provided by the application. Previous studies have shown that interactive mobile learning environments improve learner engagement, motivation, and academic achievement [2, 15].

Taken together, these findings indicate that the PoultryXpert application successfully integrates high-quality instructional content, effective multimedia design, and interactive learning features into a single mobile learning platform. The consistently high usability ratings across all three constructs suggest that the application has considerable potential to complement conventional classroom teaching and facilitate students' understanding of poultry production issues and challenges.

4.3 Educational Implications

The findings of this study have important implications for Agricultural Science education at the secondary school level. Conventional teaching approaches frequently rely on printed textbooks and teacher-centred instruction, which may limit students' opportunities to explore current issues affecting the poultry industry. The PoultryXpert application addresses this limitation by providing students with a flexible, interactive, and multimedia-supported learning environment that extends beyond the classroom.

The application also supports self-directed learning by enabling students to revisit learning materials, complete interactive quizzes, and reinforce their understanding at their own pace. Therefore, integrating mobile learning applications such as PoultryXpert into Agricultural Science teaching may improve students' conceptual understanding while encouraging greater interest in agriculture and the poultry industry.

5. Conclusion

This study successfully developed the PoultryXpert mobile learning application using the ADDIE model to support the teaching and learning of issues and challenges in poultry production. The findings showed excellent usability for content quality, interactive features, and multimedia suitability. Therefore, PoultryXpert has the potential to complement conventional classroom instruction and support independent learning among Form Four Agricultural Science students.

However, the study involved only 19 students from a single secondary school and evaluated usability without measuring actual learning outcomes. Future studies should include larger and more diverse samples and examine the application's effects on academic achievement, learning motivation, critical thinking, and long-term knowledge retention.

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