Development and Expert Evaluation of a 2D Animation Android Application for Teaching the Open Systems Interconnection Model in an IP Address and Subnetting Course

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ABSTRACT

This study designed, developed and evaluated a 2D animation Android application for teaching the Open Systems Interconnection (OSI) Model in an IP Address and Subnetting course for Information Technology students at Malaysian Vocational Colleges. Developed through the five ADDIE phases, the application integrates animation, text, narration, graphics, notes, navigation controls and quizzes. Six purposively selected experts evaluated the product: three content experts and three multimedia design experts. Two dichotomous checklists assessed content, interface, interaction and functionality, while open-ended items collected recommendations. Closed responses were summarised using frequencies and percentage agreement; written comments were categorised by application component and used to guide revisions. All content experts agreed with every rated content item. Multimedia experts agreed with every interaction item and all but one interface item; subtitle positioning received agreement from two of three experts (67%). These findings provide preliminary evidence of content appropriateness and expert-perceived multimedia functionality. They do not demonstrate effects on student understanding, engagement, achievement or retention, which require direct evaluation with the target students.

Keywords:
2D animation; OSI model; Android application; ADDIE; Expert evaluation

Introduction

Information and Communication Technology (ICT) has expanded the range of digital resources available for education. Mobile learning enables learners to access instructional materials through portable devices and can support self-directed learning when applications are designed around specific content and user needs (Razali & Khalid, 2021). In technical and vocational education, mobile applications have also been developed to organise specialised content and interactive learning activities (Ahmad et al., 2020).

Smartphones provide a practical platform for educational applications because they can combine text, graphics, audio, animation and user-controlled interaction within one portable resource. Previous Malaysian development studies have used Android applications to support self-learning and to evaluate content, interface and interaction design (Hamzah et al., 2017; Razali & Khalid, 2021). In the present study, the smartphone is therefore treated as a delivery platform for an OSI Model learning aid rather than as evidence, by itself, of improved learning.

2D animation can represent temporal sequences and processes that are difficult to observe directly. A recent overview of 29 multimedia-learning reviews found positive meta-analytic evidence for design principles including animation,

modality, segmentation and signalling, while also showing that learning depends on how multimedia is designed (Noetel et al., 2022). Accordingly, the proposed application combines 2D animation with narration, notes, controls and quizzes, while its actual effect on student learning remains a question for subsequent empirical testing.

Research Background

Malaysian educational practice increasingly emphasises student-centred and technology-supported learning. Mobile applications can provide structured opportunities for self-directed access to learning materials, while prior Android development research has evaluated information, interface and interaction features as important product dimensions (Hamzah et al., 2017; Razali & Khalid, 2021). This study applies those design considerations to a specialised networking topic in vocational education.

The OSI Model is a subtopic in the IP Address and Subnetting course for IT students at Vocational Colleges. Students often struggle to understand the processes within each OSI layer, relying on theoretical memorization without practical understanding. This challenge is supported by research indicating students' difficulty in grasping basic data flow concepts in the OSI Model (Harun et al., 2022). A thorough understanding of the OSI Model is crucial for IT students, especially for future careers in programming, teaching, or network engineering, which require strong problem-solving skills.

Preliminary interviews with two Information Technology lecturers who had taught the topic indicated difficulty explaining processes that occur within the OSI layers. The lecturers reported using printed explanations and YouTube videos, but considered these resources limited in user interaction. Their comments informed the need analysis and the decision to include user-controlled animation, notes, navigation and quizzes. Because the interviews were exploratory and involved only two lecturers, these observations are treated as design requirements rather than generalisable evidence about all Vocational Colleges.

Learners may differ in readiness, prior knowledge, interests and learning profiles; differentiated pedagogy therefore encourages teachers to vary learning resources rather than assume fixed visual, auditory, or kinaesthetic types (Mustaffa et al., 2021). Animation offers a plausible means of displaying the sequence of events across OSI layers, and recent synthesis supports animation, modality, segmentation and signalling as relevant multimedia-design principles (Noetel et al., 2022). However, claims about increased interest or learning outcomes require direct learner data. The present development study consequently evaluates the application's content appropriateness and multimedia functionality through experts and reserves student-effectiveness testing for future research.

The design problem was the limited interactivity of the materials reportedly used by the interviewed lecturers and the difficulty of representing processes that occur across the seven OSI layers. This study therefore developed an Android application that integrates animation, narration, notes, navigation controls and quizzes. Its scope is product design, development and expert evaluation; it does not test whether the application improves student engagement, understanding, or achievement.

Literature Review

The Open Systems Interconnection (OSI) Basic Reference Model provides a seven-layer conceptual framework for systems interconnection; the current ISO/IEC 7498-1 standard replaced the first 1984 edition (International Organization for Standardization & International Electrotechnical Commission [ISO/IEC], 1994). The layers are Application, Presentation, Session, Transport, Network, Data Link and Physical (Li et al., 2011). In education, Harun et al. (2022) reported that students experienced difficulty understanding basic OSI data flow and developed a mobile visual guide to support the topic. These findings justify a visual design response, but they do not establish that every vocational student has the same difficulty.

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Mobile learning and 2D animation provide relevant design precedents rather than guaranteed solutions. Hamzah et al. (2017) developed an Android application and evaluated its information, interface and interaction design, while Zhou et al. (2022) reported the development of a 2D mobile vocabulary application. Noetel et al. (2022) synthesised evidence across 29 reviews of multimedia design for learning, and Wangi et al. (2021) developed an ADDIE-based learning video in primary education. Together, these studies support the selection of mobile multimedia features, but their different participants, subjects and evaluation methods mean that effectiveness claims for OSI learning must be tested separately.

The application design draws on cognitive and constructivist perspectives. Cognitive theory emphasises the organisation and processing of information (Sutarto, 2017), while the revised taxonomy distinguishes the cognitive processes Remember, Understand, Apply, Analyse, Evaluate and Create (Anderson & Krathwohl, 2001). Constructivism views learners as active participants in knowledge construction (Suparlan, 2019) and mobile applications can operationalise this principle through user-controlled navigation, repeated viewing, notes and quizzes (Ahmad et al., 2020). These principles informed design decisions; the current expert evaluation did not measure learners' cognitive processing or knowledge construction.

The development process followed the ADDIE model: Analysis, Design, Development, Implementation and Evaluation (Branch, 2009). ADDIE provides a systematic structure for aligning needs, objectives, media production, implementation and evaluation. Existing mobile applications supplied useful precedents for content and interface development (Hamzah et al., 2017; Harun et al., 2022), while the present product adds animated representations of all seven OSI layers, notes, controls and quizzes for the targeted course. The identified gap is therefore a context-specific product-design gap, not evidence that the application has already improved learning.

Research Objectives and Questions

The objectives of this study are:

1. To design a 2D animation Android application on the OSI Model for the IP Address and Subnetting course.
2. To develop the 2D animation Android application on the OSI Model for the IP Address and Subnetting course.
3. To evaluate expert agreement regarding the content appropriateness, multimedia design and functionality of the 2D animation Android application.

The research questions are:

1. What is the appropriate design to be applied in the development of a 2D animation Android application on the OSI Model for the IP Address and Subnetting course?
2. How is a 2D animation Android application on the OSI Model for the IP Address and Subnetting course structured and developed?
3. What level of expert agreement is obtained regarding the content appropriateness, multimedia design and functionality of the 2D animation Android application?

Methods

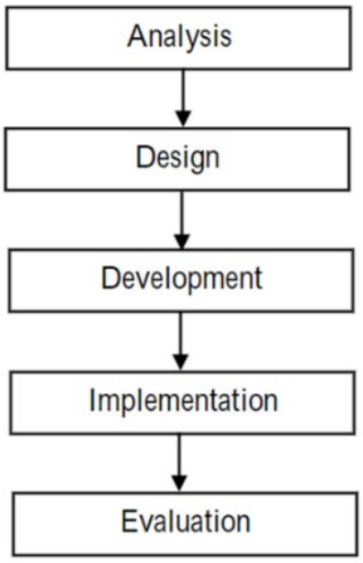
This study used a design-and-development approach to produce and conduct a formative expert evaluation of a 2D animation Android application. The unit of evaluation was the application, not student learning. The methodology comprised the ADDIE development process, purposive expert selection, two expert-review checklists, descriptive analysis of dichotomous responses and a descriptive categorisation of written comments.

The ADDIE model was selected because it organises instructional product development into Analysis, Design, Development, Implementation and Evaluation phases (Branch, 2009). In this study, implementation referred to technical deployment and demonstration of the application to the expert evaluators. Evaluation was limited to expert

review of content, interface, interaction and functionality; no student survey, interview, pre-test, post-test, or learning-outcome comparison was conducted.

Figure 1

ADDIE Model (*Branch, 2009*)



Analysis Phase

The analysis phase identified the instructional problem, target users, course content, platform requirements and multimedia needs. Evidence was drawn from the IP Address and Subnetting course outline, a review of relevant applications and literature and preliminary interviews with two lecturers who had taught the OSI Model topic. The lecturers' observations were used to define product requirements and were not analysed as outcome data.

Design Phase

During the design phase, the content sequence, navigation structure, interface, storyboards, colour scheme, typography, audio, graphics, animations, notes and quiz components were specified. Learning objectives focused on introducing the seven OSI layers, their functions and associated protocols. The design linked these objectives to the application's content screens and user-controlled learning activities.

Development Phase

During development, the approved storyboards and media specifications were converted into a functional Android application. Adobe Illustrator was used to prepare graphical assets and Adobe Animate was used to assemble the interfaces, animations, narration, buttons and navigation logic. Internal technical checks were conducted iteratively to identify broken links, incorrect button behaviour, audio problems and content-display errors before expert review.

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Implementation Phase

During implementation, the completed application was installed on compatible Android devices and demonstrated individually to the six experts. Each expert was given access to the application and instructions for reviewing the relevant domain. The content experts reviewed instructional accuracy and alignment, whereas the multimedia experts reviewed interface, interaction, presentation and technical functionality.

Expert Selection

Purposive sampling was used to recruit six experts whose qualifications corresponded to the two review domains. The content experts were Vocational College lecturers specialising in Information Technology or Computer Science, while the multimedia experts were university academics specialising in Educational Technology or Technical and Vocational Education. As reported in Tables 2 and 3, the experts had between 9 and 19 years of relevant professional experience. Three experts were selected for each domain to provide specialised formative review rather than population-level estimation. Nevertheless, the small expert panels limit the generalisability and precision of the agreement percentages.

Expert-Review Instruments

Two researcher-developed checklists were organised around the study objectives, course content, application specifications and the information–interface–interaction dimensions used in related application-development research (Hamzah et al., 2017; Hamzah et al., 2022). The content checklist comprised eight main items, several with layer-specific sub-items. The multimedia checklist comprised 16 interface items and 10 interaction/functionality items. A dichotomous Yes/No format was used because each item represented a specified application requirement that experts judged as either met or not met, rather than a graded attitude or perception. Open-ended spaces allowed experts to explain concerns and recommend revisions. No separate instrument-validation study or independent pilot study was conducted; this limitation is considered when interpreting the findings.

Evaluation Procedure

The evaluation procedure consisted solely of expert review. Three content experts and three multimedia experts independently used structured Yes/No checklists and could record written comments or recommended changes in open-ended spaces. Closed responses were summarised as frequencies and percentage agreement. Written comments were reviewed and descriptively grouped according to content, language, interface, graphics and animation, and user guidance. Each recommendation was considered by the development team, and feasible revisions were implemented and documented. No interviews were conducted during the formal evaluation and no student learning outcomes were assessed.

Data Analysis

For each closed item, percentage agreement was calculated as the number of Yes responses divided by the number of experts in that review panel and multiplied by 100. With three experts per panel, agreement values could only be 0%, 33%, 67%, or 100%; the percentages are therefore descriptive indicators of expert consensus, not inferential evidence of effectiveness. Reliability coefficients such as Cronbach's alpha were not calculated because the items were dichotomous requirement checks and the panels were small. Formal content-validity indices and chance-corrected agreement were also not computed; accordingly, the findings are reported as expert agreement and preliminary evidence of content appropriateness, not as definitive psychometric validation. Any disagreement or written recommendation was examined by the development team, and the corresponding application component was revised when the change was technically and pedagogically appropriate.

Interface Design

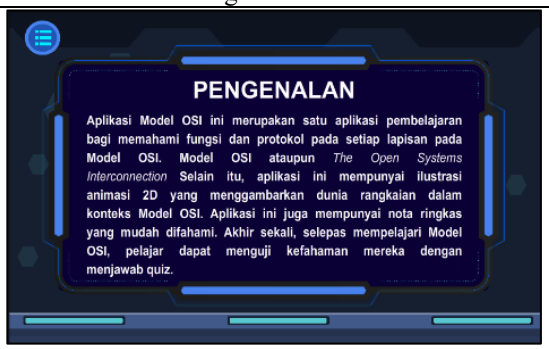
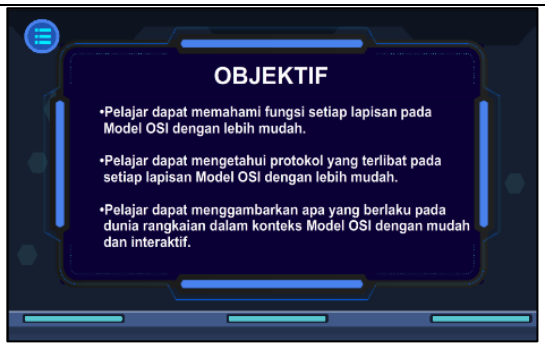
Interface design comprised the arrangement of content, multimedia and interactive elements across the application. Storyboards specified the start page, main menu, introduction, learning objectives, seven animated OSI-layer sections, notes, quiz and user guide. Table 1 summarises the principal screens and multimedia elements.

Table 1

Interface Page

Page Interface	Page Description
 Start Page	The home screen shows the use of text,graphics and audio. Text - Title of the application Graphic - Design of the background screen and interaction Animation - Text title and mailbox and characters
 Main Page	The main page shows the use of animation text, graphics and audio for the OSI Model animation. Text - Subtitle and button name Graphic - Design of the background page screen and interaction buttons Audio - Background music and video narrator Animation - Animation for 7 layers of OSI Model
 Note Tab	The note tab shows the use of text and graphics. Text - Title and content of the note Graphic - Design of the background screen and interaction

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Page Interface	Page Description
 Introduction Page	The introduction page shows the use of text and graphics. Text - Title and content of the introduction Graphic - Design of the background screen and interaction
 Objective Page	The objective page shows the use of text and graphics. Text - Title and content of the objective Graphic - Design of the background screen and interaction
 Quiz Page	The quiz page shows the use of text and graphics. Text – Question, answer, mark and button name of the quiz Graphic - Design of the background screen and interaction
 User Guide Page	The user guide page shows the use of text and graphics. Text –Button name and function of the button Graphic - Design of the background screen and interaction

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Results

Six experts completed the review: three evaluated the content and three evaluated the multimedia design. The content panel consisted of Vocational College lecturers in Information Technology or Computer Science. The multimedia panel consisted of university academics in Educational Technology or Technical and Vocational Education. Tables 2 and 3 summarise the experts' qualifications and reported years of experience.

Table 2

Background of the Content Experts

Details	Expert 1	Expert 2	Expert 3
Gender	Male	Male	Male
Educational status	Bachelor degree	Master	Bachelor degree
Specialization	Information Technology	Computer Science	Information Technology
Work Experience	10 years	18 years	9 years
Position	Lecturer	Lecturer	Lecturer

Table 3

Background of the Multimedia Experts

Details	Expert 1	Expert 2	Expert 3
Gender	Female	Female	Female
Educational status	PhD	PhD	PhD
Specialization	Educational Technology	Educational Technology	TVET
Work Experience	10 years	10 years	19 years
Position	Senior Lecturer	Senior Lecturer	Associate Professor

Content Expert Assessment Analysis

The content checklist contained eight main items, including layer-specific sub-items. Frequencies and percentage agreement are shown in Table 4. These values summarise the three content experts' judgments and should not be interpreted as evidence of student learning effectiveness.

Table 4

Content Expert Assessment Results

No.	Item	Frequency		Agreement (%)
		Yes	No	
1.	The content in this application is clearly related to the OSI Model	3	0	100
2.	The Introduction and Objective content is suitable for OSI Model learning	3	0	100
3.	The 2D animations in the following sections are easy to understand			
	i. Application Layer	3	0	100
	ii. Presentation Layer	3	0	100
	iii. Session Layer	3	0	100
	iv. Transport Layer	3	0	100
	v. Network Layer	3	0	100
	vi. Data Link Layer	3	0	100

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No.	Item	Frequency		Agreement (%)
		Yes	No	
	vii. Physical Layer	3	0	100
4.	The explanation of each OSI Model layer clearly illustrates the relevant network communication process			
	i. Application Layer	3	0	100
	ii. Presentation Layer	3	0	100
	iii. Session Layer	3	0	100
	iv. Transport Layer	3	0	100
	v. Network Layer	3	0	100
	vi. Data Link Layer	3	0	100
	vii. Physical Layer	3	0	100
5.	Notes on each OSI Model layer below use correct information			
	i. Application Layer	3	0	100
	ii. Presentation Layer	3	0	100
	iii. Session Layer	3	0	100
	iv. Transport Layer	3	0	100
	v. Network Layer	3	0	100
	vi. Data Link Layer	3	0	100
	vii. Physical Layer	3	0	100
6.	The content of the animation video can illustrate the protocols involved in each OSI Model layer	3	0	100
7.	The content used can increase knowledge about the protocols and functions of each OSI Model layer	3	0	100
8.	The narrator's audio explains the correct content	3	0	100

All three content experts selected Yes for every rated item, indicating unanimous panel agreement on relevance to the OSI Model, suitability of the introduction and objectives, clarity of the layer explanations, accuracy of the notes, representation of protocols and accuracy of the narration. The item stating that the content could increase knowledge records an expert expectation rather than a measured student outcome. One written recommendation requested additional supporting graphics; this suggestion was used to refine the visual presentation.

Interface Expert Assessment Analysis

The interface checklist assessed text, colour, graphics, icons, navigation arrangement, narration, animation, button design and the user-guide page. Table 5 reports the three multimedia experts' responses.

Table 5

Interface Expert Assessment Results

No.	Item	Frequency		Agreement (%)
		Yes	No	
1.	The text size on the main page and menu is appropriate	3	0	100
2.	The type of text used on the main page and menu is appropriate	3	0	100
3.	The positioning of subtitles in the animation section is appropriate	2	1	67
4.	The text colour on each page is appropriate	3	0	100
5.	The button colour on each page is appropriate	3	0	100

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No.	Item	Frequency		Agreement (%)
		Yes	No	
6.	The background colour on each page is appropriate	3	0	100
7.	The interface graphics on the main page and menu are attractive	3	0	100
8.	The background graphics fit the 2D animation theme of the OSI model	3	0	100
9.	The navigation button colours match the application's interface	3	0	100
10.	The icons used are easily recognizable for their functions	3	0	100
11.	The navigation button arrangement facilitates user choices	3	0	100
12.	The narration audio in the following sections is clear:	3	0	100
	i. Application Layer	3	0	100
	ii. Presentation Layer	3	0	100
	iii. Session Layer	3	0	100
	iv. Transport Layer	3	0	100
	v. Network Layer	3	0	100
	vi. Data Link Layer	3	0	100
	vii. Physical Layer	3	0	100
13.	The special audio effects on the buttons are appropriate	3	0	100
14.	The animations in this application for each section are attractive:	3	0	100
	i. Application Layer	3	0	100
	ii. Presentation Layer	3	0	100
	iii. Session Layer	3	0	100
	iv. Transport Layer	3	0	100
	v. Network Layer	3	0	100
	vi. Data Link Layer	3	0	100
	vii. Physical Layer	3	0	100
15.	The button design on the main page and menu is consistent	3	0	100
16.	The user-guide page design is appropriate and consistent	3	0	100

The three multimedia experts selected Yes for all interface items except subtitle positioning, which received two Yes responses and one No response (67% agreement). The panel therefore showed complete agreement on the remaining rated interface features, but not on subtitle placement. Written feedback recommended the use of more suitable Malay terms in selected subtitles. The result supports a targeted interface revision; it does not demonstrate usability or comprehension among students.

Table 6

Interaction and Functionality Assessment Results

No.	Item	Frequency		Agreement (%)
		Yes	No	
1.	The "guide" icon on the main page works well	3	0	100
2.	The start button takes users to the Menu page	3	0	100
3.	The "pause" icon can pause the audio and animation on each OSI Model layer page	3	0	100
4.	The "play" icon can resume the paused audio and animation on each OSI Model layer page	3	0	100
5.	The "replay" icon can replay the audio and animation on all OSI Model layer pages	3	0	100
6.	The "note" icon can display notes on each OSI Model layer page	3	0	100
7.	The "exit" icon on the note display can return to the previous page	3	0	100

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No.	Item	Frequency		Agreement (%)
		Yes	No	
8.	The "home" icon on the menu page allows returning to the main page	3	0	100
9.	The "introduction" button on the menu page allows navigating to the Introduction page	3	0	100
10.	The "objective" button on the menu page allows navigating to the Objective page	3	0	100

All three multimedia experts selected Yes for each of the 10 interaction/functionality items in **Table 6**. This indicates that, during expert inspection, the guide, start, pause, play, replay, note, exit, home, introduction and objective controls performed their specified functions. Because no student usability test was conducted, these results are limited to expert-observed functionality.

Table 7
Key Expert Feedback and Corresponding Application Revisions

Expert feedback	**Revision made**	**Status**
Adjust the size of selected animation elements.	Animation sizing was refined to improve the presentation of the affected scenes.	Implemented
Use more suitable Malay terms in selected subtitles.	Subtitle terminology was revised for clearer and more consistent Malay usage.	Implemented
Refine interface colours.	Interface colours were adjusted for greater visual consistency.	Implemented
Add or clarify the introduction to the OSI Model.	The introductory section was expanded and clarified.	Implemented
Enhance selected graphics and animation details.	Supporting graphics and animation details were refined in the relevant sections.	Implemented
Refine the user instructions.	Instructions in the user-guide component were revised for clarity.	Implemented

Discussion

The discussion is organised around the three research questions and compares the present findings with related mobile-learning and multimedia-development studies. Because the present evaluation involved experts rather than students, the comparisons concern design features, development procedures, expert agreement and product refinement; they do not establish learning effectiveness.

For Research Question 1, the application integrated an introduction, learning objectives, animated explanations of the seven OSI layers, narration, notes, user controls, a guide and quizzes. This configuration is similar to earlier Android learning applications that organise information, interface and interaction components within one mobile resource (Hamzah et al., 2017; Hamzah et al., 2022). The present application differs by focusing specifically on the sequential flow, functions and protocols of all seven OSI layers for a vocational IP Address and Subnetting course.

The combination of animation, narration and user control is consistent with the multimedia-design evidence synthesised by Noetel et al. (2022), particularly the reported benefits of animation, modality, segmentation and signalling. The experts' unanimous agreement on narration accuracy and their high agreement on the interface indicate that the intended multimedia components were present and considered appropriate. Nevertheless, Noetel et al. synthesised studies that measured learning, whereas the present study did not administer retention, transfer or achievement tests; therefore, cognitive or learning benefits cannot be inferred from expert agreement.

The closest content comparison is OSIViG, which also used a mobile visual representation to support learning of the OSI Model (Harun et al., 2022). Both studies respond to the difficulty of representing OSI data flow through

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conventional verbal explanations. However, Harun et al. (2022) analysed students' written reflections and reported predominantly positive experiences with an analogy-based visual guide, whereas the present study used expert checklists and written recommendations before student implementation. The difference in participants and evidence explains why the present findings are limited to expert-assessed appropriateness and functionality.

The design also shares features with the 2D mobile vocabulary application developed by Zhou et al. (2022), particularly the use of mobile graphics and context-specific content. Zhou et al. reported favourable feedback for a vocabulary application designed for young learners, while the present product targets vocational students and represents technical network processes. This contrast suggests that 2D mobile media can be adapted across content domains, but each application requires evaluation with its own intended users.

For Research Question 2, ADDIE provided a traceable process from needs analysis through expert evaluation. Analysis identified the topic and product requirements; Design produced the content structure, flowcharts and storyboards; Development assembled the application; Implementation deployed and demonstrated the product to experts; and Evaluation gathered structured responses and written comments. This sequence is consistent with ADDIE's systematic instructional-design function (Branch, 2009) and with the development procedure reported by Wangi et al. (2021).

A key difference concerns the scope of evaluation. Wangi et al. (2021) combined expert validation with an individual learner trial and reported a very high suitability result, whereas the present study stopped at formative expert review. Similarly, Hamzah et al. (2022) evaluated the information, interface and interaction design of the JingoCat Android application with two multimedia experts and two Japanese-language experts. The present study used three content experts and three multimedia experts, thereby providing complementary domain judgments, but neither the panel size nor the high agreement percentages should be interpreted as a substitute for student testing.

For Research Question 3, all three content experts agreed with every rated content requirement, while the multimedia panel agreed with every interaction item and all interface items except subtitle positioning. This pattern is broadly similar to Hamzah et al. (2022), whose experts agreed that the JingoCat application's information, interaction and interface designs met the intended requirements. In both studies, specialist review served as a formative quality check; however, the present finding of 67% agreement on subtitle positioning reveals a specific design issue that would have been obscured by reporting only an overall positive judgment.

The written comments help explain the high agreement alongside the need for revision. Experts regarded the main content and controls as appropriate but still recommended changes to animation sizing, Malay subtitle terminology, interface colours, introductory content, graphics and user instructions. This combination of positive ratings and targeted revisions is consistent with formative development practice, in which expert review identifies correctable design details before learner implementation (Branch, 2009; Hamzah et al., 2022).

Differences between the present findings and previous student-based studies are methodological rather than contradictory. Harun et al. (2022) reported students' predominantly positive reflections after using an OSI visual guide, and Wangi et al. (2021) included an individual learner trial after expert review. The present study cannot confirm comparable student responses because it did not collect usability, engagement or achievement data. Its stronger contribution at this stage is the documented refinement of a context-specific prototype through separate content and multimedia reviews.

The expert panels were deliberately selected for complementary expertise in networking-related content and multimedia or educational-technology design. Even so, three experts per domain produced coarse percentage categories, and unanimous Yes responses may reflect both genuine agreement and the dichotomous response format. The absence of a Likert relevance scale, formal content-validity indices, chance-corrected agreement, pilot testing and reliability estimates limits the methodological strength of the instrument evidence (Lynn, 1986; Polit et al., 2007).

Overall, the findings agree with previous development studies in showing that mobile multimedia products can meet specified content, interface and interaction requirements after expert review (Hamzah et al., 2022; Zhou et al., 2022). They differ from studies that included learners because no claim about usability or learning effectiveness can yet be made (Harun et al., 2022; Wangi et al., 2021). Future research should therefore test the application with Vocational

College students through task-based usability measures and, subsequently, pre- and post-assessment with an appropriate comparison condition.

Conclusion

This study produced a 2D animation Android application for the OSI Model through the five ADDIE phases. The product integrated content on the seven layers with animation, narration, notes, navigation controls, a user guide and quizzes. Expert review found unanimous agreement on the rated content items and interaction functions, while subtitle positioning received agreement from two of three multimedia experts. Written feedback led to targeted revisions to animation sizing, subtitle terminology, interface colours, introductory content, graphics and animation details, and user instructions.

The findings support only a preliminary conclusion that relevant specialists considered the application's content appropriate and its specified multimedia functions largely acceptable at the time of review. The study does not demonstrate that the application enhanced students' understanding, engagement, learning experience, achievement, or retention. Claims about educational effectiveness require direct empirical evaluation with the target students.

Limitations and Future Studies

The evaluation was limited by the absence of student participants, the use of three experts per domain, a dichotomous Yes/No format, no independent pilot study and no formal reliability or chance-corrected content-validity analysis. Future studies should conduct learner-centred usability testing and a learning-outcome evaluation, preferably with pre- and post-assessment, an appropriate comparison condition and delayed retention measurement. A revised four-point relevance scale and a larger expert panel would also permit stronger item-level and scale-level content-validity analysis (Lynn, 1986; Polit et al., 2007).

Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

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