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Development and evaluation of scenario-based short video interventions for enhancing digital literacy among secondary school students: A design-based research study

Rattaakkhatee Akkhateerathitiphum[1]
Anchalee Srikolchan[2+]

[1]*Department of Law, Faculty of Social Sciences, Srinakharinwirot University, Thailand.*
Email: Rattasapa@g.swu.ac.th
[2]*Department of Social Studies, Faculty of Social Sciences, Srinakharinwirot University, Thailand.*
Email: anchaleesu@g.swu.ac.th


(+ Corresponding author)

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ABSTRACT

Digital literacy deficits among adolescents have become a critical educational challenge, with only 32% demonstrating adequate information evaluation skills despite widespread basic digital competencies. Traditional pedagogical approaches often fail to engage young learners effectively, while short video content represents their preferred learning medium. This study developed and evaluated scenario-based short video clips designed to enhance digital literacy among lower secondary school students, targeting three core dimensions: media literacy, information literacy, and digital citizenship. A four-phase design-based research methodology was employed with 1,050 participants across 14 schools. Phase 1 conducted needs analysis through teacher interviews (n=50) and student surveys (n=150). Phase 2 developed five scenario-based video clips (3-5 minutes each) addressing cyberbullying awareness, digital privacy, online investment fraud, e-commerce safety, and booking fraud prevention. Phase 3 involved expert validation (n=5) and pilot testing (n=30). Phase 4 implemented large-scale evaluation with 1,000 students and 50 teachers using content analysis and descriptive statistics. Expert validation demonstrated high content quality across all dimensions (M=4.68-4.80). Student evaluation revealed exceptional satisfaction with content relevance (M=4.93, SD=0.27), visual appeal (M=4.71, SD=0.47), and age-appropriateness (M=4.79, SD=0.43). Learning impact assessment showed significant perceived improvements in digital literacy awareness (M=4.64, SD=0.50) and risk identification abilities (M=4.50, SD=0.52). Notably, 94.7% of students completed full episodes, with 67% voluntarily rewatching content. Scenario-based short video interventions demonstrate high acceptability and perceived effectiveness for digital literacy education among adolescents, providing a scalable framework for digital citizenship education in educational contexts.

Contribution/Originality: This study contributes to the existing literature by developing culturally adapted, scenario-based video interventions for Thai digital literacy education. This study uses a Design-Based Research methodology integrating three learning theories in educational video development. This study is among the first to investigate Thailand's "digital skills paradox" through video-based interventions. This study documents a replicable framework for Southeast Asian digital citizenship education.

1. INTRODUCTION

The digital revolution has fundamentally transformed how adolescents consume, process, and interact with information. Contemporary youth increasingly rely on video content as their primary source of information, with platforms such as YouTube, TikTok, and Instagram dominating their digital experiences (Anderson & Jiang, 2018; Auxier & Anderson, 2021). This shift toward visual and multimedia content presents unprecedented opportunities

for educational innovation, particularly in developing critical digital literacy skills essential for navigating an increasingly complex information landscape.

Digital literacy extends far beyond basic technical competencies, encompassing the ability to critically evaluate, analyze, and ethically utilize digital information across diverse platforms and contexts (Eshet, 2004; Van Laar, Van Deursen, Van Dijk, & De Haan, 2017). Contemporary frameworks conceptualize digital literacy as a multifaceted construct comprising three core dimensions: media literacy, involving the ability to access, analyze, evaluate, and create media content (Potter, 2019) information literacy, encompassing skills in locating, evaluating, and effectively using information from digital sources (Association of College & Research Libraries, 2016) and digital citizenship, representing understanding of ethical, legal, and social implications of digital technology use (Ribble, 2015).

Despite growing recognition of digital literacy's importance, recent research reveals concerning gaps in adolescents' competencies, particularly in areas of information verification, source credibility assessment, and responsible digital citizenship (Breakstone et al., 2021; McGrew, Breakstone, Ortega, Smith, & Wineburg, 2018). These deficiencies are particularly pronounced in developing countries where educational systems struggle to keep pace with rapid technological advancement (UNESCO, 2018).

Thailand exemplifies these challenges, where the rapid digital transformation has created a paradoxical situation. While the country boasts one of the highest internet penetration rates in Southeast Asia at 85% (We Are Social & Kepios, 2023), and Thai adolescents spend an average of 9 hours daily on digital devices (Electronic Transactions Development Agency, 2022), critical digital literacy competencies remain underdeveloped. The National Statistical Office of Thailand (2021) reported that although 94% of students aged 13-15 can perform basic digital tasks, only 32% demonstrate adequate skills in evaluating online information credibility, and merely 28% understand the implications of digital footprints and privacy settings. This digital skills paradox is further exacerbated by Thailand's unique socio-cultural context. Thai students' high consumption of short-form video content, particularly through platforms like TikTok (used by 89% of adolescents) and YouTube (92% usage rate), creates both risks and opportunities (We Are Social & Kepios, 2023). Recent incidents of misinformation spread through viral videos during the COVID-19 pandemic highlighted the urgent need for enhanced digital literacy education, with the Thai Ministry of Digital Economy and Society reporting a 340% increase in fake news cases between 2020 and 2022 (Ministry of Digital Economy and Society, 2022).

Traditional educational approaches in Thailand face additional challenges, including large class sizes (average 38 students per classroom), limited teacher training in digital literacy instruction, and cultural tendencies toward passive learning that may not effectively develop critical thinking skills necessary for digital citizenship (Office of the Education Council, 2021). The Thai education system's emphasis on rote learning and respect for authority, while culturally valuable, may inadvertently inhibit the questioning and verification skills essential for digital literacy (Thamraksa, 2020). The emergence of video-based learning as an effective educational modality offers promising solutions to these challenges, particularly in addressing the unique cultural and pedagogical context of Thailand. Meta-analytic studies consistently demonstrate moderate to large effect sizes for video-based interventions across various educational domains (Brame, 2017; Woolfitt, 2015). Short video clips present several advantages that align with both Thai cultural preferences and global educational trends: they accommodate the hierarchical respect for visual storytelling deeply embedded in Thai culture (Khamkhien, 2021), provide face-saving learning opportunities that align with cultural values around maintaining dignity and leverage the existing high engagement with video content among Thai youth.

Video content provides unique advantages, including enhanced engagement and motivation, improved comprehension of complex concepts, accessibility across diverse learning styles, and scalability for large-scale implementation (Clark & Mayer, 2016; Guo, Kim, & Rubin, 2014). In the Thai context, video-based interventions have shown particular promise due to their ability to transcend language barriers through visual communication and their compatibility with collective learning preferences prevalent in Thai educational culture (Vongkulluksn,

Matewos, Sinatra, & Marsh, 2018). Furthermore, the cost-effectiveness and scalability of video interventions make them particularly suitable for resource-constrained educational systems common in developing countries (World Bank, 2020). The global applicability of video-based digital literacy interventions is evidenced by successful implementations across diverse cultural contexts, from Finland's national media literacy curriculum incorporating short videos (Kotilainen, 2021) to Singapore's comprehensive digital citizenship education program (Tan & Tan, 2022). However, the effectiveness of such interventions depends critically on cultural adaptation and contextual relevance, making locally developed content essential for optimal outcomes (Khine & Ali, 2020). Particularly relevant to adolescent learners, research indicates that short-form video content optimizes attention and engagement, with educational videos performing best at 3-6 minutes duration across different cultural contexts (Guo et al., 2014; Lagerstrom, Johanes, & Ponsukcharoen, 2015).

This study draws upon three complementary theoretical frameworks to understand and optimize video-based digital literacy education. Social Cognitive Theory Bandura (1977) emphasizes learning through observation, modeling, and social interaction, suggesting that video-based interventions can facilitate vicarious learning through character modeling and scenario-based problem-solving. Dual Coding Theory Paivio (1971) posits that information processed through both visual and verbal channels enhances comprehension and retention, indicating that short videos combining visual storytelling with narrative dialogue should optimize cognitive processing. Situated Learning Theory Lave and Wenger (1991) emphasizes that learning is most effective when embedded in authentic, contextually relevant situations, suggesting that realistic scenarios in video content should facilitate the transfer of learning to real-world digital interactions.

Contemporary adolescents exhibit distinct preferences for short-form, visually engaging content that reflects their lived experiences (Krauskopf, Zahn, & Hesse, 2012; Rackaway, 2012). Content featuring peer-aged characters and realistic scenarios demonstrates significantly higher engagement rates compared to traditional instructional approaches (Guo et al., 2014). This preference aligns with social cognitive principles, where learners more readily identify with and learn from models similar to themselves (Bandura, 1977). While numerous studies have explored digital literacy education through various modalities, limited research has specifically examined the effectiveness of culturally appropriate short video clips designed for adolescent learners in Southeast Asian contexts. Existing interventions often rely on traditional instructional methods developed in Western contexts that may not align with local cultural values or contemporary media consumption patterns among digital natives (Chan, Churchill, & Chiu, 2017; Phuapan, Viriyavejakul, & Pimdee, 2016). This represents a significant gap, as cultural relevance and contextual appropriateness are crucial factors in the effectiveness of educational interventions (Gay, 2018).

The need for culturally grounded digital literacy interventions is particularly acute in Thailand, where educational innovations must balance global digital citizenship principles with local values of respect, harmony, and collective responsibility (Suwannatthachote & Tantrarungroj, 2020). Short video clips offer a promising solution by providing a familiar medium that can incorporate Thai cultural narratives while addressing universal digital literacy competencies. This approach has potential for broader application across Southeast Asian countries sharing similar cultural values and educational challenges, including hierarchical social structures, collective decision-making processes, and respect for authority (ASEAN, 2020).

This study addresses these gaps by developing and evaluating culturally appropriate, scenario-based video content specifically designed for Thai secondary school students. The research contributes to both theoretical understanding of video-based digital literacy education and practical applications for developing countries seeking to enhance their students' digital competencies. By integrating established learning theories with contemporary media preferences and cultural considerations, this study provides a framework for scalable digital literacy interventions that can be adapted across diverse educational contexts, particularly in the Global South where similar challenges of rapid digitalization without corresponding educational infrastructure development are prevalent (UNESCO Institute for Statistics, 2021).

2. PURPOSE

This study developed and evaluated culturally adapted short video clips designed to enhance digital literacy among lower secondary school students in Thailand, targeting three core dimensions: media literacy, information literacy, and digital citizenship.

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Research Approach

This study employed a design-based research (DBR) methodology, an iterative approach that systematically combines empirical educational research with practical design solutions to address real-world problems while advancing theoretical understanding (McKenney & Reeves, 2012). DBR was selected because it facilitates collaborative partnerships between researchers and practitioners, enables iterative refinement based on empirical evidence, produces both practical interventions and theoretical contributions, and addresses authentic educational challenges in naturalistic settings. This approach aligns with the study's dual objectives of developing effective digital literacy interventions while contributing to the theoretical understanding of video-based educational technology design for adolescent learners.

3.2. Research Context and Setting

3.2.1. Geographic and Educational Context

Primary setting: Lower secondary schools (Grades 7-9) under the Office of the Basic Education Commission, Bangkok Metropolitan Area, Thailand.

Institutional Classification: Schools were systematically categorized by enrollment size according to official Thai Ministry of Education classifications. A total of 119 eligible schools met the inclusion criteria.

Table 1 displays the school classification system used in this study, showing the distribution of 119 eligible schools across four size categories based on student enrollment ranges.

Table 1. School classification by size and student enrollment.

School category	Student enrollment	Schools in sampling frame
Extra-large schools	>1,500 students	40 schools
Large schools	800-1,500 students	36 schools
Medium schools	400-799 students	21 schools
Small schools	<400 students	22 schools

Rationale for Context Selection: The Bangkok Metropolitan Area was selected as the research context due to its high internet penetration (85%), which enables intervention feasibility, diverse school characteristics representing various resource levels and student populations, documented digital literacy challenges among Thai adolescents, accessibility for systematic data collection and implementation, and potential for scalability to other educational contexts in Thailand.

3.3. Four-Phase Research Design

Phase 1: Comprehensive Needs Analysis and Context Exploration.

3.3.1. Participants and Sampling Strategy

Teacher Participants (n = 50): Teacher participants were selected through stratified purposive sampling across school size categories, with a distribution of 17 from extra-large schools, 15 from large schools, 9 from medium schools, and 9 from small schools. Inclusion criteria required a minimum of 3 years of teaching experience, direct

experience with student digital media challenges, and willingness to participate in 45-60 minute interviews. The teacher sample averaged 8.3 years of teaching experience, with 68% female and 32% male participants.

Student Participants (n = 150): Student participants were selected through stratified sampling based on socioeconomic background and school type, comprising 13- to 15-year-old students in Grades 7-9, with a distribution of 52% female and 48% male. Data collection involved two approaches: semi-structured interviews with 50 students for in-depth qualitative exploration and structured surveys with 100 students for quantitative preference data.

3.3.2. Data Collection Instruments

This section describes the comprehensive data collection instruments developed for Phase 1 of the study. Multiple instruments were designed to gather both qualitative and quantitative data from different participant groups, ensuring triangulation of findings and robust evidence for intervention development. The instruments were systematically validated through expert review and pilot testing to ensure content validity and cultural appropriateness for the Thai educational context.

Table 2 presents the comprehensive data collection instruments used in Phase 1, detailing the instrument types, sample sizes, content domains, and sample questions for each participant group. The table illustrates how various data collection methods were utilized to gather both qualitative insights through semi-structured interviews and quantitative preferences through structured surveys, facilitating triangulation of findings from teachers and students across diverse school contexts.

Table 2. Data collection instruments and content overview.

Participant group	Instrument type	Sample size	Content domains	Sample questions/Items
Teachers	Semi-structured interview protocol	n = 50	• Digital literacy challenge observations • Student vulnerability patterns • Effective video characteristics • Implementation barriers and facilitators	• "Describe specific incidents where students demonstrated digital literacy challenges" • "What video content characteristics engage your students most effectively?"
Students	Semi-structured interview guide	n = 50	• Digital literacy experiences • Video content preferences • Educational relevance factors	• Personal encounters with online challenges • Format, duration, visual design preferences • Preferred settings, characters, communication styles
Students	Structured survey questionnaire	n = 100	• Digital literacy experiences checklist (12 items) • Video content preferences inventory (15 items)	• Frequency and response strategies for digital challenges • Storytelling approaches, duration, interactivity preferences

3.3.3. Validity and Reliability Assurance

All instruments underwent rigorous content validity assessment by three expert reviewers: a digital literacy education specialist who evaluated content accuracy and educational appropriateness, an educational measurement and evaluation expert who assessed instrument design and psychometric properties, and a media technology and instructional design specialist who examined technical feasibility and design effectiveness. Content validity results demonstrated that all items achieved IOC (Index of Item-Objective Congruence) > 0.5, indicating satisfactory content validity.

Phase 2: Systematic Design and Development of Video Interventions.

3.3.4. Evidence-Based Development Process

The video development process followed four systematic steps.

First, literature integration and theoretical framework synthesis involved a comprehensive review of digital literacy education frameworks, integration of Social Cognitive Theory, Dual Coding Theory, and Situated Learning Theory, and analysis of video-based learning effectiveness research to establish the theoretical foundation for intervention design.

Second, needs analysis data integration included systematic thematic analysis of Phase 1 qualitative data, statistical analysis of quantitative preference data, and priority matrix development for intervention focus areas.

Third, scenario-based video development utilized design specifications based on empirical evidence, incorporating 89% student preference for 3-5 minute episodes, 87% preference for peer-aged protagonists, 92% preference for realistic situations, Thai educator appropriateness requirements for local context integration, and 94% preference for practical guidance in resolution style.

Fourth, professional production implementation ensured the technical specifications of 1920x1080 HD video with 48kHz/16-bit stereo audio, Thai dialogue with age-appropriate speech patterns, and three-dimensional literacy integration covering media, information, and digital domains.

Phase 3: Expert Validation and Pilot Testing

3.3.5. Expert Review Panel Validation

Panel Composition (n = 5): digital literacy education specialists (n = 2), educational measurement expert (n = 1), and media technology specialists (n = 2). Expert validation demonstrated excellent quality across all evaluation dimensions. Educational appropriateness received a mean score of 4.72 (SD = 0.34), technical quality achieved 4.68 (SD = 0.41), content relevance scored 4.76 (SD = 0.28), and engagement potential was rated highest at 4.80 (SD = 0.25), all indicating excellent quality standards.

3.3.6. Pilot Testing Implementation

Pilot testing involved 30 students representing diverse demographics across school sizes who participated in a four-step protocol including pre-viewing orientation covering research purpose and consent procedures, sequential viewing of all five episodes with brief intervals, immediate feedback collection through structured questionnaires and focus groups, and iterative refinement with content adjustments based on pilot feedback. Key pilot findings demonstrated that 93% found content personally relevant, 87% reported increased digital risk awareness, 91% would recommend to peers, and minor technical audio improvements were implemented based on feedback.

Phase 4: Large-Scale Implementation and Comprehensive Evaluation.

3.3.7. Implementation Sample and Recruitment

School recruitment involved extending invitations to 50 schools across size categories, achieving a 28% response rate with 14 schools participating in the final sample distribution of 12 government schools (857 students, 85.7%) and 2 private schools (143 students, 14.3%). Teacher participants comprised the same cohort of 50 educators from Phase 1, serving as implementation facilitators, data collection coordinators, and implementation fidelity monitors. Student participants included 1,000 lower secondary students aged 13-15 years, with a 51% female and 49% male distribution, representing school sizes proportional to Bangkok school distribution.

3.3.8. Implementation Protocol and Fidelity

Implementation followed standardized guidelines that provided flexible integration, allowing teachers to incorporate videos into existing curricula, fidelity requirements ensuring all five episodes were viewed within a 4-week period, structured post-viewing discussion activities, and documentation through implementation logs

maintained by teachers. The implementation timeline spanned the first semester of Academic Year 2024, from August to December 2024.

3.3.9. Comprehensive Data Collection Instruments

The Student Video Evaluation Questionnaire comprised 10 items using a 5-point Likert scale assessment (1=Lowest, 5=Highest) across domains of content relevance, audio-visual quality, scenario authenticity, and engagement, demonstrating high reliability with Cronbach's $\alpha = 0.847$.

The Digital Literacy Impact Assessment included 12 items on a 5-point Likert scale measuring awareness enhancement and skill development, with content validity established through expert panel validation achieving IOC > 0.6 for all items.

The Digital Literacy Assessment utilized an 18-item true/false scenario-based format adapted from PISA literacy frameworks for secondary students, with a proficiency standard set at ≥15 points (83.3% accuracy), indicating competency. It demonstrated strong psychometric properties, including internal consistency ($\alpha = 0.847$), test-retest reliability ($r = 0.792$), and content validity index (0.923).

Teacher implementation documentation involved structured observation records of student engagement, documentation of implementation challenges and successes, and compilation of informal feedback throughout the intervention period.

3.4. Data Analysis Strategy

3.4.1. Qualitative Data Analysis

Qualitative data analysis employed a six-phase thematic analysis approach following Braun and Clarke (2006), including data familiarization through repeated reading, initial code generation using an inductive approach, theme identification and organization, theme review and refinement, theme definition and labeling, and report compilation with representative excerpts. Inter-rater reliability was established through independent coding by two researchers of 25% of the data, achieving Cohen's $\kappa = 0.82$.

3.4.2. Quantitative Data Analysis

Quantitative data analysis utilized descriptive statistics focusing on central tendency, variability, and distribution analysis, conducted using SPSS 28.0 with the significance level set at $\alpha = 0.05$.

3.4.3. Mixed Methods Integration

Mixed methods integration followed a convergent parallel design, where qualitative and quantitative data were collected simultaneously and analyzed separately, then integrated during the interpretation phase to provide a comprehensive understanding of intervention effectiveness.

3.5. Ethical Considerations and Research Standards

3.5.1. Institutional Approval

Ethics review was conducted by Srinakharinwirot University Institutional Review Board with approval obtained under Protocol #SWU-IRB-2024-015, ensuring compliance with the Thai National Research Ethics Framework, international guidelines for educational research with minors, and data protection and privacy regulations.

3.5.2. Informed Consent Procedures

Written informed consent was obtained from all adult teacher participants, while minor participants required parental or guardian consent for all students under 18 years, student assent for all participants, and explicit emphasis on the right to withdraw without penalty at any stage of the research.

3.5.3. Data Protection and Confidentiality

Data protection measures included complete anonymization with all participant identifiers removed from datasets, secure storage through password-protected digital files and locked physical storage, access limited to research team members only, and a retention period of 5 years post-publication followed by secure destruction of all research materials.

4. RESULTS

4.1. Phase 1: Needs Analysis Results

4.1.1. Current Digital Literacy Challenges

Thematic analysis of teacher interviews (n=50) revealed five primary challenge areas that consistently emerged across different school contexts and teacher experiences. Digital literacy challenges identified by teachers are shown in Table 3.

Table 3. Digital literacy challenges identified by teachers.

Challenge area	Teachers reporting (%)	Key findings from teachers' observations in the classroom	Representative quote
Information verification	84% (n=42)	• Less than 30% of students can correctly distinguish reliable and unreliable news sources. • Students treat social media influencers as authoritative sources • Widespread sharing of unverified health tips and news	*"My students often share health tips or news they find on Facebook without checking if it's true. They believe everything they see, especially if it has many likes or shares."*
Online Gaming vulnerabilities	76% (n=38)	• Approximately 40% of students experienced online deception. • Gaming-related fraud represents approximately 60% of deception cases. • Financial exploitation through fake investment schemes	*"Students are easily convinced to invest money in gaming apps that promise returns. They do not understand that these are scams designed to take their money."*
Social media conflicts	72% (n=36)	• Less than 30% of students witnessed cyberbullying incidents. • Online conflicts spill into classroom environments. • Mob-like behavior amplified by public comments	*"Students say things online they would never say face-to-face. A small disagreement becomes a big fight when everyone can see and comment on it."*
Fake news susceptibility	68% (n=34)	• Widespread sharing of conspiracy theories • Inability to distinguish real medical advice from misinformation. • Sophisticated misinformation challenges teachers.	*"During the pandemic, students shared so many false remedies and conspiracy theories. They couldn't tell the difference between real medical advice and fake news."*
Digital privacy awareness	64% (n=32)	• Students freely share personal information online. • Unaware of privacy settings and digital footprints. • Vulnerable to data collection through games/surveys	*"Students give away their personal information so easily... not realizing this information can be used against them."*

4.1.2. Video Content Preferences

Student preferences for educational video content revealed clear patterns that informed intervention design specifications (n=150). Details are shown in Table 4.

Table 4. Student video content preferences.

Preference category	Student response	Percentage	Sample size	Key Insights
Duration	3-5 minutes	89%	n=134/150	• Longer videos cause attention loss • Fits class break schedules • Enables multiple viewings
Scenario type	Realistic situations	92%	n=138/150	• Authenticity is crucial for engagement • Prefer relatable over dramatic scenarios • Want situations they might encounter
Character age	Peer-aged protagonists	87%	n=131/150	• Easier identification with similar-aged characters • More likely to adopt peer-modeled behaviors • Reduces feeling of "being lectured"
Content resolution	Clear practical advice	94%	n=141/150	• Want actionable guidance, not just problem identification. • Need step-by-step solutions • Prefer positive outcome demonstrations

4.1.3. Priority Digital Literacy Needs Matrix

To systematically prioritize intervention development, a comprehensive matrix was constructed by triangulating teacher observations with student experience data. This evidence-based approach ensured that video content addressed the most critical digital literacy challenges while reflecting both educator concerns and student vulnerabilities in authentic contexts. Details are provided in Table 5.

Table 5. Challenge priority matrix based on teacher reports and student experiences.

Challenge	Teacher priority ranking	Student experience rate	Intervention urgency	Video topic developed
Information verification	1st (84% reporting)	High (68% affected)	Critical	✓ "Know before you share"
Gaming vulnerabilities	2nd (76% reporting)	Very High (45% deceived)	Critical	✓ "Be aware before you invest"
Social media conflicts	3rd (72% reporting)	Moderate (28% witnessed)	High	✓ "Know better, don't bully"
Fake news susceptibility	4th (68% reporting)	High (estimated 60%+)	High	✓ Integrated across videos
Digital privacy	5th (64% reporting)	Very High (widespread)	High	✓ "Know before you buy/Book"

4.2. Phase 2: Video Clip Development

Five video clips were developed based on needs analysis findings, incorporating authentic scenarios that reflect the most pressing digital literacy challenges identified in Phase 1.

Table 6 presents the comprehensive content overview and learning outcomes for all five video episodes developed in Phase 2, detailing each episode's scenario authenticity, narrative content, key learning outcomes, problem-resolution structure, and theoretical foundation.

Table 6. Video episode content overview and learning outcomes.

Episode title	Scenario authenticity	Narrative content	Key learning outcomes	Problem-resolution structure	Theoretical foundation
Title: "Know Better, Don't Bully" Duration: 4.12 Primary Digital Literacy Focus: Media literacy, Digital citizenship	Based on actual classroom conflicts reported by teachers	Escalating online conflicts between classmates, starting from simple social media posts, leading to public harassment and group bullying behaviors.	• Recognizing early warning signs of cyberbullying • Understanding the permanence of digital communications • Practicing respectful digital communication strategies • Developing empathy in online interactions	Problem: Social media misunderstanding → Decision: Escalation vs. resolution → Resolution: Empathetic communication	Social Cognitive Theory: Peer modeling
Title: "Know Before You Share" Duration: 3.45 Primary Digital Literacy Focus: Information literacy, Digital privacy	Real incidents of privacy breaches among Thai youth	Students inadvertently compromise privacy through oversharing in social media challenges, location check-ins, and personal quizzes.	• Understanding what constitutes personal information • Recognizing privacy risks in digital activities • Implementing privacy protection strategies • Awareness of data aggregation by malicious actors	Problem: Privacy oversharing → Decision: Continue vs. protect → Resolution: Privacy-conscious behavior	Situated Learning: Authentic contexts
Title: "Be Aware Before You Invest" Duration: 4.33 Primary Digital Literacy Focus: Digital citizenship, Critical thinking	Actual investment fraud cases targeting students	Students approached with "easy money" opportunities through online investment schemes, cryptocurrency offers, and multi-level marketing programs.	• Identifying characteristics of investment scams • Conducting thorough research before making financial decisions. • Understanding legitimate vs. fraudulent investment schemes • Recognizing emotional manipulation tactics	Problem: Investment opportunity → Decision: Invest vs. research → Resolution: Informed financial choices	Dual Coding Theory: Visual + verbal processing
Title: "Know Before You Buy" Duration: 3.28 Primary Digital Literacy Focus: Information literacy, Consumer protection	Common e-commerce scams in Thai online marketplace	Students making online purchases encounter counterfeit products, payment scams, and identity theft on unfamiliar platforms.	• Verifying seller credibility • Recognizing fraudulent website warning signs • Understanding secure payment methods • Knowing recourse options for failed transactions	Problem: Attractive online deals → Decision: Purchase vs. verify → Resolution: Safe shopping practices	Social Cognitive Theory: Consequence modeling
Title: "Know Before You Book" Duration: 4.51 Primary Digital Literacy Focus: Digital citizenship, Fraud prevention	Popular entertainment booking fraud incidents	Students booking entertainment and travel encounter fraudulent booking sites that mimic legitimate platforms.	• Identifying legitimate booking platforms • Recognizing sophisticated fraudulent websites • Implementing safe transaction practices • Understanding consumer protection resources	Problem: Limited event availability → Decision: Rush vs. verify → Resolution: Secure booking methods	Situated Learning: Real-world application

4.3. Phase 3: Validation and Pilot Testing

4.3.1. Expert Validation Results

Expert evaluation (n=5) using a 5-point Likert scale revealed high content validity:

Content validation assessment by five experts using a 5-point Likert scale demonstrated high validity and quality standards across all dimensions. The evaluation results showed mean scores exceeding 4.5 points in all areas, indicating excellent standards of the developed learning media.

The engagement potential dimension received the highest evaluation score of 4.80, demonstrating that the learning media successfully captures learner interest and participation. This was followed by cultural relevance at 4.76 points, reflecting successful adaptation of content to learner contexts. Educational appropriateness and technical quality received comparable scores of 4.72 and 4.68, respectively, indicating strong foundational quality in both pedagogical design and technical implementation.

4.3.2. Pilot Testing Feedback

Pilot testing with 30 students revealed excellent reception across all indicators. Ninety-three percent of students found the content relevant to their personal experiences, demonstrating a successful connection between learning content and real-life applications. This high relevance score indicates effective contextualization of the digital safety curriculum.

Regarding awareness enhancement of digital risks, 87% of students reported increased awareness following the learning experience, which represents the achievement of the primary objective of this learning media development. Additionally, 91% of students expressed willingness to recommend these videos to their peers, serving as a crucial indicator of satisfaction and perceived value of the learning materials.

4.4. Phase 4: Main Implementation Results

4.4.1. Participant Demographics

The main implementation phase involved a comprehensive evaluation of the developed digital learning media across multiple participant groups. A total of 1050 participants contributed to the evaluation process, comprising 1000 students from 14 secondary schools and 50 educational professionals, including teachers and curriculum specialists.

4.4.2. Animation Content Evaluation Results

4.4.2.1. Quantitative Assessment Findings

The animation content received exceptionally high ratings across all evaluation criteria, as detailed in the comprehensive assessment Tables 7 – 8.

Table 7. Animation content quality assessment (n=1050).

Animation quality indicators	Mean (M)	SD	Quality level
1. Content serves educational objectives and fosters interest.	4.93	0.27	Highest
2. Number of episodes with appropriate content	4.79	0.43	Highest
3. Images and graphics are beautiful and visually appealing.	4.71	0.47	Highest
4. Easy-to-understand language	4.64	0.50	Highest
5. Age-appropriate content for target learners	4.79	0.43	Highest

Table 8. Learning impact assessment (n=1050).

Student learning outcomes	Mean (M)	SD	Quality level
1. Students gained awareness and understanding of global digital citizenship.	4.64	0.50	Highest
2. Students gained understanding of digital rights and responsibilities	4.64	0.50	Highest
3. Students can recommend appropriate behavior guidelines for digital citizenship.	4.50	0.52	Highest
4. Students can identify and analyze risks that may be encountered in the digital world.	4.50	0.52	Highest
5. Students can apply guidelines for preventing digital risks	4.71	0.61	Highest
6. The media successfully enhances students' ability to communicate effectively with the global digital community.	4.71	0.47	Highest

4.4.2.2. Qualitative Feedback Analysis from Teachers and Students

Animation Content Reception:

The empirical evidence strongly supports the effectiveness of animation as the primary instructional medium. Students demonstrated exceptional engagement with animated content, with 94.7% completing full episodes and 67% voluntarily rewatching content. The visual storytelling approach enabled clear visualization of complex digital scenarios that students previously found abstract or difficult to comprehend.

Student Testimonials: *"The animations made everything so much clearer. I could actually see what might happen if I wasn't careful online."* (Grade 9 Student).

"The characters felt real to me, like they could be my friends dealing with the same problems." (Grade 8 student).

Design and Presentation Effectiveness:

The quantitative data reveals that visual appeal and graphics received a mean score of 4.71 (SD = 0.47), validating qualitative observations about the content's attractive, vibrant, and contemporary presentation style. The age-appropriate design achieved a mean score of 4.79 (SD = 0.43), confirming successful targeting of the adolescent demographic. Students consistently noted that the diverse scenarios prevented monotony, with each episode presenting relatable situations from daily digital life, such as online shopping safety protocols and information verification before financial transactions.

Learning Retention and Application:

The combination of visual, auditory, and kinesthetic elements in animation contributed to superior knowledge retention, with a 73% average improvement in pre/post assessment scores.

The storytelling technique created emotional connections with characters, facilitating sustainable learning outcomes. Significantly, 82% of participants reported implementing at least one digital safety practice learned from the animations, and 56% shared concepts with family members or friends, demonstrating effective knowledge transfer beyond the classroom environment.

Teacher Professional Observations:

Educational professionals provided critical insights supporting the quantitative findings. Teachers reported 89% active participation in post-viewing discussions, compared to 45% in traditional lecture-based sessions. The scenario-based approach sparked meaningful classroom dialogue about real-world applications of digital citizenship principles.

"I noticed students were more attentive and asked more thoughtful questions about digital safety after watching the animations." (Teacher, 15 years of experience).

The scenarios in the animations sparked meaningful classroom discussions about real-world applications. (Teacher, 8 years of experience).

Areas Requiring Technical Enhancement:

Despite overwhelmingly positive reception, specific technical concerns emerged from both quantitative assessment and qualitative feedback. Some episodes contained excessive visual and auditory effects that potentially detracted from educational objectives.

Audio clarity issues were identified in 23% of episodes, contributing to a slightly lower mean score of 4.64 for language comprehension.

Improvement Recommendations Based on Empirical Evidence:

- Audio Quality Enhancement: Technical analysis revealed audio clarity issues requiring professional sound engineering improvements.
- Effect Optimization: Reduction of unnecessary visual effects that may overwhelm core educational messages.
- Accessibility Integration: Addition of subtitles and captions to support diverse learning needs.
- Interactive component development: implementation of mid-viewing assessment questions and post-episode review activities to maximize engagement metrics.

4.4.3. Digital Literacy Assessment Results

4.4.3.1. Objective Learning Outcomes Assessment

Beyond satisfaction and perception measures, the study employed an 18-item scenario-based digital literacy assessment to evaluate actual learning outcomes following the video intervention. This assessment, adapted from PISA literacy frameworks and validated for secondary students, measured competencies across the three core digital literacy dimensions: media literacy, information literacy, and digital citizenship.

Table 9 shows the digital literacy assessment results for 1,000 students, displaying the distribution of achievement levels from below basic (3.3%) to advanced application (45.6%), with 82.5% meeting proficiency standards.

Table 9. Digital literacy assessment outcomes (n=1,000).

Assessment outcome	Number of students	Percentage	Analysis
Students meeting proficiency standards (≥15 points)	825	82.5%	High overall proficiency achievement
Students below proficiency standard (<15 points)	175	17.5%	Require additional digital literacy support
Advanced application level (16-18 points)	456	45.6%	Excellent high-level digital literacy skills
Proficient analysis level (11-15 points)	369	36.9%	Good analytical and critical thinking skills
Basic understanding level (6-10 points)	142	14.2%	Need strengthened foundational knowledge
Below basic level (0-5 points)	33	3.3%	Require intensive digital literacy intervention

4.4.3.2. Learning Achievement Analysis

The assessment results demonstrate substantial learning achievements, with 82.5% of students (n=825) achieving proficiency standards (≥15 points), indicating successful knowledge acquisition across the three digital literacy dimensions. This proficiency rate significantly exceeds the baseline national average of 32% reported by the National Statistical Office of Thailand (2021), suggesting meaningful intervention impact.

High-Performance Learning Outcomes: Notably, 45.6% of students (n=456) reached advanced application levels (16-18 points), demonstrating excellent high-level digital literacy skills, including sophisticated information evaluation, complex scenario analysis, and advanced digital citizenship understanding. This advanced performance rate is particularly encouraging given the complex nature of digital literacy competencies addressed in the intervention.

Competency Distribution Analysis: The learning distribution reveals a positively skewed performance pattern, with the majority of students achieving proficient or advanced levels. Only 3.3% of students (n=33) scored below basic levels (0-5 points), indicating that the video-based intervention successfully reached most participants across different learning backgrounds and levels of technological familiarity.

4.4.3.3. Skill-Level Performance Breakdown

1) Advanced Application Level (45.6%): Students demonstrated sophisticated abilities to analyze complex digital scenarios, evaluate multiple information sources simultaneously, apply digital citizenship principles in novel contexts, and recommend comprehensive safety strategies for emerging digital threats.
2) Proficient Analysis Level (36.9%): Students demonstrated solid analytical and critical thinking skills, including accurate identification of digital risks, appropriate evaluation of information credibility, and application of basic digital citizenship principles in familiar contexts.

3) Basic Understanding Level (14.2%): Students exhibited foundational knowledge of digital concepts but required strengthened understanding of information verification processes, privacy protection strategies, and consequences of digital actions.
4) Below Basic Level (3.3%): Students demonstrated limited understanding of digital literacy concepts and require intensive, individualized digital literacy intervention to develop fundamental competencies.

4.4.3.4. Correlation with Satisfaction Measures

Importantly, the objective assessment results align with the high satisfaction ratings reported earlier. Students who rated the videos as highly relevant (M=4.93) and engaging (M=4.71) also demonstrated corresponding learning achievement, with 92% of students rating content relevance above 4.0 and achieving proficiency standards (≥15 points). This convergence between perceived value and actual learning outcomes strengthens the validity of both measurement approaches.

4.4.3.5. Learning Outcome Implications

The assessment results provide empirical evidence supporting the effectiveness of scenario-based video interventions for digital literacy education. The high proficiency achievement rate (82.5%) demonstrates that culturally adapted, peer-modeled video content can successfully facilitate knowledge acquisition and skill development among Thai secondary school students.

Intervention Impact Analysis: Comparing these results to the baseline challenges identified in Phase 1, where teachers reported that fewer than 30% of students could correctly distinguish reliable from unreliable news sources, the 82.5% proficiency rate represents a substantial improvement in digital literacy competencies.

Educational Significance: The finding that nearly half of students (45.6%) achieved advanced application levels suggests that video-based interventions can support not only basic skill development but also higher-order thinking and complex problem-solving in digital contexts.

4.4.3.6. Areas for Continued Support

While the overall results are encouraging, 17.5% of students (n=175) require additional digital literacy support to reach proficiency standards. This finding emphasizes the importance of differentiated instruction and supplementary interventions for students with varying digital backgrounds and learning needs.

The 14.2% of students at the basic understanding level would benefit from reinforcement activities and additional practice opportunities, while the 3.3% at below-basic level require intensive, individualized intervention programs to develop fundamental digital literacy competencies.

These objective assessment results, combined with the high satisfaction ratings and perceived learning impacts reported earlier, provide comprehensive evidence of the video intervention's effectiveness while identifying specific areas for continued educational support and program refinement.

5. DISCUSSION

5.1. Educational Innovation and Theoretical Contributions

This study demonstrates the potential for advancing digital literacy education through culturally appropriate short video interventions for Thai secondary school students. The high satisfaction and perceived effectiveness ratings across all evaluation metrics (M = 4.50-4.93, SD = 0.27-0.61) provide valuable insights into participant acceptance and self-reported learning value, supporting the theoretical integration of Social Cognitive Theory (Bandura, 1977) Dual Coding Theory (Paivio, 1971) and Situated Learning Theory (Lave & Wenger, 1991) in culturally responsive educational technology design.

5.2. Extending Previous Research Findings

The high satisfaction and perceived effectiveness ratings across all evaluation dimensions (M = 4.50-4.93, SD = 0.27-0.61) demonstrate strong participant acceptance and self-reported learning gains that exceed typical satisfaction scores in educational technology interventions. While satisfaction measures differ from learning outcome assessments, these consistently high ratings across diverse school contexts and large sample size (n = 1,000) provide compelling evidence of intervention acceptability and perceived value.

Our findings support previous research emphasizing the importance of culturally appropriate educational content. The high ratings for cultural relevance (M = 4.76) and engagement potential (M = 4.80) from expert evaluators align with research by Gay (2018) demonstrating that culturally responsive pedagogy enhances educational effectiveness. The strong student preference for realistic scenarios (92%) and peer-aged characters (87%) supports Social Cognitive Theory predictions about the importance of model similarity for observational learning (Bandura, 1977).

The optimal video duration findings (3-5 minutes preferred by 89% of students) align with contemporary research on adolescent attention spans while challenging some previous recommendations. Lagerstrom et al. (2015) suggested 6-10 minutes for educational content, but our evidence supports shorter durations for Southeast Asian adolescent learners, possibly reflecting cultural variations in attention patterns and digital media consumption habits.

6. LIMITATIONS AND METHODOLOGICAL CONSIDERATIONS

6.1. Fundamental Study Design Limitations

Post-Implementation Evaluation Design: This study's most significant limitation is the absence of pre-intervention baseline measurements and control group comparisons. The post-implementation evaluation design prevents the establishment of causal relationships between the intervention and actual learning outcomes or behavioral changes. Critically, this methodological constraint means that claims regarding intervention "effectiveness" must be interpreted with considerable caution. While high satisfaction ratings (M = 4.50-4.93) provide valuable insights into participant perceptions and intervention acceptability, they cannot demonstrate actual knowledge acquisition, skill development, or sustained behavioral modification (Kirkpatrick & Kirkpatrick, 2016). The lack of experimental controls fundamentally limits our ability to conclude that the intervention caused any measurable improvements in digital literacy competencies. Observed positive responses could result from novelty effects, social desirability bias, or general enthusiasm for new educational materials rather than specific intervention effectiveness. Without baseline data, we cannot determine whether participants' digital literacy competencies actually improved following exposure to the video content (Campbell & Stanley, 2015). Therefore, while perceived effectiveness is high based on participant satisfaction, actual effectiveness in terms of causal impact on learning outcomes cannot be definitively concluded without a more robust experimental design incorporating pre-post measures and control group comparisons.

Sampling and generalizability limitations: The geographic restriction to the Bangkok Metropolitan Area severely limits generalizability to rural contexts, where 66% of Thai secondary students attend school (Office of the Education Council, 2021). Rural schools face distinct challenges, including limited internet bandwidth, older technological infrastructure, reduced teacher training opportunities, and different socioeconomic student populations, which may significantly impact intervention effectiveness and implementation feasibility (Electronic Transactions Development Agency, 2022).

The convenience sampling approach within Bangkok, while yielding a large sample size (n = 1,000), may not represent the full diversity of Thai secondary education contexts. Private schools accounted for only 14.3% of the sample, potentially under-representing students from higher socioeconomic backgrounds who may face different digital literacy challenges. Additionally, the voluntary participation of schools (28% response rate) introduces

potential selection bias, as participating institutions may have been more motivated or better resourced than non-participating schools.

6.2. Measurement and Validity Limitations

Social desirability and cultural response bias: The reliance on Likert-scale questionnaires administered immediately following intervention exposure introduces significant potential for social desirability bias. Thai cultural values emphasizing respect for authority, harmony, and face-saving may have influenced participants to provide overly positive responses to avoid disappointing researchers or teachers (Thamraksa, 2020). The hierarchical nature of Thai educational contexts may have particularly affected student responses, as disagreeing with or criticizing educational content could be perceived as disrespectful.

The absence of validated instruments specifically designed for Thai cultural contexts further limits measurement validity. While content validity was established through expert review (IOC > 0.5), the instruments' cultural appropriateness and freedom from cultural response bias were not systematically assessed.

Temporal and contextual limitations: The single-semester evaluation period prevents assessment of sustained impact or long-term retention of digital literacy awareness. Educational interventions frequently demonstrate immediate positive effects that diminish over time without reinforcement, particularly for complex competencies like digital literacy that require ongoing practice and application (Clark & Mayer, 2016). The rapidly evolving nature of digital threats and platforms means that content relevance may decrease over time, requiring regular updates to maintain effectiveness.

6.3. Methodological and Analytical Limitations

Single-method evaluation: The study's reliance on satisfaction and perception measures provides limited insight into actual behavioral changes or practical application of digital literacy concepts. Objective measures such as simulated online decision-making scenarios, behavioral observation, or actual digital behavior tracking would provide more robust evidence of intervention effectiveness beyond self-reported perceptions (Breakstone et al., 2021).

Comparison Group Absence: Without comparison to alternative digital literacy interventions or control conditions, we cannot determine whether observed satisfaction reflects unique advantages of the video-based approach or general positive responses to any structured digital literacy intervention. The investment in high-quality video production may not be justified if simpler, less expensive interventions achieve similar satisfaction levels and learning outcomes.

6.4. Implications for Interpretation of Findings

These methodological limitations require that all claims regarding intervention effectiveness be interpreted as evidence of perceived value and acceptability rather than demonstrated causal impact on learning outcomes. While the consistently positive responses across diverse contexts (M = 4.50-4.93) provide valuable evidence of intervention acceptability and perceived value, the absence of pre-intervention baseline measurements and control group comparisons prevents definitive conclusions about actual effectiveness in enhancing digital literacy competencies. Future research employing randomized controlled trial designs with pre-post measurements and validated assessment instruments is essential to establish causal relationships and determine genuine intervention impact on digital literacy knowledge, skills, and behaviors.

7. PRACTICAL AND POLICY IMPLICATIONS

7.1. Practical Implementation Guidelines

The high satisfaction ratings and perceived effectiveness of the video-based intervention provide practical insights for educational implementation in Thailand and similar contexts. The cost-effective production model

($15,000 USD for developing and implementing content reaching 1,000 students) demonstrates feasibility for resource-constrained educational systems, particularly when compared to traditional technology-intensive interventions requiring specialized equipment or software (Trucano, 2016).

Curriculum Integration Strategies: Educational institutions can incorporate these video clips into existing curricula without requiring substantial infrastructure changes. The 3-5 minute duration aligns with standard class periods, allowing teachers to include content during regular lessons, homeroom sessions, or special digital citizenship weeks. The standalone nature of each clip enables flexible implementation across different subjects and grade levels, supporting interdisciplinary approaches to digital literacy education (Hobbs, 2017).

Teacher Training and Support Systems: Successful implementation requires structured teacher professional development programs focusing on three key areas: (1) facilitation of post-viewing discussions that encourage critical thinking about digital scenarios, (2) adaptation of content to local contexts and emerging digital threats, and (3) integration with existing digital citizenship curricula. The establishment of teacher learning communities, supported by online resources and regular workshops, would ensure sustained implementation quality and enable sharing of best practices across schools (Koehler & Mishra, 2009).

Scalable distribution models: The intervention's design for both online and offline viewing addresses Thailand's digital divide challenges, particularly in rural areas with limited internet connectivity. Schools can distribute content via USB drives, local networks, or periodic internet downloads, ensuring equitable access regardless of infrastructure limitations. This hybrid distribution approach could serve as a model for other developing countries facing similar connectivity challenges (UNESCO Institute for Statistics, 2021).

7.2. Policy Implications for Digital Literacy Education

The findings provide crucial evidence supporting policy reforms in digital literacy education, particularly relevant given Thailand's National Digital Economy and Society Development Plan (2018-2037) goals and the Ministry of Education's emphasis on 21st-century skills development.

National Curriculum Policy Recommendations: The three-dimensional digital literacy framework (media literacy, information literacy, and digital citizenship) validated through high participant satisfaction should inform revision of national curriculum standards. The Basic Education Core Curriculum B.E. 2551 (A.D. 2008) requires updating to reflect contemporary digital challenges identified in this study, including online investment fraud, e-commerce safety, and social media conflict management (Ministry of Education, 2021). Integration of scenario-based learning approaches into official curriculum guidelines would provide systematic coverage of digital literacy competencies across all secondary schools.

Teacher Education Policy Reform: The positive teacher responses (M = 4.68-4.80 across evaluation criteria) indicate readiness for video-based digital literacy instruction, but systematic teacher preparation is essential. Teacher education programs should incorporate digital literacy pedagogy as a required competency area, aligned with the Thailand Professional Standards for Teachers. Pre-service and in-service training should emphasize culturally responsive teaching methods and scenario-based discussion facilitation skills identified as crucial for intervention success (Phuapan et al., 2016).

National Assessment and Monitoring Systems: The validated assessment instruments developed in this research could inform national monitoring of digital literacy competencies. The establishment of regular digital literacy assessments, similar to existing national standardized tests, would enable systematic tracking of student progress and identification of schools or regions requiring additional support. This data-driven approach would support evidence-based policy decisions and resource allocation for digital literacy initiatives (Office of the Education Council, 2021).

Regional and international cooperation: Thailand's leadership in developing culturally appropriate digital literacy interventions positions the country to contribute to ASEAN regional frameworks. The shared cultural values of

respect, harmony, and collective responsibility prevalent throughout Southeast Asia (ASEAN, 2020) suggest potential for collaborative development of regional digital literacy standards and content sharing agreements. Thailand could serve as a regional hub for digital literacy innovation, supporting knowledge transfer to neighboring countries facing similar challenges.

7.3. Resource Allocation and Sustainability Considerations

The cost-effectiveness demonstrated in this study supports strategic policy decisions about educational technology investments. Rather than investing heavily in hardware or complex software systems, the evidence suggests that culturally adapted content development may yield higher returns on educational investment. Policy makers should prioritize funding for local content development, teacher training, and sustainable distribution systems over technology infrastructure alone (World Bank, 2020).

Long-term sustainability requires establishing partnerships between educational institutions, media production companies, and civil society organizations. The development of national guidelines for educational content production, quality assurance standards, and regular content updates would ensure continued relevance as digital threats evolve. Policy frameworks should also address intellectual property considerations and content sharing agreements to maximize resource utilization across institutions.

8. FUTURE RESEARCH DIRECTIONS

8.1. Methodological Enhancements and Experimental Design

Randomized Controlled Trial Implementation: The most critical priority for future research involves conducting rigorous randomized controlled trials with pre-post measurements to establish causal relationships between video-based interventions and actual learning outcomes. Future studies should employ Solomon four-group designs or similar robust experimental approaches that control for testing effects while enabling causal inference about intervention effectiveness (Campbell & Stanley, 2015). Such studies should measure actual digital literacy competencies using validated instruments before and after intervention, comparing video-based approaches with alternative methods and control conditions.

Longitudinal Impact Assessment: Extended follow-up studies spanning 6-12 months are essential to determine whether initial positive perceptions translate into sustained behavioral changes and maintained digital literacy practices. Longitudinal research should examine the decay rate of intervention effects, optimal timing for booster sessions, and factors that predict sustained behavior change. This research should incorporate multiple measurement points to track both immediate and delayed effects while accounting for maturation and external influences on digital literacy development (Shadish, Cook, & Campbell, 2002).

Mixed-Methods Integration: Future research should integrate quantitative experimental designs with qualitative ethnographic approaches to understand the mechanisms through which cultural adaptation enhances educational effectiveness. In-depth interviews, focus groups, and classroom observations could illuminate how students and teachers interact with culturally adapted content, revealing the specific cultural elements that facilitate or hinder learning transfer.

8.2. Expansion and Generalization Studies

Geographic and Demographic Expansion: Research extending beyond urban Bangkok to rural and remote areas is crucial for establishing national generalizability. Rural implementation studies should examine how infrastructure limitations, teacher preparation differences, and varying socioeconomic contexts affect intervention feasibility and effectiveness. Comparative studies across Thailand's diverse regions would identify necessary adaptations for different geographic and cultural contexts within the country (Hallinger & Lee, 2011). Cross-Cultural Validation Research: Systematic replication studies across Southeast Asian countries with varying cultural, religious, and educational

contexts would validate the cultural adaptation framework's broader applicability. Such research should examine intervention effectiveness in Buddhist, Islamic, and Christian societies while identifying which cultural adaptation principles are universal versus context-specific. International comparative studies would contribute to developing evidence-based guidelines for cultural adaptation in educational technology. Socioeconomic and Special Populations: Future research should explicitly examine intervention effectiveness across diverse socioeconomic backgrounds, including students from low-income families who may face different digital access and usage patterns. Studies with special populations, including students with learning differences, those with limited technology access, and ethnic minorities, would ensure equitable intervention design and implementation.

8.3. Theoretical Contributions

This research extends Social Cognitive Theory by demonstrating the critical importance of cultural similarity between models and learners in video-based educational interventions. The finding that peer-aged characters were essential for effectiveness (87% preference) in Thai contexts, contrasted with Western studies showing more modest peer influence effects, suggests that applications of Social Cognitive Theory must be more explicitly culturally contextualized.

The study also contributes to the understanding of collective versus individual modeling effects. While Western individualistic cultures often prefer individual decision-making models, Thai participants responded better to collaborative decision-making scenarios reflecting collective cultural values (Khamkhien, 2021). This suggests that Social Cognitive Theory's emphasis on individual agency may need modification in collectivist cultural contexts.

9. CONCLUSIONS

This research demonstrates the potential effectiveness of culturally adapted video-based digital literacy interventions based on high participant satisfaction and perceived learning gains. While the post-implementation evaluation design limits our ability to establish causal relationships or measure actual learning outcomes, the consistently positive responses across diverse contexts (M = 4.50-4.93) provide valuable evidence of intervention acceptability and perceived value among Thai secondary school students and educators.

The 40% higher satisfaction ratings compared to previous generic educational technology interventions suggest that cultural adaptation may enhance participant engagement and perceived learning value. However, future research employing more rigorous experimental designs with pre-post measurements and control groups is essential to establish whether these positive perceptions translate into actual digital literacy improvements and sustained behavioral changes.

As digital literacy becomes increasingly critical for social and economic participation globally, this research provides a framework for developing effective, culturally appropriate interventions adaptable across diverse contexts. The methodology, theoretical insights, and practical applications offer valuable guidance for educators, policymakers, and researchers working to ensure equitable access to digital citizenship education in an increasingly connected world.

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