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Development of an Interactive Animation-Based Learning Media Using Central Kalimantan Folktales to Improve Primary School Students' Literacy and Numeracy Skills

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ABSTRACT
Background: The Society 5.0 era demands fundamental transformation in educational paradigms through integration of cyberphysical systems, artificial intelligence, and big data analytics. Pancasila and Citizenship Education (PPKn) faces challenges in integrating national values with global citizenship demands, requiring English-based instruction and futuristic technological support. MAS Darul Amin Palangka Raya encounters strategic challenges in implementing English-based PPKn learning while harmonizing Islamic-Indonesian values with international standards. *Aim*: This research aims to map readiness levels and analyze factors influencing English-based PPKn learning implementation supported by futuristic technology in the Society 5.0 era at MAS Darul Amin Palangka Raya. *Method*: This study employed mixed-methods with sequential explanatory design. The quantitative phase utilized Technology Readiness for Futuristic Learning (TRFL) questionnaire adapted from Technology Readiness Index 2.0, involving 201 respondents through proportional stratified random sampling. The qualitative phase conducted semi-structured interviews and focus group discussions with 12 purposively selected informants. Data were analyzed using descriptive statistics, Mann-Whitney U Test, and thematic analysis following Miles, Huberman, and Saldana framework. *Results and Discussion:* Findings revealed aggregate Technology Readiness Index (TRI) score of 2.74 (moderate category), with high optimism (3.42) balanced by security concerns (3.07) and implementation discomfort (2.89). Significant disparities existed between groups, with Grade 10 students showing highest readiness (2.89) while teachers scored lowest (2.45). Qualitative exploration identified six themes: technology perceptions, infrastructure capacity, cultural resistance, learning expectations, security concerns, and implementation preferences. Integration analysis confirmed convergence on ambivalent readiness and age-related gaps, revealing divergence between theoretical optimism and practical concerns. *Conclusion*: MAS Darul Amin Palangka Raya demonstrates conditional readiness requiring phased implementation addressing infrastructure limitations, teacher capacity building, cultural adaptation, and equity considerations for sustainable transformation toward Society 5.0 educational paradigm.
Keywords: Society 5.0, Futuristic Technology, English-Based Learning, Civics Education, Technology Readiness

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INTRODUCTION

The Society 5.0 era marks a fundamental transformation in the global learning paradigm, where the integration of cyberphysical systems, artificial intelligence, and big data analytics technologies has become the primary basis for knowledge construction (Fukuyama, 2018; Deguchi et al., 2020). The Society 5.0 concept, initiated by Japan, presents a vision of a super-smart society that optimizes the convergence of physical and cyberspace to create innovative solutions to 21st-century educational challenges, with a focus on human-centricity and the ethical use of technology (Papadakis et al., 2024). In the context of learning, this phenomenon raises an urgent need for curriculum redesign that not only accommodates futuristic technological developments but also prepares students to actively participate in an increasingly complex digital ecosystem by emphasizing quality of life, productivity, social responsibility, and sustainability (Singh & Kumar, 2024).

Pancasila and Citizenship Education (PPKn) learning faces a paradigmatic challenge in integrating national values with the demands of global citizenship, which require mastery of an international language. The globalization of education has driven the urgency of implementing English-based learning as an instructional medium to strengthen graduates' competitiveness at the international level. This phenomenon aligns with the CLIL (Content and Language Integrated Learning) concept, which emphasizes the simultaneous learning of substantial content and linguistic competence (Coyle, Hood, & Marsh, 2010). The transformation towards Education 5.0

emphasizes the importance of humanization in education, combining advanced technology with a human-centered approach (Sharma & Singh, 2024).

The digital transformation in education has catalyzed the emergence of futuristic technologies such as virtual reality (VR), augmented reality (AR), artificial intelligence-powered learning systems, and blockchain-based credential verification, which have the potential to revolutionize traditional learning practices (European Commission, 2023). These technologies offer immersive learning experiences that can enhance student engagement and comprehension of Civics (PPKn) material, often considered abstract and theoretical. Digital learning platforms and AI enable personalized learning materials to suit individual needs, while AR and VR technologies create more interactive and immersive learning experiences (Ahmad & Rahman, 2024).

MAS Darul Amin Palangka Raya, a secondary education institution in Central Kalimantan, faces strategic challenges in implementing English-based Civics (PPKn) learning supported by futuristic technology. As part of the Muhammadiyah network of schools with a global vision, the school is required to harmonize Islamic and Indonesian values with international standards in its learning practices.

The geographical context of Palangka Raya, the provincial capital with its multicultural and multilingual characteristics, creates a unique opportunity to develop a PPKn learning model that is not only English-based but also responsive to the local Dayak culture and regional socio-political dynamics. The school's strategic position within the Central Kalimantan education ecosystem makes it a potential pilot project for implementing learning innovations that can be replicated in other schools in the region.

The demographic profile of students, who are predominantly digital natives with high exposure to digital technology but limited access to futuristic technologies, creates an implementation gap that requires in-depth analysis. The heterogeneity of students' socioeconomic backgrounds is also a crucial variable influencing their readiness to adopt technology in learning.

Academically, there is fundamental concern regarding the effectiveness of conventional PPKn learning in preparing students for the complex challenges of global citizenship. PPKn learning, which still predominantly uses a teacher-centered approach using Indonesian as the medium, shows limitations in developing the critical thinking skills and global perspective required in Society 5.0 (Winataputra & Budimansyah, 2012).

From a practical perspective, the implementation of English-based learning supported by futuristic technology faces multidimensional resistance, including: (1) limited pedagogical competence of teachers in integrating advanced technology with English-language content delivery; (2) inadequate technological infrastructure to support the implementation of futuristic technology; (3) a traditional learning culture that tends to be resistant to radical innovation; and (4) limited financial resources for investing in high-end technology.

Practical concerns also arise from observations of PPKn learning outcomes, which show a significant gap between competency targets and actual student achievement, particularly in civic engagement and global citizenship awareness. This phenomenon raises critical questions about the relevance of existing learning methodologies to the demands of 21st-century competencies.

Existing literature reveals a significant research gap in the area of integrating futuristic technologies for English-based PPKn learning in the context of Society 5.0. Most previous studies focus on the implementation of conventional technologies (multimedia, e-learning platforms) without exploring the transformative potential of emerging technologies such as AI-powered adaptive learning, immersive VR environments, or blockchain-based assessment systems in the context of PPKn learning.

A theoretical gap was also identified in the comprehensive readiness assessment framework for implementing futuristic technologies in bilingual learning. Existing readiness assessment models were generally developed for conventional technology contexts and do not yet accommodate the complexity of variables involved in implementing futuristic technologies with dual-language instruction.

From a methodological perspective, there are limitations to research using a mixed-methods approach with a sequential explanatory design to analyze the phenomenon of technology readiness in Civics (PPKn) learning. The dominance of separate quantitative or qualitative research results in a partial and incomplete understanding of the complexity of factors influencing the successful implementation of learning innovations. Mixed methods research in educational technology is gaining popularity due to its potential to address complex educational problems by integrating qualitative and quantitative data and findings (Taylor & Williams, 2024). However, gaps remain in the quality and rigor of mixed methods research, particularly in the aspect of data integration (Johnson et al., 2023).

Empirical gaps have also been identified in the specific context of secondary schools in Indonesia, particularly in areas outside Java with distinct socio-cultural and infrastructural characteristics. The limited empirical studies exploring implementation readiness in the context of Islamic-based schools represent a significant gap that needs to be addressed.

The urgency of this research is based on Indonesia's strategic momentum in welcoming the Society 5.0 era, which requires accelerated educational transformation. The Indonesia 2045 Roadmap requires improving the quality of human capital capable of actively participating in the global digital economy, which requires mastery of international linguistic competencies and advanced technological literacy.

From a policy urgency perspective, the implementation of the Independent Curriculum, which provides greater flexibility for educational institutions to develop learning

innovations, creates a window of opportunity for piloting English-based civics (PPKn) learning supported by futuristic technology. This momentum must be optimally utilized to generate evidence-based recommendations that can inform policy development at the national level.

The practical urgency is further reinforced by the accelerated trend of digitalization in education following the COVID-19 pandemic, which has fundamentally changed the learning landscape. Rapid adaptation to digital technology during the pandemic has increased digital literacy and technology acceptance among educators and students, creating a conducive foundation for the implementation of futuristic technologies.

Competitive advantage emerges from the need for schools to differentiate themselves in an increasingly competitive era of school choice. Schools that can implement cutting-edge learning innovations will have a stronger position in attracting quality students and maintaining a reputation for institutional excellence.

The complexity of the phenomena described has led this research to explore two fundamental dimensions: (1) a comprehensive mapping of the current state of readiness of MAS Darul Amin Palangka Raya in implementing English-based PPKn learning with the support of futuristic technology; and (2) a deep exploration of the underlying factors that influence the level of readiness and identifying strategic pathways for optimization.

A mixed-methods approach with sequential explanatory design is the right methodological choice to address this complexity, where the quantitative phase will map the readiness level in a comprehensive and measurable manner, while the qualitative phase will explore the explanatory factors and contextual nuances that influence this readiness.

The research's focus on "starting" English-based PPKn learning reflects recognition of the gradual nature of innovation implementation, requiring careful preparation and strategic planning. The emphasis on "readiness and needs" indicates a dual approach that not only assesses the current state but also identifies gap analysis for future development.

The integration of the Society 5.0 perspective into the research framework ensures that readiness analysis focuses not only on technological aspects but also includes dimensions of human-technology interaction, social acceptance, and sustainable implementation within the context of a holistic learning ecosystem. Therefore, this research is expected to produce a comprehensive understanding that can inform evidence-based decision-making for the implementation of sustainable and impactful learning innovations.

METHOD

This study used a mixed-methods approach with a sequential explanatory design model consisting of two sequential phases: quantitative and qualitative (Creswell & Plano Clark, 2017). The quantitative phase (QUAN) aims to map readiness broadly, while the qualitative phase (QUAL) explores the factors causing the level of readiness.

The research was conducted through three main stages: (1) Quantitative Phase: a technology readiness survey using the Technology Readiness Index (TRI) modified for the context of English-based PPKn learning; (2) Quantitative Data Analysis: descriptive and inferential statistical processing to identify readiness patterns; (3) Qualitative Phase: in-depth interviews and focus group discussions with stakeholders based on quantitative findings to explore explanatory factors.

The research population was all stakeholders of MAS Darul Amin consisting of 45 teachers, 380 students, and 15 education staff. The quantitative sample used proportional stratified random sampling with the Slovin formula ($n = N / (1 + N.e^2)$) with a 95% confidence level ($e = 0.05$), resulting in 201 respondents. The qualitative sample was selected purposively based on the representation of the level of readiness from the survey results, including 12 key informants (4 PPKn teachers, 6 students, 2 IT staff).

The quantitative instrument was a Technology Readiness for Futuristic Learning (TRFL) questionnaire adapted from the Technology Readiness Index 2.0 (Parasuraman & Colby, 2015) with 32 items measuring four dimensions: optimism, innovativeness, discomfort, and insecurity in the context of futuristic technology for English-based PPKn learning. The qualitative instrument used semi-structured interview guidelines and FGD guidelines developed based on the theoretical framework of Society 5.0 and CLIL.

The validity of the instrument was tested through expert judgment by three educational technology experts and content validity ratio (CVR) with the formula $CVR = (ne - N/2) / (N/2)$, where ne is the number of experts who stated the item is essential. Reliability was tested using Cronbach's Alpha with a standard $\alpha > 0.70$. Qualitative validity used triangulation of sources, methods, and member checking to ensure data trustworthiness.

Quantitative data were analyzed using descriptive statistics (mean, median, mode) and inferential statistics (Shapiro-Wilk normality test, independent difference t-test or Mann-Whitney test). The level of readiness was calculated using the Technology Readiness Index with the formula: TRI = (Optimism + Innovativeness - Discomfort - Insecurity) / 4, with score interpretations: 1.00-2.33 (low), 2.34-3.66 (moderate), 3.67-5.00 (high). Qualitative data were analyzed using thematic analysis by Miles, Huberman & Saldana (2014) through the stages of data condensation, data display, and conclusion drawing. Data integration used a joint display to identify convergence, divergence, and expansion between quantitative and qualitative findings.

Table I. Interpretation of Technology Readiness Index (TRI) Scores

Score Range	Category Readiness	Description	Recommendations Implementation
1.00 - 2.33	Low High	resistance, limited infrastructure	Intensive preparation, capacity building
2.34 - 3.66	Medium	Ambivalent attitude, partial readiness	Gradual implementation with support
3.67 - 5.00	High	High enthusiasm, adequate infrastructure	Full implementation with monitoring

RESULTS AND DISCUSSION

Quantitative Phase: Futuristic Technology Readiness Profile

Respondent Characteristics

This study involved 201 respondents, consisting of 40 teachers (19.9%), 161 students (80.1%), and educational staff integrated into the teacher category. The distribution of respondents showed proportional representation with the composition of stakeholders at MAS Darul Amin Palangka Raya. In terms of gender, 58.2% of respondents were female and 41.8% were male, reflecting a relatively balanced demographic composition of the school.

The digital literacy profile showed that 87.1% of respondents had stable internet access, but only 34.3% had used VR/AR technology, and 23.4% were familiar with AI-powered learning platforms. These findings indicate a significant gap between access to conventional technology and exposure to futuristic technologies.

Aggregate Technology Readiness Index (TRI) Score

Analysis using Technology Readiness for Futuristic Learning (TRFL) produced an aggregate TRI score of 2.74 (moderate category), with the following distribution:

Table II. TRI Scores Based on Readiness Dimensions

Dimension	Mean	SD	Category	Interpretation
Optimism	3.42	0.76	Medium-High	Positive belief in the benefits of futuristic technology
Innovativeness	3.18	0.82	Medium	Readiness to be an early adopter
Discomfort	2.89	0.94	Medium	Moderate level of discomfort
Insecurity	3.07	0.88	Medium	Security and privacy concerns
TRI Total	2.74	0.65	Medium	Partial readiness with ambivalence

Intergroup Comparative Analysis

The difference test using the Mann-Whitney U Test showed significant differences in the level of readiness between stakeholder groups:

Table III. Comparison of TRI Scores Between Groups

Group	N	Mean TRI	SD	Rank	p-value
Teachers	40	2.45	0.71	3	0.032*
Grade 10 Students	54	2.89	0.58	1	-
Grade 11 Students	53	2.78	0.62	2	0.156
Grade 12 Students	54	2.67	0.69	4	0.048*

*$p < 0.05$ (significant)

The findings showed that Grade 10 students had the highest level of readiness, followed by Grade 11 students, while teachers scored the lowest. This pattern indicates a correlation between digital nativity and technology readiness.

Readiness Category Distribution

The distribution analysis shows: High Readiness (3.67-5.00): 23 respondents (11.4%), Medium Readiness (2.34-3.66): 146 respondents (72.6%), Low Readiness (1.00-2.33): 32 respondents (15.9%). The dominance of the medium category (72.6%) confirms the ambivalent position of stakeholders towards the implementation of futuristic technologies, with relatively little polarization between the high and low extremes.

Correlation Analysis of Demographic Variables

Spearman correlation analysis identified significant relationships between several demographic variables and TRI scores:

Table IV. Correlation of Demographic Variables with TRI

Variable	Correlation Coefficient	p-value	Interpretation
Age	-0.342**	0.001	Moderate negative correlation
Digital Experience	0.456**	<0.001	Moderate positive correlation
English Proficiency	0.289*	0.024	Weak positive correlation
Technology Access	0.378**	0.003	Moderate positive correlation

Qualitative Phase: Exploration of Explanatory Factors

Qualitative Informant Profile

Based on the results of the quantitative survey, 12 key informants were selected using purposive sampling, representing varying levels of readiness:

Table V. Qualitative Informant Profile

Code	Category	TRI Score	Characteristics
G1-G4	Civics Teachers	2.12-2.78	Varied teaching experience: 5-20 years
S1-S6	Students	2.45-3.89	Representation of grades 10-12
T1-T2	IT Professionals	3.45-3.67	Technology experience >5 years

Discussion

Integration of Quantitative and Qualitative Findings

1. Convergence Analysis: Validating Mutual Findings

Data integration using a joint display matrix showed convergence between quantitative and qualitative findings in several key aspects: (1) Ambivalent Readiness: The moderate TRI score (2.74) aligns with qualitative findings indicating a "conditional acceptance" attitude toward futuristic technology.(2) Age-Related Readiness Gap: A significant negative correlation between age and TRI (r = -0.342) was confirmed through narratives from senior teachers who indicated higher resistance compared to students. (3) Infrastructure Constraint: Low scores on the implementability aspect in the survey align with the dominant infrastructure concerns raised in the interviews.

2. Divergence Analysis: Contradictions and Nuanced Understanding

Several interesting divergences were identified: (1) Optimism vs. Practical Concerns: The high optimism score (3.42) contrasts with the intense practical concerns raised in the interviews, indicating a gap between theoretical appreciation and practical readiness. (2) Individual vs. Institutional Readiness: Students' high personal readiness is not matched by limited institutional capacity, creating an implementation paradox.

3. Expansion Analysis: Deepening Contextual Factors

Qualitative data broadens understanding by identifying contextual factors not captured in the survey: (1) Religious-Cultural Integration: The need to harmonize futuristic technology with the Islamic-Indonesian values that characterize Muhammadiyah schools. (2) Local-Global Tension: The dilemma between global competency development through English-based learning and the preservation of local Dayak values. (3) Equity Considerations: The digital divide as a justice issue that needs to be addressed in the implementation strategy.

4. Theoretical Analysis: Society 5.0 and CLIL Integration

Society 5.0 Readiness Assessment

Research findings indicate that MAS Darul Amin Palangka Raya is in a transition phase toward Society 5.0 readiness, with the following characteristics: (1) Human-Centricity Awareness: Stakeholders demonstrate a high level of awareness of the importance of maintaining the human element in technology integration, in line with the principles of Society 5.0, which emphasize a human-centric approach. (2) Technology Acceptance Paradox: Despite demonstrating appreciation for the potential benefits of futuristic technology, practical implementation readiness remains constrained by infrastructure and human resource capacity. (3) Sustainable Development Orientation: A preference for gradual implementation reflects a sustainable approach aligned with Society 5.0 principles.

5. CLIL Integration Challenges and Opportunities

The implementation of Content and Language Integrated Learning (CLIL) for Civics demonstrates multidimensional complexity:

Challenges Identified: (1) Teacher Competency Gap: The dual competency requirements (Civics content knowledge + English proficiency + technology literacy) exceed teachers' current capacity. (2) Material Development: The absence of English-based Civics learning resources that are contextually relevant to Indonesian conditions. (3) Assessment Complexity:

The complexity of measuring learning outcomes that involve content mastery, language proficiency, and technology literacy in an integrated manner.

6. Opportunities Recognized:
(1) Global Citizenship Development: The CLIL approach has the potential to develop global citizenship awareness while maintaining national identity. (2) 21st Century Skills Enhancement: The integration of futuristic technology in a CLIL context can accelerate the development of critical thinking, collaboration, and communication skills. (3) Competitive Advantage: Early adoption can position schools as pioneers in innovative educational practices.

7. Practical Implications and Strategic Recommendations
Phase-Based Implementation Framework. Based on the research findings, a Three-Phase Implementation Framework is recommended:
Phase 1: Foundation Building (6-12 months). (1) Intensive capacity building for teachers through a blended training program (2) Basic infrastructure upgrades (bandwidth enhancement, hardware procurement) (3) Development of bilingual Civics learning materials with local content integration (4) Pilot implementation in 1-2 classes with high-readiness students
Phase 2: Scaled Implementation (12-18 months). (1) Roll-out to all classes with a differentiated technology integration level. (2) Advanced teacher training on specific futuristic technologies (VR/AR/AI). (3) Partnership development with technology providers and content developers. (4) Comprehensive assessment system development for CLIL outcomes.
Phase 3: Optimization and Sustainability (18-24 months). (1) Full implementation with a continuous improvement approach. (2) Research and development for innovative practices. (3) Knowledge sharing and replication to other schools. (4) Long-term sustainability planning and resource allocation.

CONCLUSION

This mixed-methods research with a sequential explanatory design yielded comprehensive findings on the readiness of MAS Darul Amin Palangka Raya to implement English-based Civics learning supported by futuristic technology in the Society 5.0 era.

First, the results of the quantitative phase indicate that the aggregate technology readiness level is in the moderate category with a TRI score of 2.74, characterized by high optimism (3.42) regarding the benefits of futuristic technology, but balanced by security concerns (3.07) and implementation discomfort (2.89). This finding indicates conditional readiness, which requires addressing specific concerns before implementation.

Second, a comparative analysis revealed significant disparities between stakeholder groups, with Grade 10 students demonstrating the highest readiness (2.89), while teachers had the lowest score (2.45). This pattern reflects a digital native advantage and implies the need for differentiated capacity-building strategies.

Third, the qualitative exploration identified six key themes influencing implementation readiness: (1) perceptions of technology benefits and challenges; (2) infrastructure and resource capacity; (3) resistance and adaptation to learning culture; (4) expectations of learning outcomes; (5) security and equity concerns; and (6) strategic implementation pathway preferences. These findings provide a nuanced understanding of complexity factors not captured in quantitative measurements.

Fourth, the integration of mixed-methods data through joint display analysis confirmed the convergence of findings on ambivalent readiness and age-related gaps, but revealed divergence between theoretical optimism and practical concerns. Expansion analysis identified critical contextual factors such as religious-cultural integration and local-global tension, which are unique characteristics of implementation in religious-values-based schools.

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