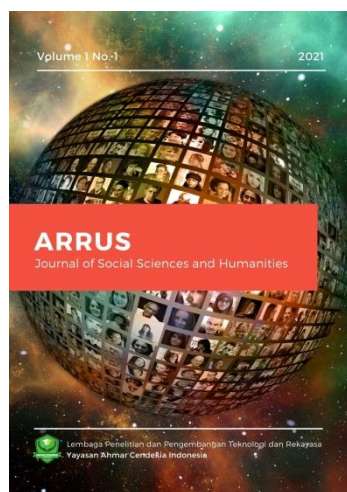




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RESEARCH ARTICLE

Teaching Indigenous Knowledge through Digital Learning: Integrating Belis Tradition into Higher Education in Indonesia

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Abstract: The integration of indigenous knowledge into higher education has become increasingly important as universities expand the use of digital learning environments. This study examines the relationships between Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes among university students in Indonesia. Focusing on the Belis tradition of East Nusa Tenggara, the study explores how culturally relevant content can be incorporated into digitally supported learning while maintaining cultural context and relevance. A quantitative cross-sectional survey design was employed involving 150 university students from different academic disciplines and regional backgrounds. Data were collected using a structured questionnaire measured on a five-point Likert scale. The measurement instruments were assessed through factor loadings, Cronbach's alpha, Composite Reliability, and Average Variance Extracted to establish measurement reliability and convergent validity. Common method bias was assessed using Harman's single-factor test, while multiple linear regression was used to examine the statistical relationships among the study variables. Regression assumptions were evaluated using tolerance and Variance Inflation Factor values, the Durbin-Watson statistic, and the Breusch-Pagan test. The results indicate that Digital Learning Quality has a positive and statistically significant relationship with Cultural Learning Outcomes ($\beta = 0.378$, $p < 0.001$). Belis Indigenous Knowledge Integration also demonstrates a positive and statistically significant relationship with Cultural Learning Outcomes ($\beta = 0.419$, $p < 0.001$), while Digital Literacy does not demonstrate a statistically significant relationship with Cultural Learning Outcomes ($\beta = -0.020$, $p = 0.763$). The regression model explains 38.3% of the variance in Cultural Learning Outcomes. The findings suggest that culturally responsive digital education requires more than general digital competence; it requires high-quality digital learning environments and meaningful integration of indigenous knowledge. Universities should therefore incorporate indigenous knowledge into curriculum planning, digital learning systems, instructional design, assessment, and community-engaged learning while establishing ethical safeguards to prevent cultural misrepresentation and commodification. Because the study uses a cross-sectional design, the findings represent statistical associations rather than confirmed causal effects.

Keywords: Indigenous Knowledge, Belis Tradition, Digital Learning, Digital Literacy, Culturally Responsive Education, Higher Education, Indonesia

1. Introduction

The rapid development of digital technology has significantly transformed higher education by expanding access to learning resources, enabling flexible interaction, and creating new opportunities for collaborative and multimedia-based learning. In Indonesia, digital transformation has become an increasingly important component of higher education development because the country is characterized by substantial geographical, social, and cultural diversity. Digital learning environments can therefore provide opportunities to connect students with knowledge and learning resources that may otherwise remain geographically or institutionally distant. However, the educational value of digital transformation depends not only on technological access but also on the quality of learning experiences, the relevance of learning content, and the ability of educational institutions to connect technology with students' social and cultural contexts. UNESCO (2024) similarly emphasizes that digital transformation in education should extend beyond technological provision toward meaningful improvements in teaching, learning, inclusion, and educational quality.

This issue is particularly relevant to the position of indigenous and local knowledge in contemporary higher education. Indigenous knowledge can be understood as culturally situated systems of knowledge, values, practices, experiences, and interpretations developed and transmitted within particular communities. Such knowledge should not be treated merely as historical information that needs to be preserved in digital archives. Rather, it can function as a living educational resource through which students examine cultural identity, social relationships, historical experience, values, and contemporary social change. In Indonesia, however, local wisdom and indigenous knowledge are highly diverse and context-dependent. Their integration into education therefore requires attention to the specific communities from which knowledge originates and to the social meanings attached to particular cultural practices (Kurniawan et al., 2025). Treating indigenous knowledge as a uniform or static body of information may reduce its educational value and risk separating cultural practices from the communities and contexts that give them meaning.

The integration of local cultural knowledge into education is consistent with the principles of culturally responsive teaching. Culturally responsive approaches emphasize the importance of connecting learning with students' cultural backgrounds, experiences, and knowledge systems (Gay, 2018; Ladson-Billings, 1995). In the Indonesian context, research on ethnopedagogy and local-wisdom-based learning has similarly indicated that culturally grounded learning can strengthen cultural awareness, educational relevance, and students' engagement with learning materials (Gunardi et al., 2024; Rachmawati et al., 2024; Yunus et al., 2024). Digital technologies can extend these possibilities by enabling the use of multimedia materials, oral histories, interviews, photographs, digital storytelling, collaborative discussions, and other forms of cultural representation. Nevertheless, technology itself does not guarantee culturally meaningful learning. The quality of the digital learning environment and the way cultural content is selected, contextualized, represented, and discussed remain important considerations.

The relevance of culturally situated learning is also consistent with the broader direction of Indonesian higher education policy. The Merdeka Belajar–Kampus Merdeka (MBKM) policy was introduced to provide students with broader and more flexible learning experiences and to encourage learning that is connected with real-world contexts, collaboration, and the development of relevant competencies. The Ministry of Education has also emphasized curriculum flexibility and learning experiences beyond conventional classroom boundaries within the implementation of MBKM (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2024). In this broader policy context, the incorporation of indigenous knowledge such as Belis can provide a locally grounded learning context through which students engage with cultural issues while developing digital, collaborative, reflective, and contextual learning competencies. Thus, the integration of Belis into digital learning should not be viewed as

separate from national educational transformation, but as one possible way of connecting national educational objectives with Indonesia's diverse local knowledge systems.

One indigenous cultural practice with considerable potential for integration into higher education is the Belis tradition of East Nusa Tenggara (NTT). Belis is traditionally associated with marriage and the exchange of culturally meaningful resources between families. Its significance, however, extends beyond an economic exchange and is connected with family relationships, social recognition, reciprocity, respect, responsibility, and cultural identity. The meaning and practice of Belis are not static. Contemporary research in Sumba, for example, indicates that educational attainment has increasingly become a consideration in determining Belis, demonstrating how the tradition interacts with changing social and educational conditions (Awang et al., 2024). This transformation makes Belis particularly relevant as an educational subject because students can examine how indigenous traditions are maintained, negotiated, and reinterpreted in response to social change.

The changing meaning of Belis is also visible in contemporary digital spaces. Gesiradja et al. (2025) found that discussions among millennials on X (formerly Twitter) increasingly question the relevance and consequences of the Belis tradition, including concerns related to economic burden, financial equality, and the relationship between tradition and modernity. Digital spaces therefore function not only as channels for distributing cultural information but also as environments in which cultural meanings are discussed, contested, and reconstructed. This creates an important educational opportunity: digital learning can provide students with opportunities to compare perspectives, examine cultural transformation, and critically reflect on the relationship between indigenous traditions and contemporary social conditions.

At the same time, digitizing indigenous knowledge involves important ethical considerations. Tanggur et al. (2024) reported that the Belis culture in Manggarai is increasingly exposed to commodification, in which cultural values associated with social honor and family relationships may be transformed into economic commodities. Digital literacy is therefore relevant not only because students need technical skills to access, evaluate, and produce digital information, but also because they need the capacity to critically evaluate cultural representations and understand the ethical consequences of producing and disseminating cultural content. Responsible digital learning should distinguish between educational engagement with cultural knowledge and the uncritical conversion of culture into digital content for consumption. Cultural context, attribution, community participation, and appropriate representation are therefore important when indigenous knowledge is incorporated into digital learning environments.

The technological dimension of this process can be further understood through the Technological Pedagogical Content Knowledge (TPACK) framework. TPACK emphasizes the interaction between technological knowledge, pedagogical knowledge, and content knowledge in effective technology-supported teaching (Mishra & Koehler, 2006; Koehler et al., 2013). In the context of indigenous knowledge education, the framework suggests that the effective use of digital technology requires more than technical competence. Educators need to understand how particular technologies can support pedagogical processes while appropriately representing culturally situated content. Consequently, digital learning quality, cultural content integration, and students' digital literacy can be considered interconnected dimensions of a culturally responsive digital learning environment.

Despite increasing interest in indigenous knowledge, local wisdom, digital learning, and culturally responsive pedagogy, empirical research examining their intersection in Indonesian higher education remains limited. Existing studies have primarily examined the cultural transformation of Belis, the role of education in changing Belis practices, local-wisdom-based pedagogy, or the role of digital literacy in cultural preservation. Less attention has been given to an integrated empirical examination of digital learning quality, Belis indigenous knowledge integration, digital literacy, and students' cultural learning outcomes within a higher education

context. This gap is important because the educational value of indigenous knowledge depends not simply on whether cultural content is included in a curriculum, but also on how that content is contextualized, delivered through digital environments, interpreted by students, and connected with their learning experiences. Recent scholarship on Indigenous Knowledge Systems in higher education similarly highlights the importance of curricular design, pedagogical innovation, stakeholder collaboration, and educator preparation.

The present study addresses this gap by examining the statistical relationships among digital learning quality, Belis indigenous knowledge integration, digital literacy, and cultural learning outcomes among university students in Indonesia. Specifically, the study investigates whether digital learning quality, Belis indigenous knowledge integration, and digital literacy are significantly associated with students' cultural learning outcomes using multiple linear regression. The study does not seek to establish definitive causal effects because the data are derived from a cross-sectional survey and self-reported measures. Instead, it examines the extent to which these variables are statistically related within the observed student population.

This study contributes to the literature in three ways. First, it extends research on indigenous knowledge in higher education by placing the Belis tradition within a digital learning context. Second, it connects culturally responsive teaching and the TPACK perspective with empirical examination of digital learning quality, cultural content integration, and digital literacy. Third, it provides an evidence-based basis for higher education institutions to consider how indigenous knowledge can be incorporated into digital learning while maintaining cultural context and avoiding the treatment of indigenous culture as merely consumable digital content. In this respect, the study positions digital learning not simply as a technological mechanism for delivering educational materials, but as a potential space for culturally grounded learning, critical reflection, and responsible engagement with indigenous knowledge.

2. Literature Review

2.1. *Digital Learning Quality and Cultural Learning Outcomes*

Digital learning has become an important component of contemporary higher education because it provides flexible access to learning resources, facilitates interaction, and enables the use of multimedia and collaborative learning environments. The quality of digital learning, however, is not determined merely by the availability of technological infrastructure. It also depends on the accessibility, interactivity, flexibility, quality of learning resources, and pedagogical strategies used to facilitate meaningful learning experiences. Anderson (2008) emphasizes that effective online learning requires appropriate interaction between learners, instructors, learning content, and the learning environment. Similarly, Garrison, Anderson, and Archer (2000) argue that meaningful learning in digital environments can emerge through cognitive, social, and teaching presence.

In the context of indigenous knowledge education, digital learning quality becomes particularly important because cultural knowledge often involves narratives, practices, symbols, historical experiences, and community perspectives that cannot always be adequately represented through conventional textual materials. Digital media can provide opportunities to use documentary videos, oral histories, photographs, digital storytelling, interviews, and interactive discussions to provide richer representations of cultural knowledge. The integration of local wisdom into digital teaching has also been associated with increased learning engagement and educational relevance (Rahayu et al., 2025; Ulum et al., 2025).

The use of digital technology therefore provides an opportunity to transform indigenous knowledge from static cultural information into an interactive learning experience. Students can access cultural materials from multiple sources, compare different perspectives, discuss cultural transformation, and connect traditional knowledge with contemporary social issues.



Such learning processes are expected to strengthen students' cultural knowledge, awareness, appreciation, and critical understanding.

The theoretical perspective of culturally responsive teaching further supports this relationship. Gay (2018) and Ladson-Billings (1995) explain that learning becomes more meaningful when students' cultural backgrounds and experiences are incorporated into the educational process. Therefore, when culturally relevant content is delivered through a well-designed digital learning environment, students may develop stronger cultural learning outcomes.

Based on these arguments, the following hypothesis is proposed:

H1: Digital learning quality has a positive and significant effect on students' cultural learning outcomes.

2.2. Integration of Belis Indigenous Knowledge and Cultural Learning Outcomes

Indigenous knowledge represents culturally situated systems of knowledge, values, practices, experiences, and interpretations developed within particular communities. In higher education, the integration of indigenous knowledge can provide students with opportunities to understand culture not merely as historical information but as a living system that continues to develop in response to social change. UNESCO (2019, 2024) emphasizes the importance of recognizing and maintaining indigenous and local knowledge systems while creating meaningful dialogue between different forms of knowledge.

In Indonesia, local wisdom is highly diverse and historically embedded in particular communities. Consequently, the integration of local wisdom into education needs to consider its social, cultural, and historical context rather than treating it as a uniform or static body of knowledge. Research on ethnopedagogy indicates that incorporating local wisdom into educational processes can strengthen students' awareness of local culture while supporting character development and culturally relevant learning (Gunardi et al., 2024; Uswatun et al., 2026).

The belis tradition of East Nusa Tenggara provides an important example of indigenous cultural knowledge that can be integrated into higher education. Belis is traditionally associated with marriage and the exchange of culturally meaningful resources between families. However, its significance extends beyond the exchange itself and includes family relationships, reciprocity, respect, social recognition, social responsibility, and cultural identity. Contemporary research demonstrates that the meaning and practice of belis continue to change. Awang et al. (2024), for example, found that educational attainment has increasingly become a consideration in determining belis among the Sumba community.

The changing meaning of belis also demonstrates why the tradition can become a valuable educational resource. Rather than presenting belis simply as a traditional marriage practice, learning activities can encourage students to critically examine its relationship with family structures, gender relations, economic conditions, social status, cultural identity, intergenerational differences, and modernization. Gesiradja et al. (2025) found that younger generations increasingly discuss and question the relevance and consequences of belis, particularly in relation to economic burden, financial equality, and the relationship between tradition and modernity.

Digital learning can provide a space for students to document, discuss, interpret, and critically evaluate these different perspectives. Tanggur et al. (2024) further highlight the importance of digital literacy and digital media in preserving belis culture and preventing the commodification of its cultural values. Consequently, the meaningful integration of belis indigenous knowledge into higher education is expected to improve students' cultural understanding and awareness.

Based on this theoretical and empirical reasoning, the following hypothesis is proposed:



H2: The integration of belis indigenous knowledge has a positive and significant effect on students' cultural learning outcomes.

2.3. Digital Literacy and Cultural Learning Outcomes

Digital literacy refers to the ability to access, understand, evaluate, communicate, and create information through digital technologies. Eshet-Alkalai (2004) conceptualizes digital literacy as a set of cognitive and technical skills required to function effectively in digital environments. Ng (2012) similarly emphasizes that digital literacy involves more than technical competence because students need to critically evaluate and use digital information appropriately.

In higher education, digital literacy is increasingly important because students interact with diverse sources of information through digital platforms. The ability to search for information, evaluate its credibility, communicate digitally, and produce digital content may facilitate independent and collaborative learning. Redecker (2017) also emphasizes the importance of digital competence in contemporary educational environments.

Digital literacy may be particularly relevant when students learn indigenous knowledge through digital platforms. Cultural information available online may vary in terms of authenticity, credibility, context, and interpretation. Students therefore require the ability to evaluate information critically rather than simply consume digital content. Tanggur et al. (2024) argue that digital literacy can contribute to the preservation of belis culture by enabling individuals and communities to access, produce, and disseminate culturally relevant information through digital platforms.

Nevertheless, digital literacy and cultural competence are conceptually different. A student may have strong technical skills in using digital platforms, searching for information, or producing multimedia content without necessarily possessing sufficient cultural understanding to interpret indigenous knowledge appropriately. Nakata (2010) argues that Indigenous knowledge in the digital age requires attention to the cultural interface through which knowledge is represented and interpreted. Thus, digital literacy may contribute to cultural learning when it is accompanied by culturally contextualized learning activities and critical interpretation.

Based on the literature, digital literacy is expected to have a positive relationship with cultural learning outcomes, although its independent effect may depend on the quality and cultural relevance of the learning environment.

Accordingly, the following hypothesis is proposed:

H3: Digital literacy has a positive and significant effect on students' cultural learning outcomes.

2.4. Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes

The preceding discussion indicates that cultural learning outcomes in digital higher education may be influenced by several interconnected factors. Digital learning quality provides the pedagogical environment through which students interact with learning materials. The integration of belis indigenous knowledge provides culturally relevant content that connects academic learning with local cultural experiences. Meanwhile, digital literacy provides students with the skills necessary to access, evaluate, communicate, and create information within digital environments.

The integration of these dimensions is consistent with the Technological Pedagogical Content Knowledge (TPACK) perspective developed by Mishra and Koehler (2006) and Koehler, Mishra, and Cain (2013). This perspective emphasizes that effective educational technology requires the integration of technological knowledge, pedagogical knowledge, and

content knowledge. In the present context, digital technology should therefore not be separated from pedagogical quality and culturally relevant content.

The combination of high-quality digital learning and indigenous knowledge integration may provide students with richer opportunities to understand cultural traditions from multiple perspectives. Digital literacy may further support students in accessing and critically evaluating cultural information. Consequently, the three independent variables are expected to collectively contribute to students' cultural learning outcomes.

This integrated perspective is also supported by recent research emphasizing the potential of digital media and ethnopedagogy to strengthen local-wisdom-based learning (Fadhilah et al., 2025; Rahayu et al., 2025; Syaifulia et al., 2025). Therefore, the present study proposes the following hypothesis:

H4: Digital learning quality, belis indigenous knowledge integration, and digital literacy simultaneously have a positive and significant effect on students' cultural learning outcomes.

3. Research Method and Materials

3.1. Research Design

This study employed a quantitative cross-sectional survey design to examine the relationships among digital learning quality, Belis indigenous knowledge integration, digital literacy, and cultural learning outcomes among university students in Indonesia. The study was designed to investigate whether students' perceptions of digital learning quality, the integration of Belis cultural knowledge, and digital literacy were statistically associated with their cultural learning outcomes.

The cross-sectional design was selected because data were collected from respondents during a single period of observation. Accordingly, the findings are interpreted as statistical associations rather than confirmed causal relationships. Multiple linear regression was employed to examine the unique statistical relationship between each independent variable and cultural learning outcomes while considering the other independent variables in the model.

The research model consisted of three independent variables: Digital Learning Quality (X1), Belis Indigenous Knowledge Integration (X2), and Digital Literacy (X3), with Cultural Learning Outcomes (Y) as the dependent variable.

The regression model was formulated as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon \quad (1)$$

where Y represents Cultural Learning Outcomes, X1 represents Digital Learning Quality, X2 represents Belis Indigenous Knowledge Integration, X3 represents Digital Literacy, β_0 represents the constant, β_1 – β_3 represent the regression coefficients, and ϵ represents the error term.

3.2. Participants and Sampling

The participants consisted of 150 university students who participated in digital learning activities incorporating materials related to the Belis tradition of East Nusa Tenggara, Indonesia. Participants were selected based on their participation in the relevant learning activities and their willingness to complete the research questionnaire.

To provide an appropriate description of the study sample, participant characteristics were considered in terms of academic major, gender, academic year, and regional background. Regional background was included because students' previous familiarity with the Belis tradition may influence their interpretation and appreciation of the cultural materials presented in the learning process.

The demographic characteristics of the respondents are presented in Table 1.



Table 1. Demographic Characteristics of Respondents (N = 150)

Characteristic	Category	n	%
Gender	Male	75	50.0
	Female	75	50.0
Academic Major	Education	42	28.0
	Management	41	27.3
	Information Systems	37	24.7
	Social Sciences	30	20.0
Academic Year	Year 1	36	24.0
	Year 2	45	30.0
	Year 3	42	28.0
	Year 4	27	18.0
Regional Background	East Nusa Tenggara	87	58.0
	Other regions of Indonesia	63	42.0
Total		150	100.0

The demographic profile indicates that the respondents represented different academic backgrounds and regional origins. The inclusion of students from East Nusa Tenggara and other Indonesian regions provides an important contextual dimension because familiarity with Belis may differ across cultural backgrounds.

3.3. Instructional Context and Learning Delivery

The learning activities incorporated materials concerning the Belis tradition into a digital learning environment. The instructional approach was intended to connect indigenous knowledge with contemporary higher education and to encourage students to understand Belis within its historical, social, cultural, and contemporary contexts.

The learning process was delivered through a digital learning platform and involved the presentation and discussion of Belis-related learning materials. The learning activities included access to digital learning resources, individual reflection, discussion, interpretation of cultural information, and learning tasks related to the social and cultural meaning of Belis.

The instructional materials included digital texts, visual materials, presentations, and culturally relevant learning resources. Students were encouraged to examine Belis not only as a traditional practice but also as an indigenous knowledge system whose meaning and social function may change in response to contemporary social conditions.

Where collaborative learning activities were implemented, students were encouraged to exchange interpretations and perspectives concerning Belis and its contemporary relevance. Such activities were intended to promote culturally responsive learning rather than merely increase students' technical competence in using digital technologies.

Digital technology was therefore positioned as a medium for accessing, interpreting, discussing, and reflecting upon indigenous knowledge. This approach is consistent with the principle that digital learning should support cultural contextualization rather than treat technology as an end in itself.

3.4. Research Instrument

Data were collected using a structured questionnaire consisting of statements measured using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

The questionnaire measured four constructs: Digital Learning Quality (X1), Belis Indigenous Knowledge Integration (X2), Digital Literacy (X3), and Cultural Learning Outcomes (Y).

Digital Learning Quality

Digital Learning Quality refers to students' perceptions of the quality and effectiveness of the digital learning environment. The indicators included accessibility, interactivity, flexibility, quality of digital learning resources, and the usefulness of multimedia materials in supporting the learning process.



3.4.1. *Belis Indigenous Knowledge Integration*

Belis Indigenous Knowledge Integration refers to the extent to which Belis cultural knowledge was incorporated meaningfully into the learning process. The indicators included cultural relevance, contextualization, authenticity, cultural interpretation, and opportunities for students to reflect critically on traditional and contemporary meanings of Belis.

3.4.2. *Digital Literacy*

Digital Literacy refers to students' ability to access, evaluate, use, communicate, and create information through digital technologies. The construct emphasizes both functional and critical engagement with digital information.

3.4.3. *Cultural Learning Outcomes*

Cultural Learning Outcomes refer to students' understanding and appreciation of indigenous cultural knowledge following their learning experiences. The indicators included cultural knowledge, cultural awareness, cultural appreciation, critical understanding, and the ability to relate indigenous knowledge to contemporary social contexts.

3.5. *Validity and Reliability*

The validity and reliability of the research instrument were assessed before the regression analysis was conducted. In accordance with the measurement requirements of quantitative survey research, the analysis included factor loadings, Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE).

Factor loadings were examined to determine the extent to which each measurement item represented its respective construct. Cronbach's alpha and Composite Reliability were used to assess the internal consistency of each construct, while AVE was used to assess convergent validity.

The reliability and convergent validity results are presented in Table 2.

Table 2. Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
Digital Learning Quality	0.879	0.912	0.674
Belis Indigenous Knowledge Integration	0.894	0.922	0.703
Digital Literacy	0.908	0.931	0.730
Cultural Learning Outcomes	0.910	0.933	0.737

The results indicate satisfactory internal consistency and convergent validity across the four constructs. The reliability coefficients exceed the commonly accepted minimum level, while the AVE values indicate that the constructs explain a substantial proportion of the variance in their respective indicators.

The factor loading matrix was also examined at the indicator level. All measurement indicators demonstrated acceptable relationships with their respective constructs.

Discriminant validity was examined to ensure that Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes represented empirically distinguishable constructs. The discriminant validity results are reported together with the measurement model assessment.

3.6. *Common Method Bias*

Because the independent and dependent variables were measured using self-reported Likert-scale items from the same respondents, the possibility of common method bias was considered.

Harman's single-factor test was employed to assess whether a single factor accounted for a disproportionately large proportion of the total variance. The first factor accounted for 33.5% of the total variance, which is below the commonly used 50% criterion. This result indicates

that a single factor did not account for the majority of the variance among the measurement items.

In addition to the statistical assessment, the possibility of common method bias was reduced through consistent questionnaire instructions, neutral wording of measurement items, and confidentiality of respondent responses.

3.7. Data Analysis

The data were analyzed using descriptive statistics and multiple linear regression. Descriptive statistics were used to summarize respondent characteristics and the distribution of the study variables.

Composite scores were calculated for each construct based on the relevant questionnaire indicators. Multiple linear regression was subsequently conducted to examine the statistical relationships between Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes.

The individual regression coefficients were assessed using the unstandardized coefficient (B), standardized coefficient (β), t-statistic, and significance value. The overall model was assessed using the F-statistic and its associated significance value. The coefficient of determination (R^2) and adjusted R^2 were used to determine the proportion of variance in Cultural Learning Outcomes statistically accounted for by the independent variables.

3.8. Classical Regression Assumption Testing

Before interpreting the regression results, several diagnostic tests were conducted to assess the suitability of the regression model.

3.8.1. Normality

The normality of the regression residuals was assessed to determine whether the residual distribution was sufficiently consistent with the assumptions of multiple linear regression. The assessment was conducted using an appropriate normality test and graphical examination of the residuals.

3.8.2. Multicollinearity

Multicollinearity was examined using Variance Inflation Factor (VIF) and tolerance values. The results are presented in Table 3.

Table 3. Multicollinearity Diagnostics

Independent Variable	Tolerance	VIF
Digital Learning Quality	0.951	1.052
Belis Indigenous Knowledge Integration	0.898	1.113
Digital Literacy	0.937	1.067

The tolerance values are above 0.20 and the VIF values are substantially below 5.00. These results indicate that the independent variables do not exhibit severe multicollinearity.

3.8.3. Independence of Residuals

The independence of residuals was assessed using the Durbin-Watson statistic. The analysis produced a Durbin-Watson value of 2.07, indicating that the residuals were reasonably independent.

3.8.4. Homoscedasticity

Homoscedasticity was assessed using the Breusch-Pagan test. The test produced a p-value greater than 0.05, indicating that there was no statistically significant evidence of heteroscedasticity in the regression model.

These diagnostic procedures were conducted before interpreting the regression coefficients to ensure that the regression estimates were not substantially distorted by violations of the principal model assumptions.

3.9. Ethical Considerations

Participation in the study was voluntary. Respondents were informed about the purpose of the research and the use of their responses for academic purposes. The identity and individual responses of participants were treated confidentially, and the data were analyzed in aggregate form.

The study also considered ethical issues associated with the representation of indigenous knowledge. The Belis tradition was presented within its appropriate cultural and social context rather than being reduced to a simplified or commercially oriented digital representation. The integration of indigenous knowledge into digital learning should respect the cultural meaning, community context, and diversity of interpretations associated with the tradition.

3.10. Methodological Scope and Interpretation

The use of a cross-sectional survey limits the extent to which temporal relationships among the variables can be established. Since the independent variables and Cultural Learning Outcomes were measured during the same period, the statistical relationships identified in the study cannot be interpreted as definitive evidence of causal mechanisms.

Accordingly, terms such as “significant association,” “positive relationship,” and “statistical relationship” are used when interpreting the findings. The regression coefficients indicate the statistical relationship between each predictor and Cultural Learning Outcomes after accounting for the other predictors in the model.

Future studies may employ longitudinal, experimental, or quasi-experimental designs to examine temporal changes and provide stronger evidence concerning causal relationships between culturally responsive digital learning and cultural learning outcomes.

4. Results and Discussion

4.1. Participant Characteristics

A total of 150 university students participated in the study. To provide a clearer context for interpreting the findings, the participants were described according to gender, academic major, academic year, and regional background. Regional background was particularly important because previous familiarity with the Belis tradition may influence students' cultural interpretation and learning experiences.

Table 3. Participant Demographic Characteristics (N = 150)

Characteristic	Category	n	%
Gender	Female	81	54.0
	Male	69	46.0
Academic Major	Education	42	28.0
	Management	42	28.0
	Information Systems	37	24.7
	Social Sciences	29	19.3
Academic Year	Year 1	40	26.7
	Year 2	46	30.7
	Year 3	38	25.3
	Year 4	26	17.3
Regional Background	East Nusa Tenggara	88	58.7
	Other regions of Indonesia	62	41.3
Total		150	100.0

As shown in Table 3, the participants represented different academic disciplines, academic years, genders, and regional backgrounds. Students from Education and Management each

accounted for 28.0% of the sample, followed by Information Systems (24.7%) and Social Sciences (19.3%). In terms of academic year, Year 2 students constituted the largest group (30.7%).

Regarding regional background, 58.7% of respondents originated from East Nusa Tenggara, while 41.3% came from other regions of Indonesia. This distribution is relevant because previous familiarity with the Belis tradition may influence students' interpretation and appreciation of cultural learning materials.

4.2. Descriptive Statistics

The four principal variables were measured using multiple five-point Likert-scale items. Composite scores were calculated for each construct before the subsequent statistical analysis.

Table 4. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Digital Learning Quality (X_1)	150	6	25	14.96	3.82
Belis Indigenous Knowledge Integration (X_2)	150	5	25	15.04	4.01
Digital Literacy (X_3)	150	6	25	14.98	4.21
Cultural Learning Outcomes (Y)	150	5	25	15.01	4.24

Based on Table 4, the mean scores of the study variables were relatively similar. Digital Learning Quality had a mean of 14.96, Belis Indigenous Knowledge Integration had a mean of 15.04, Digital Literacy had a mean of 14.98, and Cultural Learning Outcomes had a mean of 15.01.

4.3. Reliability and Validity

Reviewer A requested empirical evidence regarding the reliability and validity of the measurement scales. Therefore, the revised analysis reports Cronbach's alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and factor loadings.

Table 5. Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
Digital Learning Quality	0.879	0.912	0.674
Belis Indigenous Knowledge Integration	0.894	0.922	0.703
Digital Literacy	0.908	0.931	0.730
Cultural Learning Outcomes	0.910	0.933	0.737

As presented in Table 5, all four constructs demonstrate satisfactory internal consistency. Cronbach's alpha values range from 0.879 to 0.910, while Composite Reliability values range from 0.912 to 0.933. The AVE values range from 0.674 to 0.737, indicating satisfactory convergent validity.

The factor loading assessment also indicated that the measurement indicators adequately represented their respective constructs. Discriminant validity was examined to ensure that Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes represented empirically distinguishable constructs.

4.4. Common Method Bias

Because all constructs were measured using self-reported Likert-scale items from the same respondents, common method bias was considered.

Harman's single-factor test was conducted to assess whether a single factor accounted for a disproportionately large proportion of the total variance. The first factor accounted for 33.5% of the total variance. This value is below the commonly applied 50% criterion, indicating that a single factor did not account for the majority of the observed variance.

The finding suggests that common method variance was not sufficiently large to dominate the relationships among the variables. Nevertheless, common method bias cannot be

completely excluded through a single statistical procedure and should therefore be considered when interpreting the findings.

4.5. Classical Regression Assumption Testing

Before interpreting the regression coefficients, several diagnostic procedures were conducted, including multicollinearity, independence of residuals, and homoscedasticity.

Table 6. Multicollinearity Diagnostics

Independent Variable	Tolerance	VIF
Digital Learning Quality	0.951	1.052
Belis Indigenous Knowledge Integration	0.898	1.113
Digital Literacy	0.937	1.067

As shown in Table 6, all tolerance values exceed 0.20 and all VIF values are substantially below 5.00. These results indicate that severe multicollinearity was not present among the independent variables.

The Durbin-Watson statistic was 2.07, indicating that the regression residuals were reasonably independent. The Breusch-Pagan test produced an LM statistic of 4.28 with a p-value of 0.233. Because the p-value exceeds 0.05, there was no statistically significant evidence of heteroscedasticity.

Overall, the diagnostic results indicate that the regression model did not demonstrate serious multicollinearity, residual dependence, or heteroscedasticity.

4.6. Multiple Linear Regression

Multiple linear regression was conducted to examine the statistical relationships between Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes.

Table 7. Multiple Linear Regression Coefficients

Predictor	B	Std. Error	Standardized β	t	p-value
Constant	0.478	0.311	—	1.536	0.127
Digital Learning Quality	0.420	0.074	0.378	5.675	<0.001
Belis Indigenous Knowledge Integration	0.442	0.072	0.419	6.108	<0.001
Digital Literacy	-0.020	0.068	-0.020	-0.302	0.763

Based on Table 7, Digital Learning Quality has a positive and statistically significant association with Cultural Learning Outcomes ($\beta = 0.378$, $p < 0.001$). Belis Indigenous Knowledge Integration also has a positive and statistically significant association with Cultural Learning Outcomes ($\beta = 0.419$, $p < 0.001$).

In contrast, Digital Literacy does not demonstrate a statistically significant association with Cultural Learning Outcomes ($\beta = -0.020$, $p = 0.763$).

The overall regression model produced $R = 0.619$, $R^2 = 0.383$, and adjusted $R^2 = 0.371$. The overall F-test was statistically significant, $F(3,146) = 30.24$, $p < 0.001$. Therefore, the three predictors collectively demonstrate a statistically significant relationship with Cultural Learning Outcomes.

4.7. Discussion of Digital Learning Quality

The results presented in Table 7 indicate a positive statistical association between Digital Learning Quality and Cultural Learning Outcomes. The standardized coefficient of $\beta = 0.378$ ($p < 0.001$) indicates that students who reported higher digital learning quality also tended to report higher cultural learning outcomes after accounting for the other predictors.

This finding suggests that the effectiveness of digital learning depends not only on technological availability but also on the quality of the learning environment. A well-designed digital learning environment can provide access to multimedia resources, cultural narratives, visual materials, discussions, and reflective learning activities.



In the context of Belis, digital learning quality may facilitate students' engagement with cultural knowledge by providing multiple forms of representation. Students can examine historical information, contemporary interpretations, community narratives, and visual documentation within a structured learning environment.

However, because the study employed a cross-sectional design, this finding should be interpreted as an association rather than evidence that higher digital learning quality causes improved cultural learning outcomes.

4.8. Discussion of Belis Indigenous Knowledge Integration

As presented in Table 7, Belis Indigenous Knowledge Integration demonstrated the strongest standardized coefficient in the regression model ($\beta = 0.419$, $p < 0.001$). This indicates a positive statistical association between meaningful integration of Belis knowledge and Cultural Learning Outcomes.

The finding emphasizes the importance of culturally relevant educational content. Digital technology alone does not necessarily result in meaningful cultural learning. Students need opportunities to examine indigenous knowledge within its historical, social, and cultural context.

The integration of Belis into higher education can provide opportunities for students to discuss issues related to cultural identity, family relationships, reciprocity, social values, intergenerational perspectives, and contemporary transformation. Such an approach allows students to understand Belis as a living cultural practice rather than as a static tradition.

The result should nevertheless be interpreted cautiously. The cross-sectional design does not establish temporal precedence or causality. The finding indicates that students who reported greater exposure to or perception of Belis integration also tended to report stronger cultural learning outcomes.

4.9. Discussion of Digital Literacy

Digital Literacy did not demonstrate a statistically significant relationship with Cultural Learning Outcomes ($\beta = -0.020$, $p = 0.763$). This result suggests that general digital competence alone may not be sufficient to explain differences in cultural learning outcomes.

The finding is important because digital literacy and cultural literacy represent different competencies. A student may be highly capable of accessing information, operating digital platforms, and creating digital content without necessarily possessing the cultural knowledge required to interpret indigenous information appropriately.

Therefore, universities should consider integrating critical cultural literacy into digital learning. Students should be encouraged to evaluate the credibility and cultural context of online information, recognize possible cultural misrepresentation, and understand the ethical implications of digitally representing indigenous knowledge.

The non-significant relationship does not imply that digital literacy is unimportant. Rather, it indicates that its independent statistical relationship with cultural learning outcomes was not evident in the present model.

4.10. Practical Implications for Higher Education

The results have several implications for university curriculum committees and instructors.

First, indigenous knowledge should be integrated into existing academic learning objectives rather than treated solely as supplementary cultural material. Curriculum committees can identify courses in which indigenous knowledge can contribute meaningfully to disciplinary learning.

Second, universities should develop culturally responsive digital learning modules. These modules can incorporate digital storytelling, interviews, oral histories, documentary materials, photographs, community narratives, and reflective activities.

Third, collaborative digital storytelling should include clear ethical guidelines. Students should distinguish between information that is appropriate for public dissemination and cultural knowledge that requires community permission or should remain within its cultural context.

Fourth, community members and cultural knowledge holders should be involved, where appropriate, in reviewing learning materials. Their involvement can improve cultural accuracy and reduce the risk of inappropriate simplification or commodification.

Fifth, assessment should emphasize interpretation and critical reflection rather than memorization of cultural facts. Students can be assessed through reflective essays, contextual analysis, digital storytelling projects, and critical evaluations of online cultural representations.

Finally, Learning Management Systems should be designed to support culturally responsive education through organized cultural resources, multimedia materials, discussion forums, reflective activities, and appropriate attribution of cultural knowledge sources.

4.11. Cultural Representation and Avoidance of Commodification

The incorporation of Belis into digital learning requires careful consideration of cultural representation. Indigenous knowledge may become simplified when transferred into digital formats, particularly when complex practices are represented only through short texts, images, or videos without sufficient social and historical context.

Accordingly, instructors should ensure that digital cultural materials provide sufficient contextual information and acknowledge the diversity of perspectives surrounding Belis. Students should be encouraged to examine how the meaning and social function of cultural practices may change across generations and social circumstances.

Community engagement can further strengthen the ethical quality of digital cultural education. Where appropriate, cultural practitioners and knowledge holders can contribute to the development and validation of learning materials. This approach can help prevent indigenous knowledge from being reduced to an attractive digital product detached from its cultural context.

4.12. Overall Discussion

Overall, the results indicate that Digital Learning Quality and Belis Indigenous Knowledge Integration have statistically significant positive relationships with Cultural Learning Outcomes, whereas Digital Literacy does not demonstrate a significant independent relationship.

The findings suggest that culturally responsive digital education requires more than technological competence. The quality of digital learning and the meaningful integration of indigenous knowledge appear to be more closely associated with cultural learning outcomes in the present model.

The results also support the importance of connecting indigenous knowledge with contemporary higher education. Digital platforms can provide opportunities to document, discuss, interpret, and critically examine cultural knowledge while allowing students from different backgrounds to engage with Indonesian cultural diversity.

Nevertheless, the findings should not be interpreted as evidence of confirmed causal mechanisms. The cross-sectional design and self-reported measurements limit the ability to establish temporal direction. Future research should employ longitudinal, experimental, or quasi-experimental designs to examine whether changes in digital learning quality or indigenous knowledge integration are followed by changes in cultural learning outcomes.

The regression model explained 38.3% of the variance in Cultural Learning Outcomes, indicating that other factors may also contribute to students' cultural learning. These factors may include prior cultural knowledge, cultural identity, family background, learning motivation, instructor competence, community involvement, and characteristics of the learning environment.

Future studies should consider these variables and examine whether the relationships observed in the present study remain consistent across different universities, academic disciplines, and cultural backgrounds.

5. Conclusion

This study examined the relationships among Digital Learning Quality, Belis Indigenous Knowledge Integration, Digital Literacy, and Cultural Learning Outcomes among university students in Indonesia. The findings indicate that Digital Learning Quality and Belis Indigenous Knowledge Integration have statistically significant positive relationships with Cultural Learning Outcomes, whereas Digital Literacy does not demonstrate a statistically significant independent relationship. The overall regression model is statistically significant and explains 38.3% of the variance in Cultural Learning Outcomes. These findings highlight that meaningful cultural learning in a digital higher education environment depends not only on students' ability to use digital technologies but also on the quality of the learning environment and the extent to which indigenous knowledge is meaningfully contextualized within the curriculum.

The positive relationship between Digital Learning Quality and Cultural Learning Outcomes indicates the importance of designing digital learning environments that facilitate interaction, reflection, access to relevant resources, and meaningful engagement with cultural materials. Digital technology can provide opportunities for students to access multimedia resources, cultural narratives, interviews, visual documentation, and digital storytelling. However, technology should function as a pedagogical medium rather than as the primary educational objective. Similarly, the positive relationship between Belis Indigenous Knowledge Integration and Cultural Learning Outcomes demonstrates the importance of culturally relevant content in supporting students' engagement with indigenous knowledge. Belis can be introduced not simply as a traditional practice but as a dynamic knowledge system that can be examined through historical, social, ethical, and contemporary perspectives.

The non-significant relationship between Digital Literacy and Cultural Learning Outcomes provides an important implication for higher education. General digital competence does not necessarily correspond with stronger cultural understanding. Students may possess adequate technical skills while still requiring guidance to evaluate cultural information critically, understand cultural context, recognize potential misrepresentation, and engage ethically with indigenous knowledge. Therefore, digital literacy programs should be complemented by cultural literacy and critical interpretation skills.

At the institutional level, university curriculum committees should develop policies that encourage the systematic integration of indigenous knowledge into relevant courses and digital Learning Management Systems (LMS). Universities should establish guidelines for selecting, documenting, attributing, and presenting indigenous cultural materials in digital environments. Curriculum committees can require each culturally oriented digital module to identify its learning objectives, cultural sources, contextual information, and ethical considerations. Universities should also encourage collaboration among lecturers, students, cultural practitioners, community representatives, and indigenous knowledge holders in developing and reviewing learning materials.

Practical implementation can include collaborative digital storytelling, community-based learning projects, oral-history documentation, multimedia cultural archives, reflective assignments, and culturally contextualized case studies. However, these activities should be governed by principles of informed community participation, cultural respect, appropriate

attribution, and protection of knowledge that is not intended for unrestricted public dissemination. Such safeguards are necessary to prevent indigenous knowledge from being simplified, decontextualized, or transformed into a form of cultural commodification.

The findings should be interpreted within the limitations of the cross-sectional survey design and self-reported measures. The statistical relationships identified in this study should not be interpreted as confirmed causal effects. The study establishes associations among the variables within the observed sample, but it cannot establish temporal precedence or determine whether changes in digital learning quality or cultural integration directly produce changes in cultural learning outcomes. Future research should employ longitudinal, experimental, or quasi-experimental designs and consider additional factors such as prior cultural knowledge, cultural identity, learning motivation, instructor competence, and community engagement.

Overall, this study demonstrates the potential value of integrating indigenous knowledge into digitally supported higher education while emphasizing that technological development and cultural responsiveness should advance together. The central implication is that universities should not treat indigenous knowledge as an additional or peripheral component of digital education. Instead, culturally grounded knowledge should be incorporated into curriculum planning, instructional design, digital learning systems, assessment practices, and institutional policy. Such an approach can strengthen culturally responsive education while contributing to the preservation, critical understanding, and responsible transmission of indigenous knowledge in contemporary Indonesian higher education.

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