

Development and Validation of a Blended Learning Framework Based on Virtual Indigenous Knowledge for Support Student Digital Literacy

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ABSTRACT:

Digital transformation has changed practice learning at college high, but integration of technology learning is often not yet accompanied by an effort to preserve local knowledge (indigenous knowledge). Research: This aim is to develop and validate a framework for Blended Learning based on Virtual Indigenous Knowledge (VIK), designed to support learning in System Museum Management and improve student digital literacy. Research uses the Research and Development approach with the ADDIE model, which includes the stages analysis, design, development, implementation, and evaluation. The subject study consists of one expert validator, the lecturer's guardian eye, lecturers, and students of the Science Study Program, Islamic Library and Information. Instruments study covering sheet validation, questionnaire practicality, and testing results learning. Data analysis using Aiken's V index, Intraclass Correlation Coefficient (ICC), descriptive statistics, and t-test. Research results show that the developed framework fulfils the valid, practical, and effective categories. Integration of Virtual Indigenous Knowledge in blended learning is capable increase access student to sources culture local, strengthening literacy information based on the SCONUL Seven Pillars framework, as well as increase involvement student in the learning process. Findings show that merging digital technology and indigenous knowledge can become an innovative strategy in education tall for support digital transformation at once preservation inheritance culture.

Keywords: blended learning, indigenous knowledge, vortal, digital literacy

1. Introduction

Digital transformation has fundamentally changed the way universities design, manage, and implement learning processes. The use of digital technology is no longer seen simply as a learning tool but has become an integral part of the educational ecosystem, enabling more flexible, collaborative, and student-centered learning. In

the context of higher education, blended learning has become one of the most widely used approaches because it combines the advantages of face-to-face learning with the flexibility of online learning. Various studies have shown that blended learning contributes to increased student engagement, independent learning, critical thinking skills, and better learning outcomes

compared to conventional approaches (Anthony et al., 2022; Luo & Zhou, 2024; Istenič, 2024). Furthermore, blended learning has evolved into a learning ecosystem that integrates face-to-face interactions, online learning, and personalized learning experiences (Hrastinski, 2019; Rasheed et al., 2020). Recent developments show that the success of blended learning is not only determined by the use of technology but also by the ability of learning design to create meaningful and contextual learning experiences for students (Ramsey, 2024).

The development of digital technology, higher education also faces an equally significant challenge: the decreasing access of young people to local knowledge, or indigenous knowledge. In a global context, the recognition of indigenous knowledge is increasingly seen as part of efforts to decolonize education and strengthen a more inclusive epistemology. Local knowledge is no longer positioned as a complement to academic knowledge, but as a source of knowledge with its own validity and relevance in the learning process (Battiste, 2013; Nakata et al., 2014). This knowledge not only serves as a community's cultural identity but also serves as a learning resource that represents how communities understand their environment, history, and social life (UNESCO, 2023). However, globalization, modernization, and the dominance of universal digital information sources have led to the marginalization of many forms of local knowledge within the formal education system. This situation has the potential to reduce the connection of young people to local cultural identities, which are an important part of the nation's cultural heritage.

The urgency of preserving indigenous knowledge through education is gaining increasing attention in various higher education studies. Integrating local knowledge into the learning process not only aims to preserve culture but also to increase the relevance of learning to the social and cultural contexts of students. Johnson and Mbah (2024) emphasize that the integration of indigenous knowledge in higher education is a crucial part of decolonizing knowledge and strengthening epistemological diversity in academic

environments. Meanwhile, Durmush et al. (2024) found that learning that accommodates local cultural perspectives can increase student engagement, strengthen cultural identity, and create more meaningful learning experiences. However, the implementation of indigenous knowledge in higher education still faces various obstacles, particularly related to documentation, accessibility of learning resources, and integration into digital learning environments.

In the Indonesian context, this problem is also found in lessons related to history, culture, and museums. Previous research has shown that the younger generation is increasingly limited in recognizing various forms of local cultural heritage, including folklore, customary genealogies (*ranji*), community traditions, and various other sources of cultural knowledge (Hasfera, 2024). The lack of easily accessible information sources means that the process of learning about local culture is not optimal. This condition is increasingly evident in the Museum Management Systems course, which requires students to understand museum collections, cultural artifacts, manuscripts, and various other primary sources as part of the learning process.

Learning Museum Management Systems faces quite complex challenges because students require direct access to authentic museum collections and cultural resources. In practice, students often struggle to obtain comprehensive information about museum collections, both due to limited physical access and the lack of adequate digital documentation. Information about museum collections available online is generally partial, non-standardized, and often presents only basic information without adequate contextual descriptions. As a result, students rely more heavily on secondary sources scattered across various websites of varying quality and credibility. Dissertation research findings indicate that limited access to museum collection and cultural resource metadata is a major obstacle in learning Museum Management Systems (Hasfera, 2024).

The digital transformation of museums and cultural institutions has also changed the way users interact with cultural collections. Digital

museums no longer function solely as information repositories but have evolved into interactive learning environments that enable active knowledge construction by users (Parry, 2013; Sylaiou et al., 2020). The digital transformation of cultural collections has increased access to artifacts, manuscripts, museum collections, and various forms of cultural documentation that were previously only available physically. In the context of higher education, digital cultural heritage serves not only as a preservation tool but also as a learning resource, enabling students to explore cultural artifacts, manuscripts, museum collections, and historical documentation more broadly. According to Giannini and Bowen (2022), the digitization of cultural heritage has expanded opportunities for culture-based learning by providing more inclusive and sustainable access to previously inaccessible cultural resources. Therefore, the development of local culture-based digital repositories is a crucial strategy for bridging the needs of digital learning with the preservation of cultural heritage.

The VIK concept developed in this study aligns with the development of digital museums, which integrate cultural collections, historical documentation, and community knowledge sources into technology-based learning environments. This approach enables a connection between digital cultural heritage and formal learning activities (Srinivasan et al., 2010; Giannini & Bowen, 2024). In this study, this learning environment is developed through Vortal Indigenous Knowledge (VIK), a vertical portal designed to provide integrated access to various cultural information sources, museum collections, historical documentation, and local knowledge relevant to learning needs. Unlike general information portals, Vortal allows users to access curated information sources based on specific field needs, thus making the process of searching and utilizing information more effective (Hasfera, 2024).

From an information literacy perspective, the existence of VIK also has the potential to support the development of student competencies in identifying information needs, finding relevant

sources, evaluating information quality, managing information, and generating new knowledge. These competencies align with the SCONUL Seven Pillars of Information Literacy framework, which positions students as active learners in the process of searching, evaluating, and using information (SCONUL, 2011). In a blended learning environment, strengthening information literacy becomes increasingly important because students are required to interact with various digital information sources with varying levels of quality and credibility (Mubasiroh, 2023).

Although research on blended learning has expanded widely, most previous studies have focused on learning effectiveness, student engagement, faculty competence, or technology integration in the learning process (Anthony et al., 2022; Ramsey, 2024). On the other hand, research on indigenous knowledge generally focuses on cultural preservation and curriculum development, while studies on digital cultural heritage have focused more on the digitization of cultural collections. To date, there is still relatively limited research integrating blended learning, indigenous knowledge, digital cultural heritage, and information literacy into a comprehensive learning framework supported by a dedicated digital portal. Thus, there is a research gap that needs to be bridged by developing learning models that connect digital transformation with local cultural preservation in higher education settings. Unlike previous studies, which tended to examine blended learning, indigenous knowledge, digital cultural heritage, and information literacy separately, this study develops a learning framework that integrates these four components into a unified learning ecosystem. The novelty of this research lies in the development of Virtual Indigenous Knowledge (VIK) as a digital learning environment that functions not only as a cultural repository but also as a learning medium that supports students' exploration, evaluation, knowledge construction, and information literacy development. Thus, the developed framework is oriented not only toward improving learning outcomes but also toward preserving and transmitting local cultural knowledge through the use of digital technology.

This research contributes to three main aspects. First, theoretically, this research expands the study of blended learning by integrating indigenous knowledge, digital cultural heritage, and information literacy based on the SCONUL Seven Pillars into a unified conceptual framework. Second, methodologically, this research develops and validates a Virtual Indigenous Knowledge-based learning framework through a Research and Development approach using the ADDIE model. Third, practically, this research offers an alternative digital learning environment that can be utilized in culture and heritage-based learning in higher education, particularly in courses that require access to cultural resources and museum collections. Therefore, this research is positioned at the intersection of four fields of study: blended learning, indigenous knowledge, digital cultural heritage, and information literacy, which until

now have rarely been integrated into a comprehensive learning framework.

Based on these gaps, this study aims to develop and validate a Virtual Indigenous Knowledge-Based Blended Learning Framework to support students' digital literacy in Museum Management Systems learning. The developed framework integrates the concepts of blended learning, indigenous knowledge, digital cultural heritage, and information literacy based on the SCONUL Seven Pillars into a unified learning ecosystem. The main contribution of this research lies in the development of a learning model that not only supports digital transformation in higher education but also contributes to the preservation, documentation, and transmission of local cultural knowledge to the younger generation.

Table 1. Research Gap and Research Novelty Position

No	Researchers	Focus Study	Key Findings	Limitations Study	Identified Gaps
1	Anthony et al. (2022)	Adoption and implementation of blended learning in education	Blended learning increases the flexibility and effectiveness of learning	Focus on factors adoption technology and institutions	Not yet integrated indigenous knowledge in blended learning design (Springer Nature Link)
2	Istencić (2024)	Integrated and distributed blended learning model	Demonstrates the development of blended learning towards a digital learning ecosystem	Does not discuss the preservation of local culture and cultural learning resources	Not yet connecting blended learning with digital cultural heritage and indigenous knowledge (Springer Nature Link)
3	Dang et al. (2026)	systematic study of TPACK and AI-based blended learning	Emphasizing the importance of pedagogical design over purely technological approaches	Focus on pedagogy and AI	Does not discuss the integration of local culture as a digital learning resource (MDPI)
4	Zakariya et al. (2024)	Experience student in blended learning	Blended learning enhances the learning experience but is influenced by	Focus on experience learning	Not explored yet source Study based culture and museums (Nature)

No	Researchers	Focus Study	Key Findings	Limitations Study	Identified Gaps
			technological readiness.		
5	Yip & Chakma (2024)	Indigenous knowledge in education tall	Demonstrates the importance of integrating indigenous perspectives into the curriculum	Focus on teacher education	Not yet utilizing dedicated digital platforms For support indigenous knowledge learning (Taylor & Francis Online)
6	Johnson & Grandpa (2024)	Decolonization curriculum education tall	Indigenous knowledge is important in expand perspective epistemology	Focus on aspects curriculum	Have not developed a learning model based technology For support Implementation of Indigenous Knowledge (Taylor & Francis Online)
7	Jaber et al. (2024)	Indigenous pedagogy in education tall	Integration of indigenous values increases student engagement	Not using a dedicated digital learning environment	Not yet connecting indigenous pedagogy with blended learning and literacy information (DOAJ)
8	Oshima et al. (2025)	Hybrid blended learning and creation knowledge student	Hybrid learning supports knowledge construction and collaboration	Focus on the learning process	Not yet used source knowledge culture local as a basis for learning (Springer Nature Link)
9	Giannini & Bowen (2022)	Digital cultural heritage and the transformation of cultural learning	Digitization increases access to cultural heritage	Preservation and access oriented	Not yet developed as a blended learning model in learning education tall
10	Mubasiroh (2023)	Literacy information SCONUL based	SCONUL effectively improves students' information literacy competencies	Not linked with indigenous knowledge and digital cultural heritage	Not yet integrated to in a blended learning model based on culture local
11	Hrastinski (2019)	Conceptualization of blended learning in education tall	Blended learning is understood as a pedagogical approach that strategically	Focus on definition conceptual and design learning	Not yet integrated source Study based on indigenous knowledge and heritage digital

No	Researchers	Focus Study	Key Findings	Limitations Study	Identified Gaps
			integrates online and offline learning experiences.		culture in blended learning ecosystem
12	Rasheed et al. (2020)	Challenge implementation of blended learning	The success of blended learning is influenced by technological readiness, digital competence, and learning design.	Focus on technical and pedagogical barriers to implementing blended learning	Not yet explored the use of digital cultural heritage as a learning resource in a blended learning environment
13	Sylaiou et al. (2020)	Virtual museums and their use in a digital environment	Virtual museums enhance accessibility and experience interactive users to collection culture	Oriented towards the development and evaluation of virtual museums	Not yet developed a virtual museum as a blended learning environment that supports student information literacy
14	Srinivasan et al. (2010)	Digital museums and representation knowledge diverse cultures	Digital museums can be a means of representing various cultural perspectives and community knowledge.	Focus on cultural representation and digital information access	Not yet connected digital museum with development literacy information SCOUNL- based and learning based on indigenous knowledge

Based on study study previously , can concluded that study regarding blended learning, indigenous knowledge, digital cultural heritage, and information literacy have develop in a way significant in a number of year last . However , some big study Still examine each aspect the in a way separate . Blended learning research is more Lots focus on effectiveness learning , design pedagogical , and integration technology (Anthony et al., 2022; Istenić, 2024; Dang et al., 2026), whereas more indigenous knowledge research emphasize on development curriculum , decolonization education , and strengthening identity culture (Yip & Chakma, 2024; Johnson & Mbah, 2024). On the other hand , digital cultural heritage studies generally oriented towards digitalization and preservation inheritance culture , while study literacy information more focused on development competence information

student through framework like SCOUNL Seven Pillars.

Until moment This still very limited integrated research fourth aspect the to in One framework comprehensive learning . No learning model has been found that is comprehensive systematic combining blended learning, indigenous knowledge, digital cultural heritage, and literacy information in One ecosystem digital learning supported by vertical portals special (vortal). Therefore that , research This fill in gap the through development and validation of the Blended Learning Framework Based on Virtual Indigenous Knowledge (VIK) designed For support learning System Museum Management at once strengthen digital literacy and preservation knowledge culture local .

Research Novelty Positioning

Aspect	Previous Research	This research
Blended Learning	Focus on learning effectiveness	Integrating blended learning with indigenous knowledge
Indigenous Knowledge	Focus on curriculum and culture	Integrated into a digital learning environment
Digital Cultural Heritage	Focus on digitizing cultural collections	Used as a learning resource in blended learning
Information Literacy	Focus on information skills	Integrated through SCONUL Seven Pillars in the learning model
Learning Platform	General LMS or standard learning platform	Vortal Indigenous Knowledge based on local culture
Contribution	Digital learning or cultural preservation separately	Integration of digital learning, information literacy, and cultural preservation in one framework

2. Literature Review

2.1 Blended Learning in Higher Education

Blended learning is a learning approach that integrates face-to-face and online learning in a planned manner to create a more flexible and effective learning experience. Graham (2019) explains that blended learning not only combines two learning modes but also integrates pedagogical strategies that enable students to gain a richer learning experience through a combination of direct interaction and the use of digital technology. Over time, blended learning has become a dominant approach in higher education due to its ability to increase student engagement, learning flexibility, and independent learning abilities (Anthony et al., 2022; Istenić, 2024).

Horn and Staker (2015) identified several blended learning models, namely the Rotation Model, the Flex Model, the A La Carte Model, and the Enriched Virtual Model. Among these models, the Flex Model is considered the most suitable for supporting digital-based learning because it allows students to obtain most of the material through online platforms with flexible lecturer facilitation support. This characteristic is relevant

to the needs of Museum Management Systems learning, which requires access to various cultural information sources and museum collections available digitally.

Recent research shows that the effectiveness of blended learning is greatly influenced by the quality of the instructional design, the integration of digital learning resources, and students' ability to manage their learning independently (Ramsey, 2024; Luo & Zhou, 2024). Therefore, blended learning requires a learning environment that not only provides access to information but also supports the active construction of knowledge.

2019) emphasized that blended learning is not merely a combination of online and offline learning, but rather a pedagogical design that utilizes the strengths of each learning mode to achieve optimal learning goals. that , Rasheed et al. (2020) showed that success The implementation of blended learning is greatly influenced by the design activity learning , support technology , and readiness student in manage learning independent .

2.2 Indigenous Knowledge as Source Learning

Indigenous knowledge is system growing knowledge in something community through experience historical , interaction social and adaptation to inherited environment in a way passed down from generation to generation . UNESCO (2023) defines indigenous knowledge as knowledge local that reflects identity culture something society and have mark important in support sustainability social as well as preservation culture . In context education high , indigenous knowledge is seen as source capable learners strengthen relevance learning with context social culture students . Integration of indigenous knowledge in learning allows student understand connection between theory academic with reality developing culture in society (Johnson & Mbah, 2024). In addition , the approach This support development awareness culture , appreciation to diversity knowledge , and strengthening identity local in the middle current globalization .

Although Thus , the use of indigenous knowledge in education tall Still face various challenges , especially related documentation and accessibility source study . Most of knowledge local Still stored in form oral or spread in various institutions culture so that difficult accessible to students . Conditions This show the need development environment capable digital learning documenting and providing access to indigenous knowledge sources in systematic.

Battiste (2013) explains that integration of indigenous knowledge in education contribute to strengthening identity culture and diversity epistemology . In line with that , Nakata et al. (2014) emphasized that education tall need provide room for various system knowledge so that the learning process No dominated by one perspective epistemological certain .

2.3 Digital Cultural Heritage and Vortal Indigenous Knowledge

The development of digital technology has driven a transformation in cultural heritage management through the concept of digital cultural heritage. This concept refers to the process of documenting, digitizing, preserving, and providing access to various forms of cultural

heritage using digital technology (Giannini & Bowen, 2022). Digital cultural heritage plays a strategic role in education because it allows students to gain access to cultural collections that were previously only accessible physically. In the museum context, collection digitization serves not only as a means of preservation but also as a learning medium that allows students to explore artifacts, manuscripts, and historical documentation more broadly. Srinivasan et al. (2010) argue that effective digital museums not only provide access to cultural collections but also enable the representation of various cultural perspectives that develop in society. Furthermore, Sylaiou et al. (2020) show that virtual museums can increase user engagement through more interactive and contextual exploration experiences.

In study This , the concept of digital cultural heritage is realized through Vortal Indigenous Knowledge (VIK). VIK is a vertical portal designed For provide access integrated to various source information culture , museum collection metadata , documentation history and knowledge local . Different with information portal general , VIK functions as environment digital learning that supports search information , exploration source culture and construction knowledge student in a way independent .

2.4 Literacy Information Based on SCONUL Seven Pillars

Literacy information is ability individual For recognize need information , find source relevant information , evaluate quality information , managing information , and use information in a way effective in the learning process and solution Problems . In higher education, information literacy is an essential competency that supports students' success in navigating the complexity of digital information. One widely used model for developing information literacy is the SCONUL Seven Pillars of Information Literacy. This framework consists of seven core competencies: Identify, Scope, Plan, Gather, Evaluate, Manage, and Present (SCONUL, 2011). These seven competencies describe the step-by-step process

students undertake in discovering and utilizing information to generate new knowledge.

In the context of VIK-based learning, the SCONUL framework serves as a foundation for designing learning activities that encourage students not only to access cultural information but also to evaluate, interpret, and construct new knowledge based on available indigenous knowledge sources. In the era of digital transformation, information literacy is increasingly linked to digital literacy, which encompasses the ability to find, evaluate, manage, and use information critically in digital environments. Tang and Chaw (2016) emphasized that digital literacy is a crucial prerequisite for the success of blended learning because students are required to be able to interact independently with various digital information sources. Furthermore, Falloon (2020) added that digital competency encompasses not only technical skills but also the

ability to think critically and reflectively in using technology.

2.5 Conceptual Framework of the Research

Based on theoretical studies, this study develops a conceptual framework that integrates four main components: blended learning, indigenous knowledge, digital cultural heritage, and information literacy based on the SCONUL Seven Pillars. Indigenous knowledge serves as the primary source of knowledge documented through Vortal Indigenous Knowledge as a form of digital cultural heritage. VIK then becomes a digital learning environment that supports the implementation of blended learning. Through learning activities designed based on the SCONUL framework, students develop information literacy skills that ultimately contribute to improved learning outcomes, student engagement, and the preservation of local cultural knowledge.

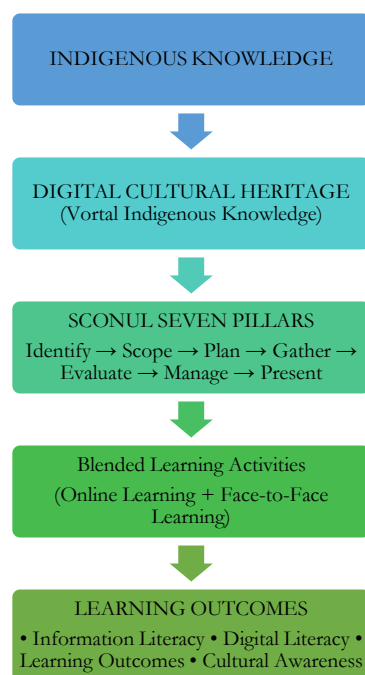


Figure 1. Vortal Indigenous Knowledge Framework

3. Methodology

3.1 Research Design

Study This use Research and Development (R&D) approach with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model for develop and validate Framework Blended Learning is based on Virtual

Indigenous Knowledge (VIK). The ADDIE model was chosen . Because provide systematic procedures in design , develop , implement , and evaluate product learning in a way sustainable . This approach allows the development of a framework that not only meets theoretical aspects but can also be tested for validity,

practicality, and effectiveness in real learning contexts. The research was conducted in the Museum Management System course at the Islamic Library and Information Science Study Program, Faculty of Adab and Humanities, UIN Imam Bonjol Padang. The focus of the development was directed at the integration of blended learning, indigenous knowledge, digital cultural heritage, and information literacy based on SCONUL Seven Pillars in a digital learning environment based on Vortal Indigenous Knowledge.

3.2 Participants and Sample

The study involved several groups of participants purposively selected according to the needs at each stage of development. In the validation

stage, participants consisted of expert validators with competencies in the fields of instructional design, learning materials, learning media, and language. Validators were selected based on their academic experience, professional expertise, and involvement in teaching materials development and educational research. In the implementation and evaluation stages, the study involved one lecturer teaching the Museum Management System course and 29 students from the Islamic Library and Information Science Study Program who were taking the course. The students were selected because they were direct users of the framework and Virtual Indigenous Knowledge being developed. The following table show characteristics participants study .

Table 3. Participants Study

Research Stage	Participants	Amount
Product Validation	Content expert validator	2
Product Validation	Design expert validator	2
Product Validation	Language expert validator	2
Product Validation	Graphics/media expert validator	2
Implementation	Supporting lecturer	1
Implementation	Student	29

3.3 Instruments

Data collection was carried out using several customized instruments with objective research. Validation sheet used to evaluate the quality of the framework and tools. The developed learning. The assessment is carried out on four main aspects: a) Content suitability; b) Language; c) Graphics/media; d) Learning design. The instrument uses a five-level Likert assessment scale, which is then analyzed using Aiken's V index and the Intraclass Correlation Coefficient (ICC).

Questionnaire practicality used to get the perception of lecturers and students about the convenience of the framework and Virtual

Indigenous Knowledge. Aspects assessed include: a) Convenience usage; b) Clarity navigation; c) Conformity with need learning; d) Efficiency use; e) Benefits for the learning process. Data analysis is carried out in a quantitative way using a number of techniques adjusted for statistics with an objective study.

4. Results

4.1 Development of the VIK-Based Blended Learning Framework

Study This produce A Framework Blended Learning based on Virtual Indigenous Knowledge (VIK) is designed For support learning System Museum Management.

Framework developed integrate four component main, namely blended learning, indigenous knowledge, digital cultural heritage, and literacy information based on SCONUL Seven Pillars.

The framework consists of on four stages main learning, namely : (1) formulating achievements learning , (2) mapping and organizing learning, (3)

designing activity learning VIK-based , and (4) assembling channel VIK -based blended learning. This framework implemented through the digital portal that provides access to museum collection , source culture local, collection metadata , and various source Study based on indigenous knowledge.

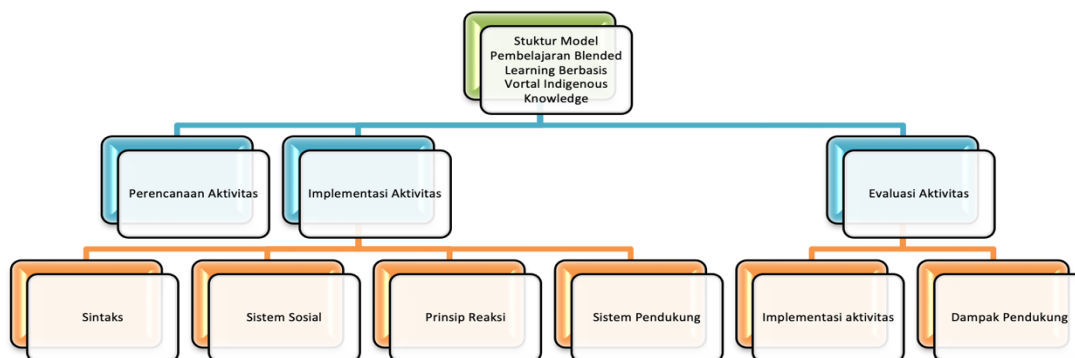


Figure 2. Blended Learning Framework based on Vortal Indigenous Knowledge

4.2 Validation Results

Framework validation was conducted by experts who assessed aspects of content, language,

graphics, and model design. Validation results showed that all framework components met the valid to very valid criteria.

Table 4. Framework Validation Results

Aspect	Aiken's V	ICC	Category
Linguistics	0.81	0.658	Very Valid
Graphics	0.85	0.710	Very Valid
Content	-	0.778	Valid
Model Design	0.77	0.924	Very Valid

(Source : Results of research data processing)

Validation results show that Aiken's V values are in the range of 0.77–0.85. ICC values range from 0.658 to 0.924, indicating that the level of validator agreement is in the good to excellent category.

4.3 Practicality Results

The framework's practicality was evaluated through implementation in a Museum Management Systems course involving one lecturer and 29 students. Assessments were conducted on ease of use, learning implementation, usefulness, and the framework's suitability to learning needs.

Table 5. Results of Framework Practicality

Respondents	Practicality Score (%)	Category
Students (n=29)	93.80	Very Practical
Lecturer	Very Practical*	

*Based on the results of the lecturer's practicality test in development research.

Most students gave positive feedback on the use of VIK in their learning. Practicality tests showed that the framework can be implemented effectively in real-world learning contexts.

4.4 Effectiveness Results

The effectiveness of the framework was measured through improvements in student learning outcomes in the Museum Management Systems course. Analysis was conducted using learning outcome scores, normality tests, and independent sample t-tests.

Table 6. Student Learning Outcomes

Variables	Experimental Class	Control Class
Average value	81.17	54.03
N-Gain	0.58	-
N-Gain Percentage	60.1%	-

The results show that average grade of students in the class experiment reached 81.17, while class control get average value of 54.03. The N-Gain value is 0.58 with percentage improvement by 60.1%.

Before hypothesis testing was carried out, the data was tested using a normality test.

Table 7. Normality Test Results

Group	Kolmogorov-Smirnov Sig.	Shapiro-Wilk Sig.
Experimental Class	0.057	0.091
Control Class	0.104	0.058

The significance value of all groups is above 0.05.

Next, a test was carried out to determine the differences in learning outcomes using a t-test.

Table 8. t-Test Results

Variables	t	df	Sig.
Learning outcomes	17,107	24	0.000

5. Discussion

5.1 Integration of Blended Learning and Virtual Indigenous Knowledge in Ecosystem Digital Learning

Research result show that the Blended Learning framework based on Virtual Indigenous Knowledge (VIK) meets valid, practical and effective criteria For used in learning System Museum Management . The high level of validity

and practicality demonstrates that the developed framework is able to systematically integrate learning components, learning resources, and digital technology. Furthermore, the results of the effectiveness test show an increase in student learning outcomes after implementing the developed framework. These findings indicate that VIK is able to support a more flexible and student-centered learning process. These findings reinforce Hrastinski's (2019) view that blended

learning should be understood as a learning design oriented towards the learning experience, not simply a combination of two learning modes. The existence of VIK allows students to gain a more contextual learning experience through direct interaction with digital cultural resources.

These findings align with Graham's (2019) assertion that the success of blended learning is determined not only by the combination of online and offline learning, but also by the ability of the instructional design to create meaningful learning experiences. Recent research also shows that blended learning has evolved from simply integrating technology into a learning ecosystem that connects learners, technology, learning resources, and the learning environment in a single, integrated system (Anthony et al., 2022; Istenić, 2024; Ramsey, 2024).

In the context of this research, VIK functions not only as a learning medium but also as part of a digital learning ecosystem that connects students with various cultural resources and museum collections. The existence of VIK enables students to explore, search for information, and construct knowledge independently, eliminating the focus on the lecturer as the primary source of information. Thus, the developed framework expands the concept of blended learning from a technology-oriented approach to one that focuses on learning experiences and culture-based knowledge construction.

5.2 Indigenous Knowledge and Decolonization of Learning in Higher Education

One of the important contributions of this research is the integration of indigenous knowledge into digital learning environments. To date, much of higher education practice remains dominated by formal sources of knowledge derived from Western academic traditions, while local knowledge is often positioned as supplementary knowledge that receives little space in the learning process. This situation has the potential to further distance the younger generation from their cultural roots and local identity.

The results of this study indicate that VIK enables students to access, study, and utilize various sources of local knowledge as part of their learning activities. This finding supports UNESCO's (2023) view that indigenous knowledge should not only be preserved as cultural heritage but also integrated into the education system to maintain its relevance for future generations. This study also supports the arguments of Battiste (2013) and Nakata et al. (2014) that integrating indigenous knowledge into higher education is an important part of efforts to build epistemological diversity and reduce the dominance of a single knowledge perspective in academic environments.

Furthermore, the integration of indigenous knowledge within this framework can be understood as part of efforts to decolonize higher education. Johnson and Mbah (2024) emphasize that decolonization of education is not only related to curriculum changes but also to recognizing the diversity of knowledge systems (knowledge pluralism) that develop within society. In this context, the VIK framework provides space for students to interact with local knowledge as a learning resource that has epistemological value equal to other academic resources.

This finding also aligns with research by Durmush et al. (2024), which shows that learning that accommodates local cultural perspectives can increase student engagement, strengthen cultural identity, and create more meaningful learning experiences. Therefore, the VIK framework not only contributes to improved learning outcomes but also supports the strengthening of cultural identity and the sustainability of local knowledge in higher education settings.

5.3 Virtual Indigenous Knowledge as a Digital Cultural Heritage Learning Environment

This research demonstrates that VIK can function as a digital heritage-based learning environment. Unlike conventional information portals that only provide access to data and information, VIK is designed to support the

learning process by integrating museum collections, cultural documentation, manuscripts, and various indigenous knowledge sources into learning activities.

These findings reinforce the argument of Giannini and Bowen (2022), who stated that the digitization of cultural heritage will have a greater educational impact if cultural collections are not only preserved but also actively utilized as learning resources. In this study, students not only accessed cultural collections in digital form but also analyzed, interpreted, and constructed knowledge based on these cultural resources. Furthermore, these findings expand the concept of digital museums proposed by Srinivasan et al. (2010) and Sylaiou et al. (2020). While previous research emphasized cultural access and representation, this study demonstrates that digital museums can be developed into learning environments that actively support students' knowledge construction.

The VIK also addresses a previously identified issue in Museum Management Systems learning: limited access to relevant collections and cultural resources. Through VIK, students gain broader access to local cultural resources without the constraints of time and space. Thus, VIK serves as a bridge connecting digital learning needs with cultural heritage preservation efforts.

This contribution is significant because most previous research on digital cultural heritage has focused primarily on the digitization and preservation of cultural collections. This research demonstrates that digital cultural heritage can be further developed into a learning environment that supports both academic competency achievement and cultural preservation.

5.4 Strengthening Information Literacy through the SCONUL Seven Pillars Framework

The research results also show that the VIK framework contributes to the development of students' information literacy. During the learning process, students engage in various activities that reflect the stages in the SCONUL Seven Pillars framework, starting from identifying information needs, exploring cultural

information sources, evaluating source credibility, managing information, and presenting cultural interpretations. The development of information literacy through VIK also shows a close relationship with digital literacy as explained by Tang and Chaw (2016). Students are not only required to find information, but also to evaluate the credibility of digital cultural sources and integrate them into a meaningful learning process.

These findings suggest that information literacy can be developed more contextually through interactions with indigenous knowledge sources. Unlike information literacy approaches that often focus on searching for scientific articles or general academic sources, the VIK framework enables students to develop information literacy competencies through authentic, culturally grounded learning experiences. These research findings support SCONUL's (2011) view that information literacy is a continuous process that develops through the search, evaluation, and use of information in real-world contexts. Furthermore, Goldstein (2022) emphasized that information literacy development will be more effective when placed in a learning context relevant to students' needs and experiences.

In this research, students not only learn to find information but also to understand cultural meaning, evaluate the validity of cultural information, and connect various information sources to generate new understandings. Thus, the VIK framework expands the function of information literacy from merely technical skills to competencies that support culture-based learning and knowledge construction.

5.5 Theoretical and Practical Implications of the VIK Framework

Theoretically, this research expands the literature on four areas of study that have previously developed relatively separately: blended learning, indigenous knowledge, digital cultural heritage, and information literacy. The VIK framework demonstrates that these four domains can be integrated into a single, mutually reinforcing learning model. These findings offer a new perspective that digital technology functions not

only as a learning medium but also as a means of cultural preservation and strengthening local identity in higher education.

Furthermore, this study introduces the concept of VIK as a digital heritage learning environment, a learning environment that utilizes digital cultural heritage as the primary learning resource. This concept expands the study of blended learning, which has previously focused on the use of Learning Management Systems (LMS) and general digital learning resources. Practically, the developed framework can serve as an alternative learning model for study programs related to culture, history, museums, archives, and cultural heritage. This framework also has the potential to support digital transformation policies in higher education, which focus not only on increasing access to technology but also on utilizing local cultural resources as part of the learning ecosystem.

5.6 Research Limitations

This study has several limitations that require attention. First, the framework was implemented in a single study program and course, so the generalizability of the research results still requires further testing in different contexts. Second, the number of participants involved in the implementation phase was relatively limited, thus not fully representing the broader higher education student population. Third, the scope of VIK content still focuses on cultural resources available within the research environment, so there is still opportunity to expand the collection and sources of indigenous knowledge from various regions and other cultural communities.

Therefore, further research is recommended to test the framework across various disciplines, expand the scope of cultural content available within VIK, and develop integration with museums, libraries, archives, and other cultural preservation institutions. Furthermore, the use of artificial intelligence technology and user-based recommendation systems could also be future development directions to enhance the personalization of students' learning experiences.

6. Conclusion

Study This succeed develop and validate Framework Blended Learning based on Virtual Indigenous Knowledge (VIK) which integrates blended learning, indigenous knowledge, digital cultural heritage, and literacy information based on SCONUL Seven Pillars in One ecosystem integrated learning. Research results show that the framework developed fulfil valid, practical and effective criteria for used in learning System Museum Management. Implementation of the framework allows student get more access wide to sources culture local at a time increase engagement and outcomes Study they in environment digital learning. Research This show that utilization of VIK is not only support digital transformation of learning, but also opens up opportunity new for integration knowledge local to in education high. With connect indigenous knowledge sources with activity learning based technology , framework developed contribute to strengthening literacy information, literacy culture and experience learn more contextual .

However, this research is still limited to implementation within a single study program and course. Therefore, further research is recommended to test the framework in various educational contexts and disciplines and develop a broader scope of cultural content through collaboration with various cultural preservation institutions.

7. Implications

7.1 Theoretical Implications

This research makes a theoretical contribution by expanding the study of blended learning through the integration of four domains that have developed relatively separately: blended learning, indigenous knowledge, digital cultural heritage, and information literacy. Most previous research has focused on the effectiveness of learning technology or cultural preservation separately. The VIK framework demonstrates that digital technology can function not only as a learning medium but also as a means of cultural preservation and the transmission of local knowledge in higher education. Furthermore, this research introduces the concept of Vortal

Indigenous Knowledge as a digital heritage learning environment, a learning environment that utilizes digital cultural heritage as the primary learning resource. This concept enriches the literature on culture-based learning by positioning digital cultural heritage as an integral part of students' knowledge construction process.

7.2 Practical Implications

From a practical perspective, the VIK framework offers an alternative learning model that can be applied to various study programs related to culture, history, museums, libraries, archives, and cultural heritage. This framework enables lecturers to integrate local cultural resources into learning activities more systematically through the support of digital technology. For students, VIK provides access to cultural information sources that were previously difficult to obtain, thus expanding opportunities for primary source-based learning. This learning environment also supports the development of information literacy skills, critical thinking skills, and the ability to interpret cultural information in an academic context.

For universities, this framework can be a model for implementing digital transformation that is not only oriented towards the use of technology, but also towards strengthening cultural identity and developing sustainable local learning resources.

7.3 Implications for Museums and Cultural Institutions

Findings study This show that museums and institutions preservation culture own more opportunities big for play a role as partners active in the educational process. Through integration museum collection to in VIK, the museum does not Again function only as institutions preservation, but also as provider source digital learning that can utilized in a way widely known by the community academic. This framework open opportunity collaboration between college high , museum, library, archive, and center documentation culture in build ecosystem

learning based inheritance digital culture . Collaboration they can expand access to collection culture at a time increase utilization digital collections in activity education, research, and community service to public.

7.4 Policy Implications

In level policy, research This show importance integration of indigenous knowledge into in the digital transformation strategy of education high. During this, policy digitalization often focused on infrastructure technology and systems management learning, while utilization source Power culture local as part from ecosystem learning Still relatively limited. The VIK framework can become a reference model for college high and government in develop policy digital learning that is not only increase access and quality education, but also supports preservation culture and strengthening identity national. Development of a digital cultural portal based on education is also in line with a development agenda sustainable which emphasizes importance preservation inheritance culture as part from development inclusive social and educational.

7.5 Future Research Directions

Study furthermore recommended for testing the VIK framework on various context learning, discipline science, and level different education in order to obtain more validation extensive. In addition, the development next can direct at integration technology intelligence artificial (artificial intelligence), learning analytics, and systems recommendation-based users for increase personalization learning. Research future can also explore the influence of the VIK framework on other variables such as involvement students (student engagement), literacy cultural literacy, skills think critical , creativity , and competence 21st century . Besides that , it is necessary done study cross institutions and cross culture for test to what extent this framework can adapted to various forms of indigenous knowledge and heritage culture at the level national and international.

8. References

- Anthony, B., Kamaludin, A., Romli, A., Mat Raffei, AF, Nincarean, D., Abdullah, A., Ming, GL, Shukor, NA, Nordin, MS, & Baba, S. (2022). Blended learning adoption and implementation in higher education: A theoretical and systematic review. *Technology, Knowledge and Learning*, 27(2), 531–578. <https://doi.org/10.1007/s10758-020-09477-z>
- Battiste, M. (2013). *Decolonizing education: Nourishing the learning spirit*. Purich Publishing.
- Boelens, R., Voet, M., & De Wever, B. (2024). The design and implementation of blended learning in higher education: A systematic review. *Educational Research Review*, 42, 100564. <https://doi.org/10.1016/j.edurev.2024.100564>
- Christen, K. (2012). Does information really want to be free? Indigenous knowledge systems and the question of openness. *International Journal of Communication*, 6, 2870–2893.
- Dang, D., Alani, NHS, Nayani, W., & Erturk, E. (2025). Blended learning design in higher education: A systematic review through TPACK and artificial intelligence perspectives. *Education Sciences*, 15(6), 848. <https://doi.org/10.3390/educsci15060848>
- Durmush, G., Craven, R.G., Yeung, A.S., & Mooney, J. (2024). Enabling Indigenous wellbeing in higher education: Indigenous Australian youth-developed strategies and solutions. *Higher Education*, 87(5), 1357–1374. <https://doi.org/10.1007/s10734-023-01067-z>
- Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency framework. *Educational Technology Research and Development*, 68(5), 2449–2472. <https://doi.org/10.1007/s11423-020-09767-4>
- Giannini, T., & Bowen, J. P. (2022). *Museums and digital culture: New perspectives and research*. Springer. <https://doi.org/10.1007/978-3-030-93706-0>
- Goldstein, S. (2022). Information literacy in higher education: Developing critical engagement with digital information. *Journal of Academic Librarianship*, 48(4), 102561. <https://doi.org/10.1016/j.acalib.2022.102561>
- Graham, C.R. (2019). Current research in blended learning. In M. G. Moore & W. C. Diehl (Eds.), *Handbook of distance education* (4th ed., pp. 173–188). Routledge.
- Hasfera, D. (2024). *Development of a blended learning model based on Virtual Indigenous Knowledge* (Dissertation) Doctor, Padang State University, Indonesia).
- Horn, M. B., & Staker, H. (2015). *Blended: Using disruptive innovation to improve schools*. Jossey-Bass.
- Hrastinski, S. (2019). What do we mean by blended learning? *TechTrends*, 63(5), 564–569. <https://doi.org/10.1007/s11528-019-00375-5>
- Istieniĉ, A. (2024). Blended learning in higher education: The integrated and distributed model and a thematic analysis. *Discover Education*, 3(1), 165. <https://doi.org/10.1007/s44217-024-00239-y>
- Johnson, AT, & Mbah, MF (2024). Disobedience, (dis)embodied knowledge management, and decolonization: Higher education in The Gambia. *Higher Education*, 88(5), 1909–1926. <https://doi.org/10.1007/s10734-024-01192-3>
- Luo, R. Z., & Zhou, Y. L. (2024). The effectiveness of self-regulated learning strategies in higher education blended learning: A five-year systematic review. *Journal of Computer Assisted Learning*, 40(6), 3005–3029. <https://doi.org/10.1111/jcal.13052>
- McKinley, E., & Smith, L. T. (Eds.). (2019). *Handbook of Indigenous education*. Springer. <https://doi.org/10.1007/978-981-10-1839-8>
- Min, W., & Yu, Z. (2023). A systematic review of critical success factors in blended learning. *Education Sciences*, 13(5), 469. <https://doi.org/10.3390/educsci13050469>
- Mubasiroh, SL (2023). Implementation of the SCONUL Seven Pillars model in development literacy information students. *Literacy: Journal of Multi-Perspective Islamic Studies*, 14(2), 125–139.
- Nakata, M., Nakata, V., Keech, S., & Bolt, R. (2014). Decolonial goals and pedagogies for Indigenous studies. *Teaching in Higher Education*, 19(1), 1–12. <https://doi.org/10.1080/13562517.2013.860101>

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- Oshima, J., Oshima, R., & Kayagi, T. (2025). Hybrid blended learning and knowledge creation in higher education. *Journal of Science Education and Technology*, 34(1), 1–17. <https://doi.org/10.1007/s10956-024-10191-z>
- Parry, R. (2013). The end of the beginning: Normativity in the postdigital museum. *Museum Worlds*, 1(1), 24–39. <https://doi.org/10.3167/armw.2013.010103>
- Ramsey, J. L. (2024). The art of blending: A systematic literature review of blended teaching competencies in higher education. *Journal of Research on Technology in Education*. Advance online publication. <https://doi.org/10.1080/15391523.2024.2437748>
- Rasheed, R.A., Kamsin, A., & Abdullah, N.A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701. <https://doi.org/10.1016/j.compedu.2019.103701>
- SCONUL. (2011). The SCONUL seven pillars of information literacy: Core model for higher education. Society of College, National and University Libraries.
- Srinivasan, R., Boast, R., Furner, J., & Becvar, K. M. (2010). Digital museums and diverse cultural knowledge. *The Information Society*, 26(4), 265–278. <https://doi.org/10.1080/01972243.2010.489412>
- Sylaiou, S., Killintzis, V., Paliokas, I., Mania, K., & Patias, P. (2020). Virtual museums, a survey and some issues for consideration. *Journal of Cultural Heritage*, 44, 307–318. <https://doi.org/10.1016/j.culher.2020.03.015>
- Tang, C. M., & Chaw, L. Y. (2016). Digital literacy: A prerequisite for effective learning in a blended learning environment? *Electronic Journal of E-Learning*, 14(1), 54–65.
- UNESCO. (2023). Knowledge transmission and safeguarding indigenous knowledge. UNESCO Publishing.
- UNESCO. (2024). Culture and education: Strengthening indigenous knowledge in the digital age. UNESCO Publishing.
- Yip, J., & Chakma, B. (2024). Indigenous knowledge integration in higher education curriculum: Challenges and opportunities. *Studies in Higher Education*, 49(8), 1345–1361. <https://doi.org/10.1080/03075079.2024.2327029>
- Zakariya, Y.F., Bjørkestøl, K., & Nilsen, H.K. (2024). Students' experiences of blended learning in higher education: A systematic review. *International Journal of Educational Technology in Higher Education*, 21(1), 39. <https://doi.org/10.1186/s41239-024-00472-8>
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