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DEVELOPMENT OF A WEB-BASED ACEH-INDONESIAN VIRTUAL MUSEUM COLLECTION FOR THE PRESERVATION OF ACEH LANGUAGE AND HISTORY

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ABSTRACT

Preserving a region's language and historical heritage plays a crucial role in maintaining Indonesia's cultural diversity, as some local languages and historical artifacts face the threat of extinction. This phenomenon is evident in Aceh, particularly among the younger generation. While government efforts to preserve Aceh language and history have been implemented through local curriculum content in primary and secondary schools, they have lacked effectiveness due to a scarcity of engaging, contextual learning materials and a shortage of qualified personnel skilled in teaching Aceh language and history. This study employed the Research and Development method using the ADDIE model: analysis, design, development, implementation, and evaluation. The research instruments consist of observation sheets, interview guidelines, and questionnaires. Data collection techniques involved observation, interviews, and questionnaires. All data underwent descriptive analysis and were interpreted through presentation in diagrams and tables. The study resulted in the creation of a museum collection product featuring: 1) a web-based virtual museum collection of Aceh-Indonesian language content designed to preserve Aceh language and history; and 2) an accessible virtual museum collection capable of making a positive contribution to students, particularly in the Aceh Besar region. The Aceh-Indonesian virtual museum collection product was deemed suitable for use by students as a medium for preserving Aceh language and history. Feasibility test results for the product were as follows: media experts rated it at 92% (very eligible), linguists at 93.3% (very eligible), history teachers at 90.6% (very eligible), 10 students at 90.2% (very eligible), and 30 students at 91.5% (very eligible).

Keywords: Virtual museum, bilingualism, preservation, language, history.

INTRODUCTION

Preserving regional languages is necessary considering that there are 719 regional languages in Indonesia, with 143 of them threatened with extinction according to UNESCO, making language preservation a global issue. Furthermore, preserving cultural heritage and historical relics has also become a concern for the central and regional governments with the issuance of Law Number 11 of 2010 which regulates cultural heritage that applies nationally, including the obligation of regional governments to care for cultural heritage and historical relics. The regional government that is very focused and consistent in preserving regional languages and historical relics is the government of Aceh.

The condition of the Aceh region is being eroded by the currents of modernization and globalization, thus changing the perspective of the younger generation in terms of

language and interpreting the historical values that exist in the surrounding environment (Kamaly et al., 2025). The Aceh regional government's efforts to address this issue include issuing Aceh Qanun No. 10 of 2022 concerning the Acehnese Language. This Qanun aims to protect, develop, utilize, and foster the Acehnese language, as well as strengthen the unity and integrity of the Acehnese people through the preservation of regional languages. The Aceh regional government also enacted Qanun No. 5 of 2021, which aims to regulate policies for the preservation of cultural and historical heritage, as well as specific Qanuns for cultural heritage at the district/city level (Pemerintah Aceh, 2022).

The Aceh Provincial Language Center noted that learning the Acehnese language as local content still faces obstacles such as time constraints, less communicative teaching methods, and a lack of engaging teaching materials. These conditions result in less contextual learning and less than optimal student engagement. On the other hand, Aceh's historical heritage holds the potential to serve as a learning resource that can integrate language, history, and culture in a more concrete way. Therefore, digitizing archaic vocabulary and historical heritage collections through a virtual Acehnese-Indonesian language museum can be a creative and contextual medium to support learning and preserve the Acehnese language and historical heritage (Istiqamah et al., 2025).

Previous research shows that the use of digital technology in preserving Acehnese language, history, and culture has developed through various forms, such as an Augmented Reality-based virtual museum (Azhari et al., 2021), an AR-based virtual tour of Acehnese tourism (Anwar et al., 2021), a web-based Acehnese traditional learning application (Musfikar et al., 2021), a 3D-based virtual tour of traditional musical instruments (Anwar, 2025), and a digital Acehnese-Indonesian dictionary (Helmi et al., 2025). However, these studies generally still focus on documentation, cultural object recognition, or the provision of digital information.

Unlike previous research, this study offers a novel approach by transforming a virtual Acehnese-Indonesian language museum collection into a tool for preserving Acehnese language and history for students in Aceh Besar. The product's content is designed taking into account the local curriculum, the developmental characteristics of Acehnese language learning for students in schools, and educational policies on preserving cultural and historical heritage (Pemerintah Aceh, 2022). Therefore, this research represents an innovation that integrates the use of digital technology, efforts to preserve Acehnese language and history, and the needs of the educational world.

This research also has several advantages over several previous studies that have been conducted. Different from previous studies, this research proposes a solution in the form of a web-based Acehnese-Indonesian language virtual museum collection, which not only presents information about the museum collection in two languages systematically, but also is equipped with attractive visual illustrations, is child-friendly, and navigation is easy to use by students. The web-based approach provides advantages in terms of accessibility across devices (computers, laptops, tablets, and smartphones),

without depending on a specific operating system. In addition, the development method using the ADDIE model provides a more systematic and structured stage starting from the formulation of the needs analysis to the evaluation stage, as an effort to refine the product before it is used by the end users (students).

The design of a web-based virtual Acehese-Indonesian language museum aims to prevent students from learning Acehese language and history in a conventional and monotonous manner. The museum can enrich the learning experience, enhance cultural and historical literacy, develop critical thinking skills, and instill national character values (Istina, 2022). Currently, museum managers are taking various efforts to ensure that museums remain relevant to young people amidst the shift in communication towards digital, especially for students who are part of Generation Z who often use digital technology for entertainment and education (Nola Fajria, 2024).

From the results of interviews with students and teachers in several schools in the Aceh Besar region, researchers complained about the difficulty of learning the Acehese language and historical heritage, the lack of real contexts of use outside the classroom, less interesting and often monotonous learning, limited teaching materials, and minimal media and technology support. Therefore, this study offers specific research objectives in the form of: 1) designing a web-based virtual museum collection of Acehese-Indonesian language for the preservation of Acehese language and history; 2) creating a virtual museum collection that is accessible and is expected to provide a positive contribution to students, especially in the Aceh Besar region.

18 The design of the Acehese-Indonesian virtual museum collection is expected to serve not only as a medium for preserving the Acehese language but also as a learning resource supporting students' understanding of Acehese history and culture. Through the digital museum collection, presented in a historical context, students can learn the Acehese language while also understanding the meaning and historical value of each relic. Thus, the virtual museum can serve as an alternative learning resource that connects Acehese language learning with an understanding of Aceh's history and cultural heritage.

21 RESEARCH METHOD

The method used in this research falls under Research and Development (R&D), which focuses on creating new products. The development stages refer to the ADDIE model: analysis, design, development, implementation, and evaluation. (Anwar, 2025). The aim of this research is to produce a web-based virtual Acehese-Indonesian language museum collection for the preservation of Acehese language and history. The design process for this virtual Acehese-Indonesian language museum collection follows the ADDIE research model procedures or stages.

The first phase, namely analysis, was conducted to obtain initial conditions and information regarding the needs of students in Aceh Besar for web-based virtual museum collections in Acehese-Indonesian. *The second phase*, design, was used by researchers to design the website header, content structure (visual display and

information on museum collections in Acehese-Indonesian), and web features (including interactive student discussion features). *The third phase*, namely development, was directed at compiling the Acehese-Indonesian museum collections into a web format and implementing validation by experts including media experts (Head of UPA ICT) and language experts (Coordinator of Acehese Language Study Program). Furthermore, the fourth phase, namely implementation, was carried out on History teachers, small groups (10 people based on academic ranking in grade XII) to determine the initial response of users.

The fourth phase, implementation, was conducted through small-group and large-group trials. The study population included history teachers and all students in grades 10, 11, and 12 at SMA Negeri 1 Jantho. Respondents were selected using a purposive sampling technique, taking into account students' academic abilities. The small-group trial involved one history teacher and 10 grade 12 students, selected based on their academic rankings, with a composition of high, medium, and low-ability students. The selection of these diverse characteristics aimed to obtain initial responses regarding ease of use, material clarity, appearance, and product understandability. After improvements were made based on the results of the initial trial, a large-group trial involved 30 students, consisting of 10 students each from grades 10, 11, and 12. Respondent selection at this stage used a stratified purposive sampling technique to ensure that each grade level was represented and the product could be assessed by users with different levels of knowledge and experience in learning history. The small-group trial was chosen for 10 students because this phase focuses on early identification of product weaknesses. The large-group trial was chosen for 30 students to obtain more diverse response and effectiveness data and to allow for more adequate quantitative analysis. Finally, *the fifth phase*, evaluation, was conducted to optimize and refine the overall product design and system.

The data in this study include oral data collected through direct field observations (at schools and museums), interviews with students and teachers in Aceh Besar, direct note-taking during the research, and review of physical documents related to the Aceh museum collection database. Additional oral data were also collected from teachers, students, linguists, or historians who have studies on the preservation of Acehese language and historical heritage. Meanwhile, written data were obtained from various library sources, the results of questionnaires completed by respondents, and a number of relevant Acehese language books and dictionaries to support the research needs.

This research on the design of a virtual Acehese-Indonesian language museum collection product combines qualitative and quantitative approaches using descriptive methods (Sugiyono, 2019). The oral data collected relates to the needs of students and teachers in Aceh Besar for virtual museum collection products, while the written data consists of a museum collection database that will be developed into a digital format using Acehese and Indonesian. The data collection process was carried out through observation, interviews, and questionnaires. Observations were used to review the use of Acehese in schools. Furthermore, interviews with experts were intended to obtain a

more in-depth and detailed explanation. This study used two types of questionnaires: the first questionnaire serves to identify product development needs, while the second questionnaire was used to determine the validator's assessment and user responses to the Acehnese-Indonesian virtual museum collection website.

This research into the design of a virtual Acehnese-Indonesian language museum utilizes two data analysis techniques. *First*, qualitative descriptive analysis was used to process the results of expert assessments. At this stage, qualitative data in the form of responses and suggestions for improvement from the questionnaire were analyzed to obtain an overview of necessary improvements. The findings from this analysis were then used as the basis for the revision and refinement process of the virtual Acehnese-Indonesian language museum. *Second*, quantitative descriptive analysis was used to process the questionnaire data into percentages. This technique utilizes percentage calculations to determine the assessment results for each respondent. The formula used to determine the percentage for each subject is as follows (Helmi et al., 2025):

$$P = f/N \times 100\%$$

Information:

P = Persentase responden
f = Percentage of respondents
N = Total number of respondents
100% = Multiplier number

The product feasibility percentage category for the web-based Acehnese-Indonesian language virtual museum was determined based on the validator's assessment results. The percentages obtained were then interpreted into several feasibility categories to determine the level of feasibility of the product being developed. The product feasibility percentage criteria are presented in Table 1 below (Sugiyono, 2019):

Table 1. Product eLigibility Percentage Criteria

Percentage (%)	Eligibility Category
90 - 100	Very Eligible
80 - 89	Eligible
70 - 79	Quite Eligible
60 - 69	Less Eligible
≤59	Not Eligible

RESULTS AND DISCUSSION

The product design process for the Acehnese-Indonesian language virtual museum collection follows the ADDIE model research procedure, namely:

1. Analysis (Analisis)

The information and data collection techniques used by researchers are as follows:

a. Teacher Needs Analysis

The analysis results indicate that teachers need web-based learning media that is easily accessible via computers, laptops, and mobile phones, has an attractive

appearance, is easy to use, and contains material that is in line with the school curriculum. Teachers also hope that the virtual Acehese-Indonesian language museum can be a learning resource that supports both classroom and independent learning, so that students are more interested in learning the Acehese language and history to improve vocabulary mastery, language skills, and understanding of local history (Alamsyah et al., 2022).

Thus, the results of the teacher needs analysis formed the basis for designing a virtual Acehese-Indonesian language museum that not only serves as a repository for language, history, and cultural collections but also as an interactive learning tool that supports the sustainable preservation of Acehese language and history. The developed product is expected to help teachers integrate digital technology into their lessons and create more innovative, effective, and meaningful learning experiences (Zis et al., 2021).

b. Student Needs Analysis

Based on the needs analysis, students expect a learning medium that can be accessed anytime and anywhere through digital devices. The virtual museum is expected to present Acehese language and history collections in an engaging manner through images, audio pronunciations, videos, and information about local culture related to the use of the language and history of Aceh (Kusumaningsih et al., 2018). The systematic and interactive presentation of material is expected to make it easier for students to understand vocabulary, practice language skills, and increase motivation to learn Acehese language and history.

The results of the student needs analysis served as the basis for determining the design, features, and content of the virtual museum. The information obtained was used to develop learning media tailored to student characteristics, support the learning process in schools, and encourage students to actively use the Acehese language and preserve Acehese historical heritage, as part of the ongoing effort to preserve the Acehese language and history.

c. Analysis of Acehese Language Use

Based on the analysis, the use of Acehese among students has tended to decline. In learning activities and daily communication at school, students use Indonesian more frequently than Acehese. Acehese use is generally limited to specific situations, such as when interacting with teachers or peers who use Acehese as the language of communication. Furthermore, students' ability to understand and use Acehese vocabulary varies, influenced by family background, residential environment, and the intensity of local language use at home.

The analysis also shows that the implementation of Acehese language in learning is not yet fully optimal. Although Acehese language learning content is available, the use of innovative and technology-based learning media is still limited. This situation has resulted in low student interest in learning and actively using Acehese (Robbani &

Rosmansyah, 2021). In addition, the lack of digital learning media integrated with Acehese language and cultural materials is one of the obstacles in supporting an interesting and contextual learning process.

These findings indicate the need for innovative learning media that can increase student engagement in learning and using the Acehese language. Therefore, the development of a web-based virtual Acehese language museum is expected to be a solution for providing interactive, easily accessible learning resources that are tailored to student characteristics (Widiyanto, 2019). By presenting a collection of vocabulary, audio pronunciation, images, videos, and information about Acehese culture, the virtual museum is expected to increase the use of the Acehese language while supporting efforts to preserve the Acehese language and history in the school environment.

d. Analisis Materi dan Sumber Belajar

The analysis also shows that digital-based learning resources supporting Acehese language and history learning are still limited. Teachers generally utilize printed textbooks, teaching modules, or information sources from the internet that are not yet integrated into a single learning medium. Furthermore, there is a lack of digital media that systematically presents Acehese language collections, complete with visual illustrations, audio pronunciations, videos, or cultural information that is easily accessible to teachers and students. This situation prevents the learning process from optimizing the use of technology as a means of preserving Acehese language and history (Azhari et al., 2021).

Based on these conditions, it is necessary to develop a virtual Acehese language museum that presents material in a structured, engaging, and easily accessible manner. The virtual museum is designed as a digital learning resource that combines vocabulary, audio pronunciations, images, videos, text, and information on Acehese history and culture in a single web-based platform (A, A. R et al., 2023). The presence of the virtual museum is expected to enrich learning resources, support more interactive learning, and increase students' interest and ability in learning the Acehese language and history on an ongoing basis.

2. Design (Perancangan)

The product design process for the web-based Acehese-Indonesian language virtual museum collection is as follows:

a. Website Header Section

The header is designed to showcase the virtual museum's identity through a logo, website name, and slogan that reflect the goal of preserving Acehese language and history. The logo serves as a visual identity that distinguishes the virtual museum from other learning media, while the website name and slogan are designed using clear, easy-to-read typography to strengthen the website's image as a center for information on

Acehnese language and history (Anwar et al., 2021). An explanation of the header composition of the Acehnese-Indonesian language virtual museum collection website can be seen in Table 2, namely:

Table 2. Composition of The Acehnese-Indonesian Language Virtual Museum Collection Website Header

No	Composition	Name and Purpose
1	Website Logos	The logo used is that of the Indonesian Arts and Culture Institute of Aceh. The campus logo was chosen to strengthen the institution's image and reputation as a university that cares about preserving regional languages and cultures.
2	Website Name	The website's name is "Aceh Virtual Museum." This name serves as the primary information, introducing the website's function as a virtual museum focused on preserving, developing, and revitalizing the Acehnese language through the use of web-based technology.
3	Website Slogan	The website's slogan is "Every legacy tells a story." This slogan was chosen to raise user awareness that regional languages serve not only as a means of communication but also as a medium for recording the history, identity, social values, and culture of a community.

Source: <https://prodisejarah.isbiaceh.ac.id/museum-virtual/>

Visually, the selection of colors, icons, and illustrations reflects Acehnese cultural characteristics. The colors used incorporate Acehnese cultural elements, reinforcing the virtual museum's identity. The header is also designed using a responsive layout, allowing it to adapt to various screen sizes, including computers, tablets, and smartphones. This ensures optimal website access without compromising functionality or display quality (Kamila, 2025).

The header image display of the Acehnese-Indonesian language virtual museum collection website is presented in Figure 1 as follows:

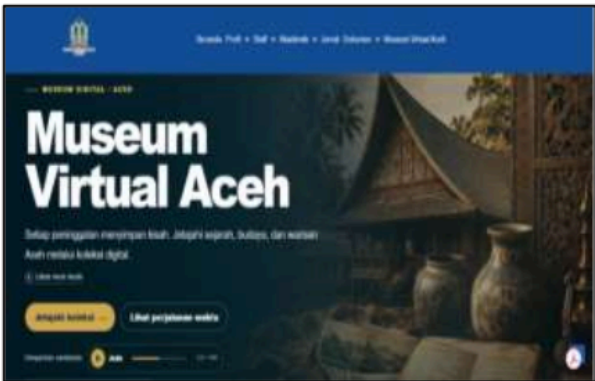


Figure 1. Display of the header image of the Acehnese-Indonesian language virtual museum collection website

(Source: <https://prodisejarah.isbiaceh.ac.id/museum-virtual/>)

b. Website Content Structure Section

The content structure is designed to connect historical information, Acehese language learning, and cultural heritage in a systematic flow so that users can study each material sequentially. An explanation of the content structure of the Acehese-Indonesian language virtual museum collection website is depicted in Table 3:

Table 3. Composition of The Content Structure of The Acehese-Indonesian Language Virtual Museum Collection Website

No	Content	Information
1	Traces of Acehese Prehistory	The material presented includes information about prehistoric sites in Aceh, archaeological findings, stone tools, artifacts, and other relics that show human activity in prehistoric times.
2	Traces of the Early Kingdom of Aceh	The material presented includes information about the early kingdoms in Aceh, such as the Indra Purba, Indra Patra, Indra Puri, Lamuri (Lamri), Perlak, and Samudra Pasai Kingdoms.
3	Sultanate of Aceh Darussalam	The material presented covers the history of the founding of the Sultanate of Aceh Darussalam, the genealogy of the sultans, the government structure, the social system, diplomatic relations, and economic development. It also includes information on important figures, such as Sultan Ali Mughayat Syah, the founder of the sultanate, Sultan Alauddin Riayat Syah Al-Kahar, and and last Sultan Iskandar Muda, who led Aceh to its glory.
4	Aceh in World Trade	The material presented includes the geographical location of Aceh on international shipping routes, main trade commodities such as pepper, camphor, gold, and forest products, as well as Aceh's trade relations with various foreign kingdoms and nations, such as Arabia, Persia, India, China, Turkey, Portugal, the Netherlands, and last England.
5	Aceh during the Colonial Period	The material presented covers the background to the arrival of Europeans in Aceh, the Aceh War (1873–1904), the policies of the Dutch colonial government, and their impact on the lives of the people. Additionally, users can learn about the roles of prominent figures in the struggle, such as Teuku Umar, Cut Nyak Dhien, Cut Meutia, Panglima Polem, and Tgk. Chik di Tiro Muhammad Saman, who led the resistance against colonialism.
6	Aceh During Independence	The material presented includes the support of the Acehese people for the struggle for independence, Aceh's role as a capital region for the Republic of Indonesia, the formation of regional government, the development of education, social life, and development in various fields.
7	Contemporary Aceh	The material presented includes the development of Acehese society post-reformation, the Free Aceh Movement (GAM), the implementation of special autonomy, the implementation of Islamic law, progress in the fields of education, arts, culture, tourism, the creative economy, and digital transformation that affects people's lives.

Source: <https://prodisejarah.isbiaceh.ac.id/museum-virtual/>

The image display of the content structure of the Acehese-Indonesian language virtual museum collection website can be seen in Figure 2 below:

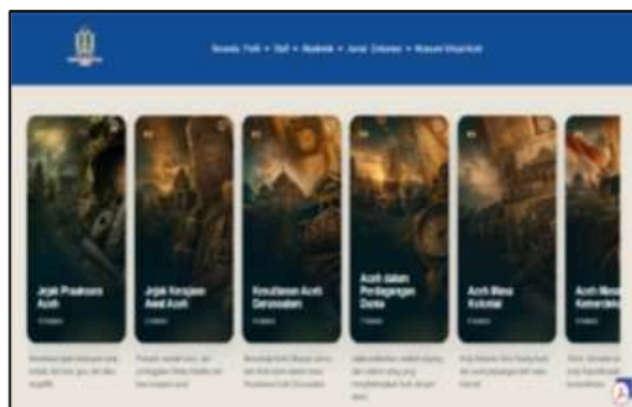


Figure 2. Image of The Content Structure of The Acehese-Indonesian Language Virtual Museum Collection Website

(Source: <https://prodisejarah.isbiaceh.ac.id/museum-virtual/>)

By organizing website content, the Acehese-Indonesian virtual language museum is expected to increase the effectiveness of Acehese language learning, facilitate the search for historical information, and become a medium that supports the sustainable preservation of Acehese language and history.

c. Website Features Section

The virtual museum features a museum collection featuring various information on the history, language learning, and culture of the Acehese region. Each collection is presented in the form of text, images, photos, audio pronunciations, videos, and descriptions explaining the historical and cultural value of each collection using Acehese-Indonesian. This multimedia presentation is expected to increase user understanding and interest in learning the regional language (Musfika et al., 2021). An explanation of the features of the Acehese-Indonesian language virtual museum collection website is shown in Table 4 below:

Table 4. Features of The Acehese-Indonesian Language Virtual Museum Collection Website

No	Features	Function
1	Home Page	As the main page, it displays the museum's identity, brief information, slogan, and navigation menu. This feature serves as an initial information center, making it easy for users to access all website services.
2	Search	Makes it easier for users to find specific collection or materials quickly based on keywords.
3	Digital Collections	A central showcase for the entire virtual museum collection. This feature includes various collections related to the region's history, language, including vocabulary, artifacts, manuscripts,

		photographs, videos, and other supporting documents. Each collection includes Acehese-Indonesian descriptions, historical information, and the cultural values they contain.
4	Aceh Map	Showing the geographical distribution of collections, historical sites, cultural heritage, and areas where regional languages are used in Aceh.
5	Sound Gallery (Audio)	Acehnese pronunciation learning media through digital audio recordings. This feature allows users to listen to vocabulary, expressions, and folktales with correct pronunciation according to Acehese language rules.
6	ABOUT MUSEUMS	THIS FEATURE CONTAINS INFORMATION ABOUT THE DEVELOPER, THE INSTITUTION THAT OVERSEES IT, THE SOURCE OF THE COLLECTION, AND THE SCOPE OF THE VIRTUAL MUSEUM.

Source: <https://prodisejarah.isbiaceh.ac.id/museum-virtual/>

The image display of the website features of the Acehese-Indonesian language virtual museum collection is presented in Figure 3 as follows:



Figure 3. Feature image display of the Acehese-Indonesian language virtual museum collection website

(Source: <https://prodisejarah.isbiaceh.ac.id/museum-virtual/>)

3. Development (Pengembangan)

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The product development phase is directed at the validation process. The validation process involves media experts and linguists. The purpose of the validation is to ensure that the Acehese-Indonesian language virtual museum collection developed by the researchers is valid and suitable for use. The validation results for the Acehese-Indonesian language virtual museum collection are as follows:

a. Media Expert Validation Data

The validation process for the Acehese-Indonesian language virtual museum collection product was assisted by a media expert. The product validation by the media expert aimed to: 1) Assess aspects of presentation feasibility, presentation techniques, and graphic feasibility; 2) Assess the initial form of the Acehese-Indonesian language virtual museum collection product; and 3) Obtain input and suggestions for product

improvement before the implementation stage in schools. The validation process was carried out by providing a validation questionnaire containing 18 assessment indicator aspects to the media expert. The results obtained from the feasibility test by the media expert are shown in Table 5:

Table 5. Details of ³⁷ The Results of The Feasibility Test of The Acehese-Indonesian Language Virtual Museum Collection Product by Media Experts

No	Assessment Aspects	Number of Indicators	Values Earned	Expected Value	Percentage	Eligibility
1	Presentation Techniques	7	35	35	100%	Very Eligible
2	Presentation Eligibility	3	13	15	86,6%	Very Eligible
3	Graphical Eligibility	8	35	40	87,5%	Very Eligible
Total		18	83	90	92%	Very Eligible

Source: Primary research data

The table details the product feasibility test results for the Acehese-Indonesian language virtual museum collection, as assessed by media experts. Based on several aspects assessed by the media experts, the presentation technique received a score of 100%, a presentation eligibility score of 86.6%, and a graphical eligibility score of 87.5%. The total score obtained from the product eligibility test by the media experts was 92%.

b. Linguist Validation Data

The validation process for the Acehese language content within the Acehese-Indonesian language virtual museum collection product was assisted by a linguist. The product validation by the linguist aimed to: 1) Assess the feasibility of the content and linguistic feasibility; 2) Assess the initial form of the Acehese language content within the Acehese-Indonesian language virtual museum collection product; and 3) Obtain input and suggestions for improving the Acehese-Indonesian language virtual museum collection product before conducting the initial field test. The validation activity was carried out by providing a validation questionnaire containing 12 assessment indicator aspects to the linguist. The results obtained from the feasibility test by the linguist will be presented in Table 6 below:

Table 6. Details of The Results of The Feasibility Test of The Acehese-Indonesian Language Virtual Museum Collection Product by Language Experts

No	Assessment Aspects	Number of Indicators	Values Earned	Expected Value	Percentage	Eligibility
1	Eligibility of content	8	37	40	92,5%	Very Eligible
2	Language eligibility	4	19	20	95%	Very Eligible
Total		12	56	60	93,3%	Very Eligible

Source: Primary research data

This table details the results of the Acehnese language content feasibility test conducted by linguists. Based on several assessments, the Acehnese language content in the Aceh-Indonesian virtual museum collection received a score of 92.5% for eligibility of content and 95% for language eligibility. The total score obtained from the linguists' product feasibility test was 93.3%.

4. Implementation (Implementasi)

The implementation process for the Acehnese-Indonesian language virtual museum collection involved history teachers and students at SMA Negeri 1 Jantho. The results of the Acehnese-Indonesian language virtual museum collection implementation are presented in the following paragraphs:

a. Product Feasibility Results by Teachers

The results of the feasibility of the Acehnese-Indonesian language virtual museum collection products provided by the History subject teacher are presented in Table 7 as follows:

Table 7. Details of The Results of The Feasibility Test of The Acehnese-Indonesian Language Virtual Museum Collection Product by Teachers

No	Assessment Aspects	Number of Indicators	Values Earned	Expected Value	Percentage	Eligibility
1	Eligibility of content	8	36	40	90%	Very Eligible
2	Language eligibility	4	19	20	95%	Very Eligible
3	Presentation Techniques	7	32	35	91,4%	Very Eligible
4	Presentation Eligibility	3	13	15	86,6%	Very Eligible
5	Graphical Eligibility	8	36	40	90%	Very Eligible
Total		30	136	150	90,6%	Very Eligible

Source: Primary research data

The table provides a more complete explanation of the product feasibility test for the Acehnese-Indonesian language virtual museum collection, administered by a history teacher. Based on several aspects assessed by the history teacher, the teacher obtained a score of 90% for eligibility of content, 95% for language eligibility, 91.4% for presentation techniques, 86.6% for presentation eligibility, and 90% for graphical eligibility. The total score obtained from the product feasibility test by the history teacher was 90.6%.

b. Assessment Results of 10 Students' Responses (Small Group)

The process of assessing student responses to the Acehnese-Indonesian language

virtual museum collection product involved 10 students (small groups) in grade 12 at SMA Negeri 1 Jantho. The results of the assessment of the 10 students' responses are presented in Table 8 below:

Table 8. Details of The Results of The Assessment of The Responses of 10 Students to The Acehnese-Indonesian Language Virtual Museum Collection Product

No	Assessment Aspects	Number of Indicators	Values Earned	Expected Value	Percentage	Eligibility
1	Eligibility of content	5	226	250	90,4%	Very Eligible
2	Language eligibility	2	93	100	93%	Very Eligible
3	Presentation Techniques	7	318	350	90,8%	Very Eligible
4	Graphical Eligibility	4	175	200	87,5%	Very Eligible
Total		18	812	900	90,2%	Very Eligible

Source: Primary research data

The table details the assessment results of the Acehnese-Indonesian language virtual museum collection product given by 10 grade XII students. Based on several aspects assessed by the students, the Acehnese-Indonesian language virtual museum collection product received a score of 90.4% for eligibility of content, 93% for language eligibility, 90.8% for presentation techniques, and 87.5% for graphical eligibility. Therefore, the total score obtained from the product suitability test by 10 students was 90.2%.

c. Assessment Results of 30 Students' Responses (Large Group)

The large group trial involved 30 students, consisting of 10 students each from grades 10, 11, and 12 at SMA Negeri 1 Jantho. The results of the 30 students' response assessment are presented in Table 8 below:

Table 8. Details of the results of the assessment of the responses of 30 students to the Acehnese-Indonesian language virtual museum collection product

No	Assessment Aspects	Number of Indicators	Values Earned	Expected Value	Percentage	Eligibility
1	Eligibility of content	5	231	250	92,4%	Very Eligible
2	Language eligibility	2	94	100	94%	Very Eligible
3	Presentation Techniques	7	322	350	92%	Very Eligible
4	Graphical Eligibility	4	177	200	88,5%	Very Eligible
Total		18	824	900	91,5%	Very Eligible

Source: Primary research data

The table explains more specifically the results of the research product assessment given by 30 students, consisting of 10 students each from grades 10, 11, and 12. Based on several aspects that have been assessed by the students, the Acehnese-Indonesian language virtual museum collection product obtained a score of 92.4% for content feasibility, a score of 94% for linguistic feasibility, a score of 92% for presentation techniques, and a score of 88.5% for graphic feasibility. So the total score obtained from the results of the product feasibility test by 30 students was 91.5%.

Thus, the researchers concluded that all media experts, linguists, history teachers, and students agreed that the Acehnese-Indonesian language virtual museum collection was highly suitable for use in the preservation and revitalization of the Acehnese language for students. The results of the assessment of the feasibility of the Acehnese-Indonesian language virtual museum collection are presented in Figure 4 in the form of the following diagram:



Figure 4. Results of The Feasibility Test of The Acehnese-Indonesian Language Virtual Museum Collection Product
(Source: Research Documentation)

The assessment results show that the Acehnese-Indonesian language virtual museum collection received a very high level of suitability from all assessor groups, namely 92% (media experts), 93.3% (linguists), 90.6% (history teachers), 90.2% (10 students' responses), and 91.5% (30 students' responses). The highest assessment from the linguists indicated that the accuracy of language use, readability, and presentation of bilingual content in the Acehnese-Indonesian language virtual museum collection product had met the expected standards. Meanwhile, the media experts' assessment indicated that the product's appearance, navigation, interactivity, and technical functions were suitable to support digital learning for students.

The difference in assessments between teachers and students in the small group test was 0.4% (teachers 90.6% and students 90.2%), indicating a congruence in assessments between the perspectives of educators as learning facilitators and students

as direct users of the product. In the large group test phase, student assessments increased to 91.5% from 30 students, indicating that the product was increasingly accepted after being used by a larger number of users. Overall, the assessment range from all validator groups was in the range of 90.2%–93.3% with a difference of 3.1%, thus demonstrating consistency in the level of product feasibility based on the assessments of media experts, linguists, teachers, and students. These findings align with research by Muhtarom et al. (2022), which explains that the development of digital learning media, including virtual museums, can increase access to historical learning resources, aid student understanding, and create a more engaging learning experience in line with developments in digital technology.

In line with that, Rahmadi et al. (2023) also explained that the virtual museum allows students to explore historical materials independently and interactively, thereby increasing their interest, motivation, and understanding of the material. Therefore, it can be concluded that the high product feasibility assessment in this study indicates that the Acehese-Indonesian language virtual museum collection has the potential to expand students' access to knowledge about cultural heritage, increase engagement in history learning, and support the preservation of the Acehese language. However, these results are still limited to a feasibility assessment, so the effectiveness of the product in improving history learning outcomes and Acehese language skills needs to be further tested through experimental research.

5. Evaluation

The trial results showed that there were several aspects that still needed improvement, including: 1) In some sections of the website menu, users needed clearer instructions for finding menus and moving between content; 2) Some materials also needed to be simplified so that the information was easier for high school students to understand; and 3) The quality and completeness of the pronunciation audio needed to be considered so that users could listen to and imitate the pronunciation of Acehese well. These findings became considerations in making product improvements.

Based on these empirical findings, improvements were made to the Acehese-Indonesian language virtual museum collection product by improving the navigation structure, simplifying the presentation of materials, enhancing the quality of audio content, and completing the virtual museum collection. The evaluation results indicate that the development of the Acehese-Indonesian language virtual museum collection product needs to consider the balance between completeness of information and ease of use. The final product of the Acehese-Indonesian language virtual museum collection is used not only as a digital collection storage medium, but also as an interactive and contextual learning resource that integrates the learning of Acehese language, history, and cultural heritage for students.

The broader novelty of this research lies in utilizing the virtual museum concept not only as a medium for documenting cultural and historical collections, but also as a contextual learning space that allows students to learn the Acehese language

through digital representations, audio, visuals, and historical narratives. This aligns with research by Amir et al. (2026) who developed a virtual museum as a technology-based history learning medium, and Fathiah et al. (2024) who developed a web-based Acehese traditional learning application. However, previous research still focused on presenting general historical and cultural information, while this study places regional languages as the main collection of the virtual museum, thus contributing to language preservation and local cultural learning. This is reinforced by research by Akyuni et al. (2022) which shows that the use of digital technology in cultural learning can increase students' access to local learning resources and strengthen cultural and historical literacy.

Thus, the final product of the Acehese-Indonesian language virtual museum collection not only functions as a digital collection storage medium, but also as an interactive and contextual learning resource that integrates the learning of Acehese language, history, and cultural heritage. The broader benefits of the Acehese-Indonesian language virtual museum collection product are: 1) In history education, this product can help students understand events, figures, traditions, and community identities through more engaging and easily accessible digital sources; 2) From a linguistic aspect, the presentation of vocabulary, speech, texts, and audiovisual recordings can expand the space for students to use the Acehese language; 3) This product also contributes to the digitalization of cultural heritage by maintaining continuous access to historical knowledge and Acehese cultural heritage that is at risk of being lost due to generational changes; and 4) The structure and approach to developing the Acehese-Indonesian language virtual museum collection product can be adapted to document other regional historical, cultural, and linguistic heritage by adjusting the materials, user characteristics, and socio-cultural context of each region in Indonesia (Musfikar et al., 2024).

CONCLUSION

The important points that can be concluded by the researcher from the results of the research and development of a virtual museum collection product in the Acehese-Indonesian language are: First, the researcher succeeded in producing a virtual museum collection product in the Acehese-Indonesian language to support the preservation and revitalization of the Acehese language for students by using the Research and Development (R&D) method, referring to the ADDIE model, namely: analysis, design, development, implementation, and evaluation. The advantages of the virtual museum collection product in the Acehese-Indonesian language are as follows: 1) The website header section is designed using a responsive layout and visual/illustration aspects are adapted to the characteristics of Acehese culture, so as to strengthen the identity of the virtual museum, 2) The content structure section is designed to connect historical information, Acehese language learning, and cultural heritage in a systematic flow so that users can study each material sequentially, and 3) The website features section is presented in the form of text, images, photos, audio pronunciation, videos, and

descriptions that provide explanations of the historical and cultural value of each collection using the Acehnese-Indonesian language. Second, the virtual museum collection product in the Acehnese-Indonesian language is declared suitable for use by students as a medium for preservation and revitalization. The results of the feasibility test of the Acehnese-Indonesian language virtual museum collection product are as follows: 1) The assessment given by media experts is 92% (very eligible criteria); 2) The assessment given by language experts at 93.3% (very eligible criteria); 3) The assessment of respondents given by history subject teachers at 90.6% (very eligible criteria); 10 students at 90.2% (very eligible criteria); and 30 students at 91.5% (very eligible criteria).

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