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Museum Virtual Tour Development Using 3D Vista as a History Learning Source

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ABSTRAK

Kunjungan ke museum juga merupakan sarana pembelajaran yang membangkitkan rasa ingin tahu dan memberikan nuansa yang berbeda dalam pembelajaran. Masalahnya saat ini adalah jarak dan waktu tidak memungkinkan jika guru membawa siswa ke lokasi museum. Solusi alternatif untuk masalah ini adalah dengan menggunakan teknologi. Penelitian ini bertujuan untuk mengembangkan alat pembelajaran virtual tour di museum Sriwijaya dengan menggunakan aplikasi 3D Vista sebagai sumber belajar sejarah. Tahapan penelitian ini menyesuaikan dengan model penelitian pengembangan produk Alessi dan Trollip yaitu design, planning, dan development. Perangkat yang dikembangkan divalidasi oleh ahli dan diujicobakan pada 30 mata pelajaran siswa kelas X SMA. Desain uji coba dalam penelitian ini menggunakan one group pretest and posttest design. Teknik pengumpulan data meliputi wawancara, tes, dan angket. Teknik analisis data menggunakan analisis hasil wawancara, tes, dan angket. Hasil penelitian ini adalah, 1) perangkat pembelajaran yang dikembangkan telah diuji validitasnya setelah melalui validasi dengan 4 ahli; 2) sumber belajar museum wisata maya telah diuji kepraktisan dengan persentase kepraktisan sebesar 87,87%; dan 3) keefektifan perangkat yang terdiri dari aktivitas siswa dalam proses pembelajaran diperoleh N-Gain sebesar 5,57 dengan kategori sedang. Kesimpulan dari penelitian ini adalah perangkat pembelajaran yang dikembangkan telah teruji valid, praktis, dan efektif.

ABSTRACT

Visits to museums are also a means of learning that arouses curiosity and provides a different nuance in learning. The problem today is that distance and time are not possible if the teacher brings students to the location of the museum. An alternative solution to these problems is to use technology. This study aims to develop a virtual tour learning tool at the Sriwijaya museum by using the 3D Vista application as a source for learning history. The stages of this research adapt to the product development research model of Alessi and Trollip, namely design, planning, and development. The device developed was validated by experts and tested on the subjects 30 student of class X at senior high school. The trial design in this study used a one group pretest and posttest design. Data collection techniques include interviews, tests, and questionnaires. The data analysis technique used analysis of the results of interviews, tests, and questionnaires. The result of this study are, 1) the developed learning tools have been tested for validity after going through validation with 4 experts; 2) virtual tour museum learning resources have been tested for practicality with a practicality percentage of 87.87%; and 3) the effectiveness of the device consisting of student activities in the learning process obtained an N-Gain of 5.57 with a medium category. The conclusion of this study is that the learning tools developed were tested to be valid, practical, and effective.

1. INTRODUCTION

Contextual historical learning is studying history by finding the relationship between the learning material and what is happening in the environment or real life, so that the material learned will be closely embedded and not easily forgotten (Andarwati, 2019; Huo et al., 2020; Wibowo et al., 2020). Contextual learning of history can be done by utilizing existing historical learning resources in the environment (Andarwati, 2019; Lionar & Mulyana, 2019; Perdana et al., 2018). One of the best environmental learning resources for history is the museum. The role of the museum is to help people understand information and context through brief interactions (Christa & Roy, 2002; Kersten et al., 2017; Loaiza Carvajal et al., 2020). Museums, in many ways, such as contemporary media, aim to please and educate (Barbieri et al., 2017; Styliani et al., 2009). Visits to museums are also a means of learning that arouses curiosity and provides a different nuance in learning. The problem today is that distance and time are not possible if the teacher brings students to the location of the museum (Suh & Prophet, 2018; Wibowo et al., 2020). An alternative solution to these problems is to use technology. Technology is

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increasingly being used in education for various fields and presents a variety of choices for teachers. Modern technology has helped many educational goals with the ability to engage emotionally (Barbieri et al., 2017; Carayannis & Morawska-Jancelewicz, 2022; Ramirez, 2021). Advances in modern technology have produced many new technological innovations that have an impact on the education sector, namely the creation of digital learning resources. Digital learning resources have the potential to overcome learning problems and facilitate learning activities (Dopo & Ismaniati, 2016; Suryani, 2018). Learning resources are all sources such as messages, people, materials, tools, techniques, and settings that are used by students to improve the quality of learning (Miniawi & Brenjekjy, 2015; Supriadi, 2017). Learning resources that can be developed to support innovative and modern technology-based learning processes are *virtual tours*.

Virtual tours have been considered a very effective way to get fun and in-depth information about museum collections (Jung et al., 2016; Tjahjawulan, I. & Sabana, 2015). *Virtual tours of historical sites such as caves, monuments, and museums can be created (Barbieri et al., 2017; Tjahjawulan, I. & Sabana, 2015)*. *A Virtual Tour Museum* is a collection of digitally recorded images, audio, text documents, and other data of historical or cultural interest that are accessed through electronic media (Kersten et al., 2017; Styliani et al., 2009). Virtual museum tours aim to disseminate online art and information about real-world museum collections (Christa & Roy, 2002; Loaiza Carvajal et al., 2020). *Virtual museum tours* are recognized as a valuable tool for museums. Users can interact with the panorama by dragging the pointer *mouse* in the selected direction. The panorama scrolls in the selected direction, creating the sensation of viewing the image from all sides (Amin et al., 2021; Wibowo et al., 2020). The collections in the museum include the results of these relics in the form of stone statues, artifacts, and inscriptions. The inscription is a historical relic in the form of a stone inscribed with ancient writings containing news, information, warnings, laws, and others (Azizah et al., 2020; Sholeh, 2017). One of the important topics in the study of history is the evidence of the legacy of the Sriwijaya kingdom. The Sriwijaya Kingdom is the oldest kingdom in Sumatra which produces some evidence of heritage and cultural products with a Hindu-Buddhist religious background (Poesponegoro & Notosusanto, 2010; Setiawan et al., 2020). Based on observations made at SMA Negeri 7 Palembang along with interviews with teacher, there are several reasons for choosing the school as the object and place of research. First, SMA Negeri 7 Palembang has never used learning resources using a virtual tour museum application and the closest distance from the Sriwijaya royal inscription to the school is around 10 km. The distance is relatively far. Based on the observations above, it is necessary to develop digital learning resources such as the virtual tour of the Sriwijaya museum, considering that students who study are a generation of miners who cannot be separated from digital. The thing that distinguishes this research from previous research is that this research will be conducted on the historical subjects of the Sriwijaya kingdom and will not only focus on the responses and interests of students but also see the effectiveness of the use of tours to the Sriwijaya museum. Based on the background that has been written, the purpose of this study is to producing a Virtual Tour Museum Sriwijaya uses 3D Vista as a valid history learning resource in class X senior high school.

2. METHOD

This research uses a type of development research (Development Research) by using the Alessi & Trollip development model which includes: 1) Planning stage, namely producing planning documents, producing manual styles, determine and collect supporting sources; 2) design stage, attention turns to detail the detailed design of the entire Sriwijaya Museum Virtual Tour product; 3) development of the implementation of the design product, development refers to the entire process of production, repair, and validation (Alessi & Trollip, 2001). The subject is at the stage of needs analysis with 4 history subject teachers and class X students in senior high school in Palembang. Virtual Tour Museum sriwijaya validated by 4 validators from the field of learning design, materials, language and products. The practicality of the Sriwijaya Museum Virtual Tour was also evaluated by 3 students of Class X Science 3 Senior high school in Palembang. The effectiveness of the Virtual Tour Museum was evaluated from the results of product trials conducted by 30 students of class X senior high school. The data collection technique used in this study is aimed at assessing the validity, practicality and effectiveness of the development of the Sriwijaya Museum Virtual Tour on history learning, instruments used to collect data on this study in the form of interviews, questionnaires and tests. Data analysis techniques in this study were obtained from research instruments in the form of qualitative and quantitative data. Quantitative data were obtained from questionnaires calculated using the N-Gain formula and qualitative data were obtained from responses or suggestions from experts and students after using the Sriwijaya Museum Virtual Tour .

3. RESULT AND DISCUSSION

Result

At the planning stage, researchers explain the results of planning that has been carried out by researchers in the form of identifying the scope of research, preparing planning documents, and producing a style manual using the choice of font color and text size, language, and menu layout on screen. The next stage is design. This product is designed to have 6 main features in the form of a welcome feature, panoramic list, location, floorplan, writer, and supervisor. The welcome menu contains a brief explanation of the Sriwijaya museum, a panoramic list containing room spots, and a location containing a map of the location of the Sriwijaya museum, which is directly connected to the Google map. The floorplan contains a roaring plan from the Sriwijaya museum, which you can click on if you want to go directly to the desired room, while the writer and supervisor feature contains a brief profile of development and research mentors. Then prepare the flowchart and storyboard, as for the flowchart and storyboard is show in Figure 1.

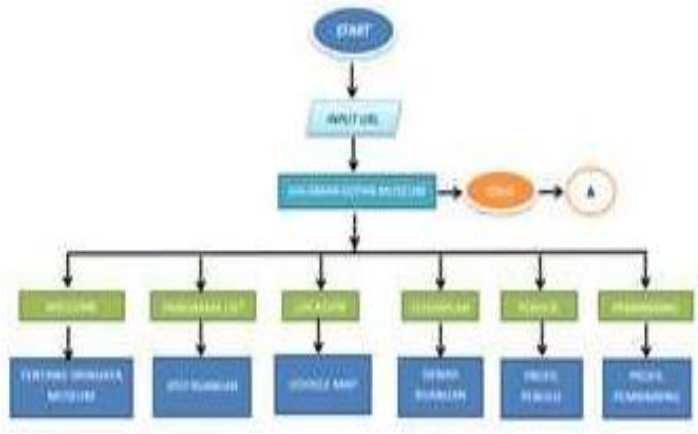

Figure 1 Flowchart Main Page *Virtual Tour* Sriwijaya

Then the researcher makes a *storyboard* that serves to see the design that tells about the stages and parts contained in the development of the *Museum Virtual Tour* according to the needs of students. Storyboarding *is* done systematically according to the plot that has been drawn on the *flowchart*. (1) welcome, (2) Panorama List (4) Location, (5) Floorplan or room plan, (5) Author Profile. (6) Advisory Lecturer. Example *of storyboard* menu display show in Table 1.

Table 1. *Storyboard* menu display

No.	Opening	
1.	**Main screen**	**Description**
		• There is a Sriwijaya University logo • There *Hotspot* for *tours* to the Sriwijaya museum. • There are menus such as *Welcome*,*Panorama list*, *Location, Floor Plan*, Author, and supervisor. • There is a *zoom* and • There is a feature for sliding left-right up, and down, • In the upper right corner there is a menu to turn off *backsound, fullscreen,* as well as an explanation feature for using *Museum Virtual Tour* Sriwjaya

Images, 3D objects, audio, and video that are designed in the form of flowcharts and storyboards are then developed into a complete product using Vista 3D software. The first step in the development stage is to prepare a panoramic drawing. Panorma 360o view of the surrounding room. Panorma 360o as

the main element in the virtual tour of the Sriwijaya museum, which will be processed using the Street View application, which is taken directly at the location of the Sriwijaya museum. The following is a 360° panoramic image using Street View. The next step is to create 3D objects and audio narration explaining the inscriptions in the museum. 3D objects are presented to convey practical and interesting material in order to make it easier to understand each collection of Sriwijaya royal heritage made with a 3D maker and processed using PPT 2019. Here is one of the 3D object images produced. Panorma 360o view of the surrounding room is show in Figure 2 and Figure 3 show 3D object maker.

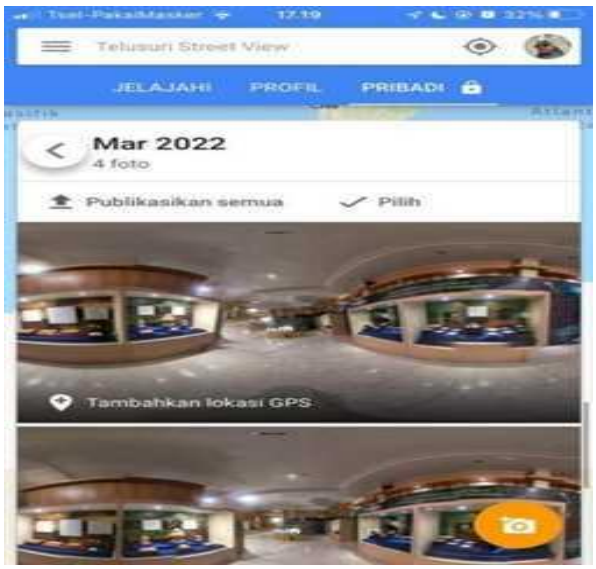

Figure 2. Taking a 360^0 Using *Street View* **Figure *3.*** 3D Objects Taken with a 3D Maker

Preparing materials or supporting materials for the Sriwijaya museum virtual tour In this research, the researchers also made operating instructions and explanations for each button and feature in the Sriwijaya museum virtual tour. Instructions will make it easier for users to operate the Sriwijaya museum virtual tour. Instructions were created using Canva. as well as the floor plan of the museum room made using Photoshop. Room Dena Sriwijaya Museum is show in Figure 4.

Figure 4. Room Dena Sriwijaya Museum

Product validation alpha test, this stage is important because products produced by professionals are evaluated to determine whether the product already has valid qualifications to be revised. Evaluation is carried out by providing sheet verification that has been prepared and recording all suggestions and input from experts regarding the products produced. The results of the alpha test are in the form of expert advice and input to improve the types of stamps so that the effectiveness of the media developed can be seen. The explanation results test is as follows. Therefore, the alpha test was completed through a verification material media design verification, verification, and verification product language *Museum Virtual Tour* Sriwijaya.

Assessment of Material Experts

The material was validated by material experts with the aim of obtaining assessments, comments and suggestions regarding the *Museum Virtual Tour* which had been developed by researchers. The validation process with the material validator is carried out online. The material validation test includes 12 statement items, namely content structure, content feasibility, material accuracy, material support, material suitability, material up-to-date, and introductory information.

Based on material experts tested valid 11 statement items out of a total of 12 statement items which is calculated by the following formula:Material Validation =1112x 100% = 91.66% Material expert validation states that the material provides a value (91.66%) with a very valid category. The improvements that have been made are that the information related to the Bukit Siguntang Buddha statue is not clearly legible. Furthermore, the researchers made improvements according to the suggestions. Based on the results of the validation of the material experts, 11 statement items are valid from a total of 12 statement items which indicates that the final product development results by researchers get a very valid value, so that the product developed can be used in the learning process and is feasible to be tested on students.

Learning Design Validation

Expert validation by learning design aims to determine the suitability of the learning design with the *Museum Virtual Tour* that has been developed. The learning design validation test includes 11 statement items, namely learning objectives, cognitive capacity, learning approaches, learning strategies, learning models, interactive, presentation of material, questions or questions, answering questions, quality of feedback, and level of mastery.

Based on material experts tested valid 11 statement items out of a total of 11 statement items calculated by the formula: Learning Design Validation =1111x 100% = 100%. Based on the above calculations obtained a value (100 %) with very valid category. Based on the negligent test data above, the final value results of the validators indicate that the product that has been developed by the researcher is very valid. Based on the results of the analysis of the alpha test data above, the design used in *Museum Virtual Tour* from the aspect of learning design, this research instrument, both lesson plans and the products developed are appropriate. The systematic and content aspects have met the pedagogical rules. In general, the instrument can be used in research.

Product Validation

Next, the researcher conducted product validation aimed at getting comments and suggestions regarding the *Virtual Tour Museum* that had been developed by the researcher. This product expert validation test consists of 17 statement items, namely display, presentation mode, text quality, image, audio, video, features, distance, navigation aids, consistency, restarting, interactive, usage control, and computer or *smartphone use.*

The product is tested valid 15 statement items from a total of 17 statement items which are calculated by the following formula. Media expert validation states that the product already valid (88.23%) with the addition of a number at each *hotspot* for *tours* as well as the addition of more *hotspots* so that the product is more interactive and the material can be operated easily and more attractively. The results of the validation of the learning design on *Museum Virtual Tour* Sriwijaya. Based on the alpha test data above, the score of the validator shows that the product developed by the researcher has a very valid score.

Language Validation

After conducting further product validation on the validation of linguists, it is conducted validate or assess about the language elements and language structure contained in the *Virtual Tour Museum* that has been made by researchers. Based on linguists validation, show the linguists tested valid 4 statement items from a total of 5 statement. Based on the calculation above, the linguist validation states that the product is already valid (80%) with punctuation correction revisions in the explanation information section about the Sriwijaya museum. The results of the validation of the learning design on *Museum Virtual Tour* Sriwijaya. Based on the alpha test data, the final result of the validator shows that the product developed by the researcher category is very valid. Linguists also provide comments and suggestions regarding punctuation and language order in which *Museum Virtual Tour* has been developed. Alpha test recapitulation can be seen in Table 2.

Table 2. Alpha Test Recapitulation (Validation Test)

No	Aspect	Expert	Persentage	Predicate
1	Theory	EA	91,66%	Very Valid
2	Learning Design	ER	100%	Very Valid
3	Product	DP	88,23%	Very Valid
4	Language	MT	80%	Valid
Total			89,97%	Very Valid

Results in Pretest

Field tests were carried out by researchers with 30 students of class X IPS 2 being followed at SMA Negeri 7 Palembang. At the first meeting, students were given a *pretest* of 20 multiple choice questions. Data recapitulation of *pretest* student is show in Table 3.

Table 3. Recapitulation *Pretest* of Student

Interval Score	Number of Participants	Percentagee	Predicate
86 – 100	0 Participants	0 %	Very Good
71 – 85	0 Participants	0 %	Good
56 – 70	1 Participant	3.34 %	Enough
40 – 55	13 Participants	43.33%	Less
0 – 39	16 Participants	53.33%	Very poor
Total	30 participants	100 %	

Based on Table 3, there are still many students who do not understand the material evidence of inheritance Sriwijaya kingdom so that a stimulus is needed to carry out learning by using *Virtual Tour Museum* to increase understanding which will have an impact on increasing students' knowledge and skills competence on evidence material from the Sriwijaya kingdom.

The results of the Posttest

Posttest are given to students after completing learning with the developed product. Implementation *posttest* using *pretest* that has been randomized as many as 20 questions. The recapitulation of the *post-test* can be seen in Table 4.

Table 4. Recapitulation of Student Posttest Results *Interval* Score

Total	Participants	Percentage	Predicate
86 – 100	2 Participants	6,66 %	Very Good
71– 85	16 Participants	53,34 %	Good
56 – 70	12 Participants	40%	Enough
40 – 55	0 Participants	0 %	Less
0 – 39	0 Participants	0 %	Very Poor
Total	30 participants	100 %	

Base on Table 4, show data *posttest* there was an increase in learning outcomes using *Museum Virtual Tour* Sriwijayacomparison between the *pretest* and *posttest* can be seen from Figure 5.

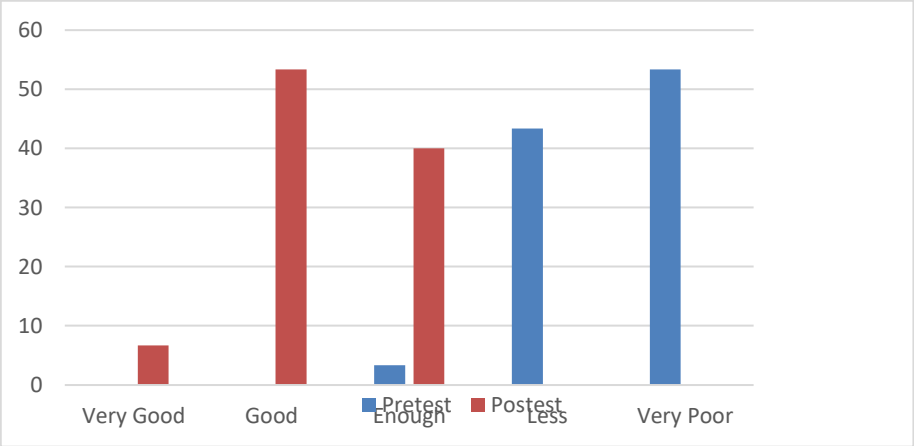

Figure 5. Results of *Pretest* and *Posttest*

Base on Figure 5, show a comparison summary *of the pre-test* and *post-test*. Showing pre-test activities before using *Museum Virtual Tour* Sriwijaya *post-test* learning outcomes student after using device *Museum Virtual Tour*. The comparison table for the recapitulation of *pretest* and *posttest scores* is show in Table 5.

Table 5. Comparison of Pretest and Posttest Recapitulation

No. Student Order	Initials Name of Student	Score *Pre-Test*	Category	Score *Post-Test*	Category
1	APF	45	Uncompleted	80	Completed
2	AS	55	Uncompleted	90	Completed
3	AZP	35	No Completed	70	Completed
4	AA	45	Completed	80	Completed
5	A	35	Uncompleted	75	Completed
6	DM	35	Not Completed	75	Completed
7	DF	65	Completed	85	Completed
8	DA	40	Uncompleted	75	Completed
9	F	30	Uncompleted	70	Completed
10	FW	35	Uncompleted	70	Completed
11	GJ	30	Not Completed	65	Completed
12	HPD	45	Not Completed	75	Completed
13	JA	35	Not Completed	70	Completed
14	MFN	40	Uncompleted	75	Completed
15	MAN	50	Not Completed	80	Completed
16	MRR	50	Completed	80	Completed
17	MNS	35	Uncompleted	70	Completed
18	NAP	35	Uncompleted	65	Completed
19	NM	35	Completed	75	Completed
20	NA	40	Uncompleted	75	Completed
21	NRF	35	Uncompleted	70	Completed
22	PA	35	Uncompleted	75	Completed
23	RAN	30	Uncompleted	70	Completed
24	RRF	30	Not Completed	70	Completed
25	RA	50	No Completed	80	Completed
26	SF	40	Not Completed	75	Completed
27	SRM	30	Not Completed	65	Completed
28	TPJ	50	Not Completed	80	Completed
29	YES	35	Not Completed	70	Completed

No. Student Order	Initials Name of Student	Score *Pre-Test*	Category	Score *Post-Test*	Category
30	ZAL	55	Not Completed	90	Completed
Total		1205		2245	
Average		40.16		74.83	

Based on Table 5, shows the average score achieved by students before using *Museum Virtual Tour* in learning is 40.16 in the low category, while the *post test* after using *Museum Virtual Tour* in history learning are 74.83 with high category when compared to the average value of the *pre test* , which is 40.16 with the average value of the posttest, which is 74.83, there is an increase of 34.67. This proves that *Virtual Tour Museum* Sriwijaya *is* effective in student learning outcomes.

Effectiveness Analysis (N-Gain)

Assessment of effectiveness was measured using *N-Gain* based on the average value of *pretest* and *posttest* . The *N-Gain* 0.57 medium category indicates that the use *Museum Virtual Tour* material evidence of the Sriwijaya kingdom's heritage has a good effect on the effectiveness of students' learning outcomes. A significant increase in the effect of the use of *Museum Virtual Tour* in the learning process. Based on the student response questionnaire to the use of *Museum Virtual Tour*, they got a good response because it can be used according to their wishes, the material is easy to understand, and there are additional explanation videos so that they can increase knowledge, but there are still shortcomings such as internet connection which sometimes becomes an obstacle to accessing *the website* due to unstable network.

Discussion

Based on the results of the analysis of teachers of history subjects then the analysis of student characteristics and the identification of facilities and infrastructure, this research needs to be carried out because the history teacher at SMA Negeri 7 Palembang has not yet once used the Virtual Tour Museum as a learning resource. Virtual Tour Museum will be created with varied content such as additions, 3D objects that can be inscriptions rotating, room plans, location maps that can be connected directly to googlemap, instructions for use and so on to help operate the Sriwijaya Museum Virtual Tour, the characteristics of the products that have been developed are: 1) products in the form of digital learning resources that have the characteristics of a virtual tour of the museum developed has elements of audio, images, videos, 3D objects; 2) products in the form of Virtual Tours that can simulate virtual tours of historical objects; 3) Products developed based on websites or online that can be accessed anywhere and anytime with laptops, tablets or smartphones. In addition, the Sriwijaya Museum Virtual Tour developed will be equipped with additional features and hotspots that allow opening information windows that provide additional information about certain panoramic objects containing various 3D objects along with the explanatory narration of each inscription, room plan and instructions to help operate the virtual Tour as well as text, video, images, and audio that use two languages, namely Indonesian and English, images which will be made as attractive as possible (Bydłosz et al., 2018; Rahmawati et al., 2021). In addition, users can freely move around the panorama (look left, right, up, down as well as move from one panorama to the next , as if they were moving from one room to another). The Sriwijaya Museum Virtual Tour can be accompanied by background sounds, which are pieces of music or sound recordings that provide an explanation of the museum's collection. Thus learners can feel immersiveness and interactivity in learning (Chust et al., 2013; de la Peña et al., 2021).

The large increase in the value of learning outcomes obtained by students shows that the learning resources of the Sriwijaya Museum Virtual Tour have a potential impact on students in learning history material evidence of the relics of the Srivijaya kingdom (Lionar & Mulyana, 2019; Perdana et al., 2018). The potential possessed by students will develop towards a good and optimal historical learning goal if directed and have the opportunity to experience learning independently (Tauresia et al., 2020; Zeng et al., 2018). This is in line with previous study that state the benefits of digital learning resources, namely the opportunity to learn independently and reduce dependence on teacher attendance, as well as get convenience in learn every knowledge he must master (Kang & Kim, 2021). There is an increase in learning outcomes after applying valid, practical and effective digital learning resources for The Sriwijaya Museum Virtual Tour for students in accordance with the opinion that the learning environment says that the learning environment digital is a need for learning and learning today (Smeda et al., 2014). It is supported by previous study that state the use of technology in the field of education makes 106 learning activities more effective and efficient so that they can attract interest in learning (Rashid et al., 2021). The difference between this research and previous studies is that this research was conducted on evidence material from the srivijaya kingdom. Virtual Tour of Sriwijaya Museum which was developed using 3D

Vista. The Virtual Tour Museum application developed will be equipped with the addition of 3D objects, complete features, diverse hotspots, locations, rooms and instructions to help operate the Virtual Tour and video, audio, images that will be made as attractive as possible and different from the existing Virtual Tour Museum. Then produce a Virtual Tour of the Sriwijaya Museum using 3D Vista as a resource for learning history in class X senior high school which is practical so that it is hoped that this museum virtual tour digital learning resource can be improve the learning outcomes in class X of senior high school.

4. CONCLUSION

Concluded that there is a need for digital learning resources in the form of a Virtual Tour of the Sriwijaya Museum with material on evidence of the relics of the Sriwijaya kingdom which can provide a simulation of visiting a historical object and there are elements audio, images, videos, 3D objects that suit the needs and characteristics of students so that they can help students in improving learning outcomes in accordance with learning objectives that already preranted. This research needs to be done because history teachers in senior high schools have never used the Virtual Tour Museum as a learning resource. Virtual Tour Museum will be created with varied content such as additions, 3D objects, rotating inscriptions, room plans, location maps that can be directly connected to googlemap, instructions for use and so on to help operate the Sriwijaya Museum Virtual Tour.

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