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Learning Model of Virtual Exhibition Using 3d Animation (Case Study: Exhibition Implementation Course in the Medan State Polytechnic Mice Study Program)

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Abstract.
The purpose of this study is to ascertain how digital 3D animation technology is used to build virtual exhibitions and whether there are any variations in students' comprehension of exhibition learning between learning about virtual exhibitions and before. Exhibitions arranged via digital media are referred to as virtual exhibitions. Virtual exhibitions can contain video content or a well-organized collection of photographs, and they are just as engaging as traditional exhibitions. According to the definition provided by the Digital Exhibitions Working Group, a digital exhibition is a collection of interconnected connections to distribute digital multimedia content to display ideas creatively while facilitating significant user engagement. To prepare students to acquire the knowledge, skills, and attitudes (competencies) to make or organize exhibition events properly, the Exhibition Implementation course in the Medan State Polytechnic (Polmed) MICE Study Program is taught in semesters 4 and 6. This will help Polmed become a reputable businessman who organizes exhibition events after graduating from the MICE study program. Data from research surveys were evaluated using a variety of tests, including a descriptive test (t-test). The Artsteps website is used in the process of constructing a virtual show. The study's findings demonstrate the value of using Artsteps to create virtual exhibitions as well as the variations in students' comprehension between before and after exposure to these types of learning environments.

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Keywords: Virtual Exhibition, Art steps, Understanding Exhibition.

1. Introduction

The Medan State Polytechnic MICE study program implemented online learning during the pandemic, but practical courses were still carried out manually. Learning during a pandemic must be carried out online. Learning that uses the lecture method may be easy to do online using the Zoom application, Google Meet, or other applications. However, for the implementation of practical teaching and learning, especially in vocational education which requires laboratories, workshops, or workshops, it requires more special digital-based techniques. This is because learning is carried out in the laboratory using equipment that is directly used and practiced by students. Educators also teach by demonstration method using equipment according to skills/expertise courses. Therefore special technology is needed to teach practical courses.

Learning for the Exhibition Implementation course in the Medan State Polytechnic (Polmed) MICE Study Program is carried out in semesters 4 and 6 to prepare students to acquire knowledge, skills, and attitudes (competencies) to make or organize exhibition events properly so that after graduating from the MICE study program Polmed will become a reliable businessman who organizes exhibition events.

Exhibition organizers are currently required to be able to master digital technology used to organize virtual or hybrid exhibitions. During the Pandemic, especially in 2020, various attempts by academics have been made to change the working pattern of teaching in the classroom, especially to teach event projects such as exhibitions. Learning to create exhibition event projects is focused on online learning methods and teaching materials have also changed from onsite event projects to virtual event exhibition projects.

The process of teaching Virtual 3D Implementation courses also requires changing the teaching model that uses onsite to learning that uses technology. In other words, the 3D Virtual Exhibition Implementation learning model uses 3D video technology in explaining exhibition implementation courses where exhibition implementation practices are also taught virtually. This learning model can be said to be a virtual reality (VR) learning model. This learning model is a learning innovation that applies more interesting learning media so that it can become a solutive and innovative learning media. Ariatama, Soni. et al. (2021). VR creates immersive simulations that allow users to interact and at the same time feel that they are in an environment that exists in a virtual world (Jamil, 2018).

There are some experts say that finding teaching forms for the creation of virtual exhibition skills (technology products) is a task that can overlap with various roles and actors. The creation process is also followed by overall contextual knowledge, providing insight into the strategic review that informs the development of virtual exhibitions.

Based on the background description above, the formulation of the problem or research question is as follows: 1. What is the process of implementing a virtual exhibition using digital

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3D animation technology? 2. How can the effectiveness of the implementation of virtual exhibition learning increase students' understanding of this learning?

2. Literature Review

Virtual exhibitions are defined as exhibitions held through digital media. Virtual exhibitions are held with video content or a series of photos arranged regularly. Usually, an exhibition event is synonymous with the performance of a work that a wide audience wants to display and enjoy, such as an exhibition of works of art. In contrast to ordinary exhibitions, virtual exhibitions can offer imaginative visual experiences, with venue design concepts that can be made as attractive as possible.

Virtual exhibitions are exhibitions organized through digital media. With video content or a group of photos arranged in such a way, virtual exhibitions are no less exciting than regular exhibitions.

According to Dumitrescui et al (2014), The Digital Exhibitions Working Group defined the digital exhibition as an ensemble of interlinks that has the objective of disseminating digital multimedia content, delivering innovative presentations of a concept, and allowing in a great measure the user interaction. This means that digital exhibitions are interlinked ensembles that aim to disseminate digital multimedia content, present innovative concepts, and enable broad user interaction.

Virtual exhibitions have the following quality characteristics: 1) Localization, meaning placing users or visitors in context and familiarizing them with the elements of the exhibition presented. 2) Relevance, to attract many visitors to access and be interested in the exhibition. 3) Interaction, giving users the possibility to interact with the application that translates the virtual exhibition, for example, to enlarge an image or select something to get a detailed description. 4) Maintenance, meaning the possibility to be updated every time a new element appears and must be added to the gallery or when the creator wants to enrich the description or improve it. 5) Accessibility, meaning reaching audiences who could never attend a physical exhibition

The main objectives of the virtual exhibition: 1) Engage members in in-depth collaborative investigations 2) Provide an opportunity to explore multiple perspectives on the theme 3) inform colleagues and staff about the purpose and general guidelines of the exhibition. 4) Collaborate with others to build participation (academicians, traders). 5) Schedule a time frame for the inquiry process, including a date for the staging of the exhibition. 6) Order the necessary facilities. 7) Determine the required resources such as internet connection, audio-visual equipment, and technology materials and consider budget constraints if necessary.

3. Method

This research uses the research development method (R&D) better known as Research and Development (R&D). This R&D research is research that is commonly used in the world of

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education. Development research can be said as a way to obtain data so that it can be used to produce, develop, and validate products. It can be said that Research and Development is defined as a type of research that focuses on the goal of developing, expanding, and exploring further theory in a particular discipline.

This study uses a quantitative and qualitative approach (mixed method). This research develops an exhibition course that is held onsite (offline) to an exhibition that is held online so that even higher knowledge and skills are needed in the field of digital technology.

This research was conducted with the first stage of the researcher observing the learning process of implementing online exhibitions for 5th-semester MICE Study Program students and the learning outcomes, namely offline exhibition event projects that had been carried out. Then in the second stage, the researchers conducted a training webinar on the creation or implementation of virtual exhibitions with 2 speakers, namely a consultant and an exhibition event organizer from the Debindo company who had experience as organizers of national and international virtual exhibitions.

Based on the process and contents of the Semester Learning Plan (RPS) for the Exhibition Implementation course and also the learning process for implementing the virtual exhibition, the researchers compiled a questionnaire and an interview guide that would be distributed to respondents, namely 47 semester 5 MICE Study Program students.

This research was conducted using the following methods: a) Interview method by making a list of interviews with informants who can be trusted to provide the right data. The number of informants is 2 teachers and 2 experts in making virtual exhibitions. b) The survey method is by submitting a questionnaire to semester 5 students of the MICE Study Program in 2 stages, namely before and after viewing the virtual exhibition learning. The pre-questionnaire was given when students were given theoretical teaching about virtual exhibitions, and the post-questionnaire was given when they had seen the virtual exhibition. Implementation of exhibitions with learning conducted offline or onsite and also received teaching on the implementation of virtual exhibitions online with 2 event organizers from PT Debindo International Trade and Exhibitions, namely Bima Riyanto in the position of Digital Marketing Specialist and Dina Gultom with the position of Exhibition Consultant.

The subjects of this study were 5th-semester students of the MICE Study Program consisting of 2 classes as a population of 47 people. Semester 5 students, namely Class MICE5A and Class MICE5B, have received learning in exhibition implementation courses (offline) during the current semester and have held exhibition events on a regional scale.

The design of this research is as follows:

1. Delivery of teaching materials in making virtual exhibitions, here it is explained how virtual exhibitions are and how to make virtual exhibitions theoretically, where the topic taken is an exhibition of paintings from around the world.
2. A pre-test was carried out in the form of distributing questionnaires which aimed to see students' understanding of the virtual exhibition

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3. The practice of making virtual exhibitions is assisted by the artsteps.com website, where students are asked to follow the steps: a) making storyboards (i.e. virtual exhibition storylines), b) making materials to be used in virtual exhibitions, c) doing layout designs exhibitions provided or customizing the layouts to be used, d) creating exhibitions.
4. The exhibition has been completed.
5. Then a post-test is held in the form of distributing the same questionnaire as those distributed in the pre-test.
6. A different test (statistical t-test) was carried out to see the extent of student understanding before and after making a virtual exhibition

4. Result and Discussion

This research takes the topic of virtual exhibitions of famous painting photos from around the world, the design of virtual exhibitions is carried out in several stages:

1. In the concept creation stage, here is how you will see/use virtual exhibitions, and how the use of art steps can make it easier to create virtual exhibitions.
2. Design stage, in this stage the research creates 1) a storyboard 2) an activity flowchart 3) a navigation structure 4) an object transition 5) a user interface
3. The material collection stage, to follow the storyboard that has been made requires material to be used in the virtual exhibition, a lot of material is taken from Google, freepik, and Pixabay.
4. The assembly stage, where the material that has been prepared is included in the art steps and adapted to the storyboard that has been made
5. In the testing phase, testing is carried out on students
6. Evaluation stage, at this stage improvements are made to what is lacking but the results still need to be perfected

4.1.1 Questionnaire results about virtual exhibitions

After previously being taught about virtual exhibitions, the respondents were given a questionnaire (pretest questionnaire), while the characteristics of the items from the variables are as follows:

LEARNING METHODS

1. Virtual exhibition practical learning is structured based on the practical learning model of implementing offline exhibitions in class according to course theories and practice, the majority still choose answers that strongly disagree (27.66%), and the smallest neutral choices (8.51%)
2. In the implementation of offline exhibition event projects, it can be used as a guide in implementing virtual (online) exhibition practices, the majority of students strongly disagree

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(29.79%) and the least disagree (12.77%). Of course, this result is very anomalous, but it shows that students' knowledge of virtual exhibitions is still limited

3. The learning model for the Virtual Exhibition Implementation Course has model parts that are used as guidelines for implementing the learning model, namely: sequence of learning steps (syntax); reaction principles; social principles, and supporting principles, the majority chose to disagree (27.66%), and the least strongly agreed (12.77%)
4. In learning the Implementation of Virtual Exhibition Events, lecturers/trainers teach the creation of exhibition event projects that have the goals and missions of digital era education, namely increasing the use of digital technology, the majority agree (27.66%), and the smallest neutral choices (10.64%)
5. The application of the learning model for implementing virtual exhibitions has a digitalized learning impact, namely learning outcomes that can be measured and the impact of accompaniment or long-term learning outcomes, the majority disagree (25.53%), and the least strongly disagree (10.64%).

USING THE INSTRUCTIONAL METHOD (MI)

1. Instructors teach the implementation of exhibitions with virtual digital technology according to the practical needs of the course, the majority choose to strongly agree (27.66%), and the smallest agree on choices (12.77%), this is also an anomaly indicating that students have not understood virtual exhibition instructional methods
2. Learning the implementation of virtual exhibitions is carried out with video content or a set of photos arranged regularly using 3D digital technology as in reality, the majority agree (42.55%), and the least strongly disagree (6.38%)
3. If there is a lack of understanding of the instructions for carrying out the assignments, the lecturer allows students to ask privately and carry out student creative ideas, the majority choose to agree and strongly disagree (23.40%), and the choices strongly disagree and agree are the smallest (17.02%), this shows how little students understand about virtual exhibition instructional methods
4. Lecturers provide creative breadth in working on exhibition event project assignments with various 3D digital technologies, the majority agree and strongly agree (23.40%), and the smallest neutral choice (10.64%)
5. Instructions from trainers/lecturers in learning the implementation of exhibition events can develop student creativity in making high-tech virtual exhibition events, the majority agree (31.91%), and the smallest disagree choices (8.51%)

3D VIRTUAL EXHIBITION MEDIA

1. In learning the implementation of 3D virtual exhibitions, it is still following the offline/onsite exhibition implementation courses, the majority chose to disagree (31.91%), and the smallest neutral choice (14.89%)

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2. In learning the implementation of virtual exhibitions, students are taught to make exhibition event project proposals that follow offline exhibition projects, the majority choose neutral (27.66%), and the smallest disagree and neutral choices (12.77%)
3. Carrying out a virtual exhibition event project with virtual 3D technology media can develop my creativity in working on making exhibition event projects in the future, the majority strongly agree (31.91%), and the least strongly disagree (14.89%)
4. Learning from Virtual Event Project Implementation based on 3D digital technology can improve the quality of bidding proposals made by students, the majority strongly agree (25.53%), and the least agree (12.77%)
5. The stages of implementing virtual 3D digital technology exhibitions improve student plans in making exhibition event projects in quality and quantity and more efficiently because there are stages that do not have to be carried out such as searching for venues which require high time and costs, the majority agree (31.91%), and the smallest neutral choice (8.51%)

Then students are allowed to see the virtual exhibition several times, then they are given another post-test questionnaire, while the characteristics of the items from the variables are as follows:

LEARNING METHODS

1. The practical learning of virtual exhibitions is structured based on the practical learning model of implementing offline exhibitions in class according to course theories and practice, the majority still choose answers that strongly agree (31.91%), and the smallest neutral choices (6.38%)
2. In the implementation of offline exhibition event projects, it can be used as a guide in implementing virtual (online) exhibition practices, the majority of students agree (38.30%) and the least strongly disagree (8.51%).
3. The learning model for the Virtual Exhibition Implementation Course has model parts that are used as guidelines for implementing the learning model, namely: sequence of learning steps (syntax); reaction principles; social principles and supporting principles, the majority agree (34.04%), and the least agree and disagree choices (8.51%)
4. In learning the Implementation of Virtual Exhibition Events, lecturers/trainers teach the creation of exhibition event projects that have the goals and missions of digital era education, namely increasing the use of digital technology, the majority agree (44.68%), and the least disagree choices (0.00%)
5. The application of the learning model for implementing virtual exhibitions has a digitalized learning impact, namely learning outcomes that can be measured and the impact of accompaniment or long-term learning outcomes, the majority agree (42.55%), and the smallest disagree choices (4.26%).

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USING THE INSTRUCTIONAL METHOD (MI)

1. Instructors teach the implementation of exhibitions with virtual digital technology according to the practical needs of the course, the majority agree (42.55%), and the smallest strongly disagree (0.00%), this is also an anomaly indicating that students do not understand virtual exhibition instructional methods
2. Learning the implementation of virtual exhibitions is carried out with video content or a set of photos arranged regularly using 3D digital technology as in reality, the majority agree (51.06%), and the choices strongly disagree and disagree are the least (2.13%)
3. If there is a lack of understanding of the instructions for carrying out the assignments, the lecturer allows students to ask privately and carry out student creative ideas, the majority choose to strongly agree (36.17%), and the choices to strongly disagree and disagree are the least (4.26%)
4. Lecturers provide creative breadth in working on exhibition event project assignments with various 3D digital technologies, the majority agree and strongly agree (31.91%), and the least strongly disagree (2.13%)
5. Instructions from trainers/lecturers in learning the implementation of exhibition events can develop student creativity in making high-tech virtual exhibition events, the majority agree (59.57%), and the least strongly disagree (2.13%).

3D VIRTUAL EXHIBITION MEDIA

1. In learning the implementation of 3D virtual exhibitions, it is still following the offline/onsite exhibition implementation courses, the majority choose to strongly agree (40.43%), and the least strongly disagree (0.00%)
2. In learning the implementation of virtual exhibitions, students are taught to make exhibition event project proposals that follow offline exhibition projects, the majority agree (36.17%), and the least strongly disagree (2.13%)
3. Carrying out virtual exhibition event projects with virtual 3D technology media can develop my creativity working in making exhibition event projects in the future, the majority agree (42.55%), and the choices strongly disagree and disagree the least (2.13%)
4. Learning from Virtual Event Project Implementation based on 3D digital technology can improve the quality of bidding proposals made by students, the majority strongly agree (40.43%), and the least strongly disagree (6.38%)
5. The stages of implementing virtual 3D digital technology exhibitions improve student plans in making exhibition event projects in quality and quantity and more efficiently because there are stages that do not have to be carried out such as searching for venues which require high time and costs, the majority voted strongly agree (31.91%), and the smallest disagree and strongly disagree options (6.38%).

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After explaining the characteristics of each respondent's answer choices, a different test (t-test) was then carried out to find out the effectiveness of implementing virtual exhibition learning to increase students' understanding of learning by comparing the results of the pre-test questionnaire with the post-test questionnaire.

Table 1 Pretest results with post-test

LEARNING METHODS	t-Test: Paired Two Sample for Means *15* *16* Mean 14.04348 18.28261 Variance 13.10918 4.829469 Observations 46 46 Pearson Correlation 0.040314 Hypothesized Mean Difference 0 df 45 **t Stat -6.91304** P(T<=t) one-tail 6.86E-09 t Critical one-tail 1.679427 P(T<=t) two-tail 1.37E-08 **t Critical two-tail 2.014103**	T count (abs 6.913) > t table (2.014) then H0 is rejected or H1 is accepted, so it can be said that there is a difference in terms of learning methods before the virtual exhibition is held and after
USING THE INSTRUCTIONAL METHOD (MI)	t-Test: Paired Two Sample for Means *21* *17* Mean 15.28261 19.76087 Variance 10.74058 5.608213 Observations 46 46 Pearson Correlation 0.080483 Hypothesized Mean Difference 0 df 45 **t Stat -7.8164** P(T<=t) one-tail 3.19E-10 t Critical one-tail 1.679427 P(T<=t) two-tail 6.39E-10 **t Critical two-tail 2.014103**	T count (abs 7.816) > t table (2.014) then H0 is rejected or H1 is accepted, so it can be said that there is a difference in terms of using the instructional method (MI) before the virtual exhibition is held and after

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3D VIRTUAL EXHIBITION MEDIA	t-Test: Paired Two Sample for Means			T count (abs 8.104) > t table (2.014) then H0 is rejected or H1 is accepted, so it can be said that there is a difference in terms of the media for implementing 3D virtual exhibitions before the virtual exhibition is held and after
		13	*18*	
	Mean	15.15217	19.86957	
	Variance	9.865217	6.29372	
	Observations	46	46	
	Pearson Correlation	0.036417		
	Hypothesized Mean Difference	0		
	df	45		
	t Stat	**-8.10452**		
	P(T<=t) one-tail	1.21E-10		
	t Critical one-tail	1.679427		
	P(T<=t) two-tail	2.43E-10		
	t Critical two-tail	**2.014103**		

The discussion here is an elaboration of the research results and is divided into two parts according to the research problem.

The Process of Implementing a Virtual Exhibition Using Digital 3D Animation Technology. Making a virtual exhibition is assisted by the Artsteps website, while the steps are the same as in the different research results here, the researcher will try to make a glimpse of the stages when creating on Artsteps: a) Open Artsteps, sign in and select the exhibition venue, click edit so that it will enter the exhibition venue and be given an edit display menu. b) Then the exhibition layout can be edited as needed c) Enter the 3D objects that we have prepared before d) Use the available tools to adjust the location of the objects we specify e) And we can also add an order/affidavit of affidavit f) After everything is finished, save it.

Overall, making virtual exhibitions with the help of Artsteps is very helpful, even though they don't have a qualified design background.

The effectiveness of implementing virtual exhibition learning can increase students' understanding of this learning. This study, to see whether there was effectiveness in increasing students' understanding of virtual exhibitions, was carried out by giving a pretest questionnaire (before learning/practicing making virtual exhibitions with steps) and a post-test (after practicing and seeing the results of making virtual exhibitions with 3 assessment criteria, namely 1) method virtual exhibition learning, 2) using instructional methods in the Semester Teaching Plan (RPS), and 3) exhibition implementation media (application and results).

The results of the pretest and post-test questionnaires were then compared with the paired t-test, the results of the three criteria had differences between the pre-test and post-test. This shows that learning to make virtual exhibitions has succeeded in increasing student understanding of virtual exhibitions.

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If you compare the implementation of virtual exhibitions with regular (offline) exhibitions, several criteria must be seen as follows:

Table 2 The Result of the pretest

Evaluation		Offline exhibition	Virtual exhibition
No	Criteria		
1	Location	Requires a large space	Requires a large space
2	Relevant	The exhibition held must be set with the theme to be used and here will need cost, especially for exhibition additional properties	Exhibitions can be set easily and no need for any costs for properties
3	Interaction	Participants, visitors, and executors can interact directly (face-to-face)	Participants, visitors, and executors can interact using the chat button
4	Accessibility	The exhibition can only be accessed by visitors who willing to come to exhibitions and limited by distance	The exhibition can be accessed by anyone without being limited by distance
5	Maintenance	Maintenance will be more difficult, especially if you have to look after paintings by other people who have to be displayed in an exhibition room and need to be done very carefully.	Maintenance is non-existent at all because it only uses images not an original painting

5. Conclusion

The conclusions that can be drawn from this research are

1. The process of creating virtual exhibitions using digital animation technology is greatly facilitated by Artsteps
2. There are differences in the level of student understanding of learning to implement virtual exhibitions after being taught to make virtual exhibitions.

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