Design Of A 360° Video-Based Virtual Tour Model Of The Penanggungan Mountain Slope Site As Selft Direct Learning In History Learning

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Abstract: This research aims to design a virtual tour-based learning model of the Lereng Gunung Penanggungan site using 360° video as a tool for self-directed learning in history lessons. Gunung Penanggungan, rich in historical sites, offers great potential as an authentic and engaging learning resource for students. The model is designed to enhance students' understanding of local history, develop digital literacy skills, and foster self-directed learning. The 360° video-based virtual tour allows students to explore historical sites interactively and in-depth, as if they were physically present. This research involves the development of 360° video content that includes historical explanations, important artifacts, and the cultural and archaeological context of the sites on the slopes of Gunung Penanggungan. Additionally, it includes a self-directed learning guide to help students further explore the information and gain a deeper understanding of the material. The results of this research indicate that the learning model effectively increases students' interest in and understanding of historical content, while also encouraging independent learning. Students also reported improvements in their technological skills and digital literacy. Thus, this 360° video-based virtual tour model represents an innovation in history teaching methods, offering a more engaging, interactive, and relevant approach in line with the advancement of educational technology.

Keywords: 360 video, virtual tour, penanggungan mountain, self direct learning

1   Introduction

The 21st-century education era demands a paradigm shift from teacher-centered learning to a student-centered approach. This approach emphasizes the importance of self-directed learning to prepare the younger generation for the future. It enables students to take an active role in the learning process, encouraging critical, creative, and innovative thinking[1] The ability to learn independently equips students to adapt to change and face various global challenges Self-directed learning allows students to

learn at their own pace and according to their abilities, with the support of technology[2]. This approach is crucial for developing a generation that is prepared to navigate the complexities and dynamics of the 21st century.

Mount Penanggungan holds a wealth of history that has yet to be fully uncovered, particularly through its ancient sites such as temples and stepped pundens. The lack of in-depth research, combined with limited accessibility due to the difficult terrain, makes information about these sites scarce and difficult for the public to access. As a result, these sites often suffer from neglect, damage, and looting. To address this issue, it is essential to design a virtual tour model of the Mount Penanggungan slope sites, utilizing 360° video as a tool for self-directed learning in history education. The 360° video-based virtual tour model offers a more enjoyable, emotionally engaging, and cognitively stimulating learning experience [3]This model allows students to feel as if they are physically present, providing a strong sense of immersion.

The material presented in the 360° Virtual Tour video of the Jolotundo site on the slopes of Mount Penanggungan aligns with the independent curriculum's focus on understanding key concepts. In the History subject, the learning outcomes expect students to grasp fundamental historical concepts and recognize historical research to analyze connections between the past, present, and future. Students study significant events across local, national, and global contexts, from the Hindu-Buddhist kingdoms to the Islamic kingdoms The presence of historical sites around students provides vast learning potential[4].

The use of historical sites as a learning resource aims to help students directly engage with historical material, making history more tangible, interesting, and understandable. It enhances students' enjoyment and interest in learning history by allowing them to observe sites firsthand, while also helping teachers explain details by referencing the actual state of the site. This aligns with the view of [5]who emphasize the importance of utilizing the surrounding environment as a learning resource. Studying the ancient sites of Mount Penanggungan not only deepens our understanding of past history and culture but also highlights the importance of preserving and protecting cultural heritage[6] These ancient sites are not merely objects of research and learning, but also serve as sources of inspiration for the younger generation to appreciate and safeguard cultural heritage.

Learning using 360° video provides students with the practice to explore historical sites virtually, gain an in-depth explanation of artifacts and their historical context and develop their analytical skills. This innovation is in line with the principles of the independent curriculum that are currently being applied, which emphasizes the freedom and independence of student learning and teachers play the role of facilitators [7]The independent curriculum demands relevant and meaningful learning for students, which is not only limited to the classroom but also involves a broader learning experience. Thus, this virtual tour-based learning model is expected to be an effective solution in overcoming the limitations of conventional methods and creating a more exploratory and educational history learning experience.

Previous research admitted by related to the development of virtual reality applications to study local cultural heritage[8]. This study explores the use of virtual reality in learning local history in Pasuruan with a focus on the development of learning media. The goal is to make it easier to understand cultural heritage without having to visit other destination physical locations to increase historical awareness

and preservation of cultural heritage in the area. Research conducted by shows that accessible and immersive learning tools, such as 360° videos, can have a positive impact on students' interests, learning outcomes, and emotions [9]The ease of access and the ability of 360° video to evoke long-term emotions make it a valuable tool for facilitating deeper and meaningful learning.

The research focuses on investigating the influence of *the Self-Directed Learning* learning model on students' cognitive abilities in history subjects at SMAN 2 Trenggalek[10]. The results of the study show that the application of *the Self-Directed Learning* model significantly improves students' cognitive abilities compared to conventional learning methods. Based on the previous research that has been presented, it can be concluded that digital platforms made based on virtual tours are able to present objects according to real conditions[10]. So the author believes that the application of *Virtual tours*, which are integrated with 360° videos on learning media, is able to stimulate students' curiosity through objects presented in real life.

The author is interested in conducting research and development with the title "Design of a Virtual Tour Model of the Penanggungan Mountain Slope Site Based on 360° Video as *Self-Directed Learning* in History Learning". This study offers the design of a virtual learning model of the Penanggungan Mountain Slope site based on 360° video as a self-directed learning tool in history learning. The slopes of Mount Penanggungan, with its wealth of historical sites, provide authentic and contextual learning resources for students. The material about the Mount Penanggungan site is still minimal, which is studied for the reason that it is difficult to reach. History textbooks only examine the evidence of Hindu-Buddhist culture in general. The presence of learning media in the form of a 360° virtual video tour will greatly help support history learning activities, as if the object is present from various sides. This method not only enriches students' understanding of the material, but also improves their digital literacy skills.

2   Method

This research uses a type of research and development (Research and Development), to design technological development in history learning. The model used refers to ADDIE, which consists of five stages, including analysis, design, development, implementation, and evaluation[11]. In the analysis stage, the researcher analyzes the curriculum, problems, and needs. The curriculum analysis process is carried out at the high school level in the history learning phase E (Social Sciences) with historical relics of Hindu material[12]. Furthermore, a problem analysis was carried out based on a context analysis related to the Penanggungan mountainside site and the audience of high school students who were close to the site location. The needs analysis was carried out by distributing questionnaires related to learning media, history learning, historical sites and mountain slope sites. After the analysis, the design is carried out.

The researcher conducted a product design, related to how the 360° video virtual tour was made, starting from determining specific history learning goals through the virtual tour. Construct storyboards and 360° video scenarios°, including determining the important points of the site and the historical narrative to be conveyed. In accessing this 360° video, students will use the youtube platform. Virtual tour 360°,

created with a navigation system and interactive elements to make it easier for participants to explore the virtual tour. Furthermore, the researcher conducts development in the form of product development.

At the product development stage, the researcher collected all the materials that were used for the Virtual Tour. 360° video captureon the Penanggungan mountain slope site. Next is the editing stage and the video preparation process. Additional Content Creation in the form of compiling narratives, texts and supporting images that will be displayed in the Virtual tour to further conduct tests on both students, and experts (material and media). This research and development is carried out up to the stage of product development, but not yet at prototype testing. This is intended to focus on designing products until the product is complete. Thus the 360° video tour virtual product° can be in accordance with the needs and expectations of users.

3   Result and Discussion

3.1 Pembelajaran Self Direct Learning

Self-Directed Learning *(SDL)* is a learning approach in which individuals are proactive in the learning process. This learning activity is driven by internal motivation. SDL's emphasis is not only on the result, but also on how individuals are actively involved in each stage of learning [13]The main characteristics of *Self-Directed Learning* include responsibility and self-direction in learning, self-discipline, and perseverance. *Self-Directed Learning* students are able to orient themselves by recognizing learning phenomena and opportunities, setting achievable goals, and managing time and priorities effectively. Self-discipline is the foundation of *Self-Directed Learning*, allowing students to stay committed and get work done despite challenges [14]Students who have *Self-Directed Learning* skills can achieve effective and sustainable learning throughout their lives.

Another characteristic is that *Self-Directed Learning* students have strong intrinsic motivation, awareness of learning needs, and the ability to monitor their own development. They tend to be innovative, think critically, and have good problem-solving skills. Lifelong learning and creativity are also an important part of *Self-Directed Learning*, where students are constantly seeking new knowledge and creating innovative solutions. Strong self-confidence, organizational skills, and the ability to receive constructive feedback are also important characteristics of SDL students, allowing them to continue to grow and achieve their learning goals effectively [15]. *Self-Directed Learning* prepares students to become successful self-directed learners in a variety of situations.

The following are six steps of Self-Directed Learning (SDL) in the context of learning history related to the site heritage on Mount Penanggungan:

Table 1.1 Design of Self-Directed Learning in Learning by Visiting Historical Sites on the Slopes of Mount Penanggungan

No.	Learning Syntax	Activity Focus
1.	Determining learning objectives, setting goals to be achieved in learning.	I want to understand the history and meaning of the statue heritage on Mount Penanggungan.
2.	Outline the assessment of the achievement of the goal to know that the goal has been achieved.	I will make a written report and maybe a diagram describing my discovery of the history and meaning of the statue on Mount Penanggungan.
3.	Identify the structure and sequence of activities to be taken to achieve the goal.	I would read the literature about the statues on Mount Penanggungan, then visit the site to collect field data and conduct interviews with local historians.
4.	Organize a timeline by defining a schedule to complete each activity.	I will complete the literature research in two weeks and the field visit in the third week.
5.	Identify the resources needed to achieve the goal.	I needed to access history books, academic journals, archaeological site maps, and documents from local museums.
6.	Seek feedback by finding a lecturer or mentor who provides feedback on the plan that has been prepared.	I will ask for the help of history and archaeology lecturers and research colleagues to review my report.

3.2 Potential of the Penanggungan Mountain Slope Site Based on 360-Degree Video for History Learning

The Mount Penanggungan Slope Site, a natural laboratory rich in historical artifacts, especially from the Hindu-Buddhist era, has great potential as a medium of learning. Its strategic location and diverse heritage allow us to reconstruct past lives and understand historical dynamics. Based on research, most of the sites on Mount Penanggungan were established in the 14th to 15th centuries. However, the discovery of the oldest year figures in 977 AD and the youngest in 1511 AD shows a wider time span in the development of this site [16]Making it an invaluable learning resource for future generations.

The Jolotundo site on Mount Penanggungan, according to a study by KCB Penangungan, is one of the proofs of the existence of human civilization since ancient times. This place is believed to be the hermitage place of King Airlangga after resigning as king. Mount Penanggungan as a whole is an area rich in ancient sites, in the form of former settlements, monuments, artifacts, and inscriptions. By observing

these relics firsthand, we can imagine the lives of people in the past, especially in the Hindu-Buddhist era. The spatial layout of the site that follows the concept of Hindu-Buddhist cosmology provides a deeper understanding of the beliefs and values embraced by the community at that time [17]The Jolotundo site is an ideal nature laboratory to study the history and civilizations of the past.

Studying the history of the Jolotundo Site site inspires students to be able to see how the cultural heritage of the past is still alive and developing today in the form of traditions, art, and beliefs of the surrounding community. The Jolotundo Site Site stores a lot of information about the Hindu-Buddhist kingdoms that once ruled in East Java. The Jolotundo site can study how religion and beliefs develop and interact with society [18]The Jolotundo site can be evidence of intercultural interactions that occurred in the past. Students are trained to think critically and draw conclusions based on existing evidence through analyzing archaeological data [19]. Students can compose historical narratives based on findings on the site, thus practicing their ability to construct logical arguments. Learning the history of their own nation, students will have a deeper love for the homeland.

360° videos allow students to "take a virtual walk" at a historical site, as if they were actually there, by seeing the details of the architecture, reliefs, and surrounding environment from a free perspective. This technology makes it easy to access and provides a virtual environment that appears more realistic [20]It offers an affordable and accessible representation of the real world, in contrast to virtual simulations [21]. This experience allows for deeper learning and longer exposure time, especially for learners who need more time to master the material, as well as allowing them to learn at their own pace anytime and anywhere, with a deeper understanding as time is spent [22]. 360° video can develop students' creativity and become a tool for collaboration, for example by having online discussions with other students about what they see in the video [23]. This technology makes learning history more interesting and fun, so it can increase students' motivation to learn and help them remember historical information better.

3.3 Design of a Virtual Tour Model of the Penanggungan Mountain Slope Site Based on 360-Degree Video Based on Selft Direct Learning in History Learning

360° video-based virtual tours Designed to make it easier for students to know the Mount Penanggungan slope site without having to visit directly. The design of this learning media is designed to be flexibly accessed anytime and anywhere. As we know the location and access to sites with difficult terrain, this is what makes the existence of the site less widely known, especially students. The design of the virtual space is designed using the *Self Direct Learning* to complete the exploration through the virtual space completely. In the concept of approach *Self Direct* learning students can learn to take initiative and be responsible for the learning process they face. Besides *Selft Direct Learning* It does not seek to print a person's individualism, but rather to develop their ability to be able to learn independently throughout life. In addition, students become accustomed to searching, analyzing, and evaluating information on their own. This is an important part of the skill of understanding and interpreting a historical event. The virtual tour design developed by the researcher seeks to increase students' interest and motivation in historical materials. Learning

process When doing exploration, students can direct the learning process themselves, with the direction they are interested in.

The learning process is designed to train students to think critically in analyzing historical sources. Analyze sources and draw conclusions based on historical evidence. Design of a virtual tour model of the Penanggungan mountainside site based on 360° Video Strive to present the object space in a real way. Thus, they can observe various sites on the slopes of the mountain, the condition of the site and the surrounding area, and the condition of the site closely, starting from the relief and texture. The presence of site objects with virtual tours 360° This brings history learning flexibly and efficiently to distance, and time. The presence of objects makes students real. Exploration on the mountain of the mountain of protection Here's a 360 video-based virtual flow design°. The exploration of the virtual space begins with the user, namely the student playing a 360° video, then the student makes an observation, It was followed by an interpretation of the existing site on the slopes of Mount Penanggungan based on their observations.
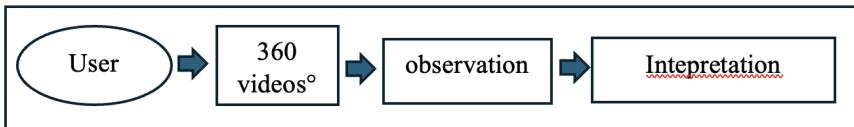

Figure 1. Virtual browsing design
Source: Researcher, 2022

The exploration was carried out on the slopes of Mount Penanggungan in the hilly area of Bekel. The exploration begins by crossing many unknown sites, before passing the main site, namely the Kontrol Sada Temple in this virtual space, will pass through Baby Temple, Chair Temple, Temple Temple, Putri Temple, Kama III Temple, Naga Temple I, Naga Raja Relief/Gini. 360 video design° which originally consisted of 2 sides will later be combined to facilitate the process of exploring virtual spaces. The shape of the 360° video designed by the researcher is as follows:

Figure 2. Buyung Cave
Source: Researcher, 2022

Figure 3. Kendalisada Temple
Source: Researcher, 2022

Video-based virtual video tour design 360° designed to make it easier for learners to learn anywhere, and anytime. In the process of user interaction, information features, interactive maps, and quizzes are provided. The existence of this virtual tour serves to increase user involvement to learn independently. In addition, user engagement through interactive features and an immersive visual experience.

sites, but the lack of in-depth research and limited accessibility make information about this site minimal and difficult to reach. The virtual tour model offers a solution to this problem. Previous research has shown that accessible and immersive learning tools, such as 360° videos, can have a positive impact on students' interests, learning outcomes, and emotions. This research uses a type of research and development and follows the ADDIE model. Self-Directed Learning (SDL) is a learning approach in which individuals are proactive in the learning process. The Penanggungan Mountain Slope Site has great potential as a medium of learning due to its strategic location and diverse heritage. 360° videos allow students to "take a virtual walk" at a historical site and offer an affordable and accessible representation of the real world. The design of the virtual tour model of the Penanggungan mountainside site based on 360 Video seeks to increase students' interest and motivation in historical materials.

4   Conclusion

This research focuses on designing a virtual tour-based learning model of the Lereng Gunung Penanggungan site using 360° video. The model aims to increase students' understanding of local history, improve digital literacy skills, and encourage self-directed learning. In the 21st century, there is a need for a shift from teacher-centered learning to a student-centered approach. The design of a 360° video-based virtual tour model offers a more enjoyable and cognitively attention-grabbing learning experience. The Slope Gunung Penanggungan site is rich in historical sites, but the lack of in-depth research and limited accessibility make information about this site minimal and difficult to reach. The virtual tour model offers a solution to this problem. Previous research has shown that accessible and immersive learning tools, such as 360° videos, can have a positive impact on students'

interests, learning outcomes, and emotions. This research uses a type of research and development and follows the ADDIE model. Self-Directed Learning (SDL) is a learning approach in which individuals are proactive in the learning process. The Penanggungan Mountain Slope Site has great potential as a medium of learning due to its strategic location and diverse heritage. 360° videos allow students to "take a virtual walk" at a historical site and offer an affordable and accessible representation of the real world. The design of the virtual tour model of the Penanggungan mountainside site based on 360 Video seeks to increase students' interest and motivation in historical materials.

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