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DEVELOPMENT OF MOBILE VIRTUAL FIELD TRIPS IN IJEN CRATER GEOSITES BASED ON 360^0 AUTO STEREOSCOPIC AND GEOSPATIAL TECHNOLOGY AS GEOGRAPHY LEARNING MEDIA

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Abstract: The Covid-19 pandemic limits the space for teachers and students in the Geography learning process, thus affecting the achievement of the competencies and capabilities of geography students. The purpose of this research is to develop Ijen Geosites Mobile virtual field trip (M-VFTs) media to help facilitate Geography learning. This study aims to develop Ijen Crater Geosites based on Mobile Virtual Field Trips media based on 360^0 Auto Stereoscopic and Geospatial Technology. This research is included in research and development by adopting the PLOMP model. The results obtained consist of making M-VFTs related to the Ijen Geosites study with interactive informative access that can be easily accessed by users. The results of this study can relate the risk of limitations in obtaining information during actual visits, especially in learning geography, so that it can help students learn to be active, independent and meaningful through observation and exploration activities.

Key words: mobile virtual field trips, Ijen crater geosites, 360^0 autostereoscopic, geospatial technology

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INTRODUCTION

The temporal review shows that the earth's dynamics as a living space has a long record in its development. The record is shown through the dynamics of geosphere phenomena in the variation of landscape spatial (O'Sullivan et al., 2019). The energy that is processed as a causal relationship of endogenous and exogenous energy forms unique geographical features (Sallam et al., 2018). Indirectly, nature provides information to help humans understand the dynamics of processes, interrelations, and areas of geosphere phenomena (Gosal et al., 2021). Therefore, the Geological Heritage (Geosite) deals with the unique form of geographical features by emphasizing the information process about complex geological phenomena (Geosite) (Ibanez et al., 2021). Geological Heritage (Geosite) is closely related to Geodiversity, as a complex diversity process of physical and non-physical processes. Geological heritage has the value of a place to help provide information about processes on the earth's surface (Bruno et al., 2020) The Geosite concept is formed from the relationship of phenomena in the historical aspects of complex geological phenomena (Parkes et al., 2021). Therefore, Geosite has an important part in human life, not only in the view and culture but also in scientific studies (Kubalíková et al., 2021).

Geosite as a scientific study is one of the interesting topics in Geography studies. Geosite with a complex scope was formed from power and force as a result of the geological activity (Chicote, 2021), geomorphologic form and landscape (Reynard et al., 2021), weather and climate dynamics, and environmental (socio-humanities) track record (Cayla and Megerle, 2021; Coratza et al., 2018; Pralong, 2005). Geosite is an essential topic in Geography study (Rutherford et al., 2015), mainly as a tool in the spatial analysis unit of various geosphere phenomena above the earth's surface (Filocamo et

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al., 2019). Geography's complexity in Geosite can be packaged into a comprehensive learning resource, concepts, principles, and approaches in Geography learning materials have been integrated and merged into Geosite (Lansigu et al., 2014). Besides, Geosite can be a natural laboratory that helps students understand geosphere phenomena and supports media for exploration and actual learning in Geography learning (Guilbaud et al., 2021). However, learning activities with actual learning encountered many obstacles, especially during the Covid-19 pandemic. Field trip learning during the Covid-19 pandemic was a big challenge for Geography teachers. The demand to maintain the competence and capabilities of students' learning outcomes was limited by pandemic conditions (Barton, 2020). The massive increase of pandemic cases in Indonesia has forced teachers to do virtual learning (Chatziralli et al., 2020). It limits the learning between teachers and students and limits interaction with the surrounding environment (Chaturvedi et al., 2021). Therefore, teachers must provide practical solutions for the actual learning process in Geography during the Covid-19 pandemic by developing learning media for Mobile Virtual Field Trips (M-VFTs) based on 360º autostereoscopic and geospatial technology.

The development of M-VFTs can be a solution for actual learning in Geography, especially during the Covid-19 pandemic. Immersive experiences in M-VFTs development can help facilitate student interaction with their environment (Hamilton et al, 2021). The implementation of M-VFTs can be used as a substitute for contextual media in Geography without reducing student knowledge in learning material content (Bursztyn, 2020). M-VFTs with learning activities in actual learning provide various benefits to students in learning Geography (Kingston et al., 2012a), such as spatial abilities, spatial thinking, and geographical skills. Therefore, developing M-VFTs is necessary based on 360º autostereoscopic and geospatial technology with integrated and comprehensive content in the Geosite concept to support the optimal Geography learning process. The limitation of the M-VFTs product lies in the specific scope of the material (Ijen Geosites Geographical Characteristics). Thus, the use of this media is limited to studying the interaction of geographical characteristics phenomena, not using other approaches.

MATERIALS AND METHODS

Object of Research

The research is located at Ijen Crater (2,386 masl), located in Banyuwangi and Bondowoso Regencies, East Java Province, Indonesia. It has 20 km wide and was formed more than 50,000 years ago due to the collapse of the Ijen stratovolcano (van Hinsberg et al., 2010). The Ijen Crater volcano is the only volcanic mountain that is still active, formed during the Pleistocene era as a stratovolcano with a hydrothermal system consisting of the largest hyper-acid lake in the world (Caudron et al., 2015). The magmatic-hydrothermal system of Ijen Crater is very active and appears on the surface as actively degassing fumaroles, large hyper acidic volcanic lakes, and acid rivers flowing to the west side (Caudron et al., 2015; van Hinsberg et al., 2010). The summit has two craters that form a depression extending by a crater lake bordering a cliff 250 m above the lake (except gap on the west side).

Research Methods

This study uses the Research and Development method with the PLOMP development model by (Plomp and Nienke, 2013). The PLOMP model has several developments as follows; (1) Preliminary Research, (2) Prototype Design and Development, and (3) Evaluation. Research procedures can be described in the following flow chart.

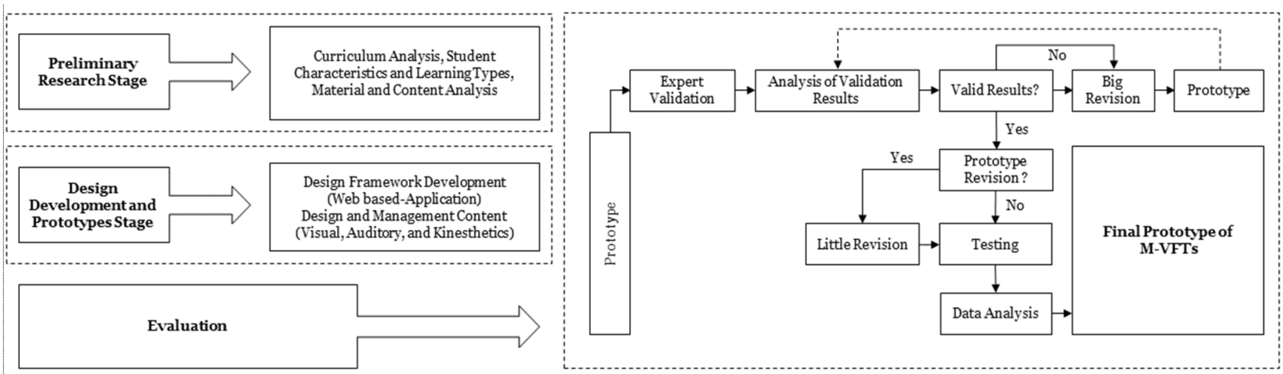

Figure 1. Research Methods Flow Charts of M-VFTs Development System based on Geospatial Technology (Source: Research Data, 2021)

The data analysis technique uses quantitative descriptive with expert validation and product development testing. Media expert validator (Professor of Learning Media) and Material expert validator (Professor of Physical Geography) at Universitas Negeri Malang.Then the results of expert validation were revised and tested at SMA Laboratorium UM.

Prototype Design

Mobile Virtual Field Trips (M-VFTs) aimed to construct a real-world environment regarding a visual representation of geosphere phenomena (atmosphere, lithosphere, hydrosphere, biosphere, and anthroposphere) on the earth's surface. The integration of various media such as images, 360^0 Autostereoscopic, videos, to articles with exploratory learning activities is an important component in the input system. The development of M-VFTs referred to three main components, namely (1) 360^0 Autostereoscopic rendering, (2) Development framework (content and layout of M-VFTs), (3) Scene customization in M-VFTs (hotspots positioning, object information based geographical characteristics, scientific infographics for students' information literacy).

Framework Development

The framework design for M-VFTs is developed using a web-based application. This condition is based on the performance, openness, responsibility, and accessibility of the devices used by the user. Also, web-based applications have great opportunities for accessibility by users with internet access is the domain in digital technology. User convenience has made M-VFTs to be integrated with web-based applications as an important issue in this research. Technology-based learning can help students in learning activities (Fu and Hwang, 2018). The development of integrated M-VFTs was a web-based application with programming assistance in JavaScript, XML, and HTML5. Map, 360^0 Autostereoscopic, Photo, Video features are integrated into the coding system. HTML5 is based on a simple and non-monotonous interface for users to access of M-VFTs easily. JavaScript is the basic coding system used in developing M-VFTs. Then, XML is used as a link representation by HTML5 and JavaScript functions. System development and packaging using mobile devices in M-VFTs have high efficiency and high effectiveness in the learning process (Markowitz et al., 2018).

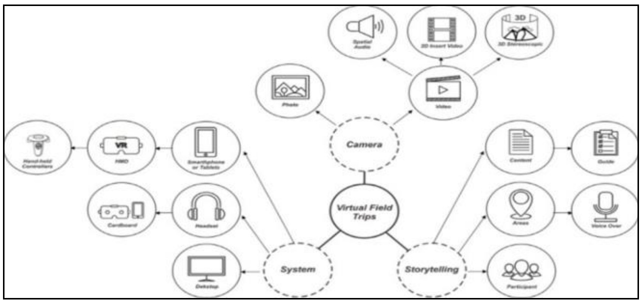

Figure 2. Design of M-VFTs Development System based on Geospatial Technology (Source: Source: Research Data, 2021)

Figure 3. Codification of the M-VFTs Architecture System based on Geospatial Technology (Source: Research Data, 2021)

RESULTS AND DISCUSSION

Results

The strengths and limitations of M-VFTs development can be identified through the product trial process. The trial was tested on teachers and second-year high school students in Social Class at UM Laboratory High School. The process includes: (1) the projection area as an exploration unit, and a menu icon with a multi-linked information system helps students to reconstruct conceptual knowledge and understanding, (2) provide introductory information provides a general description of the material (showed in Figure 4), (3) Menu bar that contains menu options for displaying M-VFTs access (desktop and cardboard views), introductory information, and other menus (full screen, hotspots, sound, and share). In the early access of M-VFTs, teachers and students could access the link on both desktop/PC and mobile devices. The Geographical Characteristics content of Ijen Geosites was selected based on curriculum analysis, material analysis, and student needs. The icons on M-VFTs help students to access information presented in various media (photos, infographics, and videos on the YouTube platform). Based on Figures 4a and 4b, the video demonstrated the Geographical Characteristics of Ijen Geosites. The Geographical Characteristics study at Ijen Geosites contains Physical studies including Geology, Geomorphology, Soil, Weather and Climate, and non-physical studies including Socio-Economic and Cultural studies. These studies are presented in 'hotspots viewpoints' on M-VFTs to learn through interaction, information literacy, and exploration activities. Then, the cardboard display helps students to reconstruct spatial knowledge and skills through an immersive experience in M-VFTs via mobile devices.

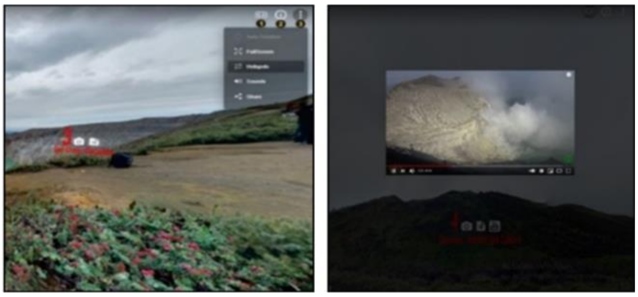

Figure 4. (a) M-VFTs Main Menu (b) Access to M-VFTs Multimedia Information of Ijen Geosites M-VFTs Main Page and Multimedia Information of Ijen Geosites (Source: Research Data, 2021)

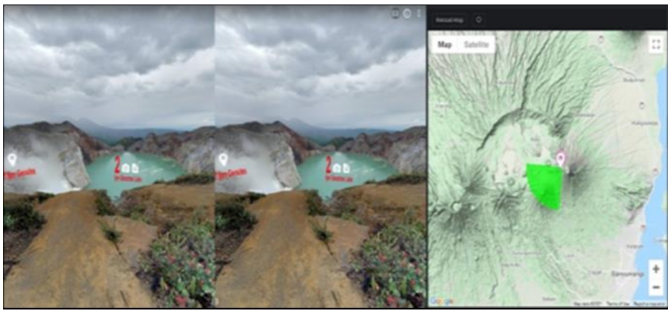

Figure 5. M-VFTs based on Geospatial Technology (Source: Source: Research Data, 2021)

Geospatial Technology in M-VFTs is oriented towards giving students immersive experiences. Geospatial Technology is used, such as 3D topographic visualization, GIS overlays, satellite imagery, aerial photos, and digital maps. The development of M-VFTs emphasized Geospatial Technology, 3D topographic visualization, and digital maps. The Geospatial Technology concept in M-VFTs that emphasize 3D visualization helped students think contextually through visualizing 3D topographic geographical characteristics. Then, digital maps are used as a virtual exploration media for students, thus helping students in spatial orientation and analysis (Figure 5). The M-VFT product as a product in research and development activities has several limitations. In general, these limitations refer to (1) Acquisition of new personal knowledge and experience, thereby limiting some of the development of competencies and skills for users, (2) Limitations of developing textual material content, (3) User usability is a top priority in accessing M-VFT, (4) M-VFT cannot accommodate the attention, motivation and interest of individual users. Based on some of the limitations of the research above, the researcher suggests several considerations in the development of M-VFT, namely: (1) In-depth identification of needs as an early stage of M-VFT development is highly recommended, (2) M-VFT as a medium with a complex technology base needs to get attention, specializing in content management, (3) It is recommended to create a user guide in accessing M-VFT.

Table 1. Scope of Ijen Geosites Geographical Characteristics
(Source: National Geography Standards (1994)

Charac-teristics	Sub-Characteristics	Topics
Physics	Physical Features	Geology and Geomorphology
	Weather	Air Temperature, Air Pressure, Air Moisture
	Climate	Precipitation, Wind and Cloud
	Soil	Physical, Chemical and Biological
	Water	Physical
	Vegetation	Flora Type and Distribution
	Animal life	Fauna Type and Distribution
Human	Social	Language, Religion, Political System and Population Distribution
	Economy	Economic Activities
	Culture	Norm and Value

Case Study

The M-VFTs trial was carried out for a limited time at the UM Laboratory High School, Malang, Indonesia. The research participants and development activities were used in small groups (5-10 participants) of Geography students in Social class at UM Laboratory High School. The participant was selected based on topics taken in the previous class, namely Chapter 4. Dynamics of the Lithosphere and the Impact for life (taken in the first year or Class X and) Chapter 3, Management of Indonesian Natural Resources (taken in the second year or Class XI). During testing, the M-VFTs features helped facilitate the Geography learning process effectively and efficiently. M-VFTs 360^0 Autostereoscopic design is presented in a panoramic collection. It is used as a virtual student learning environment, as shown in the following Table 2.

Table 2. M-VFTs Panoramas Ijen Geosites Content (Source: Research Data, 2021)

Spot Site (Altitude Range)	Number of Panoramas	Location	Main Features of Geographical Characteristics
Mountain Ijen Geosites (2,377 masl)	4	Banyuwangi $8^0$03’28” S - $114^0$14’ 52” E	Structure (including lithic types), Geological Scale, Lithic Formation, Landscape, Landform, Stratigraphy, Morphogenesis, Morfo-arrangement, and Vegetation
Mining and Socio-Cultural Life of Ijen Geosites (2,146 masl)	1	Banyuwangi $8^0$03’35” S -$114^0$14’38” E	Occupation, Social-Cultural Life
Tourism of Ijen Geosites (2,305 masl)	1	Banyuwangi $8^0$03’47” S -$114^0$14’45” E	Economic Activity
Volcano Complex of Merapi-Ranti-Wurung (1,627 masl)	1	Bondowoso $8^0$03’47” S -$114^0$10’06” E	Complex volcanic formation
Hydrological Kalipahit: River Under Ijen Geosites (1,723 masl)	1	Bondowoso $8^0$03’44” S -$114^0$12’58” E	Hydrological Characteristics
Lava Flow of Plalangan Geosites (1,110 masl)	1	Bondowoso $8^0$00’33” S -$114^0$09’09” E	Structure (including lithic types), Geological Scale, Lithic Formation, Landscape, Landform, Stratigraphy, Morphogenesis, Morfo-arrangement

Table 3. M-VFTs *Framework Development* and Student Learning Activity (Source: Research Data, 2021)

Main System	Accessibility Feature	Learning Activity	Learning Outcomes
Storytelling	Content	Interactive and Engagement Information Literacy Ijen Geosites	Curiosity
	Area	Searching Content Ijen Geosites	
System	Desktop	Verification and Explore Ijen Geosites Process	Exploring (Immersive and Non-Immersive)
	Cardboard		
	HMD		
Camera	Photo	Explaining the Evidence of the Ijen Geosites Phenomenon	Discovery
	Video		

The complex content in Ijen Geosites is packaged in 3600 Autostereoscopic in M-VFTs Ijen Geosites panorama. The panorama available in M-VFTs Ijen Geosites is packaged in the geological formation of Ijen Geosites. Thus, the panoramic spots for M-VFTs are Mountain Ijen Geosites (Crater Wall of Mount Ijen, Ancient Caldera of Ijen Geosites, Solfatara Permanent of Ijen Geosites, 'Blue Fire' from East Java, Mining and Socio-Cultural Life of Ijen Geosites, Tourism of Ijen Geosites), Volcano Complex Merapi-Ranti-Wurung, Lava Flow Plalangan Geosite. The features are based on the architectural system design of the M-VFTs, consisting of three main systems, namely (1) Storytelling (Visualization of M-VFTs Content), (2) System (Presentation and Access to M-VFTs Tools), (3) Camera (M-VFTs Media Input). Then, these features are built for easy access for students to the material content using Audio (Content and Area), Visual (Desktop, Cardboard, HMD), and Audio-Visual (Photo-Video). The system design and accessibility have a main function in supporting learning activities and outcomes. In general, the features in M-VFTs are presented about the overall system design, feature accessibility, learning activities, and learning outcomes in using Ijen Geosites M-VFTs, as shown in Table 3.

The M-VFTs features supported Geography learning activities effectively and efficiently. Each feature was facilitated learning activities and oriented to predetermined learning outcomes. The features are designed to give students cognitive guidance with deductive-inductive thinking patterns. The main storytelling system with accessibility features in content and areas were emphasized learning activities of information literacy and content searches about Ijen Geosites. M-VFTs provided an overview of the geographical characteristics of Ijen Geosites through the feature guide content and voice-over on the feature area. Relevant scientific articles are packaged in multi-linked information and scientific infographics to increase students' knowledge about Ijen Geosites, so student curiosity as the learning outcomes will be increased. Students could access all features in desktop, cardboard, and HMD at the M-VFTs system. Information literacy that has been supported by the storytelling feature is applied to system features by emphasizing learning activities about verification and exploration of the Ijen Geosites Process. Learning outcomes were emphasized exploration activities regarding the non-immersive and immersive transfer of knowledge. The system features are integrated with the camera feature as supporting media input in photos and videos. Then, the features were emphasized learning activity by explaining and showing evidence of the Ijen Geosites Phenomenon. Finding discoveries could help students to reconstruct the concepts of Ijen Geosites.

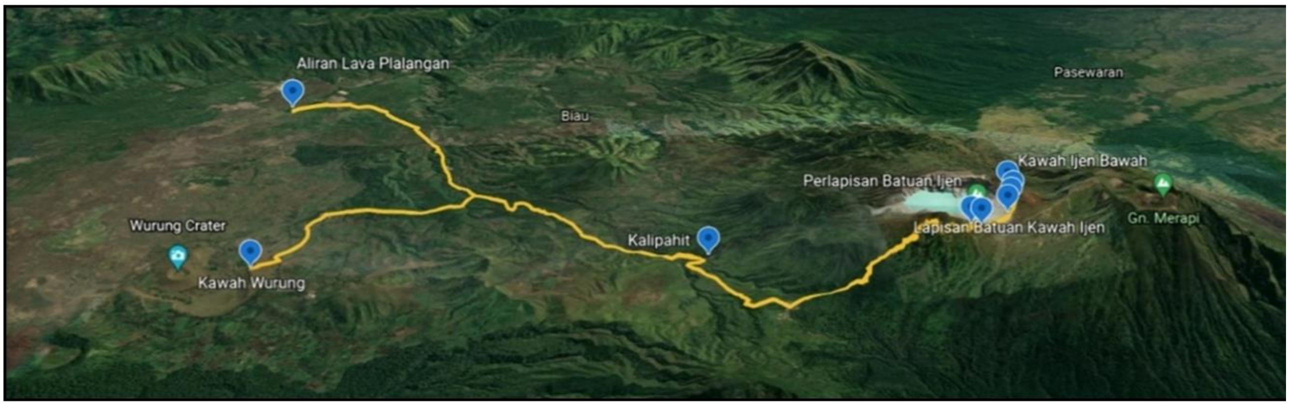

Figure 6. Spot Site Plotting of M-VFTs Ijen Geosites Panorama (Source: Research Data, 2021)

Discussion

The M-VFTs development contributed to learning Geography, mainly related to facilitating learning activities about exploration. Exploration in learning activities is limited by the Covid-19 pandemic (Marek et al., 2021) so that M-VFTs media could be an effective solution in the virtual environment for student exploration activities (Mead et al., 2019). The virtual environment in M-VFTs is based on the 360^{0}Autostereoscopic panoramas and Geospatial Technology. The integration helped provide an immersive experience (Cummings and Bailenson, 2016), by achieving learning outcomes. Students could access various media of information, including the geographical characteristics of Ijen Geosites. The M-VFTs Ijen Geosites has facilitated students' interactive learning process. In addition, the immersive experience gained by interacting virtually with 360^{0}Autostereoscopic and Geospatial Technology helped students be active and independent. Exploration of the M-VFTs panorama encouraged learning outcomes in curiosity, exploration, and discoveries related to Ijen Geosites. The Ijen Geosite content is packed in 6 main spot sites, as shown in Table 2.

Figure 7. The Complexity of Mount Ijen Geosites (Source: Research Data, 2021)

Spot Site 1: Mountain Ijen Geosites (coordinate: 8003'28 "S-114014 '52" E)

There are 4 panoramas of Ijen Geosites with medium exploration, namely Dynamics Process of Ijen Geosite (Physics and Non-Physics), Ancient Ijen Crater, Ijen 'Blue Fire' Mountain, Solfatara Permanent of Mount Ijen. Ijen Geosites is a composite volcano with a stratovolcano (Spica et al., 2015). The physical appearance is caused by the complex activity of geological processes (Berlo et al., 2020). A geological review shows that young Mount Ijen is included in the geological unit (Qhvi) as subduction of the Indo-Australian plate with the Eurasian plate (Daud et al., 2018), and is included in the quarter volcanic mountain range with the Solo-Randublatung depression zone (Caudron et al., 2015).

Ijen Geosites is an active volcano in Indonesia. Massive volcanic processes have been recorded since 1770 with phreatic-magmatic eruptions (Caudron et al., 2015).In a morphological review, Ijen Geosites have morphogenetic diversity due to the process complexity. The morphogenesis of Ijen Geosites is dominated by eruptive material with exhalation in sulfur oxidation (permanent solfatara and fumaroles) (Mora Amador et al., 2019) located in the Southeast of Ijen Geosites Caldera and the Blawan Fault. The process complexity can be seen in the emergence of unique phenomena in Ijen Geosites, namely Ijen 'Blue Fire' Mountain and Acid Lake (Amador et al., 2019). This condition can be used as a natural laboratory for Geography learning media to provide meaningful learning for students.

Spot Site 2 dan 3: Mining, Social Cultural, and Tourism of Ijen Geosites (coordinate: 8003’47” S-114^{0}14’45” E)

The socio-economic and tourism aspects of Ijen Geosites are an interesting topic study. The economic activities contained in Ijen Geosites are dominated by sulfur mining activities (Aliya Fatimah, 2021) . Mining activities in Ijen

Geosites use traditional methods (Rouwet, 2021). The traditional method is considered the most effective way due to difficult terrain along the Ijen Geosites climbing route. Sulfur mining at the Ijen Geosite is uniquely formed. Mining materials in Ijen Geosites do not form by themselves but are the result of condensation of fumarole emissions in Ijen Crater (Van Hinsberg et al., 2017). In addition, based on the socio-cultural of mining at the Ijen Geosite, it is hereditary (Setiadji and D. Artaria, 2018). Such uniqueness makes Ijen Geosites not only based on physical, but also tourism is an important aspect of Ijen Geosites to be studied. Ijen Geosites has tourism attractions with access to the landscape's beauty (Widowati et al., 2019). Besides, based on the community's socio-economic point of view, sulfur mining workers attract local and foreign tourists (Purnomo et al., 2019). Socio-economic as geographical characteristics at Ijen Geosites shows a causal relationship between physical and non-physical aspects of geosphere phenomena on the earth's surface. The integration of social aspect studies in M-VFTs media helps facilitate students to master the topic concept.

Figure 8. Sulfur Mining Activities and Products as a Tourism Attraction (Source: Research Data, 2021)

Figure 9. 360^0 Projection Area of Complex of Merapi-Ranti-Wurung (Source: Research Data, 2021)

Figure 10. 360^0 Projection Area of Kalipahit (Source: Research Data, 2021)

Figure 11. 360^0 Projection Area of Lava Flow Plalangan Geosites (Source: Research Data, 2021)

Spot Site 4: Volcano Complex of Merapi-Ranti-Wurung (coordinate: $8^0$03’47” S-$114^0$10’06” E)

The volcano complex of Merapi-Ranti-Wurung is formed in a series of volcanoes. The volcano complex is included in the Ijen volcano (Maryanto, 2018). The intra-Ijen volcano forms the Merapi-Ranti-Wurung complex volcanic route through a magma breakthrough (Arafat et al., 2020). A further process is seen in young Mount Ijen with a shallower magma chamber (Daud et al., 2018). Wurung Crater is one of the unique volcanic studies in Ijen Geosites.

Wurung Crater is located in Bondowoso, Indonesia. The volcanic view shows that the Wurung crater is included in 17 mountains as a volcanic process of Ancient Mount Ijen (Afandi et al., 2021). The unique study of the Wurung crater lies in the volcanic landform and the eruption process in vitric tuff, lithic tuff, basalt scoria, andesite scoria, andesite lava, andesite lava scattering, and andesite bombs (Afandi et al., 2021). Showing facts through various M-VFTs media helped students in contextual learning about the geosphere phenomena.

Spot Site 5: Hydrological Kalipahit: River Under Ijen Geosites (coordinate: $8^0$03’44” S-$114^0$12’58” E)

Kalipahit is a river that originates from the Ijen Geosites crater. Kalipahit flow to the west from two inputs: springs and overflow of the Ijen Geosites Caldera and springs in Ijen Ancient Crater (Blawan Fault) (Daud et al., 2018). The unique appearance lies in the river's complex hydrological characteristics (Sugiyarto et al., 2018). There are two hydrological characteristics of the river that flows into the village of Watu Capil, Bondowoso. The riverbed of the Blawan fault system has an orange-brown colour from a hydrothermal process containing chloride sulfate bicarbonate (Spica et al., 2015). Meanwhile, the riverbed in the Kalipahit system is white from solfatara sedimentation (Spica et al., 2015). Such conditions can provide opportunities to be developed into local community tourism potential (Maryanto et al., 2017). The material content on spot site 5 is mostly presented through visual media (3D modelling) assisted by Geospatial Technology in M-VFTs. It helped students understand content clearly so that cognitive outcomes can be achieved optimally.

Spot Site 6: Lava Flow of Plalangan Geosites (coordinate: $8^0$00’33” S-$114^0$09’09” E)

The panorama presented in spot site 6 is the Plalangan Geosites lava flow. The lava flow has a geological structure representing the Ancient Ijen lava flow system (van Hinsberg et al., 2010). This condition can be seen in the lava flow associated with the Ancient Ijen caldera wall in the North. The characteristic colour of the lava flow is dominated by black, indicating the eruption output is basaltic. Also, other eruptive materials can be identified in breccias, tuff sand, lava block, andesitic, and alluvium deposits (Maryanto, 2018). The basaltic eruption was spread over 10.51 km^2 from Mount Anyar to Blawan. The Plalangan Geosites have type AA lava flow based on lava flow classification. The AA lava flow at Plalangan Geosites appeared from the eruption of Ancient Ijen Mountain. AA lava flow has a rough surface with the bottom flow angled less than 350. The lava type comprises tapered fragments with a diameter of <50 cm. The fast cooling process causes shrinkage and rupture of the lava flow. 360^0Autostereoscopic landscape features assisted students in active and independent exploration activities. Also, being prepared hotspots containing various information with multimedia concepts can improve students' information literacy.

CONCLUSION

Geosites are one of the complex geological heritages and have a high scientific value. Geosites can be an effective and efficient medium for students to learn the content. The effectiveness and efficiency of Geosites as learning media can be seen in the Ijen Geosites M-VFTs media. Ijen Geosites with a complex formation process can become an effective learning medium in Geography. Ijen Geosites M-VFTs can facilitate students' active and independent learning through exploration activities in a mobile-virtual environment. The exploration based on a contextual approach is needed by students, especially during the Covid-19 pandemic. This study aimed to research and develop mobile virtual field trips (M-VFTs) media innovation in Ijen Geosites based on 3600Autostereoscopic and Geospatial Technology. 360^0 Autostereoscopic combined with Geospatial Technology in M-VFTs media aimed as an interactive environment media for students to connect actual field trips in learning activities. The Ijen Geosites M-VFTs prototype development is based on a framework that contains the main system, feature accessibility, learning activities, and learning outcomes to facilitate student learning in understanding the Ijen Geosites geographical characteristics. The study results indicate that M-VFTs can facilitate the actual learning process in Geography during the Covid-19 pandemic through exploration activities with Ijen Geosites.

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