JPPIPA 9(4) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Preliminary Analysis of Enrichment Media Based on Physics Edupark in Cave Tourism Destination

Tessa Destia Putri Lisa[1], Hamdi Rifai[2*], Husna[3], Pratiwi Ineke Anwar[1]

[1] Magister of Physics Education Study, Universitas Negeri Padang, Padang, Indonesia.
[2] Faculty of Mathematics and Natural Science, Universitas Negeri Padang, Padang, Indonesia.
[3] Faculty of Science and Technology, Universitas PGRI Sumatera Barat, Padang, Indonesia.

Received: December 23, 2022
Revised: April 27, 2023
Accepted: April 29, 2023
Published: April 30, 2023

Corresponding Author:
Hamdi Rifai
rifai.hamdi@fmipa.unp.ac.id

DOI: 10.29303/jppipa.v9i4.2705

Abstract: This research is preliminary research that aims to analyze the needs in developing enrichment media based on edupark physics in cave tourism destinations. The type of research used is the research and development using the Plomp model. This research is only a preliminary research phase which consists of teacher analysis, student analysis, and potential material analysis. The data used in this study were obtained from interviews and questionnaires given to physics teacher and 68 students from class X which is combined from SMAN 1 Lareh Sago Halaban and SMAN 2 Sijunjung students. Based on this preliminary research, the results show that media in video form has advantages for: motivating students to learn, showing physical phenomena as a whole, helping to develop student's knowledge and skills, and helping students master the physics material. Besides that, cave tourism activities can be used as a physics edupark and as an object in developing physics edupark enrichment media in the form of videos because they have many connections with physics concepts. It can be concluded that multimedia interactive in the form of video is the most suitable learning media to be used as an enrichment media based on physics edupark.

Keywords: Cave tourism destination; Enrichment media; Physics edupark

Introduction

The learning losses experienced by students as a result of studying at home during the Covid-19 pandemic, if left untreated, will hinder the development of students' potential (Zainudin et al., 2022). Learning loss is indicated by a decrease in: student learning outcomes, literacy and numeracy abilities, and learning motivation (Jojor et al., 2022; Pratiwi, 2021; Widyasari et al., 2022). To restore learning due to learning loss, an Kurikulum Merdeka was formed in the Indonesian education system (Cerelia et al., 2021; Kemdikbudristek, 2022; Zainudin et al., 2022). Curriculum changes by aligning with children's learning levels are expected to restore conditions resulting from long-term learning losses (Kaffenberger, 2021). The Kurikulum Merdeka provides educational attention and services according to the needs of each student (Marliana et al., 2022). This shows that learning must be carried out in accordance with the characteristics and needs of students and integrated with the potential that exists in the environment around students. In other hand, Indonesian curriculum encourages science learning to be more contextual, with an emphasis on real-world knowledge and experience (Martawijaya et al., 2023).

The Kurikulum Merdeka currently used in the education system in Indonesia divides learning in schools into two, namely intra-curricular learning (regular) and co-curricular learning through projects to strengthen the profile of Pancasila students. Intracurricular learning activities for each subject refer to learning outcomes (Kemdikbudristek, 2022). It can be seen that in the Kurikulum Merdeka, the intended competencies are in the form of learning outcomes arranged per phase, while in the Kurikulum 2013 the intended competencies are in the form of basic competencies in the form of points to achieve core competencies. Learning in the Kurikulum Merdeka is carried out according to the student's learning stage. For students who have reached: (1) advanced or very good

How to Cite:
Lisa, T.D.P., Rifai, H., Husna, H., & Anwar, P.I. (2023). Preliminary Analysis of Enrichment Media Based on Physics Edupark in Cave Tourism Destination. *Jurnal Penelitian Pendidikan IPA*, *9*(4), 2135–2143. https://doi.org/10.29303/jppipa.v9i4.2705

stage, (2) learning completeness of 86-100% based on exam scores or written tests, or (3) learning completeness of 81-100% based on the learning objectives mastery rubric, then needs to be given enrichment or more challenge (BSKAP, 2022). This shows the need for the implementation of enrichment programs for students who have achieved learning mastery.

Enrichment programs can be activities, experiences, or subjects that take students outside the curriculum, challenge their skills, satisfy their knowledge, and engage their time (Maulana et al., 2018). Enrichment activities can be a solution in overcoming learning loss (Putri et al., 2021) by increasing students' academic abilities and literacy, because enrichment books have several benefits, including being able to improve and enrich students' abilities, discuss broader material , digging deeper into certain topics, encouraging students' interest in reading, and improving skills in using ICT (Asrizal et al., 2021). To support this enrichment activity, supporting materials are needed to deliver the enrichment material. So far, enrichment materials have only been delivered in the form of enrichment books. In today's digital era, it is necessary to innovate in the delivery of learning information, including in the delivery of enrichment material. The use of digital learning media can be a solution in responding to challenges in this digital era (Indriana et al., 2023).

The current rapid technological developments have made students feel addicted to smartphone, therefore they cannot be separated from their devices even for a moment and student's needs are higher for smartphones than textbooks (Dewi et al., 2018; Festiyed et al., 2019). The development of technology-based physics learning media can bridge the activity of observing physical phenomena and allow students to actively participate in learning because it involves many members of the five senses. This promote constructtivist learning (Suherman et al., 2023) and will make learning physics more meaningful so that it will optimize student learning outcomes (Nuraini et al., 2022). Smartphone-based media can increase student’s independence and understanding of concepts (Isnaeni et al., 2021), so that by utilizing the habits of students using smartphones and the use of technology can improve understanding and student learning outcomes.

Physics is a science that studies the relevance of physical concepts to real life, so that physics is not just a series of facts, but a process of interacting with the environment and understanding nature scientifically (Derlina et al., 2018; Marliana et al., 2022; Mufit et al., 2023; Nuraini et al., 2022), so it is necessary to link physics learning with the environment around students. Learning Physics trains students to apply learning materials in everyday life and solve problems independently (Asrizal et al., 2019; Fauzal et al., 2023; Mufit et al., 2023). One way to support regional potential as part of the physics learning process is to make it an educational park (edupark) (Lestari et al., 2020). Edupark-based learning can make it easier for students to understand scientific concepts (Elvisa et al., 2020), because it encourages interaction between students and the environment which provides a complete learning experience for students so that it helps students gain more knowledge and know its application in everyday life (Ummah et al., 2020).

West Sumatra Province, Indonesia, has abundant natural and man-made tourism areas to serve as physics eduparks, for example Geopark Ranah Minang Silokek, Sijunjung (Ummah et al., 2020), Geopark Harau, Lima Puluh Kota (Yulia et al., 2019), Ngarai Sianok Destinations, Bukittinggi (Emafri et al., 2019), Sarasah Kajai Waterfall, West Pasaman (Yunita et al., 2020), Padang Beach (Elvisa et al., 2020), Carocok Beach, Painan (Rahmadhani et al., 2020), Bukik Chinangkiek, Solok (Lestari et al., 2020), Mifan Water Park, Padang Panjang (Sari et al., 2019), and Rumah Gadang Istana Rajo Balun, South Solok (Sadraini et al., 2020). From some of these edupark studies, the use of cave tourism in learning is still rarely done. While the potential for cave tourism in West Sumatra is very large, 34 caves are scattered in the West Sumatra region. This is evidenced by data on the distribution of caves obtained by the (Tim Kerja Penyusunan Data dan Informasi Gua dan Karst Indonesia, 2022).

Based on the description of the problem above, it is very important to teach physics through natural phenomena that exist in the environment around students. To study physics based on the context of everyday events, resources or teaching materials are needed that have the ability to guide students to study or analyze various contexts related to subject matter (Festiyed et al., 2020). One way is through learning enrichment media. Therefore, it is necessary to know which enrichment media are suitable for integration with cave tourism edupark.

Method

The type of research used is the research and development using the Plomp model. The Plomp model is used because it is in accordance with the characteristics found in the field. Plomp's model consists of three stages: 1) preliminary research 2) prototyping stage, and 3) evaluation stage. The advantages of using this model are: 1) it is better for research purposes that produce products in the form of learning tools, models, and learning media, 2) systematic, 3) products are revised by researchers and consulted with people who are competent before the product is tested, 4) there are assessments by individuals and small groups. This research is only a preliminary research phase which consists of teacher analysis, student analysis, and potential material analysis.

The data used in this study were obtained from interviews and questionnaire about cave knowledge and enrichment media given to physics teachers and 68 students from class X which is combined from SMAN 1 Lareh Sago Halaban and SMAN 2 Sijunjung students. Questionnaires for identifying learning styles were also given to 125 students in class X and an initial knowledge questionnaire in physics to 127 students in class XI who were members of SMAN 1 Lareh Sago Halaban, SMAN 2 Sijunjung, SMAN 2 Padang Panjang, and SMAN 1 Bukit Sundi. Besides that, an analysis of the physics concept in cave tour activities was also carried out. Questionnaires were distributed to teacher about the implementation of Merdeka Belajar and the use of media in learning physics using a Likert scale. While the questionnaire about the student's knowledge of cave exploration tours and the need for enrichment videos uses the Yes or No choices. The weight of statement category using a Likert scale can be seen in Table 1.

Table 1. Weight of Statement Category

Statement Weight	Statement
1	Never
2	Sometimes
3	Often
4	Always

Student's initial knowledge of Physics was identified through a multiple choice test consisting of 15 questions about physics concepts developed from the Force Concept Inventory and the Converging Lenses Concept Inventory (Wörner et al., 2022). Data analysis techniques used in the form of quantitative and qualitative descriptive statistical analysis. Quantitative descriptive analysis was performed by calculating the percentage of the total score of the responses based on the respondent's answers for each response using the formula:

$$Index\ \% = \frac{total\ score}{maximum\ score} x100 \quad (1)$$

The percentages are then categorized qualitatively as in Table 2.

Table 2. Percentage of Category Division

Percentage (%)	Category
0-25	Bad
26-50	Not Bad
51-75	Good enough
76-100	Good

For student's knowledge of cave exploration activities data, the percentage of quantitative data obtained is then categorized as in Table 3.

Table 3. Percentage of category division

Percentage (%)	Category
0-25	Not knowing at all (TT)
26-50	Barely Know (KT)
51-75	Know Eough (CT)
76-100	Very know (ST)

Identification of student learning styles was carried out based on a modified method from the Learning Style Inventory developed by Kolb. Identification of learning styles is done in the following way: Add up scores for each learning mode, including: Concrete Experience (CE); Reflective Observation (RO); Abstract Conceptualization (AC); and Active Experimentation (AE). Each learning mode is represented by 10 statements. Then, transfer each score to the Learning Style Profile by marking the number you scored in each of the previous four learning modes. Connect the four marks with a straight line, and student learning styles are distinguished by convergent, divergent, assimilative, and accommodative. The student's dominant learning style is determined by placing the quadrant with the largest closed space on the Learning Style Profile as shown in Figure 1.

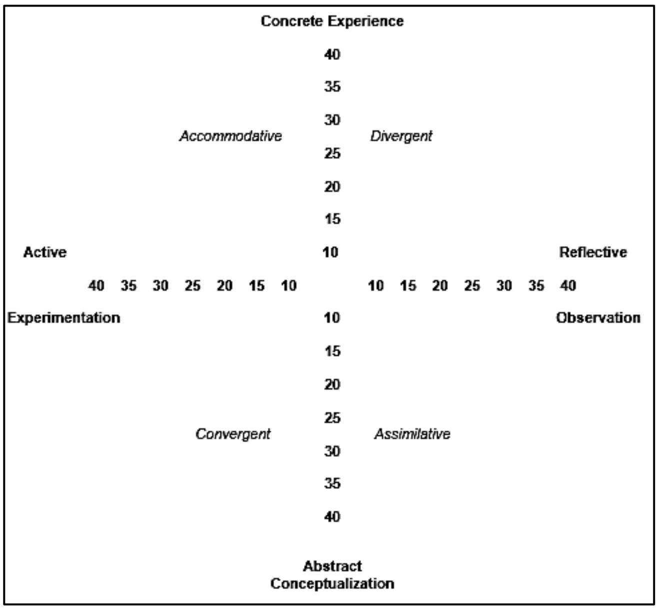

Figure 1. Learning style profile

Result and Discussion

The distribution of questionnaires and interviews to physics teachers and class X students of SMAN 1 Lareh Sago Halaban and SMAN 2 Sijunjung was carried out at the beginning of the semester of the 2022/2023 academic year. Based on the analysis of the results of the teacher's questionnaire, it is known that the implementation of the Merdeka Belajar program in class X SMAN 1 Lareh Sago Halaban is already in the good category with a percentage of 80.43% and the use of media in learning physics is in the pretty good category with a percentage of 73.91%. And it is known that teachers have never developed learning media in the form of videos because they do not have enough time to do it, so that in learning teachers use less varied media. This shows that the development of physics learning media has not been carried out properly. In line with research of Manurung et al. (2020) which said that the conditions at school lack of learning media. Meanwhile, using learning media is very important because the use of media as a learning aid influences the situation to helping students meet their teacher-set learning objectives (Tamrin et al., 2023).

So many media that can be developed according to the concept of Merdeka Belajar. The Kurikulum Merdeka which seeks differentiated learning expects learning to be adapted to the characteristics of students, one of which is adapted to student learning styles. It is important to differentiated learning so that learning can be adapted to the characteristics and needs of students. In line with (Marliana et al., 2022) which reveals that each learner has uniqueness and different characteristics, so that education must be able to adapt and meet up the needs of each student with all these differences. Srijayanti et al. (2020) added that teachers should analyze and learn student characteristics to further motivate students and connect physics learning with daily life. Therefore, teachers need to provide learning media that suit the learning needs of students. The results of identifying student learning styles show data as shown in Figure 2.

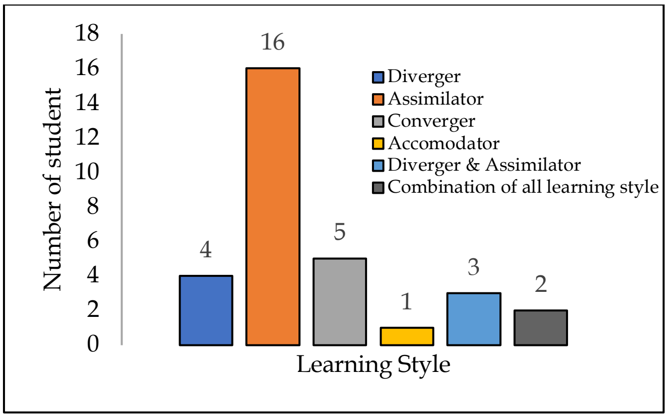

Figure 2. Types of student learning styles

The data in the Figure 2 shows that the students have diverse learning styles, but student are dominated by assimilator. Assimilator students are known to dislike material with long texts, like to make learning summaries and do individual work, so they are suitable for learning using media that provide information accompanied by visual symbols, objects and short texts. (Soraya et al., 2020). Besides that, testing of student's prior knowledge of Physics concepts was also carried out to see the extent of student's knowledge of Physics concepts. The results of student's prior knowledge tests are shown in Figure 3.

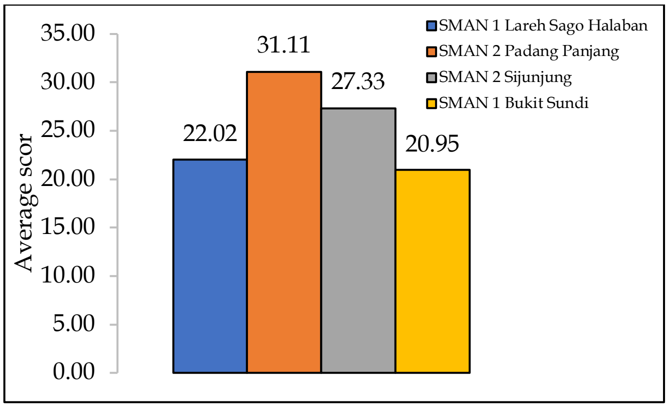

Figure 3. Diagram of student's prior knowledge of physics

The diagram shows that student's initial knowledge of Physics concepts is in the less category. Therefore, learning that is carried out should be able to increase student's knowledge of Physics concepts through various ways, one of which is through learning media interactive in the form of video. Video can assist teachers in providing experiences for students to observe an object, present the phenomenon as a whole, help students analyze the phenomenon that is displayed as a whole, can develop student's higher order thinking skills (Novisya et al., 2020), training students to use IT, and helping students master physics material as a whole (Asrizal et al., 2018). In other side, interactive multimedia is effective for both in-person and online learning because it allows students to enter responses, select responses, conduct experiments, and receive feedback through interactive multimedia (Putri et al., 2023). Interactive multimedia has the potential to stimulate students to be able to respond positively to the learning material presented (Atmam et al., 2023) and addition the video in interactive multimedia helps explain physics concepts that are not understood by students, so that students can understand these concepts independently (Festiyed et al., 2019). Adding animation to videos increases learning motivation (Ahmad et al., 2021). This shows that video is the right medium in conveying physical phenomena. s

In line with that, based on student questionnaires it is known that the learning media that students are most interested in is video (74%). The application of learning using video is one way for students to have great motivation to learn about related material. This is in line with Zulherman et al. (2019), that people will be more interested in presentations or applications that display shows in video form and with (Novisya et al., 2020) that videos are more easily absorbed than other media. This is because videos can influence the thoughts and feelings of learning by directing students to experience these phenomena. Videos can also help students overcome real-world barriers and promote student-centred learning because Video provides a realistic representation of what typically transpires in daily life or an environment, by using contextual learning videos that encourage students to make connections between knowledge and its application in everyday life (Sari et al., 2023; Tamrin et al., 2023).

However, teachers have never used video media to deliver enrichment material. The teacher provides enrichment to students who achieve learning mastery through giving questions related to the material that has been studied. The video used must be adjusted to the learning objectives (Azman et al., 2022). The development of interactive enrichment media in the form of videos is expected to help students recover from the learning losses they experience. Besides that, the contents of the enrichment material must be related to the student's daily life and environment so they can easily learn it. It is also due to the knowledge that students accumulate in the process of learning consists of prior knowledge and knowledge acquired in class to more complex knowledge (Lisa et al., 2021).

With so many caves around the school environment and in a karst area, it would be nice if this natural phenomenon were integrated into physics learning. However, teachers still do not utilize the natural phenomena of caves in physics lessons. Based on the analysis of the results of the knowledge questionnaire of students whose school around the cave area, it can be seen that most of the students already have sufficient knowledge about cave tourism activities. In fact, there were no students who did not know anything about cave tourism, as can be seen from the diagram shown in Figure 4.

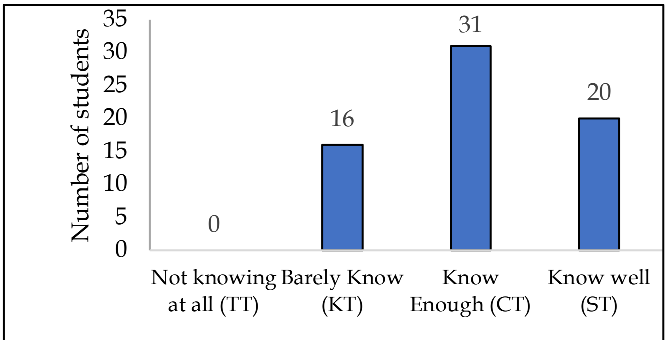

Figure 4. Diagram of student knowledge about cave exploration activities

The data from graphic shows that students already have prior knowledge about cave tourism. Besides that, based on student questionnaires, it was found that 39% of students had entered the cave for various reasons. As many as 73% of students visit the cave for entertainment purposes, as much as 15% to take pictures, and only 10% of students visit the cave for educational reasons. It is shows that the potential of the cave as an educational tour has not been maximally implemented. To find out the potential of the caves around the school environment, observations were made of Gua Rantai and Gua Danau which are located in Lareh Sago Halaban District. For more details, a map of the location of Gua Rantai and Gua Danau can be seen in Figure 5.

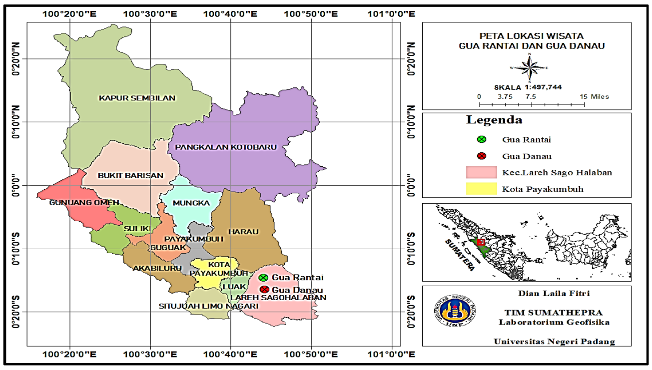

Figure 5. Location map of Gua Rantai and Gua Danau

Based on Figure 5, it is known that the Gua Rantai and Gua Danau are located in Lareh Sago Halaban District, Kabupaten Lima Puluh Kota, Provinsi Sumatera Barat. Both of these caves have entrances in the form of horizontal holes with cave ornaments dominated by brown. The thing that distinguishes these two caves is the typical fauna that inhabits the Gua Rantai, namely bats, so this cave is quite damp and slippery because the floor of the cave is filled with guano (bat droppings). Meanwhile, Gua Danau is not inhabited by bats, so the condition of this cave is quite dry. The shape of the main door of the cave from the front view is shown in Figure 6.

(a) (b)

Figure 6. Main entrances of (a) Gua Rantai and (b) Gua Danau

Based on the results of observations made at Gua Rantai and Gua Danau, it shows that there are several physics concepts that can be found in cave exploring activities. This is in line with (Dahniar et al., 2018), that the natural wealth of karst is closely related to physics, particularly measurement, matter and energy, static and fluid dynamics, energy changes, and so on. For more details, several physics concepts that can be revealed from cave exploration activities are shown in Table 4.

Table 4. Physics Concept in Cave Exploration Activities

Exploration Aspect	Components	Physics concept
Cave ornament	The formation of stalactites and stalagmites	Capillarity
	Water drops at the end of the stalactites	Surface tension
	Cavern shape	Fluid flow
	Cave zone	Temperatur, humidity, and light
Standard caving equipment	Headlamp	Light and optics
	Speleo helmet	Impuls
	Boots or shoes with large jagged soles	Friction
	Coveralls	Temperatur and humidity
	Rope	Force on inclined plane
	Compass	Application of magnetism
Cave exploration ethics	Don't throw garbage around the cave	Environmental pollution
	Don't commit acts of vandalism on cave ornaments	Environmental pollution
	Don’t damage cave ornaments	Environmental pollution
	Don’t take the guano	Climate change
	Don’t smoke in the cave	Gas radiation
Danger of cave exploration	Hit by stalactite	Pressure Newton’s law
	Slipping	Friction
	Lost	Sound intensity
	Gas poisoning	Kinetic theory of gas
	Sink	Fluids Light refraction
	Shivering (Hypothermia)	Air temperature
Cave Fauna	Bats	Sound and waves

Based on data in Table 4, it can be seen that many aspects of cave tourism activities can be related to the concept of physics. This will give students an idea that many natural phenomena around them are related to the physics concepts they learn at school and make them aware that tourist objects can not only be used as a means of entertainment but can also be used as a means of education, especially in learning physics. Based on the results of observation and analysis of the potential of this material, it can be concluded that cave tourism activities can be used as a physics edupark and as an object for developing physics enrichment media in the form of video.

Conclusion

Based on the preliminary research data that has been done, it can be concluded that the enrichment program is an important part of learning physics in Merdeka Belajar era. Media in the form of video has advantages in motivating students to learn, showing physical phenomena as a whole, helping students develop student knowledge and skills, and being able to help students master physics material. Video is the most suitable media used in explaining physics enrichment material based on nature phenomena. Cave tourism activities can be used as a physics edupark and as objects in the development of physics knowledge enrichment videos because it has many connections with physics concepts.

References

Ahmad, N. J., Yakob, N., Bunyamin, M. A. H., Winarno, N., & Akmal, W. H. (2021). The Effect of Interactive Computer Animation And Simulation on Students’ Achievement And Motivation in Learning Electrochemistry. *Jurnal Pendidikan IPA Indonesia*, *10*(3), 311–324. https://doi.org/10.15294/jpii.v10i3.26013

Asrizal, Amran, A., Ananda, A., & Festiyed. (2019). Effects of Science Student Worksheet of Motion in Daily Life Theme in Adaptive Contextual Teaching Model on Academic Achievement of Students. *The 2018 International Conference on Research and Learning of Physics*, *1185*(1), 1–10. Institute of Physics Publishing. https://doi.org/ 10.1088/1742-6596/1185/1/012093

Asrizal, Desnita, & Darvina, Y. (2021). Physics Enrichment Book Based on Contextual Teaching and Learning to Develop Academic Performance of Students. *International Journal of Scientific & Technology Research*, *10*(4), 1–5. Retrieved from www.ijstr.org

Asrizal, Yohandri, & Kamus, Z. (2018). Studi Hasil Pelatihan Analisis Video dan Tool Pemodelan Tracker pada Guru MGMP Fisika Kabupaten Agam. *Jurnal Eksakta Pendidikan (JEP)*, *2*(1), 41. https://doi.org/10.24036/jep/vol2-iss1/84

Atmam, P. L., & Mufit, F. (2023). Using Adobe Animated CC in Designing Interactive Multimedia Based on Cognitive Conflict on Parabolic Motion Materials. *Jurnal Ilmu Pendidikan Fisika (JIPF)* , *8*(1), 64–74. https://doi.org/ 10.26737/jipf.v8i1.3597

Azman, A. N., & Johari, M. (2022). Investigating the Effwctiveness of Videos Designed Using Cognitive Load Theory on Biology Student’s Academic Achievement. *Jurnal Pendidikan IPA Indonesia*, *11*(3), 461–468. doi: 10.15294/jpii.v11i3.37324

Cerelia, J. J., Sitepu, A. A., Azhar, F., Pratiwi, I. R., Almadevi, M., Farras, M. N., … Toharudin, T. (2021). Learning Loss Akibat Pembelajaran Jarak Jauh Selama Pandemi Covid-19 di Indonesia. *Seminar Nasional Statistika X*, 1–14. Bandung:

Departemen Statistika FMIPA Universitas Padjadjaran. Retrieved from http://prosiding.statistics.unpad.ac.id
Dahniar, Arsyad, M., & Khaeruddin. (2018). Pengembangan Perangkat Pembelajaran Fisika Berbasis Ekosistem Karst Untuk Kelas VII SMP Negeri 4 Bantimurung. *Seminar Nasional Fisika 2018 PPS UNM*, 1–4. Makassar: UNM. Retrieved from http://eprints.unm.ac.id/11849/1/jurnal.pdf
Derlina, Dalle, J., Hadi, S., Mutalib, A. A., & Sumantri, C. (2018). Signaling Principles in Interactive Learning Media Through Expert's Walkthrough. *Turkish Online Journal of Distance Education*, *19*(4), 147–162.
Dewi, D. K., Astra, I. M., & Susanti, D. (2018). Buku Suplemen Berbasis Android Sebagai Media Pembelajaran Pada Materi Gelombang Elektronik Untuk Peserta Didik SMA. *Seminar Nasional Fisika*, 1–8. https://doi.org/10.21009/03.SNF2018
Elvisa, G. O., & Rifai, H. (2020). Preliminary Analysis Learning Media Based on Edupark Physics with Scientific Methods on Padang Beach. *The 2nd International Conference on Research and Learning of Physics*, *1481*(1), 1–7. https://doi.org/10.1088/1742-6596/1481/1/012094
Emafri, W., & Rifai, H. (2019). Ngarai sianok as physics education's edupark. *The 2018 International Conference on Research and Learning of Physics*, *1185*(1), 1–9. https://doi.org/10.1088/1742-6596/1185/1/012123
Fauzal, N., Hermita, N., & Afriyani, E. (2023). Need Analysis to Develop a Physics Module Integrated Natural Disaster and Mitigation. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1024–1029. https://doi.org/10.29303/jppipa.v9i3.3170
Festiyed, Djamas, D., & Ramli, R. (2019). Learning Model Based on Discovery Learning Equipped with Interactive Multimedia Teaching Materials Assisted by Games to Improve Critical Thinking Skills of High School Students. *The 2018 International Conference on Research and Learning of Physics*, 1–8. Padang. https://doi.org/ 10.1088/1742-6596/1185/1/012054
Indriana, R. A., & Kamaludin, A. (2023). Development of Interactive Electronic Module for Charged Reaction Rate Science Technology Engineering and Mathematics (STEM). *Jurnal Penelitian Pendidikan IPA*, *9*(3), 977–986. https://doi.org/ 10.29303/jppipa.v9i3.1788
Isnaeni, W., Sujatmiko, Y. A., & Pujiasih, P. (2021). Analysis of the Role of Android-Based Learning Media in Learning Critical Thinking Skills and Scienctific Attitude. *Jurnal Pendidikan IPA Indonesia*, *10*(4), 607–617. https://doi.org/10.15294/jpii.v10i4.27597
Jojor, A., & Sihotang, H. (2022). Analisis Kurikulum Merdeka dalam Mengatasi Learning Loss di Masa Pandemi Covid-19 (Analisis Studi Kasus Kebijakan Pendidikan). *EDUKATIF: Jurnal Ilmu Pendidikan*, *4*(4), 5150–5161. https://doi.org/ 10.31004/edukatif.v4i4.3106
Kaffenberger, M. (2021). Modelling the Long-run Learning Impact of the Covid-19 Learning Shock: Actions to (more than) Mitigate Loss. *International Journal of Educational Development*, *81*(102326), 1–8. https://doi.org/10.1016/j.ijedudev.2020.102326
Kemdikbudristek. *Keputusan Mendikbudristek Nomor 262/M/2022 Tentang Perubahan Atas Keputusan Mendikbudristek Nomor 56/M/2022 Tentang Pedoman Penerapan Kurikulum Dalam Rangka Pemulihan Pembelajaran.* , Pub. L. No. 262, 1 (2022). Indonesia: jdih.kemdikbud.go.id.
Lestari, N. V., & Rifai, H. (2020). Preliminary Analysis of Bukik Chinangkiek Edupark's Potential as a Learning Resource for Physics in Senior High School at X Koto Singkarak Solok, Indonesia. *The 2nd International Conference on Research and Learning of Physics*, 1–10. Padang. https://doi.org/ 10.1088/1742-6596/1481/1/012049
Lisa, T. D. P., Rifai, H., Lestari, N. V., Murtiani, & Dewi, W. S. (2021). Instrument of Understanding Level Test of Newton ' s Law Concept : Case Study Flying Fox Ride in Bukik Chinangkiek Edupark , West Sumatera , Indonesia. *EDUCATUM JSMT*, *8*(2), 57–68. https://doi.org/10.37134/ejsmt.vol8.2.6.2021
Manurung, S. R., & Panggabean, D. D. (2020). Improving Students' Thinking Ability in Physics Using Interactive Multimedia Based Problem Solving. *Cakrawala Pendidikan*, *39*(2), 460–470. https://doi.org/10.21831/cp.v39i2.28205
Marliana, L., Dariyani, N., Sriyanti, I., Sudirman, S., & Meilinda, M. (2022). Development of Differentiated Physics Teaching Modules Based on Kurikulum Merdeka. *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2286–2292. https://doi.org/10.29303/jppipa.v8i5.2061
Martawijaya, M. A., Rahmadhanningsih, S., Swandi, A., Hasyim, M., & Sujiono, E. H. (2023). The Effect of Applying the Ethno-Stem-Project-Based Learning Model on Students' Higher-Order Thinking Skill and Misconception of Physics Topics Related to Lake Tempe, Indonesia. *Jurnal Pendidikan IPA Indonesia*, *12*(1), 1–13. https://doi.org/10.15294/jpii.v12i1.38703
Maulana, S., Desnita, & Raihanati. (2018). The Development of Knowledge Enrichment Books Concerning Ice and Snow Physical Studies for High-School Students. *JPPPF (Jurnal Penelitian Dan Pengembangan Pendidikan Fisika)*, *4*(1), 83–90. https://doi.org/ doi.org/10.21009/1.04205
Mufit, F., Festiyed, Fauzan, A., & Lufri. (2023). The Effect

of Cognitive Conflict-Based Learning (CCBL) Model on Remediation of Misconceptions. *Journal of Turkish Science Education*, *20*(1), 26–49. https://doi.org/10.36681/tused.2023.003

Novisya, D., & Desnita. (2020a). Analisis Pengembangan Video Pembelajaran Fisika Berbasis CTL pada Materi Fluida. *Jurnal IPA Dan Pembelajaran IPA (JIPI)*, *4*(2), 141–154. https://doi.org/ 10.24815/jipi.v4i2.16682

Novisya, D., & Desnita. (2020b). Penilaian Instrumen Efektifitas Video Pembelajaran Fisika Berbasis Contextual Teaching and Learning (CTL) Materi Fluida. *Jurnal Inovasi Dan Pembelajaran Fisika*, *7*(2), 129–139. Retrieved from ejournal.unsri.ac.id/index.php/JIPF

Nuraini, L., Anggraeni, F. K. A., Harijanto, A., Prastowo, S. H. B., Subiki, Supriadi, B., … Wahyu, R. (2022). Development of Al-Qur'an-Based Physics Learning Media Applications to Improve Higher Order Thinking Skills and Spiritual Attitudes for Preservice Physics Teacher. *Indonesian Review of Physics (IRiP)*, *5*(1), 32–39. https://doi.org/10.12928/irip.v5i1.4268

Pratiwi, W. D. (2021). Dinamika Learning Loss: Guru Dan Orang Tua. *Jurnal Edukasi Nonformal*, *2*(1), 147–153. Retrieved from https://ummaspul.e-journal.id/JENFOL/article/view/1847

Putri, K. E., Gustina, M., Febrinawati, & Hidayat, M. (2021). Analisis Pelaksanaan Program Remedial dan Pengayaan di SMAN 1 Kerinci. In A. Supriatin, L. I. N. Indahsari, J. Annovasho, N. Azizah, & S. Swestyani (Eds.), *Seminar Nasional Pendidikan MIPA Tahun 2021* (pp. 73–81). Palangka Raya: LP2M IAIN Palangka Raya Press. Retrieved from https://www.academia.edu/download/78092131/Prosiding_Semnas_PMIPA.pdf#page=82

Putri, N. S., Mufit, F., Putra, A., & Hidayati. (2023). Design and Validity of Interactive Multimedia Based on Cognitive Conflict in Kinetic Gas Theory Materials Using Adobe Animate CC. *Gravity : Jurnal Ilmiah Penelitian Dan Pembelajaran Fisika*, *9*(1), 17–27. https://doi.org/10.30870/gravity.v9i1.12690

Rahmadhani, N., & Rifai, H. (2020). Preliminary Analysis Learning Media in The Form of Interactive Multimedia Based on Edupark Physics Carocok Beach Painan Indonesia with The Scientific Method. *Journal of Physics: Conference Series*, *1481*(1), 1–7. Institute of Physics Publishing. https://doi.org/10.1088/1742-6596/1481/1/012087

Sadraini, & Rifai, H. (2020). Preliminary Analysis of Learning Resources for Edupark in the Matter Rigid Equilibrium by Destination Rumah Gadang Istana Rajo Balun South Solok Indonesia. *The 2nd International Conference on Research and Learning of Physics*, *1481*(1), 1–9. https://doi.org/10.1088/1742-6596/1481/1/012086

Sari, D. P., & Rifai, H. (2019). Preliminary Analysis of Edupark Fluid Learning Tool in MiFan Water Park in Padang Panjang City. *The 2018 International Conference on Research and Learning of Physics*, *1185*(1), 1–9. https://doi.org/10.1088/1742-6596/1185/1/012091

Sari, R. S., & Desnita. (2023). The Effect of Using Context-Based Physics Learning Videos on Critical Thinking Skills of XI Grade High School Students. *Jurnal Ilmiah Pendidikan Fisika*, *7*(1), 146–157. doi: https://doi.org/10.20527/jipf.v7i1.6306

Soraya, K., Martasari, R., & Nurhasanah, S. A. (2020). Profil Gaya Belajar (David Kolb) di SMA Swasta Tasikmalaya dalam Mata Pelajaran Biologi. *Bioedusiana: Jurnal Pendidikan Biologi*, *5*(1), 50. https://doi.org/10.34289/bioed.v5i1.1198

Srijayanti, P., & Derlina. (2020). Ethnophysical Integration in Cooperative Learning Based on Javanese Culture to Improve Generic Science Skills and Student Self-Efficacy. *Jurnal Pendidikan Fisika*, *9*(1), 30–34. Retrieved from http://jurnal.unimed.ac.id/2012/index.php/jpf

Suherman, A., Komaro, M., & Ana, A. (2023). E-book Multimedia Animation Implementation on Concept Mastery and Problem-Solving Skills of Crystal Structure Subjects in Engineering Materials Course. *Indonesian Journal of Science & Technology*, *8*(2), 259–280. Retrieved from http://ejournal.upi.edu/index.php/ijost/

Tamrin, H., & Desnita. (2023). The Effect of Using Context-Based Learning Videos on Global Warming Materials on Students' Problem-Solving Skills. *Physics Education Research Journal*, *5*(1), 21–28. https://doi.org/ 10.21580/perj.2023.5.1.13082

Tim Kerja Penyusunan Data dan Informasi Gua dan Karst Indonesia. (2022). Data Sebaran Gua dan Karst di Sumatera Barat. Retrieved November 3, 2022, from Indonesian Speleological Society website: https://caves.or.id/peta-karst

Ummah, K., & Hamdi Rifai. (2020). Preliminary Analysis Learning Media Based on Edupark Science with Scientific Methods in The National Geopark of Ranah Minang Silokek of Sijunjung. *The 2nd International Conference on Research and Learning of Physics*, *1481*(1), 1–9. https://doi.org/10.1088/1742-6596/1481/1/012065

Widyasari, A., Reza Widiastono, M., Sandika, D., & Tanjung, Y. (2022). Fenomena Learning Loss sebagai Dampak Pendidikan di Masa Pandemi Covid-19. *BEST JOURNAL: Biology Education Science & Technology*, *5*(1), 297–302. Retrieved from https://jurnal.uisu.ac.id/index.php/best/article/

view/5144/4003

Wörner, S., Becker, S., Küchemann, S., Scheiter, K., & Kuhn, J. (2022). Development and validation of the Converging Lenses Concept Inventory for middle school physics education. *arXiv preprint arXiv:2205.09861*. Retrieved from https://arxiv.org/abs/2205.09861

Yulia, & Rifai, H. (2019). Preliminary Study of Edupark Energy in Geopark Harau Lima Puluh Kota Regency. *The 2018 International Conference on Research and Learning of Physics*, *1185*(1), 1–5. https://doi.org/10.1088/1742-6596/1185/1/012098

Yunita, R. A., & Rifai, H. (2020). Preliminary Analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a Learning Resources of Works and Energy. *The 2nd International Conference on Research and Learning of Physics*, *1481*(1), 1–7. https://doi.org/10.1088/1742-6596/1481/1/012047

Zainudin, M., & Fatah, D. A. (2022). Supporting Strategies of the Recovery for Student's Literacy and Numeracy in Elementary School Environment. *Jurnal Hurriah: Jurnal Evaluasi Pendidikan Dan Penelitian*, *3*(3), 9–21. https://doi.org/10.5806/jh.v3i3.97