Preliminary analysis of Edupark Sarasah Kajai Waterfall, Indonesia as a learning resources of works and energy

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Abstract. Sarasah Kajai Waterfall is one of the potential of West Pasaman natural tourism that has been visited by tourists only to enjoy its beauty, even though this tourism are contains many physics concepts that can be used as learning resources for example potential energy. This advantage was not be used by teachers yet to make physics learning more interesting by observing the nature phenomenon directly. Unsuitable teaching materials would make students difficult to understand physics concepts. Therefore, a preliminary analysis of the characteristics of the students, regional potential, teacher competence and teaching material was carried out. This research use Plomp’s Development Model. Data were taken by using questionnaires and interviews teachers and students of SMAN 1 Pasaman and SMAN 2 Pasaman. Preliminary analysis showed that students prefer learning in nature using digital teaching materials. This is used as the basic for the development of digital teaching materials (e-books) based on edupark Sarasah Kajai waterfall as a learning resource in understanding physics concepts Works and Energy.

1. Introduction

Indonesia continues to make improvements in many aspects towards the Industrial Revolution 4.0, included education and curriculum. Curriculum made to prepare students more active, creative and innovative towards the future. One of government’s effort was improving curriculum as K-13 revision to perform student-centered learning with more varied methods and approach while teachers as facilitators. Form of assessment proportionally based on competencies such as attitudes, skills and knowledge. Physics as part of curriculum, requires students to understand the concepts by observing natural phenomenon and tried to find a connection between realities and solve the problems by observing these symptoms. However, some teachers only use lecture method, then doing exercises and learning process was still teacher-centered so that the purpose of the curriculum was not achieved yet.

Learning in nature, especially in tourist spots can be one of the solutions in the understanding of physics concepts. The beauty of nature in a tourist spots which is usually enjoyed simply by taking a picture or selfie, can be used as a learning resource to understand physics concepts which is called edupark. Based on previous research of edupark, tourist spots which used as a learning resource would give a positive effect to learning process such as Janjang Seribu and Merah Putih mountain Sulit Air[1].
Mifan Padang Panjang [2], Ngarai Sianok [3], the geopark Harau in 50 Kota [4], hot water Semurup Kerinci [5] and the school garden in SMAN 2 Lubuk Basung [6]. Sarasah Kajai waterfall is one of the tourist spots located in West Pasaman regency of West Sumatra province. This tourist area can be reached easily from Simpang Empat, West Pasaman district capital. The beauty of nature and waterfalls presented by Sarasah Kajai waterfall could provide comfortable for visitors. Unfortunately, this beauty untapped for studying physics concept while learning in this resources, students are expected could explain phenomenon of nature directly with fun. Therefore, author do a preliminary analysis of edupark Sarasah Kajai waterfall as a learning resource in understanding physics concepts especially Works and Energy.

2. Method
This research was conducted at Sarasah Kajai waterfall in West Pasaman with the subjects of the two schools SMAN 1 Pasaman and SMAN 2 Pasaman each one 25 students of class X MIPA and 4 physics teachers from both. This research used research and development type at Plomp development model [7]. Plomp development model (2013: 19) consists of three phases: a preliminary analysis, the prototype phase and the assessment phase. Of the three phases, this study uses only the initial phase.

Descriptive analysis of this research by integrating waterfall tourist spots Sarasah Kajai and physics concepts with Fittings Concepts Technique [8]. The stages of Fitting Concepts Technique is 1) analysis of physics concepts which will be integrated and derivations, 2) analysis of the environment and derivations, 3) analysis edupark from environment, 4) bring forth physics concepts were integrated with edupark Sarasah Kajai waterfall by matching relevant concepts, 5) implement edupark Sarasah Kajai waterfall through learning physics. The stages were showed in Figure 1.

![Figure 1. Stages of Fitting Concepts Technique for analyzing edupark Sarasah Kajai waterfall](image)

The data collected by using questionnaires and interviews. The questionnaire is an efficient data collection technique if researchers know certain measured variables and determine what can be expected from the respondents [9].
Analysis of subject questionnaires used Likert Scale with category: (1) never (2) sometimes (3) frequent and (4) always. Every aspect in the questionnaire were translated in several indicators. Analysis of learning activities obtained from interviews to teachers used alternative options Yes/No.

Technique of data analysis use equation (1) [10].

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Score = \frac{\text{score total}}{\text{score maximum}} \times 100\%
\]  

(1)

Data analysis of each indicator analyzed by using conditions in Table 1.

| No. | Score Observations (%) | Category       |
|-----|------------------------|----------------|
| 1.  | 76-100                 | Well           |
| 2.  | 51-75                  | Enough         |
| 3.  | 26-50                  | Not good       |
| 4.  | 0-25                   | Not good       |

(Modified from Riduan, 2009: 89)

The analysis of teaching materials is done by analyzing the teaching materials that used by teachers and students in the learning process. Observations were done directly into the field (Sarasah Kajai waterfall). Analysis of physics concepts were analyze the basic competencies that related to the natural conditions around the Sarasah Kajai waterfall.

Waterfall Sarasah Kajai is tourist spot at mountain Talamau, Kenagarian Kajai, West Pasaman district. This is located about 20 km from the district capital, Simpang Empat and can be reached by motorcycle. Then visitors can go directly to the location of the waterfall by walk about 30 minutes along the river. Location Sarasah Kajai waterfall is showed in Figure 2.
Kajai Sarasah waterfall has several levels that can be explored. The first waterfall has a height of about 50 meters, can be seen in Figure 3.

![Image of Kajai Sarasah waterfall](image1)

**Figure 3.** Sarasah Kajai waterfall

3. Results and Discussion

The initial analysis of teachers and students were done on June 17, 2019 by filling out questionnaires and interviews. Analysis of teachers questionnaire can be seen in Table 2.

| Aspect                                      | Percentage |
|---------------------------------------------|------------|
| Utilization teaching materials e-book by teachers | 0%         |
| Teachers make instructional e-book           | 0%         |
| Teachers visit edupark (tourist spots) with students for physics learning process | 43.75%     |
| Students applying physics concepts in edupark (tourist spots) | 56.25%     |

From Table 2 may concluded that teachers have not utilized nor create an e-book yet. Based on interviews, teachers only use the available teaching materials such as textbooks from the government. This is due to lack of time and competencies of teachers. Teachers also had not utilized and applied physics learning in edupark.

Analysis of students questionnaire can be seen in Table 3.

| Aspect                                      | Percentage |
|---------------------------------------------|------------|
| Make connection between phenomenon of nature and physics concepts | 51%        |
| Begin learning process with the facts, helped students in connecting physics concepts | 72%        |
| Prefer learning process with experiment in the lab | 77%        |
| Utilization tourist spots as learning resource | 61.50%    |
| Prefer studying physics at the tourist spots | 72.50%     |
| Prefer learning by using e-book              | 64.33%     |

From Table 3 it can be seen that only 51% of students who can connect physics concepts with phenomenon of nature and 72% admit to prefer learning begin with the facts, helped students in learning. This is because students do not observe a phenomenon of nature, so that students have not been able to connect the physics concepts. Learning that begins with the facts would helped students make the
connections physics concepts with phenomenon of nature easily. Students also prefer learning process with experiment in the lab, it is reached 77%. Students liked being involved actively in learning process. Active learning condition would make a meaningful learning experiences for students and may think something about they did [11]. With the practical learning, students would hone their skills and were able to connect the results of experiments with physics concepts.

Students who taken advantage of tourist spots as learning resource only 61.50%, like studying physics in tourist spots reached 72.50% and like learning by using e-book was 64, 33%. This is because teachers have not actively encourage students to take advantage of tourist spots as a learning resource. Students are also quite fond of learning in the tourist spots by using e-book. New thing in education such as advances of technology and learning methods, not only to fulfill the curiosity of students but would utilized for facilitating to understanding physics concepts.

Based on the observations in edupark Sarasah Kajai waterfall, there were some physics concepts that can be learned, which can be seen in Table 4.

| No. | Basic Competencies of Physics according to the Curriculum 2013 | Physics concepts | Class | Edupark for physics education |
|-----|---------------------------------------------------------------|------------------|-------|--------------------------------|
| 1   | 3.7 Analyze interactions on force as well as the relationship between force, mass and rectilinear motion of objects as well as its application in daily life | Newton's laws of motion | X     | Road to waterfall              |
| 2   | 3.9 Analyzing the concept of energy, works, connection works-energy and the changes, conservation of energy law, as well as its application in daily life | Potential energy and the changes | X     | Dropping waterfall             |
| 3   | 3:10 Applying the concept of momentum and impulse, conservation of momentum law in daily life | Momentum Impulse | X     | Dropping waterfall             |
| 4   | 3.3 Applying fluid static law in daily life | Fluid Static | XI    | Puddle of dropping waterfall    |
| 5   | 3.4 Applying the fluid dynamics principles in technology | Fluid Dynamic | XI    | Stream waterfall                |
| 6   | 3.5 Analyze the effects of heat and heat transfer covering the thermal characteristics of a material, capacity, and thermal conductivity in daily life | Heat transfer | XI    | Fog                            |
| 7   | 3.8 Analyze the characteristics of mechanical waves | Reflection and refraction of light waves | XI    | The light of sun that comes into waterfalls valley |
Table 4. Analysis of physics concepts were integrated with edupark Sarasah Kajai waterfall

| No. | Basic Competencies of Physics according to the Curriculum 2013 | Physics concepts | Class | Edupark for physics education |
|-----|---------------------------------------------------------------|------------------|------|-------------------------------|
| 8   | 3:11 Analyze limited energy sources and its impact on life    | Renewable energy sources alternative energy | XII  | Waterfall utilization         |

Based on Table 4 can be seen there were some physics concepts could be learned by utilizing the Sarasah Kajai waterfall as a learning resource. Physics learning design in nature could increase students competencies. Beside travelling, learn and practical process with the project in nature would improve the ability of students to analyze the physics concepts.

4. Conclusion
Based on the results of the preliminary analysis, interviews and observations at the Sarasah Kajai waterfall, the author might conclude there were a necessity of development of e-book as teaching materials on the edupark Sarasah Kajai waterfall. The analysis of the teaching material, it contains many physics concepts on tourist spots to help students understanding physics concepts through direct observation of nature phenomenon around the Sarasah Kajai waterfall. Author recommend there should be a development of edupark Sarasah Kajai waterfall, as a learning source, especially for physics concepts on Works and Energy.

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