Design of edupark Physics book with Project Based Learning based on Ngarai Sianok National Geopark, Indonesia

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Abstract. Ngarai Sianok is a Nasional Geopark, Indonesia. Utilizing Geopark as learning resources material of physics was named "Edupark". Ngarai Sianok Physics Edupark is using geopark Ngarai Sianok as physics material for learning. This research aims to develop the book as learning device in the form of Physics Edupark book using Project Based Learning (PjBL) used Ngarai Sianok National Geopark information at Senior High School Physics Book which are valid. The type of this research is development research. This research used a first prototyping phase Plomp’s model (Self Evaluation). In the prototype phase is conducted the design of learning devices based on PjBL for the second grade of Senior High school. The result of design of the physics edupark book based on Ngarai sianok national geopark at the beginning were called prototype 1.

1. Introduction

Suggestions The analysis results of the Concept Fitting Technique in learning physics at the National Geopark of Sianok Gorge is that further research is needed to develop teaching materials that utilize the nature of Edupark\textsuperscript{[1]}[2]. Because the Government of Indonesia in the 2013 curriculum stipulates the Minister of Education and Culture Regulation No. 22 of 2016 \textsuperscript{[3]}. Learning resources, can be in the environment or other relevant learning resources.

Ngarai Sianok as Physics Education's Edupark uses nature as a place to study. Learning innovations carried Ngarai Sianok as Edupark for physics learning. Ngarai Sianok is one of four National Geoparks in the Province of West Sumatra. Mayor of Bukittinggi H. M. Ramlan Nurmatias, S.H. has received the certificate of recognition of Ngarai Sianok as a National Geopark by the Indonesian National Geopark Committee through the Minister of Tourism Dr. Ir. Arief Yahya, M.Sc. on 30 November 2018 \textsuperscript{[4]}.

The development of geopark is the center of attention of the Ministry of Maritime Affairs together with the Ministry of PPN / Bappenas, the Ministry of Energy and Mineral Resources, the Ministry of Tourism, the Ministry of Education and Culture to turn Indonesia's Geopark into a nature-based tourism \textsuperscript{[5]} \textsuperscript{[6]} \textsuperscript{[7]} \textsuperscript{[8]} \textsuperscript{[9]}. Efforts to develop geopark areas based on the principle of education are the responsibility of each element, namely the government and the community. This certainly becomes a challenge for the administration of education in Indonesia.
2. Research Methods
This type of research used is descriptive research. Descriptive analysis of Physics material based on the 2013 curriculum, PjBL activities at the potential place of the Sianok Gorge Bukittinggi Geopark. The rules used are prototype I about the manufacturing phase (development or prototyping phase) of the PLOMP phase [10] [11] [12]. About basic competence in knowledge and basic competence in skills 2013 curriculum.

3. Results and Discussion
Based on the results of the analysis at the preliminary stage, physics learning is designed based on the National Ngarai Sianok geopark which is compiled in the Physics edupark textbook. Draft of Physics Edupark book developed are:
- Containing based on information of Geopark Ngarai Sianok related to basis competenson (KD) physics materials for seniors High grade XI [13].
- PjBL steps were used to guide the study tour activities that created the project in Ngarai Sianok. Because the project-based learning model (Project Based Learning) can develop student learning creativity [14] [15] [16] [17].
- Consists of 5 knowledge Competence and Skills Competence with Project Based Learning.
- The results of the analysis of attractions in the National Geopark Ngarai Sianok compiled into a Physics edupark book are in the table 1.

Table 1. Competence composition contained in the Physics Edupark Book

| Chapter | Ngarai Sianok Geopark Tourism Destination | Basic Competence (KD) | PjBL Basic Skills Competency at Ngarai Sianok National Geopark |
|---------|------------------------------------------|-----------------------|-------------------------------------------------------------|
| 1       | “Bridge of the Heart” Tourism Guguak Tabek Sarojo Gathering | 3.1 Applying the Concepts of Torque, Moment of Inertia, Center of Strength, and Angular Momentum in Firm (Static and Dynamic) Objects in Daily Life | Make a miniature bridge in the Ngarai Sianok geopark |
|         | Tourism Guguak Tabek Sarojo Gathering | 3.2 Analyzing the elasticity of materials in everyday life | Make a miniature gate from a arranged stone |
| 2       | “Japan's Hole” Tourism Historical site of the Japanese colonial period | 4.1 Create works that apply the concepts of center of gravity and balance of rigid objects | 4.2 Conducting experiments on the elasticity of a material along with the presentation of results and their physical meaning |

[18] This steel material bridge, became the "two hearts" linker between the jorong: Guguak Randah and Guguak Tinggi, Kenagarian Guguak Tabek Sarojo, IV Koto, Agam. Separated stretch of Ngarai Sianok under which flows Sianok Batang. Bridge length 125 meters and a height of 150 meters from the bottom of the canyon [18].

[19] The Japanese Gate Gate in Sianok Gorge is in the form of a semicircular arch. The curved stones experience compressive stress (the stones are stuck together) so that they can...
### Basic Knowledge Competencies in the Edupark Physics Book

| Chapter | Ngarai Sianok National Geopark Tourism Destination | Basic Competency (KD) | Products Produced During The Study Tour | Basic Competency (KD) |
|---------|-------------------------------------------------|----------------------|----------------------------------------|----------------------|
| **3**   | Tabek Taruko is a tranquil pool at Café Taruko [21] which is one of the objects of great interest during a visit to the Ngarai Sianok National Geopark The kinds of fluids found in Ngarai Sianok are, air, and water. The Taruko Tabek is an example of static fluid. | 3.3 Apply the laws of static fluid in everyday life | Make a canoe for rowing at Tabek Taruko | 4.3 Plan and conduct experiments that utilize the properties of static fluids, along with the presentation of results and their physical significance |
| **4**   | Tourism “Batang Sianok” Along the bottom of the Ngarai Sianok flows a river called Batang Sianok [22] [23]. River is an example of dynamic fluid. | 3.4 Apply the principle of dynamic fluid in technology | Making Batang Sianok water purification technology | 4.4 Create and test a simple project that applies the principles of fluid dynamics, and their physical meaning. |
| **5**   | Jackets are clothes that must be prepared to enjoy the cool temperature of Ngarai Sianok in the morning. Body temperature will be higher than in the morning air temperature in Ngarai Sianok. So that heat will move from the body to the environment [24]. So that the body feels cold. | 3.5 Analyzing the effect of heat and heat transfer which includes the thermal characteristics of a material, capacity, and heat conductivity on daily life | Making solar stoves to cook food at Ngarai Sianok Geopark | 4.5 Plan and conduct experiments on the thermal characteristics of a material, especially related to the capacity and heat conductivity, along with the presentation of results and their physical significance. |
| **6**   | The location of Ngarai Sianok at an altitude of 909–941 meters above sea level makes it cool air with temperatures ranging from 16.1–24.9 °C [25]. The air in the Ngarai Sianok has less kinetic energy, so the heat generated when | 3.6 Analyzing the effect of heat and heat transfer which includes the thermal characteristics | Make colored water games on the surface of colorful plates and balloons with the aim of showing the | 4.6 Present a report on the results of thinking about the kinetic theory of gas, and its physical meaning. |
collisions occur between gas molecules is also small. Conversely, air near the sea surface has greater kinetic energy so that the heat generated when collisions occur between gas molecules is also a lot. In addition, if the number of gas molecules is small then the chance of collision is also small.

- **Knowledge Competency Consist of the core, introduction of Edupark Psychics Textbooks, material description based on information of Ngarai Sianok, summary, assignments, exercises, competency tests.**

3.1. **Book sections**

3.1.1. **Cover**

Figure 1 displays the 2013 curriculum logo (arrow number 1). This logo indicates that the contents of the book are in accordance with the demands of the 2013 curriculum. While Project Based Learning (arrow number 9) is a learning model that has syntax, but is only placed on students' activities, because it is assisted. There is a picture on the skin of the book (arrow number 4). This picture means that students will learn physics based on information from the National Geopark Ngarai Sianok. Arrow number 5 is
the name of the book's writing team. indicates that the material learned in textbooks is based on the 2013 curriculum, which is used by high school class XI students and their equivalents. Next, the name of the writing team (arrow number 6) is the name of the researcher who is trying to develop a physics textbook product. Edupark Ngarai Sianok (arrow number 8) is the main theme that will connect one subject with another subject. Picture of Ngarai Sianok (arrow number 9).

3.1.2. *The Front of the Book.* The front of the book there is an introduction, page of contents. Preface is writing a phrase or two broken ata by the author about textbooks. Preface contains thanksgiving, thanks, and writer's remarks regarding the purpose and objectives of writing a book, the learning process related to the book's material and hopes for book publishing. Table of contents is the order of titles in each chapter along with the pages contained in a book or writing.

3.2. **Textbook Section**

The teaching part of the book consists of chapter titles, KI identity, basic competency, indicators, and learning objectives, concept maps, exposure to material content, student activity sheets, exercises, evaluations.

3.2.1. **Chapter title.** In the chapter title there is a range of material that contains important things in the description of the material. Contains the scope of learning material contained in physics textbooks. The chapter titles can be seen in Figure 2 below.

![Figure 2. Design Chapter Title](image-url)

3.2.2. **Identity.** Identity includes the identity of core competencies, basic competencies, indicators, and learning objectives. Basic competence is made according to Permendikbud No. 24 of 2016. Indicators based on basic competencies. Learning objectives refer to indicators, which contain the abilities that are expected after students have done the learning.

3.2.3. **Concept maps.** Concept maps are meaningful relationships between one concept and other concepts that are connected by words in a particular unit. Due to natural science learning, Mind Mapping are grouped into chemistry, physics, and biology. The concept map design can be seen in Figure 3.
3.2.4. Expose The Contents Of The Material. Exposure to the contents of the material contains an introduction and a detailed explanation of the learning material arranged according to indicators and learning objectives.

3.2.5. Exercise. The exercise contains questions or questions given to students during the learning process after studying a material. The exercise aims to hone the ability of students, especially in solving problems. The design of the exercise can be seen in Figure 5.
3.2.6. Evaluation. Evaluation or competency test contains questions to test students' understanding of the subject matter. Evaluations are arranged according to indicators and learning objectives. Evaluation consists of two parts, namely multiple choice questions and essay questions. An evaluation page snippet can be seen in Figure 6.

![Figure 6. Evaluation](image)

3.3. Back of the Book

At the back of the book contains a bibliography and appendix appraisal. Bibliography is the writing that is arranged at the end of a scientific work which contains the name of the author, the title of the article, the publisher, the identity of the publisher and the year of publication as the source or reference of an author. While the assessment sheet in the form of a self-assessment sheet filled out by students, in order to know the extent of the attitude of the students towards a statement.

4. Conclusions and Prospects

Physics learning was designed based on the Sianok National Canyon using the designed PjBL model, the results of the prototype design at the beginning were called prototypes 1. It is necessary to analyze its validity by expert reviews, one to one evaluation, small group evaluations, at the end field test to produce textbooks that are practically effective.

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