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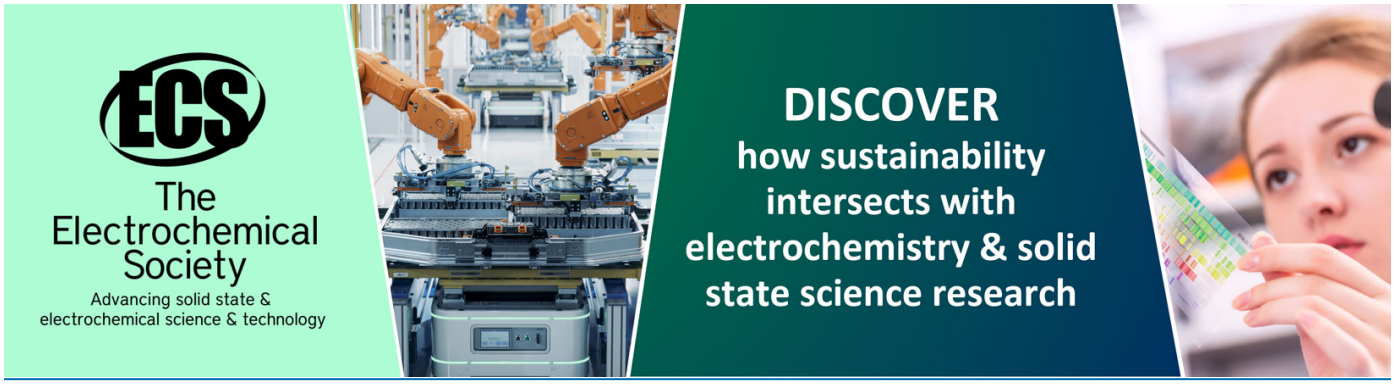

IOP Conf. Series: Journal of Physics: Conf. Series **1481** (2020) 012049 doi:10.1088/1742-6596/1481/1/012049

Preliminary analysis of Bukik Chinangkiek edupark's potential as a learning resource for physics in senior high school at X Koto Singkarak Solok, Indonesia

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Abstract."*Alam takambang jadi guru*" is a Minangkabau philosophy that is suitable implemented in the learning process. Nature tourism in Indonesia is very supportive for the implementation of contextual physics learning, one of which is Bukik Chinangkiek Edupark. Bukik Chinangkiek has natural conditions and rides related to physics for example rotational dynamics but it has not been utilized in physics learning. This study aimed to analyze the potential of Bukik Chinangkiek as an edupark-based learning resource for physics. Analysis was carried out with the Plomp development model at the preliminary analysis phase. The data of this study were obtained from questionnaires and interviews along with teachers and students in high schools throughout X Koto Singkarak Subdistrict, while concepts relevant to physics subject matter were obtained from direct observation of Bukik Chinangkiek Edupark. The technique of data analysis was descriptive percentages. Analysis shows that learning physics has not been integrated into the surrounding natural environment so students have not understood the concept of contextual physics and most students tend to use IT in learning. The results of this study is intended to be used as the basis for developing digital book of edupark (e-book) for high school.

1. Introduction

"*Alam takambang jadi guru*" (nature is a teacher) is the philosophy of Minangkabau[1][2] which is suitable to be implemented in the learning process towards education in the Industrial Revolution era 4.0. This philosophy has a deep meaning that all that exists in nature, both living in nature and all that is in nature including the phenomena that occur are as a learning resource [3] especially physics learning. Some natural phenomena that have been integrated in physics learning are the integration of wind energy material in work materials, energy, harmonious vibrations, momentum and impulses [4] and integration of ocean wave energy in work materials and energy and simple harmonious vibrations [5]. Utilization of various resources in Learning is in conformity with the requests of the curriculum in Indonesia, namely the 2013 Curriculum.

The 2013 Curriculum has been established by the Indonesian government as a framework used in learning in schools today. In implementing the 2013 Curriculum, the Ministry of Education and Culture explained that learning in the education unit was carried out interactively, inspiratively, fun, challenging

and motivated students to actively get involve and provide sufficient opportunities for initiative, creativity and self-development based on their talents, interests and physical and psychological development [6]. Students must be equipped with the ability to find out, learn from various sources, construct knowledge based on natural phenomena that occur around them and use information and communication technology [7] to improve the efficiency and effectiveness of learning. One effective learning resource used is a tourist spot called also edupark.

Educational park (edupark) is a location that has a value of entertainment (tourism) and education [8]. Tourism is a secondary need for everyone[9], which is very important to do to get rid of fatigue and tiredness from daily activities. Many people go on tours just to have fun and capture the moment of vacation without knowing the meaning of each object they observe. It is very good if the tour activities are made as educational tours [10] [11] namely tours while studying [12] so that the tours are not only for vacationing, taking photos and getting rid of boredom but being made meaningful tours such as understanding the concepts of kinematics and energy through the game of trampoline [13]. Indonesia has abundant natural destinations, such as in West Sumatra which is rich in natural beauty and culture that can be developed as a tourist area [14] and education, one of which is the Solok Regency [15].

Bukik Chinangkiek is one of the tourist destination located in Jorong Tampunik area, X Koto Singkarak district, Solok Regency, West Sumatra Province, Indonesia with post code 27356 [16] as shown in Figure 1. It was built in a 20 Ha hilly area [17] and is close to community settlements and is about 1-2 KM from SMA N 1 Singkarak and MAN 2 Solok. Bukik Chinangkiek Edupark has natural conditions and rides related to physical concepts such as the concept of rotational dynamics in the ferris wheel, bengali, swing ride, the concept of static and dynamic fluids on the swimming pool so that Bukik Chinangkiek Edupark can function as a learning resource for physics as in figure 2. But the potential of Bukik Chinangkiek Edupark as a learning resource for physics has not been well utilized for the schools around it or for visitors. Consequently it is important to develop an integrated teaching material Bukik Chinangkiek Edupark.

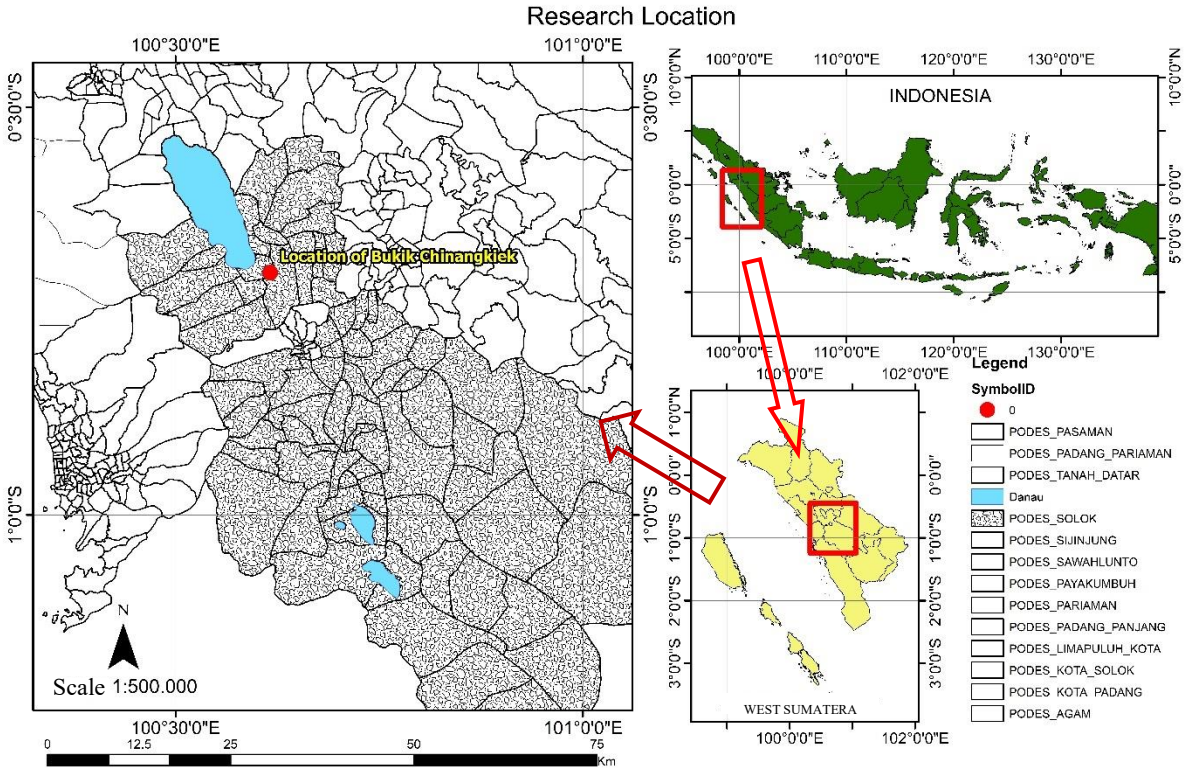

Figure 1. Map location of Bukik Chinangkiek Edupark.

Figure 2. Natural conditions and rides of Bukik Chinangkiek.

Some eduparks in West Sumatra have been analyzed as learning resources, like Geopark Harau Lima Puluh Kota Regency[18], Air Panas Semurup Kerinci district[19], Mifan Water Park in Padang Panjang city[20], SMAN 2 Lubuk Basung's garden[21], Janjang Seribu. and Merah Putih Mountain in Sulit Air Solok[22], Ngarai Sianok[23]. While in this paper, the Bukik Chinangkiek potential is analyzed. This is so that all resources in the form of edupark can be analyzed and utilized as a resource of real learning for students.

Today, technology is developing rapidly throughout the region. The industrial revolution 4.0 is marked by the era of digitizing information[24] and utilizing artificial intelligence in various sectors of life [25]including in the education[26]. Internet can be accessed anywhere and smartphone users also continue to increase every year. A digital research institute estimates about 100 million smartphone users in 2018[27] and the Indonesian internet service association states that around 64.8% of Indonesians are connected to the internet network throughout 2018[28]. This potential is very good if it is utilized in the education world such as the provision of digital-based teaching materials (e-book) so that the learning is effective and efficient.

2. Research Method

This research used research and development (R&D). The development model was adopted from the Plomp model. The model has three phases: (i) Preliminary analysis, (ii) Prototyping phase, and (iii) Assessment phase [29]. This research is only in the preliminary analysis phase of the potential of Bukik Chinangkiek as a resource of high school physics learning. The subjects of the study were teachers and students from high schools in the X Koto Singkarak Solok Subdistrict. The sample of research subjects were class XI students of SMA N 1 X Koto Singkarak Solok as many as 30 people and 2 physics teachers and MAN 2 Solok as many as 20 students and 1 physics teacher.

The study was conducted by analyzing physical material related to Bukit Chinangkiek Edupark and analysis of schools located around Bukit Chinangkiek. The data of this study were obtained from questionnaires [30] and interviews with teachers and students in high schools throughout X Koto Singkarak Subdistrict while the physics concept was obtained from direct observation to Bukik Chinangkiek Edupark. Data analysis techniques obtained from teachers and students use descriptive percentages, while physical concepts analysis techniques integrated in edupark use the Concepts Fitting Technique [31].

Concepts Fitting Technique is a technique developed to enable every relevant element such as physical material, tourist destinations (edupark) to be connected to each other so that an educational

learning resource based on edupark is obtained. The steps of the Concepts Fitting Technique are 1) analysis of physics material according to the 2013 Curriculum, 2) regional potential analysis, 3) analysis of Bukik Chinangkiek Edupark, 4) produce to integrated physics material Bukik Chinangkiek Edupark by matching relevant concepts, 5) Bukik Chinangkiek Edupark as a learning resource for physics. The Concepts Fitting Technique steps are explained in Figure 3:

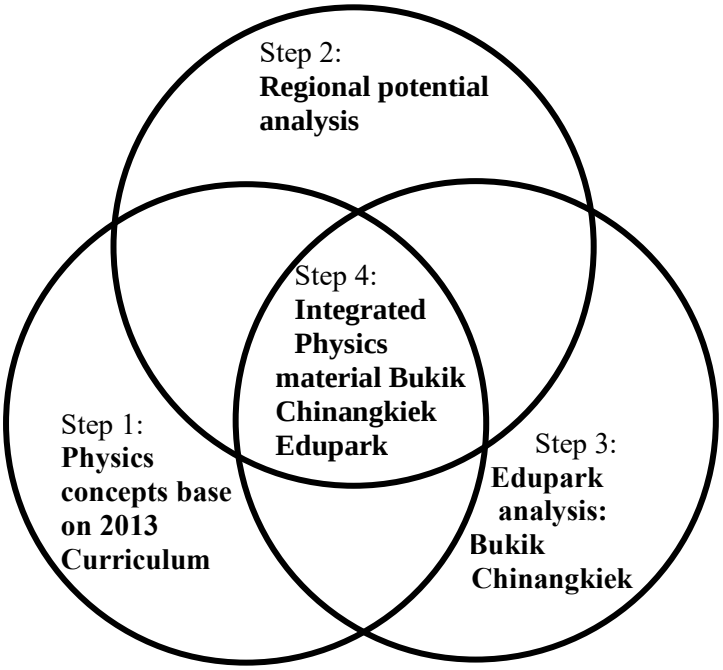

Figure 3. Analysis steps of Bukik Chinangkiek Edupark through Concepts Fitting Technique.

Analysis of the questionnaire for teachers and students using a Likert scale. The Likert scale is used in four categories namely (1) never (2) sometimes (3) often and (4) always. Every aspect of the questionnaire was agreed upon in several indicators. Analysis of learning activities taken from interviews with teachers with alternative choices Yes / No.

Data analysis techniques using formula 1 [32]

$$score = \frac{total\_score}{\max\_score} x100\% \quad (1)$$

Data analysis used the category in Table 1 for assessing the need analysis.

Table 1. Analysis category.

Observation Score (%)	Category
76 - 100	Good
51 - 75	Enough
26 - 50	Not good
0 - 25	Bad

(Modified from Riduwan, 2009:89)

3. Results and Discussion

The preliminary analysis of teachers and students was conducted on 15 and 17 June 2019. On 15 June 2019 only conducted interviews with physics teachers while on 17 June 2019 distributed questionnaires to teachers and students. Analysis of the teacher's questionnaire is shown in table 2.

Table 2. Teacher analysis of teaching materials and learning resources.

Aspect	Percentage	Category
Teachers utilize printed teaching materials (books, Worksheet)	86.67 %	Good
Teachers make printed teaching materials (books, Worksheet)	60,00 %	Enough
Teachers utilize non-printed teaching materials (e-book)	44,44 %	Not good
Teachers make non-printed teaching materials (e-book)	16,67 %	Bad
Teachers visit edupark (tourist destination) with students in the physics learning process	41,67 %	Not good
Students apply physics learning with edupark (tourist destination)	56,25 %	Enough

From Table 2 it can be seen that teachers are still dominant in utilizing and making printed teaching materials compared to utilizing and making non-printed teaching materials. From the interview results, teachers use printed teaching materials that are already available in the form of textbooks from the government and worksheet from publishers. While learning is expected to lead to the 4.0 revolution is digital-based learning (technology and informatics). At least in learning more teachers use and make digital teaching materials in the form of e-books so that the students produced are students who are literate with technology. Teachers also have not made use of the natural surroundings in the form of destinations (edupark) as a source of learning so that physics learning for students still feels abstract so that aspects of skills have not been reached to the maximum.

Preliminary analysis of students is also done by questionnaire and interview. The following results of the students' analysis is shown in table 3

Table 3. Preliminary analysis of students.

Aspect	Percentage	Category
Linking natural phenomena with the concept of physics	50 %	Not good
Learning that starts from facts makes the students easy to relate it to learning	76 %	Good
Like to use e-books (digital books) for learning that contain material, pictures, videos and animations	87,95 %	Good
Like to use the surrounding environment such as a tourist destination for learning	91 %	Good

From Table 3 it is explained that the ability of students to associate natural phenomena with physics is still 50% and learning that starts from the facts about 76% makes it easy for students to associate with learning. This is because students do not observe the facts of natural phenomena directly so that students have not been able to link natural phenomena with the concept of physics. From the interview, it is known that students like to learn directly in the field not only in the school environment. Moreover, if learning is carried out in a tourist place, in addition to traveling, they can also directly observe the physical concepts contained in every object in the tourist destinations. This is shown from the questionnaire analysis which states that 91% of students like learning in tourist destinations.

Technological progress is currently very rapidly developing like a smartphone. The existence of this smartphone is very good as a support for learning. From interviews, more than 90% of students use

smartphones and 87.95% of students like learning by utilizing digital books that can be accessed via smartphones. According to them, teaching materials available in the form of e-books that can be accessed via smartphone are very practical and effective. Smartphone is lightly carried,it is an important item that is always carried wherever it goes. So it is very useful to take advantage of technological sophistication as a support for learning in this practical era.

Analysis of the physical concepts that exist in the edupark Bukik Chiangkiek is done by direct observation using the fitting concept technique. The concept of integrated physics Bukik Chinangkiek Edupark is described in table 4.

Table 4. Analysis results of integrated physics material Bukik Chinangkiek Edupark

Bukik Chinangkiek Edupark	Physics Concept	Class	Basic competencies (KD) for high school base on Curriculum 2013
Street 	- Inclined plane	X	- KD 3.7
Ladder 	- Inclined plane	X	- KD 3.7
Slide 	- Inclined plane - Friction force - Straight motion	X	- KD 3.4, KD 3.7
Ferris Wheel 	- Circular motion	X	- KD 3.6
	- Rotational dynamics	XI	- KD 3.1
Bengali	- Simple harmonic motion	X	- KD 3.11
	- Rotational dynamics	XI	- KD 3.1

Bukik Chinangkiek Edupark	Physics Concept	Class	Basic competencies (KD) for high school base on Curriculum 2013
 Swing Ride	- Circular motion	X	- KD 3.6
	- Rotational dynamics	XI	- KD 3.1
 Flying Fox	- Accelerated linear motion - Second Newton's law	X	- KD 3.4, KD 3.7
 Suspension Bridge	- Equilibrium rigid body - Center of Gravity	XI	- KD 3.1
 Suspension Bicycle	- Equilibrium rigid body - Center of Gravity	XI	- KD 3.1
 Swing	- Kinetic energy - Potential energy - Simple harmonic motion	X	- KD 3.9, KD 3.11
	- Dinamika Rotasi	XI	- KD 3.1
Tree House	- Equilibrium rigid body	XI	- KD 3.1

Bukik Chinangkiek Edupark	Physics Concept	Class	Basic competencies (KD) for high school base on Curriculum 2013
	- Center of Gravity		
Swimming Pool 	- Third Newton's Law - Kinetic energy - Potential energy	X	- KD 3.7, KD 3.9
	- Static Fluid - Hydrostatic pressure - Archimedes law - Dynamic fluid (volume flow rate)	XI	- KD 3.2, KD 3.4
Bombom Car 	- Work - Energy	X	- KD 3.9
Motor ATV 	- Work - Energy	X	- KD 3.9

From Table 4, it is showed that there are so many physics concepts that can be learned by utilizing Bukik Chinangkiek Edupark as a learning resource. Learning done directly on real objects will make learning meaningful. In the opinion of one of the physical teachers at SMA N 1 X Koto Singkarak, it needs innovation in learning so that the learning process is not boring. Smartphones are the most popular thing for young people now, so it is very beneficial if a smartphone can be a tool to access learning resources. In accordance with the demands of the times, industrial revolution 4.0 based on information technology, it is very efficient if the learning of physics is integrated in nature (edupark) by presenting learning resources in the form of digital books (e-book). By using edupark integrated e-book, it is expected that physics learning will be meaningful, practical and efficient.

4. Conclusion

After the interviews and analysis results of the X Koto Singkarak high school teachers questionnaire it was found that teachers used more and made printed teaching materials while the interview results and questionnaire analysis of students found that they preferred to learn directly in nature (edupark) and

liked to use e-books which can be accessed on their smartphones while observations on Bukik Chinangkiek Edupark obtained many physics concepts there. So it can be concluded that innovation in physics learning is needed so that learning is meaningful, fun and integrated with informatics technology by developing digital physics teaching materials (e-books) based on tourist destinations (edupark)for high school towards industrial revolution 4.0.

Acknowledgments
Thank you to the principal, teachers and students of SMA N 1 X Koto Singkarak and MAN 2 Solok and thank the manager of the Bukik Chinangkiek tourist site for giving permission to make observations for the preliminary analysis of the potential of Bukik Chinangkiek as a source of physics learning. Thank you also to the Master Program in Physics Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang which organized ICRLP as a means of publication of scientific papers.

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