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Identification of Teaching Materials for Physics *Edupark City Park* Cindua Mato Batusangkar Using *Concepts Fitting Technique*

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ABSTRACT

City Park Cindua Mato is a green open space located in the center of Batusangkar city and serves as a place for recreation, sports, and social interaction. The existence of facilities such as basketball courts and reflection stone rides make this park an environment rich in phenomena that can be studied scientifically. Despite having the potential of an environment rich in physical phenomena, its utilization in the context of education is still very limited. Problems found based on direct observation show that students often have difficulty in understanding physics concepts because the teaching materials used tend to be theoretical. Observations also show a lack of learner involvement in learning because the media used has not been able to attract their attention, especially those with visual learning styles. In addition, the teacher said that the current teaching materials have not utilized local potential as a source of learning, so students feel that the material presented is less relevant to their daily lives. This research aims to identify the needs of teaching materials that are in accordance with the characteristics of students and the surrounding environment. This research is a preliminary study of the research and development method with the EDUPARK model, which at this stage is focused on the EDU stage. Data were collected through interviews with 3 physics teachers and distributing questionnaires to 31 students of Class XI Phase F Moving Physics 1 SMAN 1 Sungai Tarab. The results of the analysis show that the available teaching materials have not accommodated the local potential and learning styles of students optimally. Therefore, a teaching material is needed in the form of a physics enrichment book integrated with City Park Cindua Mato Batusangkar that is in accordance with the characteristics of students and their learning environment.

Keywords: Enrichment Book, Edupark, Concepts Fitting Technique.

I. INTRODUCTION

Physics is the study of physical phenomena and symptoms that occur in nature. Physics learning is a branch of science that underlies technological progress and the concept of natural phenomena [1]. A good understanding of the concepts of physics can be obtained through direct observation of phenomena in the surrounding environment [2]. Scientific activity is a series of systematic processes carried out to understand natural phenomena through a logical and structured scientific approach. These activities include making observations, formulating problems, making hypotheses, conducting experiments, drawing conclusions, and finding theories and concepts [3].

The purpose of physics learning is to assist students in developing attitudes, knowledge, and skills by understanding the concepts and principles of physics so that they can apply them in everyday life. Physics learning aims to improve the thinking ability of students, so that they are not only capable and skilled in the psychomotor and cognitive fields, but also able to support systematic, objective and creative thinking [4]. The interaction of students with the surrounding environment to study the phenomena that occur can be realized through learning outside the classroom.

Learning outside the classroom, especially in the natural environment, allows learners to explore their knowledge directly. This method is a form of learning that prioritizes direct experience, where learners develop knowledge, thinking skills, and psychomotor skills through direct interaction with learning resources [5]. By utilizing the environment as a learning medium, students are invited to observe the conditions around them both inside and outside the school.

Along with the development of science and technology in the era of globalization, the government continues to implement policies to improve the quality and efficiency of the education system in Indonesia. One of the government policies to improve the quality and quality of education can be seen from several curriculum changes. Curriculum changes are related to the development of education because the curriculum is one of the important components in the implementation of education [6]. Curriculum change is an important step because the curriculum acts as the main guide in the learning process. The curriculum reflects the educational objectives, materials taught, learning methods, and the evaluation system used. Therefore, curriculum adjustments are inevitable to ensure that the education system remains relevant to the needs of the times.

The curriculum is designed with the aim of facilitating the educational process [7]. As part of the government's efforts to improve the quality of education that is relevant to technological developments, the Merdeka Curriculum is implemented. This curriculum is designed to provide flexibility for education units and educators in designing learning in accordance with the characteristics of students. The independent curriculum emphasizes *student-centered learning*, strengthening the Pancasila learner profile, and developing essential competencies through thematic and project approaches. The Merdeka Curriculum is a reform in the Indonesian education system designed to provide higher freedom for educators and students in the learning process [8].

The Merdeka Curriculum provides flexibility in learning so that it allows material adjustments to the needs of students. One form of material adjustment to the needs of students is by utilizing tourist attractions as learning resources. Learning resources that utilize tourist objects to observe natural phenomena are called *eduparks.* The term *Edupark* comes from the word *Education* which means education, and *Park* which means park. So that *Edupark* is an educational park designed as a learning facility with the aim of observing and understanding various applications of science concepts through direct observation [9].

The use of educational park as tools for leaerning can make physics learning more interesting and easily understood by students. Various physics *edupark* developments have been carried out in a number of tourist sites, including Geopark Ranah Minang Silokek [10], Sianok Canyon [11], Tourism Destination Rumah Gadang Istana Rajo Balun [12], Tiger Camp Lubuak Minturun Padang City [13], Bukik Cinangkiak Solok [14], Sarasah Kajai Waterfall [15], Carocok Painan Beach Tourism [16], Hot Waterboom South Solok [17].

Enrichment material is a key elemnt in the learning process. Enrichment materials are given to students who have successfully achieved learning outcomes in accordance with the learning objectives [18]. Enrichment activities require supporting materials as a medium in delivering material that is useful for deepening the understanding of students [19]. One of the supporting materials for the enrichment program is an enrichment book.

Enrichment books are books that contain additional material that is more extensive and serves as a companion or complement to the main textbook. Enrichment books are one of the non-textbooks that contain additional material to support students' understanding of a learning material [20]. Enrichment books aim to enrich insight, deepen understanding, and provide additional information beyond the main textbook. Enrichment books are additional learning resources designed with the aim of expanding the knowledge and skills of learners [21].

II. METHOD

The method used in writing this article is descriptive analysis by integrating the *City Park* Cindua Mato Batusangkar tourist attraction to understand physics concepts using the *fitting technique* concept. These steps follow the steps of developing *edupark* teaching materials known as EDUPARK development steps. The EDUPARK development steps consist of 7 steps, namely EDU for research steps and PARK for development steps. The EDUPARK steps are, *Edupark Finding (E), Direct Observation (D), Understanding of Teacher, Student, and Curriculum Characteristic (U), Preliminary Design by Concepts Fitting Technique (P), Auto Assessment (A), Result of Product Quality Test (R),* and *Kick off Publish (K)* [22]. The steps used in this study are limited to the research steps (EDU) with the steps used: *Edupark Finding (E)*, namely choosing a tourist attraction or regional potential that is feasible to be used as an *edupark; Direct Observation (D)*, namely, making direct observations to the location of the selected tourist attraction; *Understanding of Teacher, Student, and*

Curriculum Characteristic (U), namely, analyzing the characteristics of teachers, students, and curriculum with the aim of recognizing common problems in the learning process; and integrating the EDU stage to carry out the pre-design stage of the *City Park* Cindua Mato Batusangkar physics *edupark* enrichment book.

The research was conducted in February 2025 with the aim of identifying the needs of physics teaching materials that are relevant to the characteristics of students, suitability for the curriculum, and the potential of the surrounding environment. Data collection techniques used include interviews, *direct observation,* and analysis of physics materials. Observations were made directly at the *City Park* Cindua Mato Batusangkar tourist attraction which is used as an *edupark*, by documenting various physics phenomena found in the *City Park* Cindua Mato Batusangkar environment.

The subjects in this study consisted of 3 physics teachers and 31 students of Class XI Phase F Moving Physics 1 SMAN 1 Sungai Tarab. The object of research is the utilization of *City Park* Cindua Mato Batusangkar environment as a physics learning resource. Interviews were conducted to obtain an overview of the characteristics of teachers, and the extent to which teachers utilize local potential in the learning process. In addition, questionnaires were distributed to students to find out their learning styles, as well as their perceptions of the relevance of physics material to everyday life.

Data collection also includes analyzing the suitability of photo documentation from field observations with physics materials listed in the Merdeka Curriculum. The information obtained from this stage is used as a basis for identifying teaching materials that are suitable for the characteristics of students. After data collection is complete, the data is then analyzed quantitatively and qualitatively.

Analysis and assessment are carried out based on a Likert scale, which is used to measure the attitudes, opinions, and perceptions of individuals or groups towards various aspects. The Likert scale used is with the highest score of 4 and the lowest score of 1. The approach to data analysis involves both qualitative and quantitative descriptive statistics. The quantitative aspect is conducted by determining the percentage of the overall respondent scores, derived from evaluating each response as outlined in Equation 1.

$$P = \frac{f}{N} \times 100\% \quad (1)$$

Description:

P = Total score
f = Score obtained
N = Maximum score

The percentages obtained quantitatively were then analyzed qualitatively using the provisions in Table 1.

Table 1. Category Distribution Percentage

Percentage	Category
0-25	Very bad
26-50	Poor
51-75	Good
76-100	Very good

(Source: [23])

After the EDU stage in the EDUPARK development model is completed, the next step is to combine the results of the *Edupark Finding (E), Direct Observation (D), Understanding of Teacher, Student, and Curriculum Characteristic (U)* steps that have been analyzed by designing teaching materials using the *concepts fitting technique*. The stages of *Concepts Fitting Technique* are 1) analyzing physics concepts that will be integrated and obtaining concepts; 2) Analyzing the environment of *City Park* Cindua Mato Batusangkar; 3) Analyzing *eduparks* derived from the environment of *City Park* Cindua Mato Batusangkar; 4) Producing physics materials integrated with *City Park* Cindua Mato Batusangkar by matching relevant concepts. The stages of *Concepts Fitting Technique* can be seen in Figure 1.

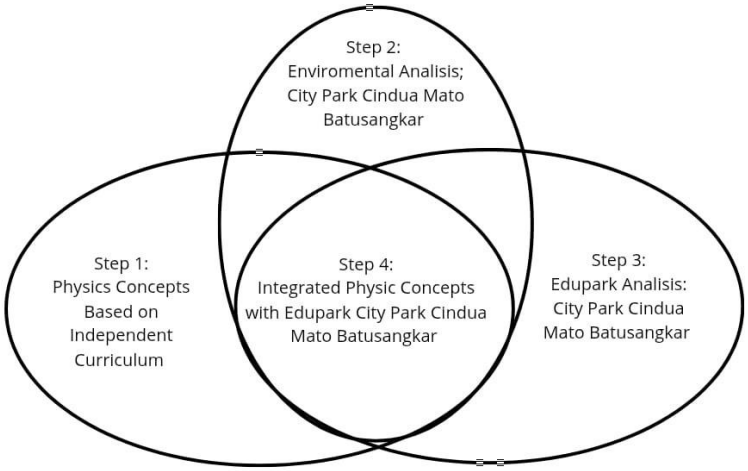

Fig. 1. Steps of Analysis of *City Park* Cindua Mato Batusangkar with Concepts Fitting Technique

III. RESULTS AND DISCUSSION

Based on the analysis of the results of interviews with 3 Physics teachers of SMAN 1 Sungai Tarab, it was found that the school had implemented the Merdeka Curriculum. From the results of the interview it is known that physics learning is only carried out in the classroom and in the laboratory for certain subject matter. The learning process that involves students in everyday problems has not been optimized by the teacher. Based on the problems found, researchers offer enrichment book solutions that are integrated with physics concepts in City Park Cindua Mato Batusangkar.

The analysis conducted to students in the form of learning style analysis, enrichment book needs, interest in learning in the *edupark*, and knowledge about the *City Park* Cindua Mato Batusangkar tourist attraction. Findings from the analysis of questionnaires administered to students of Class XI Moving Physics 1 SMAN 1 Sungai Tarab regarding learning styles can be seen in Figure 2.

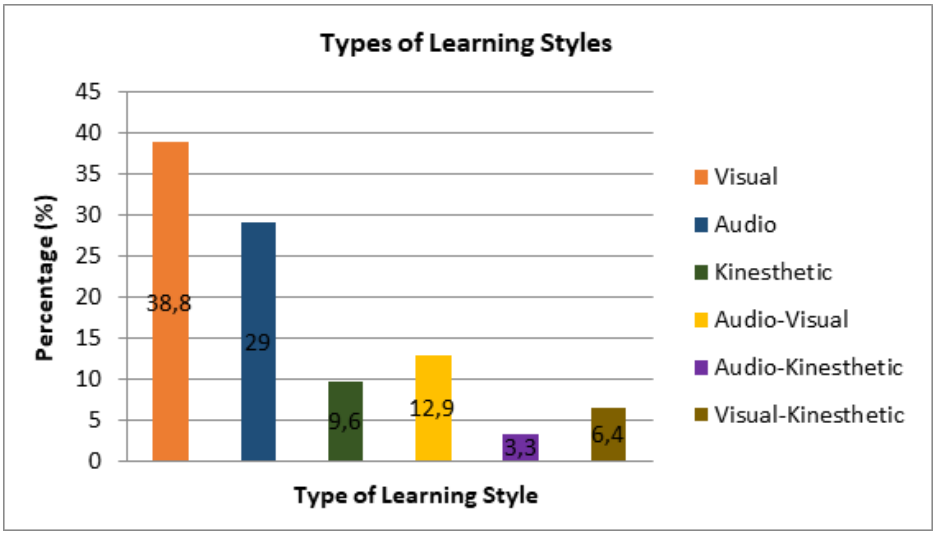

Fig. 2. Types of Learning Styles

The most dominant learning style owned by students is the visual learning style with a percentage of 38.8%, where they rely on vision to obtain information and knowledge. Learners with a visual learning style understand the subject matter through observation, such as seeing the teacher's expression and body language, and focusing attention by observing or looking at the material being studied [24]. The learning process can be supported by various printed media, such as learning books and modules. With the existence of visual media, students not only listen to learning but students have other activities such as observing, doing, and demonstrating [25].

Then the results of the questionnaire analysis from students regarding teaching materials and enrichment books can be seen in Figure 3.

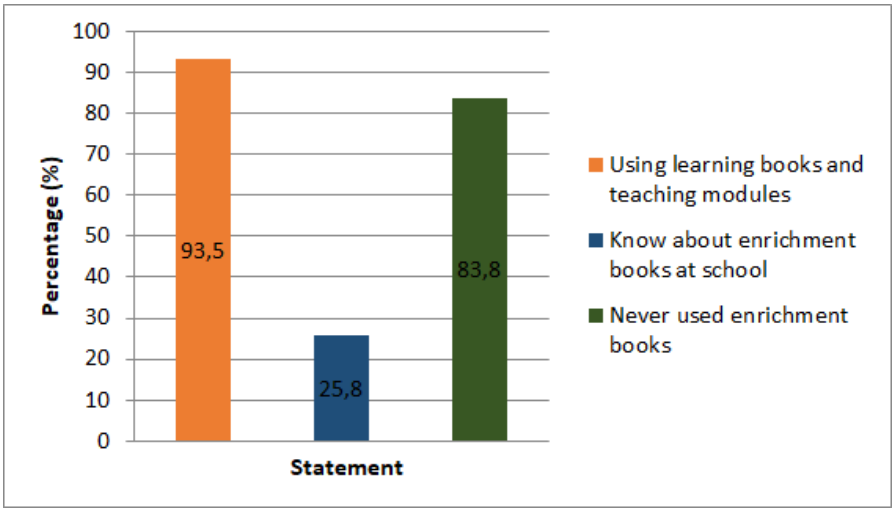

Fig. 3. Results of Analysis of Learners' Questionnaires about Teaching Materials and Enrichment Books

Based on the results of the analysis, it is known that students tend to use conventional teaching materials such as textbooks, teaching modules, and the like in the learning process at school. However, to support learners who want to deepen their understanding through enrichment programs, schools have not provided adequate additional learning resources as support. It is known that 83.8% of learners have never used enrichment books.

The analysis outcomes of students' responses related to the *edupark* are presented in Figure 4.

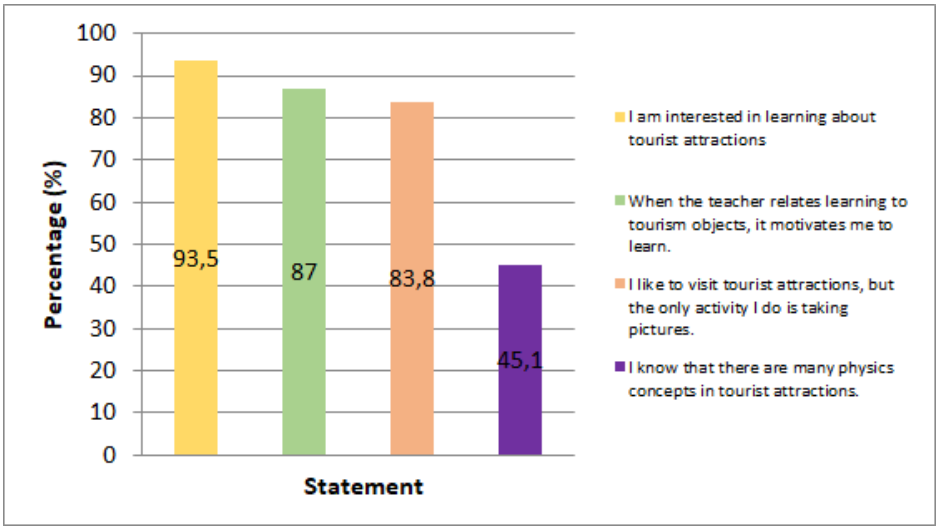

Fig. 4. The results of the analysis of students' questionnaires about *Edupark*

Findings from the analysis of student questionnaires related to the *edupark* show that 93.5% of students are interested in learning at the tourist attraction. This interest can be seen from the increased learning motivation of students when the teacher links the material being studied with objects found in tourist attractions. This shows that contextual-based learning through the use of *edupark* is able to create a more meaningful and relevant learning experience for students.

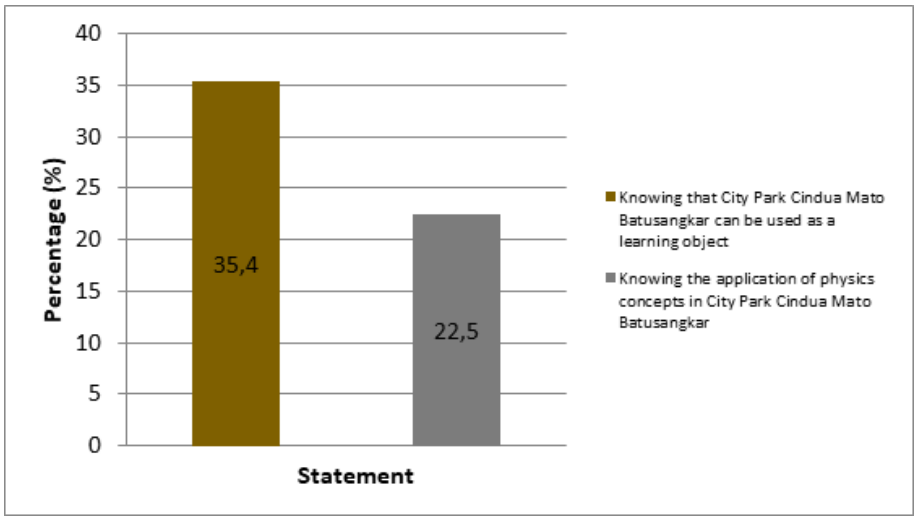

Fig. 5. Results of Analysis of Student Questionnaires about *City Park* Cindua Mato Batusangkar

The results of the analysis show that the level of understanding of students of physics concepts contained in the *City Park* Cindua Mato Batusangkar tourist attraction is still relatively low, which is around 22.5%. These results occur because the utilization of *edupark* as a learning resource is not optimal. Integration of physics learning with the surrounding environment can encourage students to identify and explore physics concepts directly. Tourism-based learning not only increases the relevance of the material, but also makes the learning process more meaningful and fun.

After making observations at City Park Cindua Mato Batusangkar, there are several parts of the object that can be used as learning resources for certain physics concepts. Utilization of edupark attractions as a learning resource can be done by making direct observations of edupark objects, then identifying physics concepts that exist in the City Park Cindua Mato Batusangkar tourist attraction. Attractions at City Park Cindua Mato Batusangkar that can be used as learning resources are rides playing basketball, basketball games and reflection stone rides. For more details about these rides can be seen in Figure 6.

(a)

(b)

(c)

(d)

Fig. 6. (a) *City Park* Cindua Mato Batusangkar; (b) Basketball Playground; (c) Basketball Game; (d) Reflection Stone Playground.

When basketball players play on the field, there are many physics concepts that they do not realize can be used as a learning resource. The identification of physics concepts in basketball rides and games can be seen in Table 2.

Table 2. Identification of Physics Concepts in Basketball Rides and Games

Physics concept	Explanation
Parabolic Motion	When the player throws the ball towards the ring, the trajectory of the ball forms a curve that resembles a parabola. This is due to the existence of two components of motion, namely horizontal motion with constant speed and vertical motion influenced by gravitational acceleration.
Newton's Laws	- Newton's Law I: a running player will continue to move forward at a constant speed if there is no external force such as friction of shoes with the floor or pushing force from other players. - Newton's Law II: when the player throws the ball, the greater the thrust applied, the greater the acceleration of the ball, so that the ball will reach the ring faster and with a longer trajectory. - Newton's Law III: when the player bounces the ball to the floor, the player's hand exerts a downward force on the ball (action force), and the floor exerts an upward force (reaction force), so the ball bounces back up.
Weight and Normal Force	For a basketball player standing on the court, the weight of his body is resisted by the normal force from the floor, resulting in a vertically balanced state. When the player jumps, the normal force exerted by the floor increases to counterbalance and exceed the weight force, so the body is propelled upwards.
Frictional Force	Frictional force occurs between the player's shoes and the court surface. This force is essential to prevent the player from slipping when running or changing the direction of force suddenly. Basketball-specific shoes are designed to have a high coefficient of friction to add stability to the player's movement.
Effort and Energy	When a player jumps, he makes an effort on the floor, which is then converted into gravitational potential energy upon reaching the maximum height. This energy is then converted into kinetic energy when the player comes back down.
Balance of a Solid Object	When a ball hits the backboard of a basketball hoop or a player hangs onto the hoop after a *slam dunk*, this additional force produces a torque that must be countered by the structural strength and bearing capacity of the foundation to prevent the pole from collapsing.

Elasticity	The concept of elasticity is essential to explain the behavior of a ball as it bounces off a floor surface or a bouncing board. When a ball is dropped and thrown to the floor, the shape of the ball will deform momentarily due to the impact, then the elastic potential energy in the structure of the ball will return to its original shape, encouraging bouncing back up.

The reflection stone ride is composed of stone and *stainless steel* handle structure that ensures stability, strength, and safety. The identification of physics concepts on the reflection stone ride is outlined in Table 3.

Table 3. Identification of Physics Concepts on Reflection Rock Rides

Physics Concept	Explanation
Pressure	Pressure occurs when the stone soles of the feet touch the surface of the stone that has a prominent and uneven shape, the wider the surface that is stepped on, the greater the pressure felt.
Friction Force	Friction force occurs between the soles of the feet and the surface of the reflection stone when visitors walk on the reflection stone. This force prevents the foot from slipping and allows the body to move forward.
Weight and Normal Force	Weight force is the force of attraction of the earth towards the visitor's body, working vertically downwards. This force will be resisted by the normal force of the rock surface acting upwards. The interaction between weight and normal force is important to maintain balance.
Balance	Walking on a reflecting stone requires good balance as the uneven surface disrupts the distribution of forces and torques.
Effort and Energy	While walking on a reflecting stone the user exerts effort as the muscles of the body exert force moving the mass of the body. This effort is converted into mechanical energy to move from one point to another.
Temperature changes	The surface of the reflection stone exposed to sunlight will absorb heat energy and increase in temperature. When the foot touches the hot stone surface, heat energy transfers from the stone to the body through conduction.
Heat Transfer	Transfers made of *stainless steel* experience heat transfer mainly through conduction and radiation mechanisms. *Stainless steel* is a metal that has moderate thermal conductivity, so when the handle comes into contact with objects or air of different temperatures, heat will flow from the hotter part to the cooler part through conduction.

Based on the analysis of students' learning styles, it was found that visual learning style is the most dominant. Therefore, the most suitable learning media is print media. The results of interviews with teachers show that the development of edupark-based physics enrichment books has never been done. During this time, the learning process is mostly done conventionally in the classroom, causing students to feel bored and less interested.

In addition, from the results of the analysis of the attractiveness of the City Park Cindua Mato Batusangkar tourist attraction, it was found that the location has great potential to be used as a learning resource. Direct observation of the attraction revealed the existence of various physics concepts that can be integrated into learning materials. These physics concepts can be developed into additional teaching materials in the form of enrichment books that are able to deepen students' understanding of the application of physics in everyday life in a contextual manner.

Enrichment books are learning resources that contain additional material to broaden and deepen students' understanding and function as a complement to textbooks by presenting additional information, sample problems, and application of concepts in everyday life [26]. Enrichment books are flexible, meaning they can be used in the long term. Even though the curriculum is updated in the future, edupark-based enrichment books are still relevant to use because the writing of enrichment books is not tied to the curriculum structure.

IV. CONCLUSION

The results of preliminary research show that enrichment programs are an important part of supporting the implementation of the Merdeka Curriculum. Based on the needs analysis at SMAN 1 Sungai Tarab, it is known

that the school does not yet have teaching materials in the form of physics enrichment books. Meanwhile, the City Park Cindua Mato Batusangkar tourist attraction has potential as a learning resource because there are many physics concepts that can be utilized in learning. Based on the results of interviews with physics teachers, it is known that the development of *edupark-based* enrichment books has never been done, although students have a high interest in learning if the material is related to the environment and tourist attractions. Therefore, it is necessary to develop a physics enrichment book integrated with tourist attractions as an effort to strengthen students' understanding of physics concepts in life.

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