Preliminary analysis of learning resources for edupark physics in hydroponic cultivation of SMK N 2 Batusangkar, Indonesia

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Abstract. Environment based learning is a strategy in learning by utilizing the environment as a learning tool, learning resource, learning media that aims to achieve learning goals. One of them is the environment at SMK N 2 Batusangkar which is used as an edupark (educational park) in the form of hydroponic cultivation which has physics concepts that have not been implemented. Based on need for learning resources in learning physics, a preliminary analysis of the physical concepts which is contained in hydroponic aquaculture edupark. The data used is obtained from interviews and questionnaires that were developed based on learning process parameters, learning tools, student characteristics and environmental characteristics, as well as a description of the potential of edupark, especially those supporting physics subject matter including fluids, temperatures, heat, light intensity, capillarity. Based on the results of preliminary research, it appears that the importance of developing hydroponic aquaculture edupark textbooks in physics learning.

1. Introduction

National education serves to grow the ability and build the character possessed by students and the nation's civilization so that it is dignified in the context of educating the life of the nation, while the goal of national education is to develop the potential of the students so that they become people of faith and devotion to God Almighty, has noble character, knowledgeable, creative, independent, and can be a democratic and responsible citizen. Education a conscious and planned effort to realize an active teaching and learning process so the students' self-potential that can be developed such as having spiritual strength, control themselves, having personality, intelligence, and noble character[1].

Formulation of the objectives of national education reflects the general picture of the human figure that is expected and must be produced through the implementation of any educational planning. Therefore, the formulation of national education goals becomes the foundation in developing the cultural values of a character. The character education can be interpreted as a form of human activity in which there is an act of educating from one generation to the next and aims for to shape individual self-improvement in a structured manner and can train one's ability to move towards a better direction.

One effort to create character in students is through an environment-based teaching and learning process. The environment-based teaching and learning process is a strategy in learning by utilizing the
environment as a learning tool, learning resource, learning media that aims to achieve learning goals[2]. The environment-based teaching and learning process is important to carry out because class-oriented learning is boring for students so it is difficult to understand a natural phenomenon that is in fact in the surrounding environment. The environment-based teaching and learning process has a positive impact, especially for students, so they can be motivated by an attitude of curiosity and analysis about something in the surrounding environment. This is following the four pillars of education namely learning to know, learning to be, learning to do and learning to live together[3].

Implementation of environment-based learning can be realized by utilizing the environment around students, especially in the school environment. The school environment can be used as an educational park (edupark). Edupark is an educational park that is used as a source of learning and learning tools to achieve learning goals. Edupark-based learning can be applied to all subjects, one of them is in learning physics at school. The Physics is studied of natural behavior in various forms of symptoms to be able to understand what controls or determines these behaviors[4]. Environment-based learning can be a source of learning to understand the concepts of physics, because learning physics is studying natural phenomena with a series of scientific processes that result in scientific products both artificial and natural[5]. Based on this, learning physics cannot be separated from the mastery of basic concepts of physics through understanding. The theory of physics is not only enough to read, because physics theory is not merely memorized but also must be read and understood and practiced, so students can explain the existing problems. Empirically the research conducted by Dewi Puspita explained that the use of edupark-based textbooks can increase enthusiasm and eliminate students' boredom towards learning physics so that students easily understand the contents of learning material [6]. One of the school environments that can be used as an educational park (edupark) is the school environment at SMK N 2 Batusangkar, Indonesia. This can be seen from the existence of hydroponic cultivation which in fact there are many physical concepts but have not been fully realized. The implementation of physics learning in schools is still centered on the teacher (teacher center) and reading books only, and have never implemented physics learning into the surrounding environment with physics guide books based on edupark especially edupark hydroponic cultivation which caused the saturation of students so that their potential is difficult to develop and learning achievement is not in accordance with the objectives to be achieved.

The location of the hydroponic aquaculture edupark is at SMK N 2 Batusangkar which is located on Jalan Bukit Gombak-Batusangkar, Lima Kaum District, Tanah Datar District, West Sumatra, Indonesia, at geographical position 0029 '00.74 " LS and 100037 '00.45 " BT.
Figure 1. Map of location for hydroponic cultivation of edupark samples at SMK N 2 Batusangkar: a) Location Map of Edupark Hydroponic Cultivation b) Map of Indonesia

Information:
1. Setting the layout of the pipe (equilibrium and inclined plane)
2. Making hole pipe (measurement)
3. Water flow (dynamic fluid)
4. Use of water pump in a box (dynamic electricity)

Figure 2. Hydroponic Cultivation of SMK N 2 Batusangkar, Tanah Datar District, West Sumatra, Indonesia.

Edupark (educational park) hydroponic cultivation can be in the form of natural science concepts consisting of capillarity, temperature, heat, light intensity, static fluid, and dynamic fluid. Based on this background, a preliminary analysis was conducted on the needs of students, learning resources and regional potential in the selection of physics edupark textbooks in hydroponic cultivation at SMK N 2 Batusangkar, Indonesia.
2. Research Method

The type of research used is development research using the Plomp model[7]. The research was conducted only at the initial research stage, which consisted of student analysis, educator analysis, curriculum analysis, material analysis, and regional potential analysis. This research was conducted at SMK N 2 Batusangkar, Tanah Datar District, West Sumatra, Indonesia.

The data used are several parameters developed such as teaching and learning process, learning tools, student characteristics, and environmental characteristics, as well as a description of the potential of hydroponics aquaculture edupark, especially those that support physics subject matter.

Collecting data on some of these parameters is carried out in a literature study and observation of educators and students in SMK N 2 Batusangkar with interviews and questionnaires. It aims to get a general picture of the learning process, learning tools, student characteristics and environmental characteristics. Observations were also made directly to the field to see the potential of the environment. Then, analyze the objects contained in the environment related to the concept of physics. The material analysis begins with analyzing basic competency and competency achievement indicators in physics that are directly related to natural conditions around the hydroponic aquaculture edupark of SMK N 2 Batusangkar, Tanah Datar District, West Sumatra, Indonesia. The results of the observation and analysis of several parameters are used to determine the potential of hydroponic cultivation related to physics learning material. So we get a picture of hydroponic aquaculture edupark.

Questionnaires distributed to educators consist of student performance and development, while questionnaires distributed to students consist of aspects of knowledge, skills, initial abilities, learning styles, and motivation. Every aspect of the questionnaire was translated into several indicators. Questionnaires were distributed to educators for performance aspects using alternative answers to "yes or no" while weighting questionnaires for students' developmental aspects and questionnaires for students using a Likert scale. The Likert Scale, developed by Likert Rensis, is a series of items. Respondents only gave their approval or disapproval of the items[8].

| Statement          | Statement weight |
|--------------------|------------------|
| Always             | 4                |
| Often              | 3                |
| Sometimes          | 2                |
| Never              | 1                |

Data analyzed using quantitative descriptive statistical analysis techniques, then categorized with qualitative descriptive. Quantitative descriptive technique by calculating the percentage of the total score obtained against the maximum score of respondents using formula 2.1 [10];

\[ V = \frac{x}{Y} \times 100 \% \]  

Information:

\( V \) = Final value  
\( x \) = Score obtained  
\( Y \) = Maximum score

The percentages obtained from quantitative descriptive are then categorized descriptively qualitatively as in Table 2.
Table 2. The category of the percentage of the value obtained[11]

| Percentage (%) | Category   |
|---------------|------------|
| 76-100        | Good       |
| 51-75         | Enough     |
| 26-50         | Less       |
| 0-25          | Not less   |

3. Results and Discussion

The initial research conducted consisted of student analysis, educator analysis, curriculum analysis, material analysis, and regional potential analysis obtained based on learning process parameters, learning tools, student characteristics and environmental characteristics, as well as a description of the potential of hydroponics aquaculture edupark especially those that support material physics. Analysis of the questionnaire to educators consisted of performance analysis and analysis of the learning process. Performance analysis includes 7 aspects including learning tools, steps in learning, utilization of printed teaching materials, utilization of non-printed teaching materials, manufacturing of printed teaching materials, manufacturing of non-printed teaching materials, as well as supporting facilities and facilities as shown in Table 3.

Table 3. Educator Analysis of Performance Aspects

| no. | Aspect                                | (%) Results |
|-----|---------------------------------------|-------------|
| 1.  | Completeness of learning devices      | 100         | 0            |
| 2.  | Application of learning steps         | 92.07       | 55.6         |
| 3.  | Use of printed teaching materials     | 93.35       | 33.33        |
| 4.  | Use of non-printed teaching materials | 66.7        | 75.03        |
| 5.  | Making printed teaching materials     | 55.5        | 83.39        |
| 6.  | Making non-print teaching materials   | 83.38       | 83.33        |
| 7.  | Complete facilities and supporting facilities | 100 | 0          |

Table 3 above illustrates that the completeness of learning tools by educators has reached 100% meaning that educators have made learning devices as they should, in the aspect of applying learning steps the educator has applied some of the learning steps with a value of 92.07%, in the aspect of using teaching materials print educators have used it with a value of 93.35 while in non-print teaching materials educators have not fully utilized it with a value of 75.03. Then in the aspect of making teaching materials both print and non-print educators have not been able to make it with a value of 83%. while supporting facilities and equipment in schools are already owned and can be used fully with a value of 100%. So that we need a teaching material that is following the potential possessed in the area and the achievement of the target of the learning process of students. Broadly speaking, it can be concluded that educators have not been able to make teaching materials both print and non-print, because so far educators only utilize teaching materials that have been provided. Teaching material is a description of materials that are arranged systematically both written and unwritten to support the learning process of students [12].
Furthermore, the learning process questionnaire for educators consisting of 5 aspects, namely students' interest in printed teaching materials, students' interest in non-printed teaching materials, visits to eduparks (educational parks) in learning physics, linkages of facts with physics materials, application of physics learning with edupark (educational park) in Table 4.

**Table 4. Educator Analysis on Aspects of the Learning Process**

| No. | Aspect                                                                 | (%) Results | Category |
|-----|------------------------------------------------------------------------|-------------|----------|
| 1.  | The interest of students utilizes printed teaching materials           | 75          | Good     |
| 2.  | The interest of students utilizes non-print teaching materials         | 80          | Good     |
| 3.  | Relation of facts to physics                                          | 100         | Good     |
| 4.  | Visit edupark (educational park) in physics learning                  | 50          | Less     |
| 5.  | Application of physics learning with edupark (educational park)       | 50          | Less     |

Table 4 above illustrates that students are interested in making use of 75% printed teaching materials and 80% non-printed teaching materials in either category. This indicates that students are interested in using teaching materials both print and non-print. Furthermore, the aspect of the relationship of facts with physical material shows a value of 100% with a good category, meaning that educators and students have linked physics material with facts in the environment. Then for the aspect of visits to edupark in learning physics and the application of learning physics with edupark (educational park) shows a value of 50% with the category of not good. This shows educators and students in SMK N 2 Batusangkar have never visited and applied physics learning with edupark (educational park), so that the use of edupark in physics learning is needed. Edupark (educational park) which is utilized from the physical environment (nature) as a means to study natural phenomena or phenomena related to physical concepts and principles can be used to study the application (concepts or principles of physics) that are either directly or indirectly utilized by the community in their activities [13].

Analysis of students includes 6 aspects, namely knowledge, skills, initial abilities, learning styles, learning resources, and motivation possessed by students in Table 5.

**Table 5. Learner Analysis**

| No. | Aspect            | (%) Results | Category |
|-----|-------------------|-------------|----------|
| 1.  | Knowledge Aspect  | 57.2        | Enough   |
| 2.  | Skills Aspect     | 72.57       | Good     |
| 3.  | Initial ability   | 66.43       | Enough   |
| 4.  | Learning style    | 64.67       | Enough   |
| 5.  | Learning Resources| 63.50       | Enough   |
| 6.  | Motivation        | 68.75       | Enough   |

Table 5 shows the percentage of knowledge aspects of students 57.2% with enough categories. Based on observations, edupark hydroponic cultivation can be utilized to improve aspects of students' knowledge. This was also revealed from interviews with Physics educators. In the aspect of the students'
skills with a score of 72.57% gained in the good category. The initial ability acquisition of students is 66.43%, with sufficient criteria. While the percentage of students learning styles with a value of 64.67% with the category enough. The percentage of new learning resources is at 63.50% with enough categories. This is because learning resources are still oriented towards teacher textbooks and learning tends to be teacher-centered. While the percentage of motivation is at a value of 68.75% with a sufficient category. This is due to the lack of use of the environment as a source of learning and monotony only in the classroom. To make students more motivated in learning, then by making physics learning as close as possible to the real life of students so that they can make them enthusiastic in learning.

Besides, from observations that have been made at the edupark of hydroponic cultivation in SMK N 2 Batusangkar, there are many applications of physical concepts in it. Some physical concepts contained in hydroponic aquaculture edupark in Table 6.

**Table 6.** Physics Concepts in Edupark Hydroponic Cultivation at SMK N 2 Batusangkar

| Destination Name                  | Parts                          | Science Concept    | Indicators of Competency Achievement                                      |
|-----------------------------------|--------------------------------|--------------------|----------------------------------------------------------------------------|
| Edupark Hydroponic Cultivation    | Water flowing in the pipe      | Fluid              | Knowing the concept of water discharge in a pipe                           |
|                                   |                                | Energy             | Understand the change in electrical energy into mechanical energy          |
|                                   |                                | Inclined plane     | Understand the concept of sloping fields in the water flow cycle           |
| Use of a water pump               | Dynamic electricity            |                    | Know the concept of electric power                                         |
| Light setting                     | Light intensity                |                    | Knowing the concept of faraday law (GGL)                                  |
| Temperature regulation            | Air fluid                      |                    | Know the concept of light intensity in hydroponic cultivation              |
| Setting the location of the pipe  | Equilibrium of Tegar objects   |                    | Understand the concept of rigid object equality                            |
| Making pipe holes                 | Measurement                    |                    | Able to measure physical quantities and calculate unit conversions         |

Table 6 explains the many physics concepts that can be utilized in the physics learning process at school. As demanded in graduate competency standards that cover aspects of attitudes, knowledge, and skills, this edupark can be integrated with physics learning. From the integration of edupark, it can shape the character education of students such as energy-saving, responsibility, discipline, social care and the environment [14].

4. **Conclusion**

The results of the initial research consisting of educator and student analyzes conducted by interview and questionnaire as well as material analysis and regional analysis conducted at SMK N 2 Batusangkar can be concluded that the development of edupark learning resources for hydroponic cultivation is needed at the school. The development of learning resources includes the development of textbooks so that they can carry out learning following the demands of the 2013 curriculum and the potential of the region.
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