Literature Review: How If The Adventure Based Learning Used in Mathematics Learning?

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**Abstract.** A paradigm shift is needed so mathematics learning is not a rigid thing. One way to change the paradigm is to make learning innovations. One of the learning innovations which can be used is Adventure Based Learning where the learning process is done outside the classroom. This learning consists of physical activities which are designed to be structured learning with a reflection that can help the personal development and social development of students. This learning is based on learning theory with experiential learning and discovery. The aim of this article is to describe learning mathematics using Adventure Based Learning. The method used is literature review, by collecting articles related to Adventure Based Learning. The results obtained that learning with Adventure Based Learning can give students the opportunity to learn through things that have gone through adventure, so as to create soft skills such as critical thinking skills, motivation, leadership, and teamwork.

1. Introduction

Education is an essential and inseparable aspect of human life [1]. The existence can see this of laws that guarantee that everyone has the right to education [2]. One of the subjects that must be learned from formal education is mathematics.

Everyone needs math without any limitation of age [3]. Mathematics is a subject that always exists in formal schools from elementary school to the college [4]. Mathematics is given to equip students with logical, analytic, systematic, critical, and creative thinking [5]. These abilities are needed to face the development era [5][6]. Therefore, mathematics is one of the essential foundations needed in life, especially for face global challenges.

However, the importance of mathematics is not in line with the reality. Mathematics is still considered a difficult subject and is feared by most students in schools [4]. One of the reasons for this case is the monotonous and rigid learning process [7]. To get quality education, of course, it is closely related to the learning process, both inside and outside the classroom [8]. Almost all of the mathematics learning process in formal schools occurs in the classroom so that innovation is needed in the mathematics learning process that is expected to change students' paradigm of rigid mathematics learning becomes fun. The innovations that can be done are learning mathematics outside the classroom.

Learning outside the classroom can be done by the teacher by making games. The game is made so that each student work together in a team to solve problems eich are package in an adventure designed to be solved. Adventure provides students opportunities to learn and create soft skills such as abilities think, problem analysis, problem-solving skills, and personality development [9]. With students' involvement in solving a problem that is packaged in an adventure, it is hoped that it can make students not bored and interested in the learning process. Therefore,it is expected that it can change the views of student related to mathematics which previously considered a difficult and boring subject to becomes a fun learning. One of the learning innovations with a combination of learning outside the classroom and adventure is Adventure Based Learning (ABL) [10].

ABL is a learning theory based on experiential learning and discovery learning [11]. This model provides experience in the real world directly to students. So that learning with this model can produce an environment collaborative that can be used during the learning and teaching process.

Previous studies have done tone see the effect of the ABL model. However, there are still not many previous studies on ABL when used in mathematics learning. So, this article aims to describe how if ABL is used in mathematics learning. This was done by reviewing seven articles related to ABL used in mathematics learning.

1. Method

This article uses the literature review method. The steps used as a reference in making this article are as follows: (1) selecting the topic to be reviewed, (2) searching and selecting the appropriate articles, (3) analyzing and synthesizing literature, and (4) organization of writing the review [12].

## Selecting the topic to be reviewed

This article aims to answer the question of how if ABL is used in mathematics learning and what abilities can be developed with this ABL model.

## Searching and selecting the appropriate articles

1. Data based search. Articel searches are carried out by searching for articels in journals or proceedings online.
2. Search keyword. The selection of articles is made by writing the keywords "Adventure Based Learning" and "Adventure Based Learning in mathematics learning."
3. Selection of paper. The criteria articles selected are: (1) articles that discuss the consequences of using the ABL model in learning mathematics and (2) articles published in the period 2013-2019.

## Analisis dan sintesis literatur

1. Analysis. Analysis of seven articles that have been selected and match the criteria 2.2.3. includes: author, year published, the method used, research subject, research location, and research results.
2. Synthesis of the result. Linking the results of the analysis in 2.3.1 regarding the consequences of ABL when used in mathematics learning in cognitive and affective aspects.

## Organization of writing the review

Organizing the results of 2.3.2 in an organized written form.

1. Result and Discussion

After selecting the articles obtained, seven articles were selected about ABL which are used in mathematics learning. Criteria for articles selected in corresponding with 2.2.3. Table 1 below is a research article selected corresponding to criterion 2.2.3.

**Tabel 1**. Selected Articel

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Author** | **Years of Publication** | **Research Subject**  | **Location** |
| 1. | Fagerstam E and Blom J [13] | 2013 | Secondary School | Sweden |
| 2. | Bahurudin M A, Tajudin M and Adnan M [14] | 2016 | Collage student | Malaysia |
| 3. | Crismono P C [15] | 2017 | Secondary School | Indonesia |
| 4. | Mohd Afifi Bahurudin Setambah, Nor’ain Mohd Tajudin and Mazlini Adnan[16]  | 2016 | Expert | Malaysia |
| 5. | Mohd Afifi Bahurudin Setambah, Nor’ain Mohd Tajudin, Mazlini Adnan and Muhamad Ikhwan Mat Saad[10]  | 2017 | Collage student | Malaysia |
| 6. | Setambah M A B, Tajudin N M, Adnan M and Saad M I M [17] | 2017 | Expert and Collage student | Malaysia |
| 7. | Nor’ain Mohd Tajudin, Mohd Afifi Bahurudin Setambah, Norsida Hassan, Noorazrin Abd Rajak and Mazlini Adnan [18] | 2019 | Diploma | Malaysia |

From Table 1 above, it can be seen that there is still not much ABL research on mathematics learning. However, from analyzing some of these articles, it was found that ABL effects when used in mathematics learning. Table 2. the following is a description of the research results obtained from each of the studies that have been carried out:

**Table 2.** Methods and Results of Selected Articles

| **No** | **Title** | **Methode**  | **Result** |
| --- | --- | --- | --- |
| 1 | Learning Biology And Mathematics Outdoors: Effects and Attitudes in A Swedish High School Context [13] | Quasi-Experimental Design | In the affective aspect, students feel more interested in learning, motivation, and teamwork, students too increased. While on cognitive outcome obtained that level long term memory of students with learning outside the classroom is higher than learning inside the classroom. |
| 2 | Walking, Explore Race and Flying Fox Adventure Activity In Learning Statistics: Effect on Leadership Skills[14] | Quasi-Experimental Design | ABL can upgrade student leadership skills. Moreover, it was found that ABL was better than conventional use because ABL contributes to the development of human resources, student center, and fun learning. So that students become more active in the learning process, able to reflect the experience and increased group cooperation. |
| 3 | Pengaruh Outdoor Learning Terhadap Kemampuan Berpikir Kritis Matematis Siswa [15]  | Quasi-Experimental Design | Method outdoor learning affects the ability of critical thinking mathematical skill students. |
| 4 | Development , Validity and Reliability Adventure Based Learning Module in Fundamental Statistics[16] | Quantitative Correlation Studey | The ABL learning module that has been made has high validity and reliability, where the module is developed with the ADDIE model. The analysis result shows that face validity and content validity are very good with CKI 0.97 and CVI 0.96. In comparison, the reliability of the ABL module is good, with 0.76 points. |
| 5 | Adventure Based Learning Module in Statistics: Development and Impact on Students Achievement , Critical Thinking and Leaderships Skills [10] | Development design and quasi-experimental design | ABL can make an impact positive towards student achievement, think critical skill, and leadership. |
| 6 | Adventure Based Learning Module: Content Validity and Reliability Process [17] | A Quantitative Approach by Correlation Study | The results of the analysis, CVI, and PCM are 0.98 and 83.4%. The ABL module made has a reliability value of 0.71 and 0.73. These results indicate that the ABL module created has high validity and excellent reliability. Besides, this ABL model can be an alternative method for lecturers or teachers to provide additional value to students. Furthermore, students on critical thinking and leadership skills. |
| 7 | Synergizing Mathematical Learning for Future Ready Curriculum using Adventure-Based Learning [18] | The Development and Research Design | The article explains that ABL modules made for higher education have good validity and reliability so that they can serve as guidelines for lecturers and can be extended to other subjects. This study contributes to the field of teaching and learning mathematics in universities by concluding that mathematics learning should be planned systematically and driven by adventure-driven to ensure that students acquire knowledge and values ​​that will make them ready for the future. |

From table 2. some findings related to ABL when used in mathematics learning. These findings can be grouped into two aspects, namely, cognitive and affective. Where these aspects are seen in table 3. below:

**Tabel 3.** The ability of review findings

| **No.** | **Aspect**  | **Ability** | **Number of Artikel** |
| --- | --- | --- | --- |
| 1 | Cognitive | Critical Thinking Skill | [10][15][17] |
|  | Cognitive | Longterm memory | [13] |
| 2 | Affective | Motivation | [13] |
|   |   | Leadership | [10][14][17] |
|   |   | Teamwork | [13] |

Look in Table 3. that learning mathematics with ABL affects cognitive and affective aspects. Where in the cognitive aspect, ABL can be used to improve mathematical critical thinking skills. Meanwhile, in the affective aspect, ABL is used to increase motivation, leadership, and teamwork.

1. *The results of learning mathematics using ABL on cognitive aspects*

The cognitive aspect found in learning mathematics using ABL is a critical thinking skill [15][10]. ABL is a new learning model in the scope of mathematics education [10]. This learning model consists of physical activities designed in such a way as to be structured learning with a reflection [19]. The process reflection that occurs after physical activity structure would resemble a student-centered approach [20]. Here students will begin to analyze the problems given, then students will look for ideas, and student dialogue will be directed to form directions or topics discussion to solve the problems given [19]. Then this model in addition to using an experimental approach and discovery learning, this model also uses an approach as well as fun to try something new which will be effective when: (1) enjoying the activity, (2) being interested in what is being learned, (3) actively participates in activities, (4) can reflect on experiences, and (5) can relate what is obtained to other material even in everyday life [18]. An active learning approach can develop critical thinking skill students' [15][21]. Besides finding an increase in critical thinking skill students', it turns out that learning mathematics with ABL can affect long-term memory of students [13]. Learning by connecting the material and activities carried out with ABL makes a complete memory so that students' long-term memory is increased. In contrast to learning in the classroom where material and activities are rarely linked, they become separate memories.

1. *The results of learning mathematics using ABL on the affective aspect*

ABL, when used in mathematics learning, has an impact on affective aspects. The affective aspects found, among others, were increased motivation students, leadership, and teamwork.

1. *Motivasi.*Adventure is synonymous with exploration, challenge, and risk. Adventure means finding something and encouraging physical activity or emotional feelings that cause a person to feel happy, and when someone feels happy, intrinsic motivation will arise in him [22]. Motivation can be increased by using ABL in mathematics learning, where learning is designed in the form of adventure and involves activity physical[13]. Students need learning motivation in the learning and teaching process, and students with high motivation will get good learning outcomes [23]. One of the causes of changes in motivation is due to learning innovations [13]. ABL is an alternative that can be used to make learning innovations [17][18].
	* 1. Leadership and Teamwork. ABL is learning designed using sequenced adventure activities and activities team building that provides space for participants to work together, communicate, and solve problems [20]. The sequence made in the activity will involve the games and student initiatives that are made in such a way as to make students actively move both physically and thoughtfully. The sequencing can be carried out through communication, cooperation, trust, and in the end, it can solve the initial problems given [24]. Where these activities increase leadership [10][14][17] and one's teamwork [13].
2. **Conclusion**

ABL, when used in mathematics learning, affects. The influence that occurs is divided into two aspects, namely aspects, cognitive and affective. The cognitive aspect obtained is critical thinking skill. Meanwhile, the affective aspect obtained is an effect on increasing motivation, leadership, and teamwork. Besides, ABL can also be used as an innovation in mathematics learning.

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