

The Need for The Development Of Building Evaluation Textbook to Improve Student's Skills on Building

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Abstract. This paper intends to analyze the needs for learning development through the Building Evaluation textbook to improve students' skills in healthy buildings. Students' skills tend to be low in planning healthy buildings that meet the rules of Building Physics. Based on this, an analysis of the need for learning development and the design of textbooks to improve students' skills in healthy buildings was carried out. The data of this research were obtained through a questionnaire given to several lecturers and students in the Diploma 3 Study Program in Civil Engineering, Unimed. The needs analysis is analyzed using Root Cause Analysis. The results of the analysis found main reasons for the importance of developing textbooks to improve students' skills in healthy buildings. Then a search for the root causes can be found so that the need for the importance of development is obtained through a residential evaluation approach.

Keywords: skills, building physics, design, evaluation.

1 Introduction

The concept of building a healthy home is not always synonymous with luxury homes. In planning a building, in addition to paying attention to the aspect of beauty, cost, and security, it is also necessary to pay attention to the health aspect of the building so that it can really function to provide comfort for its occupants. Building health is closely related to the balance between the buildings and the natural factors where it is located. It is called the physical enjoyment of the building. Some Indonesians are now increasingly aware of the importance of considering environmental issues, such as going green, low energy, and antitoxin. But most others do not pay attention to the balance of their buildings with natural conditions, resulting in unhealthy houses that are not in harmony with nature, [1]Prasasto Satwiko, 2009.

In Civil Engineering and Architecture, it is crucial to understand the science of Building Physics, which is very concerned with the comfort and health of residents. Buildings designed by considering the science of Building Physics will benefit when they are built according to spatial arrangements, material selection, and proper and efficient physical arrangements in

harmony with the surrounding natural environment. Without understanding Building Physics, the work of the building created will be useless. Designing a building without considering the science of Building Physics will cause discomfort for the occupants of the building. The purpose of this Building Physics course is to develop students' knowledge and skills in planning a building that has physical enjoyment in harmony with nature. It can minimize the adverse effects of nature on the building and the surrounding environment, [2] Mohammad Kholid Ridwan, 2010 .

The students tend to have the low ability in healthy buildings that meet the rules of Building Physics. It can be caused by several things, including students understanding Building Physics only through theory without evaluating existing buildings. In this regard, to raise students' understanding and skills of houses following the rules of Building Physics, it is necessary to conduct learning through evaluation of existing buildings. In this study, developing a textbook on Building Evaluation according to the rules of Building Physics is needed. In this regard, it is necessary to analyze to determine the need for teaching materials development for Building Evaluation materials.

2 Literature Review

The learning outcomes achieved by students can be assessed from three domains of cognitive, affective, and skills. Cognitive learning outcomes consist of two dimensions. They are the dimensions of cognitive processes and the dimensions of knowledge. The affective domain includes receiving phenomena, responding to phenomena, valuing, organization, and internalizing values. The psychomotor aspects include reflex movements, fundamental movements, perception, physical abilities, skilled movements, and no discursive communication. The learning outcomes are actual achievements displayed by children, where learning outcomes are abilities obtained after learning activities. The factors that affect learning outcomes consist of internal and external factors. One of the internal factors comes from the influence of the school, including the way of learning or the learning method used.

One effort to develop students' knowledge and innovation on environmental problems is developing environment-based learning. [3]Y Yamin et al. (2017) researched the Application of Model Project Based Learning on Integrated Science in Water Pollution. Through this research, some data show that the development of integrated science learning can increase the mastery of concepts in students. [4]Maria Elena Arce et al. (2013) researched Project-Based Learning: Application to a Research Master Subject of Thermal Engineering. This study result is effective in facilitating the acquisition of student competencies. [5]Ahmet Kilinc (2010) conducted research entitled Can project-based learning close the gap? Turkish student teachers and pro-environmental behaviors. This study was conducted because of the gap between cognitive patterns and human behavior towards the pro-environment. The findings of this study indicate that an environment-based learning environment causes positive changes in participants' behavior regarding environmental protection.

The results of these studies prove that it is important to develop learning in developing students' skills to play a role in the environment.

3 Method

This study uses a survey design. Empirical data were collected in this study using a set of questionnaires. The questionnaire was distributed to lecturers of the D3 Civil Engineering program at the State University of Medan to get feedback and suggestions. The questionnaire is divided into four sections that invite participants to assess and provide answers on the following areas: (i) knowledge development related to healthy buildings, (ii) learning related to buildings according to Building Physics, (iii) learning can improve skills towards healthy homes, (iv) learning based on building evaluation according to Building Physics rules, (v) Evaluation results become building learning materials according to Building Physics rules. Furthermore, the Design of Textbooks needs (1) the selection of materials according to the characteristics of students and the demands of competence in Building Physics to be achieved, (2) learning strategies, and (3) the form of worksheets and evaluations.

The approach in this study follows the following framework in **Figure 1**.

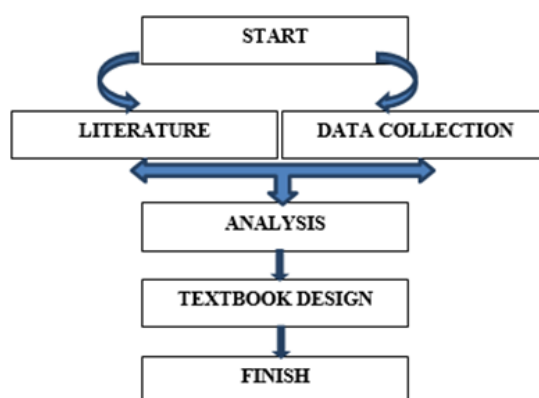


Fig. 1. Research Framework

4 Results And Discussion

To get the need for learning development, this research uses Root Cause Analysis (RCA). The RCA process examines the performance of the problem from the root cause layer by layer up to a minimum of five layers. It is significant to determine the main cause so that the need for solving the problem can be recommended, [6]Ryan Watkins, pp. 207-213.

In this study, the problem stems from the fact that students' skills do not develop in buildings according to the rules of Building Physics. So, this cause is examined layer by layer by exploring the respondents' opinions to get the root cause.

Based on the respondents' opinions analysis, we can identify the importance of developing teaching materials for Building Evaluation according to the rules of Building Physics. The RCA process is shown in the following Table 1.

Table 1. Main Root Cause Factors in RCA

No	Cause Factor 1	Steps of the Root Cause Map	Recommendation
1	Students' knowledge and skills do not develop related to healthy buildings according to the rules of Building Physics	<i>The way students think is fixated on concepts and theories only.</i>	<i>Changing the way students think so that their knowledge and skills develop</i>
No	Cause Factor 2	Steps of the Root Cause Map	Recommendation
1	Learning related to healthy buildings received is only in the form of concepts and theories	<i>Learning has not been developed to improve students' skills in facing building and environmental problems</i>	<i>Improve student skills on building problems</i>
No	Cause Factor 3	Steps of the Root Cause Map	Recommendation
1	Learning related to buildings so far has not improved students' skills related to building problems	<i>Learning has not been developed to improve students' skills in facing building and environmental problems</i>	<i>It is necessary to develop learning towards improving student skills through existing buildings</i>
No	Cause Factor 4	Steps of the Root Cause Map	Recommendation
1	Learning about healthy buildings according to the rules of Building Physics so far is not directed at surveying existing buildings	<i>Learning has not been directed to conduct surveys and evaluations of existing buildings so that students' skills in healthy buildings can improve</i>	<i>It is necessary to develop learning through building evaluation textbooks to improve students' skills in realizing buildings according to the rules of Building Physics</i>

For each recommendation, follow the rubric in the following Table 2.

Table 2. Rubric for Recommendations

Category	Not available	Less available	Moderately available	Available
Changing the way students think so that their knowledge and skills develop	<i>No application</i>	<i>There is application but very little</i>	<i>There is application but not continuously</i>	<i>Application is carried out continuously</i>
Improve student skills on building problems	<i>No application</i>	<i>There is application but very little</i>	<i>There is application but not continuously</i>	<i>Application is carried out continuously</i>
It is necessary to develop learning towards improving student skills through existing buildings	<i>No application</i>	<i>There is application but very little</i>	<i>There is application but not continuously</i>	<i>Application is carried out continuously</i>
It is necessary to develop learning through building evaluation textbooks to improve students' skills in realizing buildings according to the rules of Building Physics	<i>No application</i>	<i>There is application but very little</i>	<i>There is application but not continuously</i>	<i>Application is carried out continuously</i>

From the results of this analysis, the need for the required learning development, namely the need to develop learning through Building Evaluation textbooks according to Building Physics rules to improve student skills.

Furthermore, the design of the book contents' structure and framework is determined according to the competence of Building Physics to be achieved. According to Hugo, Building Physics is an applied science that studies hygrothermal, acoustic, and light properties related to building components (roofs, facades, windows, partition walls, etc.), spaces, buildings, and building installations, [2]Mohammad Kholid Ridwan, 2010. It can be interpreted that the purpose of Building Physics is to answer problems related to the influence of the building environment. Furthermore, there are three components in Building Physics, as stated by to Hugo, namely: hygrothermal, lighting, and building acoustics.

A house that functions as a decent and healthy place to live for its residents must have four main functions. They are 1). the house must protect its occupants against climate disturbances; 2). the house must provide a sense of security and tranquility for its inhabitants; 3). the house must be able to protect its occupants from disease transmission; 4). the house must be able to protect its occupants from outside disturbances, [7]Heinz Frick, 2005:1-2. Thus, the design of the building evaluation assessment for each aspect is carried out following these criteria.

5 Conclusion

Based on the analysis results, we can identify the main causes of the importance of developing learning activities. They are to improve students' skills in buildings. Therefore, learning needs to be directed to building evaluation. For this reason, it is necessary to develop a Building Evaluation textbook that is adjusted to the competencies according to the objectives of Building Physics.

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