



ROBOTICS AND THE CONSTRUCTIVISM APPROACH AS A MEANS OF INCREASING SELF EFFICACY

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ABSTRACT

Students who get hands-on experience have more confidence than students who only use simulations. Hands-on learning is an implementation of the constructivism approach in learning. The constructivism approach positions knowledge as a person's cognitive construction of objects or experiences, not just memorization. One of the learning media that supports the constructivism approach is to use robotics because the use of robotics gives students the experience of constructing knowledge through direct (hands-on) experience. Because of this, the use of robotics indirectly affects students' self-confidence in a more positive direction. With increasing student self-confidence, student self-efficacy also increases. This article aims to identify the use of robotics that uses a constructivist approach, self-efficacy on the use of robotics, and the relationship between constructivism approaches that use robotics and self-efficacy. The method used is a systematic literature review. The main findings show that the use of robotics using a constructivist approach has a positive impact on students' self-efficacy. This article provides scientific support that the use of robotics has a positive impact on learning.

INTRODUCTION

Robotics has been used in education for the past decade. The results of observations in recent years show that the popularity and interest in the use of robotics in education have increased drastically (Benitti, 2012). This is supported by the availability of robotics that can be used in the world of education which is also experiencing rapid development (Cruz-Martín, 2012). The use of robotics itself in higher education is usually used in the field of computer science or related engineering. Whereas in secondary school education it is usually used at extra-curricular times. Robotics tools that can be used in the world of education, for example, are the LEGO Mindstorms, Arduino-based robotics, and so on.

The success of using robotics in education is because robotics is considered attractive by students. After all, robotics provides hands-on experience and does something (3) rather than learning it through books or simulations. Besides, indirectly students become actively involved in learning. Learning that uses hands-on experience is part of learning that uses a constructivist approach. In this constructivism approach students are not only passive and accept the knowledge given by others, but students are active in seeking new knowledge and giving new meaning to the knowledge they learn (Pribadi, 2009).

In the constructivism, approach students are positioned at the center of learning and building their knowledge, while the teacher is tasked with leading them during the process of building knowledge. The most important goal in learning by using the constructivism approach is to enable students to learn deeply and more meaningfully (Rikers, 2008). Several studies have even shown that the implementation of the constructivism

approach has a positive impact on academic success. One of the basic factors that influence success in the learning environment is the self-confidence to complete tasks or self-efficacy (Uredi, 2015). Because the learning process does not only require students to have technical skills, but students are also expected to have a strong motivation to achieve good beliefs to get the desired learning achievement (Kurniyawati, 2012). This article can later be used as a basis that students who have learning motivation will be able to spend more time studying and be more diligent than students who have little or no learning motivation, which can be measured through self-efficacy. Furthermore, this self-efficacy variable can be used as a predictor of the independent variable of learning motivation.

The method used in this article is a systematic literature review method. The literature review is used to identify the relationship between the use of robotics using a constructivist approach to self-efficacy. The purpose of this article is to analyze findings regarding the effect of using robotics on self-efficacy and to provide scientific support that the use of robotics has a positive impact on learning.

RESEARCH METHODS

To conduct a systematic literature review in this article, the guidelines used and followed are those proposed by Okoli and Schabram (Okoli, 2010). The guide is divided into several steps as follows:

Step 1. Plan.

- 1.1. Determining the Purpose of a Literature Review
- 1.2. Setting Standards and Rules

Step 2. Selection.

- 2.1. Search for Literature
- 2.2. Screening of literature to be used

Step 3. Sorting.

- 3.1. Screening of unused literature
- 3.2. Information extraction

Step 4. Workmanship

- 4.1. Analyze findings
- 4.2. Write a Review

1. Plan

In this planning process, the objectives and standards of the rules used are determined. The goal has been determined whether the use of robotics affects self-efficacy. Then add a constructivism approach in the use of robotics.

2. Selection

This selection process includes determining keywords and filtering articles that will be used as a literature review material. The article database is used to find suitable articles. Then for keywords using 3 different keywords, namely self-efficacy, constructivism, and robotics. To limit the articles used are in the context of the world of education. Whether it's basic education, secondary education, or higher education.

3. Sorting

This sorting process is related to which articles are not used, then extracts the information. For the process of selecting articles that are not used, it is taken into account in the context of the research being carried out. Articles that contain predetermined but unrelated keywords in the world of education are not used as a literature review. For articles that have educational context and goals, but are not related to the level of primary education, secondary education, or higher education, they are not used as a reference for the results of this literature review. Then for the information extraction process used a matrix. The matrix contains the author of the article, the title of the article, the context of the article's research, the method used, the findings obtained, and the development for further research. The matrix is made to facilitate the process of combining information when it is in the working stage.

4. Processing

This process involves combining information and writing literature. The process of combining information is based on a matrix that has been created. Because based on the matrix, results will be seen that are aligned between the findings of the articles that have been reviewed and the objectives that have been set. Then write it in the form of

an article by considering the information that has been adjusted to the original goal. The expected result of combining this information is that the use of robotics has a positive impact on self-efficacy. The findings in this article can later be used as a consideration for the use of robotics in learning which can increase learning motivation through self-efficacy.

RESULTS AND DISCUSSION

One of the reasons for using robotics in education as an effective learning tool is because the use of robotics can help create a fun and interesting learning environment, thereby making students more interested and involved in learning. Robotics in education is seen as very enjoyable because it provides a direct learning experience (Eguchi, 2014) and makes students more active. With learning that involves and can encourage students to be more active, students are encouraged to gain deeper knowledge related to the subjects they are studying. This is in line with the definition of the constructivism approach, namely as a way of learning that aims to maximize student understanding. Constructivist-based learning allows students to be active in exploring knowledge and increasing understanding of the concepts being learned (Cruickshank, 2006).

The constructive approach itself has several characteristics including (1) Active learning. (2) The teacher has the role of a facilitator and provider of support who can assist students in carrying out knowledge construction. (3) Learning activities must be interesting and challenging. (4) Students must be able to relate new information to information they already have. (5) Students can reflect on the knowledge being learned (Cruickshank, 2006).

Student learning activities will take place more effectively if students are directly related to the object being studied. Students can learn and build their knowledge while trying to understand the environment around them. Bringing students in direct contact with the object or event being studied allows students to build a better understanding of the object or event being studied (Pribadi, 2009). So indirectly the use of robotics has applied a constructivist approach.

Woolfolk explained that one of the characteristics of learning planning that reflects the implementation of the constructivism approach is being courageous and able to face problems. Being brave and being able to face problems is closely related to self-efficacy. Although there are still few studies explicitly saying that the constructivism approach is related to self-efficacy, there are studies that find the results that the application of the constructivism approach has a positive association with self-efficacy (Uredi, 2015).

Self-efficacy is a person's belief that he can do a certain task well. Self-efficacy has effectiveness, that is, individuals can judge themselves as having the power to produce the desired effect. The high perceived self-efficacy will motivate individuals cognitively to act more directed, especially if the goals to be achieved are clear goals (Azwar, 1996). A person who has high self-efficacy will have more high learning motivation, the higher one's self-efficacy, the higher the learning motivation. This is reflected in the amount of effort put into it and the persistence in overcoming the existing obstacles. He will continue to do his duties and not easily give up and endure when he encounters difficulties. People who have high self-efficacy will try harder in overcoming the obstacles that exist.

For its relation to the use of robotics, self-efficacy has a positive impact. In the use of robotics, students become more confident in their problem-solving abilities. The result is that students who use robotics will feel a positive impact on their self-efficacy.

Table 1. The Relationship between Using Robotics and Self-Efficacy

Author	School Level	Result
Master et al. (2017)	Primary school	The results show that the use of robotics has a positive impact on student self-efficacy
Kaloti-Hallak et al. (2015)	Junior high school	Robotics has a positive relationship with self-efficacy
White (2017)	Junior high school and senior high school	The results show self-efficacy by using robotics.
Leonard et al. (2017)	Teacher of senior high school	Measurements of teachers show the use of robotics has a positive impact on self-efficacy.

Overall, as shown in Table 1, the use of robotics has a positive impact on self-efficacy. It does not only affect students, but the impact of using robotics on self-efficacy is also felt by teachers.

CONCLUSION

From the results of the review that has been done, the results obtained are that there is a positive relationship between the use of robotics on self-efficacy. Although explicitly the use of the constructivism approach

is not stated, implicitly the constructivism approach is used when using robotics learning media aids. Then for self-efficacy has a positive impact on the use of robotics. When only applying a constructivist approach, self-efficacy also has a positive impact.

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