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Roslani Supinah | Ishaq Nuriadin

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Analysis of Obstacles to Learning Mathematics Online in View of Constructivism Theory

Roslani Supinah^{*1}, Ishaq Nuriadin², Isha Bin Ahmad³

¹SMA Negeri 6 Tangerang Selatan, Tangerang, 15417, Indonesia

²Program Studi Pendidikan Matematika, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta, 13830, Indonesia.

³School of Education, Universiti Utara Malaysia, Keddah, 06010, Malaysia.

*roslani@smn6tangerangselatan.sch.id

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Abstract

Constructivism learning theory is very relevant to be applied in Indonesia because it has advantages that can be used as an innovative learning method. However, the constructivism learning model is still rarely applied, especially in mathematics learning so that the learning objectives are not achieved properly. This research was conducted to obtain comprehensive information on how constructivism theory is used in online mathematics learning and the obstacles faced. This can be useful to find out good new adaptations in implementing online mathematics learning in the future. In addition, it can be useful as an evaluation material for the application of constructivism theory in online mathematics learning in the future. This research uses descriptive analysis method with literature study technique. The constructivism theory referred to in this study is a constructivist learning theory that has been explored in the application of online mathematics learning into four parts, namely: a learner-centered learning environment, a knowledge-centered learning environment, an assessment-centered learning environment, and an assessment-centered learning environment. community-centred learning.

Keywords: *constructivism, learning mathematics, daring*

Abstrak

Teori belajar konstruktivisme sangat relevan diterapkan dalam pembelajaran di Indonesia karena mempunyai keunggulan yang dapat digunakan sebagai metode belajar yang inovatif. Akan tetapi model pembelajaran konstruktivisme masih jarang diterapkan khususnya pada pembelajaran matematika sehingga tujuan pembelajaran tidak tercapai dengan baik. Penelitian ini dilakukan untuk mendapatkan informasi yang komprehensif bagaimana teori konstruktivisme digunakan dalam pembelajaran matematika secara daring dan kendala yang dihadapi. Hal ini dapat bermanfaat untuk mengetahui adaptasi baru yang baik dalam menerapkan pembelajaran matematika secara daring pada waktu yang akan datang. Selain itu dapat bermanfaat sebagai bahan evaluasi penerapan teori konstruktivisme pada pembelajaran matematika secara daring di masa yang akan datang. Penelitian ini menggunakan metode analisis deskriptif dengan teknik studi kepustakaan. Teori konstruktivisme yang dimaksud pada penelitian ini adalah teori belajar konstruktivisme yang telah dieksplorasi dalam aplikasi pembelajaran matematika secara daring ke dalam empat bagian yaitu : lingkungan belajar yang berpusat pada peserta didik, lingkungan belajar yang berpusat pada pengetahuan, lingkungan belajar yang berpusat pada penilaian, dan lingkungan belajar yang berpusat pada komunitas

Kata Kunci: Konstruktivisme, pembelajaran matematika, daring.



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1. Introduction

Since the Covid-19 pandemic began to spread in Indonesia, almost all sectors have implemented work from home (WFH). This is done to prevent the transmission of the Covid-19 virus which continues to increase. The education sector also applies the same thing so that there is a change in the implementation of education from conventional methods to online learning (Amalia & Sa'adah, 2020). Another reason for doing online learning (in the network) is because of the demands of the industrial revolution 4.0 which also affects the world of education (Lubis & Lubis, 2021). The industrial revolution 4.0 expects students to have 21st century skills, namely collaboration, communication, computational thinking, and social/cultural competence (Voogt & Roblin, 2012).

The education system in Indonesia through the 2013 curriculum has basically adapted 21st century competencies (Andrian & Rusman, 2019). The education system in the country of Indonesia functions to improve capabilities, shape national character and civilization in order to educate the nation's life, and realize national goals. Paradigm developments in Indonesia are experiencing developments, one of which is by realizing the application of constructivism learning theory in the learning process (Nugroho, 2016). Constructivism theory used in online learning can make students more active and the teacher acts as a facilitator (Budyastuti & Fauziati, 2021).

Constructivism learning theory can be applied to learning mathematics in schools because it can be used as an innovative method. Applying constructivism learning theory in the learning process can also be used to increase activity so as to improve student learning outcomes (Nugroho, 2016). A constructivist approach to learning mathematics can also minimize students' learning difficulties (Simanullang, 2019). The theory of constructivism is based on theory and real experience that can increase activity and thinking skills so that constructivism is considered an appropriate learning model for online mathematics learning (Hulukati et al., 2021). This was also expressed by (Tahrin, 2021) that the development of learning models in virtual or online classes is very appropriate using constructivism learning theory. In fact, different things happen in the field, the constructivism learning model is still rarely applied, especially in learning mathematics (Hulukati et al., 2021). Lack of knowledge regarding the essence, benefits and how to apply the constructivism model makes online mathematics learning less effective so that learning objectives are not achieved (Hulukati et al., 2021).

Online learning is distance learning through media in the form of the internet and other supporting tools (Putria et al., 2020). According to Isman, online learning is the use of the internet network in the learning process (Dewi, 2020). Online learning is learning that utilizes internet networks with accessibility, connectivity, flexibility, and the ability to bring up various types of interactions in learning (Moore et al., 2011). By utilizing the online system, students have more flexibility in terms of study time,

learning can be done anytime and anywhere (Handayani, 2020). However, in reality, learning that is done online is not as maximal as learning that is done in class, especially in learning mathematics (Fauzy & Nurfauziah, 2021). Online mathematics learning has many drawbacks such as the lack of interaction between teachers and students which can slow down reasoning in the mathematics learning process (Utami & Cahyono, 2020). The use of complex applications and often constrained by internet network access will disrupt student learning activities (Utami & Cahyono, 2020).

Several studies have been conducted regarding online mathematics learning such as research conducted by (Mustakim, 2020), (Alyaa et al., 2020), (Arifin & Chotimah, 2021), (Ayus et al., 2021), (Siregar et al ... mathematics online and the obstacles encountered. This can be useful for knowing good new adaptations in implementing online mathematics learning in the future, this is in line with what was expressed by (Fauzy & Nurfauziah, 2021). Apart from that, it can also be useful as material for evaluating the application of constructivism theory to online mathematics learning in the future so that all related parties can work together to minimize existing obstacles.

2. Research methods

The method used is descriptive analysis using library research techniques. This technique seeks to collect data related to online mathematics learning in terms of constructivism theory through various literature. In the advanced stages, data processing or citation of references is carried out, presented as research results, abstracted into complete information, and interpreted into findings to draw conclusions. This is done in a systematic way to capture, evaluate, and summarize the existing literature (Creswell, 2010).

3. Results and Discussion

The theory of constructivism referred to in this research is constructivism learning theory which has been explored in online learning applications into four parts (Swan, 2005), namely: learner-centered learning environment, knowledge-centered learning environment, assessment-centered learning environment, and a community-centered learning environment. This is in line with the perspectives in constructivism according to (Suparlan, 2019), namely: exogenous constructivism which holds the view that there is influence of the outside world on the construction of knowledge such as experience in learning activities; endogenous constructivism which holds that knowledge develops through cognitive activity; dialectical constructivism which argues that knowledge can be obtained through interactions between friends, teachers, neighbors and the surrounding environment.

The first part is a learner-centered learning environment. Constructivism theory is a paradigm shift from behaviorism to cognitive theory. Piaget argued that constructivism is a system that explains how

students as individuals can adapt to increase their knowledge (Budyastuti & Fauziati, 2021). The constructivism school understands that students can build their knowledge from their own learning experiences (Gani, 2016). According to Paul Suparno (Suprijono, 2009) Piaget's knowledge construction is personal, individuals construct their own knowledge when interacting with experiences and objects encountered. Knowledge acquired by someone is the result of construction of an activity or action that relies on interaction with objects or experiences. One cannot construct knowledge without this process (Suprijono, 2009).

Student-centered learning must pay attention to correcting student misconceptions. Constructivism suggests that teachers must be able to help students build their thinking (Swan, 2005), in other words teachers must be able to make students active and act as facilitators in learning (Budyastuti & Fauziati, 2021). Brooks and Brooks revealed that in constructivism classes, teachers facilitate learning in terms of providing solutions or answers to students' questions and trying to make students able to express their respective perceptions and prepare a learning environment so that students can build a knowledge (Suprijono, 2009).

Online learning poses many challenges to the development of a learner-centered environment because interactions in learning are carried out online (Swan, 2005). Several studies related to student-centered learning environments have been carried out and obtained information that students predominantly experience problems with accessing the internet network due to places where the network is difficult to reach and constraints on weather factors as expressed by (Yulia et al., 2021), (Fauzy & Nurfauziah, 2021), (Andriyansah et al., 2021), (Sulistyo & Alyani, 2021), and (Yustitia & Kusmaharti, 2021).

Another obstacle that occurs is that the lecturer has good teaching materials during online learning but there are complaints about the presentation of videos taken from YouTube which are not made by the lecturers themselves and the presentation of teaching materials that are quite good is not in line with the understanding of students who find it difficult to understand the material without there is face-to-face (Zamista et al., 2020). The same thing was also expressed (Yustitia & Kusmaharti, 2021) that 50% of students could not understand the material properly in learning mathematics online.

Difficulties in understanding the material can be corrected by preparing the material properly using a variety of learning methods and media (Khairunnisa et al., 2021). This is intended to increase interest and motivation so that students participate actively in learning mathematics online. Parents are encouraged to continue to participate in building children's learning motivation and provide maximum assistance.

The second part is a knowledge-centered learning environment. In the development of constructivism theory, it is necessary to pay attention to the basic principles, namely prior knowledge/previous experience, namely prior knowledge that has been known by students and the Conceptual-change process, namely changes in thought processes that are constructed by other concepts so that they are more accepted in real situations. According to Agus Suprijono (Suprijono, 2009), constructivism's idea of knowledge is not limited to a description of the real world, but is the subject's activity in constructing reality. Knowledge is formed in the structure of one's concept. Subjects form the cognitive schemas, categories, concepts, and structures necessary for knowledge.

The use of online media indeed allows students to repeat material anytime and anywhere according to their own choice (Handayani, 2020). However, mathematics teachers are felt to be lacking in providing learning motivation to students as conveyed by (Sulistyo & Alyani, 2021). Students also find it difficult to understand math material because there is no direct explanation from the teacher and a lack of explanation from the practice questions given (Andriyansah et al., 2021). The existence of difficulties in online mathematics learning should be able to trigger teacher enthusiasm and motivation to carry out various innovations to present interesting, creative and fun learning and maximize the use of technology so that online mathematics learning can run as planned, this is in line with what was stated (Zamista et al., 2020) and (Yulia et al., 2021).

The solution that can be done is to make learning videos that are interesting, creative and fun by utilizing internet facilities so that the material provided by the teacher can be understood by students (Andriyansah et al., 2021).

The third part is an assessment-centered learning environment. Constructivism theory recognizes the importance of assessment and feedback. A good assessment is one that respects the knowledge construction process and emphasizes learning by understanding and applying students' knowledge (Swan, 2005). Many platforms provide assessment tools and process them so that the assessment becomes transparent for students. Brooks and Brooks revealed that in constructivism class, assessment is integrated during learning through portfolios and observations (Suprijono, 2009).

Research (Fauzy & Nurfauziah, 2021) reveals that 60% of assignments given by teachers are from textbooks, this is due to the limitations of teachers to explore and explain mathematics material more deeply in online learning.

The fourth part is a community-centered learning environment. Constructivism implies that learning is strengthened by an environment that supports and values the active role of all students, social norms encourage students to collaborate with one another (Swan, 2005). The obstacle faced in a community-centered environment is the low level of students' understanding of learning mathematics

due to the lack of interaction space between students and teachers so that teachers are not optimal in understanding students' academic conditions as expressed by (Fauzy & Nurfauziah, 2021) and (Utami & Cahyono, 2020). The teacher did not open the question and answer session so that students did not understand the material presented as stated by (Yulia et al., 2021). Students are more interested in learning in class because they can interact and ask questions directly with the teacher as expressed by (Andriyansah et al., 2021) and (Sulistyo & Alyani, 2021). Most students who are used to asking questions directly face-to-face sometimes have problems submitting questions in written form (Zamista et al., 2020). To overcome this obstacle, it is necessary to collaborate and support various related parties, namely students, parents, schools, teachers and stake holders so that learning can run well (Yulia et al., 2021).

4. Conclusion

The theory of constructivism referred to in this study is constructivism learning theory which has been explored in online mathematics learning applications into four parts, namely: a learner-centered learning environment, a knowledge-centered learning environment, an assessment-centered learning environment, and an environment community-centered learning. Each section has different obstacles that must be faced together. Lack of knowledge regarding the essence, benefits and how to apply the constructivism model makes online mathematics learning not work effectively so that learning objectives are not achieved.

The application of constructivism theory is still sought to run optimally in the online mathematics learning process because it can increase activity so that it affects student learning outcomes (Nugroho, 2016) and can also minimize students' learning difficulties (Simanullang, 2019). To deal with the obstacles and difficulties of learning mathematics online, it is necessary to collaborate and support from various related parties, namely students, parents, schools, teachers and stakeholders so that learning can run well (Yulia et al., 2021).

Identitas Penulis

Roslani Supinah

Email : roslani@sman6tangerangselatan.sch.id

Ishaq Nuriadin

Email : ishaq_nuriadin@uhamka.ac.id

Isha Bin Ahmad

Email : ishabin.ahmad@uum.edu.my

Konflik Kepentingan

Penulis menyatakan tidak ada konflik kepentingan

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