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By Lilik Anifah

Learning Strategies to Improve Computational Thinking in Problem Solving

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ABSTRACT

Computational thinking is an ability needed to face technological advancement and today's complex development. In the 21st century, through computational thinking students are guided to have critical, creative, communicative thinking skills and be able to collaborate in problem solving. With the right learning strategy, the goals of education in preparing students can be achieved. However, the achievement in learning to improve students' computational thinking is still unsatisfactory. This can be seen from the number of graduates who are currently unemployed due to a lack of skills or provisions in facing technological developments. In this case, an appropriate learning strategy needs to be applied. This article uses a literature study to find out appropriate learning strategies to improve computational wondering to remedy troubles of the research.

Keywords: *Learning Strategies, Computational Thinking, Problem Solving.*

1. INTRODUCTION

Advances in technology have led to the emergence of various abilities that become challenges in educational world, one of which is the ability to think computationally or computational thinking. The twenty first century additionally requires computerization in all fields. Computational questioning capacity become first added through Seymour Papert in 1980. Then Jeanette Wing added it once more in 2006. Computational questioning becomes a fundamental talent used through all people in the world in the mid-twenty first century (Wing, 2006). Wing defines computational questioning as an method to remedy issues, designing systems, and expertise human conduct through describing the fundamental standards in computing. According to Denning (2017) computational questioning is a concept method worried in formulating issues in order that their answers are represented as computational steps and algorithms that may be correctly accomplished through facts processing agents. According to Wing (2014) computational questioning is a concept method worried in formulating issues and expressing the answer in the

sort of manner that computers, human beings or machines can put into effect them correctly.

The traits of computational wondering in ISTE & CSTA (2011) include: 1) self-self belief in handling complicated troubles, 2) endurance in operating in handling hard and complex troubles, 3) tolerance for differences, 4) cappotential to remedy troubles openly, 5) the cappotential to speak with others in accomplishing dreams or locating answers to troubles. Computational wondering is a manner of knowledge and fixing complicated troubles with pc technological know-how strategies and ideas such as decomposition, sample recognition, abstraction and algorithms. These strategies and ideas are the abilities a good way to help training in 21 century. However, the fulfillment in gaining knowledge of to improve students' computational wondering continues to be low. This may be visible from the number of unemployed graduates because they do not have the skills or abilities that fit the desires of the arena of work. This may be visible via the boom in unemployment rates for excessive school, vocational excessive school graduates, even degree and college

graduates in 2019 (Central Statistics Agency, 2019). An appropriate gaining knowledge of approach can assist the manner of teaching and gaining knowledge of sports according with instructional dreams in the demanding situations of the twenty first century, namely computational wondering skills. Learning techniques are methods that will be used by teachers to select gaining knowledge of sports to be used in the course of the gaining knowledge of manner (Uno, 2008).

2. METHOD

This research employs literature study as an activity to collect information relevant to the topic used as the object of research (Notar & Cole, 2010). Data collection techniques are carried out by conducting studies on journals about learning strategies in improving computational thinking. The data obtained were described to get answers to the problems studied related to learning strategies in improving computational thinking.

3. RESULTS AND DISCUSSION

The increasingly rapid development demands the world of education to adapt to the existing developments. The demand for existing technological developments is the ability to think computationally. In his article on computational questioning, Wing (2006) argues that computational questioning represents universally everyday attitudes and talents that everyone, now no longer simply laptop scientists, could be open to analyze and use. Computational questioning is an important, essential, and absolutely twenty first century skill (Einhorn, 2012; Voogt et al., 2015; Wing, 2006). Computational questioning is a method to clear up troubles in a manner that may be carried out with computers. Students aren't handiest device customers however device maker. They use a hard and fast of concepts, inclusive of abstraction, recursion, and new release to manner and examine data, and to create actual and digital artifacts.

Computational questioning is a hassle fixing method that may be computerized and transferred and implemented to all topics in pc majors (T. Ball & B. Zorn, 2015) and non-pc majors (Chen & Zheng, 2017). Computational questioning is a concept manner this is wanted in formulating troubles and answers, in order that those answers can grow to be powerful facts processing marketers in fixing troubles (Wing, 2011). Computational questioning may be labeled into numerous concept processes, along with abstraction, set of rules design, decomposition, sample recognition, and facts representation (Sengupta et al., 2013; Wing, 2006). These strategies can resolve troubles, and are also essential for modeling, reasoning, and hassle fixing

in a big wide variety of medical and mathematical disciplines (National Research Council, 2010; Wing, 2006). The goal is to attain greater college students to expect the dearth of the facts technology workforce and also allow humans to make use of computational questioning to resolve troubles in any field (Barr & Stephenson, 2011). In his take a look at E. H. Cohen (2007) argues that maximum of the primary yr college students lack enjoy in hassle fixing skills. In this case, right mastering techniques main to multiplied computational questioning are indispensable.

The gaining knowledge of strategy is the design of teaching and gaining knowledge of sports withinside the lecture room finished through the trainer for you to assist college students attain gaining knowledge of goals. Dumford, Cogswell, & Miller (2016) state that a learning strategy is a special pattern or combination of various academic activities that students use to acquire knowledge and become an important component in successful learning. The purpose of learning is to obtain good learning outcomes, besides that students also have the ability or skills according to their respective fields or majors. Student ability is one of the focuses of educational reform and a key component of 21st century education (Geller, Son, & Stigler, 2017) which can be used as a basis for gaining problem-solving skills (Wismath, Orr, & Mackay, 2015). The benefit of solving this problem is to make students acquire the skills and attributes they need. The purpose of learning is not to focus on solving certain problems, but the skills and attributes that students acquire by solving these problems (Chen, 2017). A problem can be said to be a problem if it meets the following conditions: 1) Generalization: students can get a general approach by completing the assignment. 2) Moderate difficulty: questions that are too simple cannot improve students' learning abilities. Conversely, questions that are too complex are beyond

the ability of students to learn. 3) Decomposability: students can reduce the difficulty of problems, and this decomposition makes it easier for students to work together in solving problems. 4) Independence: Problems do not depend too much on certain backgrounds, which makes students unable to pay attention to the key part (Chen, 2017).

In this case, there are various studies that explain learning strategies that are suitable for problem solving (Yusof et al., 2012), namely 1) problem-based learning (PBL) that is an effective learning strategy (Yusof et al., 2012). Student-centered and PBL allow students to solve problems by observing and understanding real-world experiences through an active learning process (Chen, 2017). PBL is widely

applied **1** learning, and has a positive impact (Sugiharto et al., 2019). PBL is the right strategy to promote critical thinking skills and problem solving abilities because students are actively involved in dealing with significant problems (Yew & Goh, 2016). PBL makes use of a constructivist method, wherein college students attempt to resolve issues in regular existence in a collaborative surroundings (Mustofa, R.F & Hidayah, 2020).

1 The fundamental goal of the PBL method is to reveal college students the relevance of the problem be counted with the aid of using conveying an appropriate, sensible and sensible context (Alrahlah, 2016). 2) Project primarily based totally getting to know is a learner-targeted coaching technique (Bas, 2011). Project-primarily based totally getting to know is a coaching technique thru which college students are guided with the aid of using their trainer thru a step-with the aid of using-step hassle-fixing manner, usually: figuring out issues; increase plans; and whole the project (Mahasneh & Alwan, 2018). Project-primarily based totally getting to know technique is **3**ewise an interdisciplinary approach wherein college students have the possibility to examine, evaluate, and speak answers to real-existence issues in a acquainted study room surroundings. It enables college students to increase their information thru the manner of designing and constructing their projects (Erdem, 2002; Korkmaz & Kaptan, 2002. ; Schneider et al., 2002; Solomon, 2003), therefore permitting college students to resolve issues with lively participation (Doppelt, 2003). 3) Game-primarily based totally getting to know describes an surroundings wherein sport and sport content material complements the purchase of information and skills. Game sports contain hassle- fixing and mission areas that supply gamers / inexperienced persons a feel of accomplishment (Kirriemuir & McFarlane, 2004; McFarlane et al., 2002; Prensky, 2001; Li & Tsai, 2013). Examples of well-designed instructional video games encompass Quest Atlantis (Barab et al., 2009) and the

Radix Endeavor (MIT, 2014) wherein video games offer a complex, holistic hassle-primarily based totally surroundings which can guide lively getting to know, actual collaboration, and offer challenges and direct feedback (Gee, 2007; Squire, 2011). The improvement of cell instructional video games with the term "Mobile Game-Based Learning" (MGBL), which mixes cell getting to know (m-getting to know), particularly schooling thru packages on cell phones (Chung et al., 2019), and sport-primarily based totally getting to know. MGBL refers to the use of video games that embody instructional cost or numerous software program packages that use video games for instructional functions through cell devices. Mobile video games anticipate that gamers are concerned in sports, it may additionally encompass the choice to

research a skill, connect to different gamers (social interactions), and spend time in decided on evaluation units (Nikou & Economides, 2018). 4) Collaborative getting to know helps superior coaching and getting to know withinside the feel of growing a person's collaborative social interplay at some stage in hassle fixing, reflection, sharing information, and concept generation (Attaran et al., 2017; Kop & Carroll, 2011). In their study (Griffin et al., 2012; OECD, 2013) that the keys to collaboration are social and cognitive. Cognitive is usually associated with hassle fixing and impartial getting to know (Griffin et al., 2012; Zimmerman & Schunk, 2011) and consists of project law and information constructing. Social is targeted at the methods required for effective collaboration (OECD, 2013) for example (Hesse et al., 2015) participation, angle taking, and social law.

In addition to mastering strategies, we additionally want to pay attention to the evaluation tools used so that mastering goals in enhancing computational wondering are achieved. In his study (Werner et al., 2012), he believes that the development of evaluation tools is the key so that computational wondering may be covered in education. 1)J. Moreno-I et al (2015) proposed a Web software "Dr. Scratch" that may robotically examine college students' Scratch programming undertaking data. Scratch is an internet visible programming language evolved via way of means of the MIT Media Lab. Users can create on line initiatives and create whatever via way of means of coding with easy blocks. 2) LOGO is a pc programming language that is easy to research and use. Students can use it to attract patterns, rely and emit sound, and it's also a brand new manner for simple faculty college students to research pc programming language. 3) C is an critical pc programming language and unique device instruction, which offers a bridge to embed and operate systems with various types of software software. 4) C ++ is a compiled language, with implementations to be had on many platforms. The performance and versatility of C ++ is likewise beneficial in lots of different contexts. 5) AgentCubes is an academic programming language for children to create 3-d and 2D on line video games and simulations. It is a device to educate kids approximately computational wondering via video games and simulation designs primarily based totally at the Scalable Game Design curriculum. Scalable Game Design is a curriculum for mastering approximately computational principles at the extent of computational wondering applicable to recreation layout and computational science.

4. CONCLUSION

From the effects of this literature take a look at it became located that maximum of the studies that were carried out formerly used the Problem Based Learning, Project Based Learning, Game Based Learning and Collaborative Learning techniques. In addition to getting to know techniques, there are additionally evaluation tools that can be used to enhance computational questioning, particularly Dr. Scratch, LOGO, C, C ++, and AgentCubes. Most studies focuses on programming skills training and there are additionally research that permit college students to control and examine cloth with computational questioning.

Efforts to pick out getting to know techniques and coaching media are meant to attain the needs of the twenty first century improvement requiring computerization. According to Wing (2014), computational questioning is a thought process that is involved in formulating troubles and expressing answers in this kind of manner that computers, human beings or machines can enforce them effectively.

AUTHOR'S CONTRIBUTIONS

Rosita, S.Pd is responsible for all activities, composing articles and presenting articles at seminar activities. Prof. Dr. Ekohariadi, M.Pd, Dr. Lilik Anifah , S.T., M.T, Dr. Tri Rijanto, M.Pd., M.T, Pro. Dr. H. Munoto, M.Pd, and Prof. Dr. Hj. Lutfiyah Nurlaela, M.Pd helped review and discuss the articles compiled.

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