Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.11, No.28, 2020

The Analysis of Student's Science Metacognition Ability in Information System and Computer Technology Courses

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Abstract
This study aims to analyze and describe students' scientific metacognition abilities in the Computer Information Technology Course. Through a quantitative approach, data collection using a survey model and involving 156 students at the State Islamic University of Sulthan Thaha Saifuddin Jambi and the Islamic Institute of Nusantara Muara Bulian. Based on the data and discussion, it can be seen that in general, students' science metacognition ability is in the "medium" category as much as 48.62%, the "high" category is 40.38%, and the "low" category is 11%. More in-depth data analysis shows that the ability to identify problems (128,20), plan learning activities (152,88), and make conclusions (156,26) is in the "high" category. The ability to consider the implications of a concept (112,53), construct the relationship between previous knowledge and the knowledge to be studied (113,14), monitor every step to be taken (96,27), and identify sources of error (88,87) is in the "medium" category. Meanwhile, the ability to identify concepts with an average score (78.52) is in the "low" category. Therefore, these abilities and skills must remain the attention and focus of educators (teachers and lecturers) in using appropriate learning models to improve scientific metacognition skills, including learning courses in information technology and computer systems and others.
Keywords: Science Metacognition, Computer Information Technology
DOI: 10.7176/JEP/11-28-11
Publication date: October 31st 2020

Introduction

Metacognition is thinking about what is being thought, including self-regulation that involves emotions (Widoretno, Ramli, and Dzaky, 2016). Metacognition ability is the ability to think about how to learn (Amrulloh and Ardhi, 2017). Metacognition is a cognitive process regulation that is very supportive of student learning activities (Hamimah and Kartika, 2019). Metacognition is one of the higher-order thinking skills. Metacognition refers to the knowledge that people have about their thought processes (Mahmood et al., 2016). Metacognition is related to a person's awareness of their thinking and the ability to regulate their thinking in learning or solving problems (Anggo, 2012).

Metacognition abilities, including metacognition knowledge and skills that are oriented to increase awareness of students' thinking abilities in controlling the learning/work they do (Hapsari and Widodo, 2016). According to (Lai, 2011) metacognition consists of two components: knowledge and regulation. Metacognitive knowledge includes knowledge about oneself as a learner and the factors that can affect performance, knowledge about strategies, and knowledge about when and why to use strategies. Metacognitive regulation is the monitoring of a person's cognition and includes planning activities, awareness of understanding and task performance, and evaluation of the effectiveness of monitoring processes and strategies.

When associated with science, metacognition-science is a person's ability and awareness of his thinking and the ability to regulate his thinking in learning science or solving problems related to science. Referring to the opinion of Permanasari (2016) that science plays an important role in preparing students who have scientific literacy, namely who can think critically, creatively, logically, and take the initiative in responding to issues in society caused by the impact of the development of science and technology, science metacognition It can also be understood as awareness to think about how to develop scientific thinking skills, namely: thinking critically, creatively, logically, and taking the initiative in responding to issues in the community. Wang, Cao, and Wang (2020) and Nuñez, Pauchard, and Ricciardi (2020) in the study also mentioned that the ability of science also plays a role in preventing the spread of the CORONA-19 virus.

Based on the description above, it can be understood that metacognition-science is a very important ability,

and must be the main orientation of the educational process. Mistianah, Corebima, and Zubaidah, (2014) state that metacognitive skills are very important in learning and are a determinant of academic success. According to research by Syarifah, Indriwati, and Corebima (2016), it shows that there is no difference in metacognitive skills between female and male students. According to Riyadi, Sunyono, and Efkar's (2018) research, the relationship between metacognition and self-efficacy is very strong, positive, and significant. Besides, the results of research by Kurniawati, Leonardi, and Airlangga (2013) also show that metacognition greatly affects student academic achievement and as a driving force for developing critical thinking skills (Magno, 2010). Metacognition skills are also closely related to problem-solving skills (Novita, Widada, and Haji, 2018). Hong (2016) also states that metacognition is important in learning because it is closely related to motivation, wandering thoughts, and creativity. Therefore Hacker, Bol, and Matt C (2015) state that metacognition plays an important role in the educational process. This is also proven by the research of LaCaille and Maslowski (2019) that metacognition plays a very important role in the achievement of learning competencies.

The importance of metacognition-science has not been fully understood by the public, including teachers. The survey results show that there are 11.37% of teachers who have developed metacognition skills, while 88.63% have never developed metacognition skills (Hapsari and Widodo, 2016). This proves that metacognition-science still has to be discussed and developed so that society in general can understand and develop these abilities, including knowing how to measure them. Experts have developed many ways to measure metacognition, one of which is the Metacognition Awareness Inventory (MAI) which is an assessment to measure metacognition awareness as used to measure metacognition skills (Mistianah et al., 2014) and (Widoretno et al., 2016). By looking at this situation, developing scientific metacognition skills is one of the important points in the educational process.

In today's contemporary and modern era, often referred to as the digital era, computers and the internet have become necessities and as one of the most popular sources of information among academics and students and the wider community because they can offer easy, fast, and easy access to information. an almost unlimited number. Therefore, the ability to access and use digital information requires adequate knowledge and abilities. This digital capability is known as digital literacy. This is as stated by Nurjanah, Rusmana, and Yanto (2017) that digital literacy is the ability to understand and use information in various formats that come from various digital sources displayed via computers. This is also reinforced by Maulana (2015) that digital literacy is the ability to use and understand the use of communication and information technology. Besides, A'yuni (2015) also wrote that digital literacy is the ability to understand and use information from various digital sources. Digital literacy is a knowledge base supported by integrated information technology (Mustofa and Budiwati, 2019). Digital literacy is a concept that talks about relevant literacy and competency-based literacy and technology, communication skills, but emphasizes better information evaluation skills (Wahono and Effrisanti, 2018).

According to Maulana (2015), Digital literacy has many benefits, for example being able to find valuable information to make better decisions. On the other hand, if we refer to the important elements of digital literacy, digital literacy also includes many other abilities, for example how to maintain privacy in the online world, understand all types of cybercrime such as online theft via credit cards (carding), recognize the characteristics of fake websites (phishing), email fraud, and so on. Thus, it can also be said that digital literacy competencies are used to deal with the information explosion due to the emergence of the internet (A'yuni, 2015). Digital literacy is very important and it is the duty of all of us, including parents, to provide extensive knowledge about the information contained in the media and the internet (Wahono and Effrisanti, 2018). Therefore, for those who are not literate about digital systems, in addition to being left behind such information quickly, it can also have a negative impact. As stated by Kurnianingsih, Rosini, and Ismayati (2017) that the lack of information literacy skills among students has a bad impact, one of which is a large number of plagiarism of copyrighted works that occur in the school academic environment. Besides, digital literacy is also intended to reduce problems as a result of the development of internet technology such as hoaxes or fake news, violations of privacy, cyberbullying, violent and pornographic content, and digital media addiction (Kurnia and Astuti, 2017).

Mustofa and Budiwati (2019) state that there are nine important elements in the world of digital literacy, namely: social networking, transliteration, maintaining privacy, managing digital identity, creating content, organizing and sharing content, reusing/repurposing content, filtering and selecting content. Besides, Mardina (2017) also states that the development of information literacy material is multiliteracies, which includes literacies such as digital technology, information, multimedia, visuals (images), audio, critical thinking, and understanding ethical, moral issues. legal, social and cultural aspects that surround the digital environment, as well as how to participate in online communities politely and responsibly.

According to Kurnia and Astuti's research (2017) that universities are the main actors in the digital literacy movement in Indonesia, public speaking forums are the most digital literacy activity, the main target group for digital literacy is youth and schools are the best partners in digital literacy activities. Therefore, one of the efforts to improve digital literacy skills in higher education is through the Computer Information Technology course. At the State Islamic University of Sulthan Thaha Saifuddin Jambi and the Nusantara Islamic Institute, Jambi, these courses are compulsory for all students. In this way, it is hoped that students' digital literacy levels can be improved

properly.

Referring to the explanation above, the focus of this research is to analyze how the scientific metacognition abilities of students at the State Islamic University of Sulthan Thaha Saifuddin Jambi and Nusantara Islamic Institute, Jambi on Information Systems and Computer technology recovery. Knowing the profile of the results of this analysis can provide an accurate picture of the achievement of indicators in scientific metacognition. The description of the achievement of scientific metacognition indicators can be used as a basis for decision making for lecturers in using the right learning model so that the indicators that have been achieved can be maintained and those that have not been achieved (low) can be improved. Therefore, this research is considered very strategic and contributes very important in developing scientific metacognition skills as an integral part of efforts to improve thinking skills to achieve good academic achievements and foster scientific attitudes in each individual.

Method

This research was conducted using a quantitative approach, with the data collection method is a survey. This is as stated by Sugiyono (2017) that the quantitative approach is a method used to answer research problems related to data in the form of numbers and statistical programs. This study involved 156 students at the State Islamic University of Sulthan Thaha Saifuddin Jambi and the Nusantara Islamic Institute, Jambi-Indonesia who had attended the Information Technology and Computer Systems course.

Measurement of scientific metacognition ability using instruments based on scientific metacognition indicators, which includes the ability to: identify problems, identify concepts, consider the implications of a concept, construct the relationship between previous knowledge and the knowledge to be studied, plan learning activities, monitor every step taken. Will be done, identify the sources of error, and make conclusions (Anita & Assagaf, 2019). Overall, each indicator used uses a scientific context, which is related to the course of information systems technology and computers. Thus, there are eight indicators measured in this study. Each indicator includes five different questions using answers on a scale of 1-4 (Likers scale). Therefore, the maximum score a student will get is 160 points and the lowest score is 40 points.

Data analysis was carried out based on the scores obtained by the students in answering the instruments provided. Based on the scores that have been obtained, each student is grouped into three categories, namely: high ability, medium ability, and low ability. Furthermore, based on these scores will also be analyzed based on the score obtained for each indicator variable. Thus it will be known which indicators are still relatively weak and which indicators are already good. The next analysis was to correlate between variables, namely scientific metacognition with students' digital literacy abilities. This aims to find out where the relationship between the two variables is. Correlation analysis was carried out using SPSS 25 software so that the analysis results were more convincing.

Result and Discuss

Based on the data obtained from the instruments that have been answered by all respondents, namely 156 respondents, then the data analysis is carried out as planned. Based on the results of the data analysis that has been done, the following information is obtained:

Table 1.Categories of Students' Science Metacognition Ability

No	Category	Range of Score	Number of Students	Percentage(%)
1	High	122-160	63	40,38
2	Moderate	81-121	76	48,62
3	Low	40-80	17	11
	Total		156	100

Based on Table 1 above, it can be seen that in general, students' science metacognition abilities are in the medium category, namely as much as 48.62%. Next are students with high science metacognition abilities as much as 40.38%. The students with the low category were 11%. The data above shows that in general students can: identify problems, identify concepts, consider the implications of a concept, construct the relationship between previous knowledge and the knowledge to be studied, plan learning activities, monitor every step to be taken, identify sources of errors, and make conclusions (Anita & Assagaf, 2019) in the process of lecturing information technology and computer systems.

Furthermore, in more detail and in-depth analysis of the ability of scientific metacognition is carried out. This aims to find out more deeply about each indicator of scientific metacognition so that the best steps can be taken against indicators with certain categories. The results of the analysis of each indicator on scientific metacognition ability are as follows:

Table 2. Science Metacognition Ability on Each Indicator

No	Indicators	The number of Subjects (N)	Rata-rata	Category
1	Identify the problem	156	128,20	High
2	Identify concepts	156	78,52	Low
3	Consider the implications of a concept	156	112,53	Moderate
4	Constructing the relationship of previous knowledge with the knowledge to be learned	156	113,14	Moderate
5	Planning learning activities	156	152,88	High
6	Monitor every step that will be carried out	156	96,27	Moderate
7	Identify the sources of the error	156	88,87	Moderate
8	Make a conclusion	156	156,26	High

Based on table 2 above, namely the analysis of indicators on the ability of scientific metacognition, it is known that the high category average score is an indicator of identifying problems (128.20), planning learning activities (152.88), and making conclusions (156.26). This data shows that students have good abilities in all three things while studying information technology and computer systems. Therefore, the ability of these indicators needs to be maintained.

Furthermore, based on Table 2 above, it is also known that the science metacognition ability of students in the "medium" category is the indicator considering the implications of a concept (112,53), constructing the relationship of previous knowledge with the knowledge to be learned (113,14), monitoring every step to do (96,27) and identify the sources of the error (88,87). This shows that some students still have difficulty considering the implications of a concept, constructing the relationship between previous knowledge and the knowledge to be learned, monitoring every step to be taken, and identifying sources of errors. However, some of them already have good abilities in this regard. Thus, the capabilities of this indicator still need to be improved.

Referring to table 2 above, it is also known that the lowest ability category is to identify concepts with an average score of 78.52. If linked to table 1 above, it can be said that 17 people, or about 11% of students still have difficulty identifying concepts in learning information technology and computer systems. Therefore, this should be of particular concern for lecturers to take constructive steps so that the student's abilities improve.

Discussion

Based on the data that has been obtained as can be seen in tables 1 and 2, it can be understood that there are still students who are in the "high" category of 40.38%, "moderate" which is 48.62% and the "low" category. as much as 11%. This shows that in general students can: identify problems, identify concepts, consider the implications of a concept, construct the relationship between previous knowledge and the knowledge to be studied, plan learning activities, monitor every step to be taken, identify sources of errors, and make conclusions (Anita and Assagaf, 2019) in the process of lecturing information technology and computer systems, although some of them are still experiencing difficulties.

Based on the data in table 2 above, namely the analysis of indicators on the ability of scientific metacognition, it is known that the high category average score is an indicator of identifying problems, planning learning activities, and making conclusions. This data shows that students have good abilities in all three things while studying the information technology and computer systems course. These three abilities are very important elements in supporting one's success. The ability to identify problems is the first step in solving problems. Therefore, people with the ability to identify the problem are good, they will tend to have good skills in solving problems. The ability to solve problems is the core of learning which is a basic skill in the learning process (Hidayat and Sariningsih, 2018). Even the ability to solve problems is one of the main goals in education and has been formulated in government regulations (Mawaddah and Anisah, 2015). Likewise, in terms of the ability to plan learning activities and make conclusions, those who can plan to learn well will tend to get good results, while those who fail to plan to learn will get bad results. In the context of education, the ability to plan learning activities and is the first step towards success, while making conclusions is strong evidence that someone has understood something and is ready to do something. According to Syarifah, Usodo, and Riyadi (2018), these three abilities are included in critical thinking skills. Therefore, the ability of these indicators needs to be maintained.

Furthermore, based on the data in Table 2 above, it is also known that the students' scientific metacognition ability in the "medium" category is the indicator considering the implications of a concept, constructing the relationship of previous knowledge with the knowledge to be studied, monitoring every step that will be taken and identifying sources error. This shows that some students still have difficulty considering the implications of a concept, constructing the relationship between previous knowledge and the knowledge to be learned, monitoring every step that will be taken, and identifying sources of errors. However, some of them already have good abilities in this regard. Thus, the capabilities of this indicator still need to be improved.

The ability to consider the implications of a concept, construct the relationship between previous knowledge

and the knowledge to be learned, monitor every step that will be taken, and identify sources of error is part of the ability to think creatively. This is because this ability is identical to thinking skills (cognitive) and its ability to find new solutions to problems, including identifying difficulties and sources of problems in learning activities. Mardhiyana and Sejati (2016) state that someone who thinks creatively can use their cognitive skills and abilities to find new solutions to a problem. These solutions can be in the form of new and valuable thoughts and ideas, which are obtained from the results of describing, refining, analyzing, and evaluating. For this reason, there must be concrete efforts to increase this capability.

Some concrete efforts to improve creative thinking skills based on research results include applying open-ended problem-based learning (Noer, 2011), (Ikromi, 2018) using Eliciting Activities Model learning (Firdausi and Asikin, 2018), learning based on problem posing or asking questions (Siswono, 2004) and (AM and Rohaeti, 2014), Learning Learning Based on Higher Order Thinking Skills (Sani, 2019). Therefore, these abilities and skills must remain the attention and focus of educators (teachers and lecturers) in using these learning models to improve creative thinking skills to achieve scientific metacognition abilities including learning courses in information technology and computer systems and others.

As shown in Table 2 above, the lowest ability is to identify concepts with an average score of 78.52. If it is related to table 1 above, it can be said that 17 people, or about 11% of students still have difficulty identifying concepts in learning information technology and computer systems. Therefore, this should be of particular concern for lecturers to take constructive steps so that the student's abilities improve. The ability to identify concepts is a very important part of studying science. Those who fail in identifying the concept will cause misconceptions. This is in line with Laksana's (2016) explanation that misconception is the notion of a concept that is not right, wrong in using the concept of a name, wrong in classifying concept examples, doubts about different concepts, inappropriate in connecting various kinds of concepts in the hierarchical arrangement or making generalizations of a concept that is excessive or unclear. Meanwhile, according to Astuti, Redjeki, and Nurhayati (2016), the misconceptions experienced by students are very detrimental to their learning progress and success.

As stated by Medina, Castleberry, and Persky (2017), instructors can help students develop metacognitive skills in the classroom and experience settings by carefully designing learning activities in courses and curricula. To improve the ability to identify concepts and overcome the possibility of misconceptions in students, accurate learning steps are needed. According to Fadllan (2016), cognitive conflict-based learning can be used as an alternative in curating and overcoming student misconceptions. Juhji (2017), one of the efforts that can be made in overcoming misconceptions is by implementing concept map-based learning. Meanwhile, according to Gita, Murnaka, and Sukmawati (2018) Application of the Conceptual Understanding Procedures (CUPS) Learning Model can also overcome the possibility of student misconceptions. Thus it can be understood that the ability to identify concepts can be improved with appropriate learning models. Besides, lecturers and teachers also need to consider the learning styles of students to provide better opportunities for optimizing scientific metacognition (Samsudin and Hardini, 2019).

Conclusion

Based on the data and the division as done above, it can be seen that in general, students' scientific metacognition abilities are in the medium category, namely as much as 48.62%. Next are students with high science metacognition abilities as much as 40.38%. The students with the low category were 11%. More in-depth data analysis shows that the ability to identify problems (128,20), plan learning activities (152,88), and make conclusions (156,26) is based on the high category. The ability to consider the implications of a concept (112,53), construct the relationship between previous knowledge and the knowledge to be studied (113,14), monitor every step to be taken (96,27), and identify sources of error (88,87) is in the "medium" category. Meanwhile, the ability to identify concepts with an average score (78.52) is in the "low" category. Therefore, these abilities and skills must remain the attention and focus of educators (teachers and lecturers) in using appropriate learning models to improve creative thinking skills to achieve scientific metacognition abilities including learning courses in information technology and computer systems as well as other.

Acknowledgment

High appreciation and sincere thanks are conveyed by the authors to all parties who have contributed to this research, especially to all respondents in this study. Furthermore, the researchers hope that the results of this study will be able to make a positive contribution to the development of science, especially in the field of education.

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