



# **Analysing Metacognitive Strategies Used in Reading Scientific Article: A Case Study of EFL University Students**

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## **Abstract**

In the process of reading, students have to be aware, think what difficulties that they always encounter, and think the strategies used in reading known as metacognitive awareness. Hence, this study is necessary to analyse students' perceptions about reading in English and their ways to cope with the problems by assessing their own metacognitive strategies. This study applies case study of qualitative approach with 39 first year of EFL university students. The results indicate that 58,97% students like reading because it can boost their understanding in vocabulary, sentence structure, language skills, academic achievement, and speaking English properly. There are no difficulties encountered in reading English since it is fun, easy to understand and give them new knowledge. While the rest, 41,02% students explained different experiences since they perceived reading English is boring and a bit difficult in case of pronunciation and words, but it is needed in students' job. While the most frequent strategies used in metacognitive awareness of reading are (*when the text becomes difficult, I re-read to increase my understanding*), (*I read slowly but carefully to be sure I understand what I am reading*), and (*I try to get back on track when I lose concentration*). In sum, most students like reading because it supports their academic achievement, and the metacognitive strategies are helpful for students to evaluate their ability in comprehending the of scientific article for future improvement.

**Keywords:** *metacognitive; strategies; scientific article; EFL*

## Introduction

Reading is a receptive skill that students have to receive many new things to know and understand the information. In case of reading, foreign learners usually encounter many obstacles in understanding or comprehending the English reading whereas the final goal of reading is comprehension (Nation, 2019). Reading arranges communication, language learning, and the exchange of ideas and information (Salsyabillah. M et al., 2025) which is a synchronous process of extracting and constructing meaning while interacting with texts and it is fundamental skills in the process of language learning (Pahrizal et al., 2025; Kharisma et al., (2023) .

The processes of language learning mean that there are varied strategies in reading that students have to comprehend the text well such as how to know the main idea, references, supporting details, conclusions, and various vocabulary. They have to enrich and store vocabulary to translate the words, clauses, sentences, and understand the whole text. One sentence can result numerous meanings depending on the comprehensions which are constructed by the readers. Bria & Mbato, (2019) declared that reading comprehension is a memory construction which classifies comprehension as the consistency for the reader to construct the idea based on one's intention and the correlation between the reader's interpretation and the interpretation intended by the authors.

The reading activity applied in classroom does not only for answering questions, but students have to be able to summarize and retell what they have read and comprehended using their own statements (Al Aziz & Yusanti, 2020). Therefore, comprehending a text is much important for foreign learners to result the understandable and logical meanings using the appropriate reading strategy.

However, foreign learners usually encounter many obstacles in comprehending the English reading because reading activity is rarely done through the process using the reading strategies in class instead of only answering the questions from the text. Reading strategies are necessary as a monitoring system which involve the reflection of readers' reading processes, awareness of their interaction with text, and understanding on how reading strategies relate to text comprehension (Pahrizal et al., 2025). Yudhodibroto (2024) stated that reading is considering and understanding the meaning in written form because it is one of the basic language learning skills which needs to interpret the meaning through context and develop students' thinking learning processes to comprehend the whole text and collect new information through a text (Pahrizal et al., 2025).

Having good skill in comprehending readings will be helpful for someone to be successful (Pahrizal et al., 2025 and Salsyabillah. M et al., 2025). Until nowadays, reading is still becoming a difficult skill to master for EFL students since students have low motivation in literacy activity and English scientific literatures to read and inherent complexity of the text they have to read which can hamper their understanding and engagement with material (Salsyabillah. M et al., 2025). Reading activity can be started by exposing students to texts they like such as short story

books and continuing to school English modules and scientific articles to make students used to reading various texts such as using media which are created by teachers or using digital media such as digital books.

It is attractive, colourful, and interesting with various titles provided. Different kinds of text also need different strategies such as scientific articles, story books, modules, and various kinds of book. In case of scientific articles, it is highly recommended for college students to be the best references as the journals are trusted and it is the result of research (Novarita, 2023). Scientific literature will help one understand what has already been discovered and what questions remain (Subramanyam, 2013). Students are suggested to have various prior knowledge of the text to be able to comprehend the text as stated by Pahrizal et al., (2025) that accurate comprehension happens when the reader's knowledge and skills match the characteristic of the text and reading activity.

In the process of reading, students have to be aware, think what difficulties that they always encounter, and think the strategies which can be appropriately used in reading. It is known as metacognitive awareness in which the practice of reading cannot be detached from the role of metacognition (Deliany & Cahyono, 2020). Metacognitive is one of the important aspects in determining reading comprehension (Deliany & Cahyono, 2020) because it is thinking about thinking (Safitri et al., 2024) or cognition about cognitive phenomena, and concerns on how an individual knows what they know (Hayat et al., 2023). Metacognition is having knowledge of the individual's characteristics, the nature of cognitive process to be accomplished, and the structure of the strategies chosen as a solution to the task (Babayigit, 2019).

Metacognition is required in the learning process to achieve good cognitive ability when analysing difficulties, identifying, choosing solutions, and evaluating the whole problem solving processes (Safitri et al., 2024) as cited by Salsyabillah. M et al., (2025) in (Mevarech & Fridkin, 2006) that metacognitive is crucial due to involving the planning, monitoring, and evaluating someone's process of learning. Yudhodibroto, (2024) as cited in Wilson and Conyers (2016) explained that metacognitive is as the ability to comprehend about the learning process, be conscious of the factors affecting intellectual performance, know how, when, where, and why to use certain strategies as the adjustment the student's learning performance.

Metacognitive skills are seen as someone's knowledge to control their ability in arranging, monitoring, and re-examining their understanding and action in solving a problem (Ijirana & Supriadi, 2018). In cognitive psychological theory, metacognition is seen as a form of someone's awareness of cognition, how its cognition works, and how to regulate it (Ramadhanti & Yanda, 2021) as cited in Flavell (1979). Metacognition focuses on words of awareness and monitoring, and evaluation (Mahamde et al., 2021) that are related to regulating self-regulated about knowledge. Metacognition can be stated as a way to take a look inside ourselves for

assessing the ability of current problems as stated by (Danar et al., (2023) that assessment is a process for receiving information in any form that can be utilized as a basis for making decisions.

Metacognition confirms that the students are able to create meanings from texts as well as to respond on these thought processes and recognize strategies related to reading using their intellectual activities, actions, aims, and experiences (Irfan et al., 2019). It is students' duty to solve the difficulties challenged in reading scientific article to be able to reach good outcomes as University students are expected to be able to read more texts as the obligation to search various references. It is also beneficial for underachieving students which can improve their reading ability to the level of high-achieving students and show that metacognition can aid close to the achievement gap in English learning (Salsyabillah. M et al., 2025).

To improve students' metacognitive awareness in reading activity, Metacognitive Awareness of Reading Strategies Inventory (MARSI) strategy is helpful to use such as MARSI version 1.0 from (Mokhtari & Reichard, 2002). It is not intended to be used as a measurement for students' comprehensive monitoring capabilities instead of designed as a tool for helping students to increase metacognitive awareness and strategy while reading. This can increase students' awareness of their own reading strategies and the information can make them evaluate about reading from the text. Likewise, the information from MARSI can provide a useful means for teachers to assess, monitor, and document the types and number of the reading strategies used by students.

The purpose of MARSI also is to assess students' metacognitive awareness or perceived reading strategies when reading texts for academic purposes. The MARSI 1.0 measures three broad categories of strategy namely (1) Global Reading Strategies (*Glob*), (2) Problem-solving Strategies (*Prob*), and (3) Support Reading Strategies (*Sup*). *Glob* can be thought of as generalized or global reading strategies aimed at setting the stage for the reading act such as setting purpose of reading, previewing text content, predicting what the text is about. *Prob* is placing and focusing the problem-solving or repair strategies used when problems emerge in understanding textual information such as checking the understanding when encounter the difficult information and re-reading the text for better understanding.

The last is *Sup* for providing the support tools aimed at sustaining responsiveness to reading such as using reference materials in case of dictionary or other supporting tools. MARSI 1.0 instrument can be utilized to large subject populations representing students with equivalent reading abilities ranging from middle school to college, so that this is expected to be able to be applied for EFL University students.

There have been extensive previous researches on metacognition in reading in the world of education such as a study revealed by Bria & Mbato, (2019) who used metacognitive strategies for undergraduate and postgraduate students in reading. The findings showed that both levels of students made use of metacognition

strategies although postgraduate students exposed more metacognitive strategies and maturity in reading. In line with Bria and Mbato (2019), Irfan et al., (2019) also carried out a research of metacognitive awareness of reading for University students in which Metacognitive Awareness of Reading Strategies significantly predicts academic achievements of University students.

Another study of metacognitive strategy on reading was from Yudhodibroto, (2024) who found that students mostly used *PSS* (Problem-Solving Strategy) in metacognitive awareness using MARSIR. Different from kinds of previous studies above, this current study is analyzing metacognitive strategies in EFL University students especially for scientific article using MARSIR 1.0 in which some previous studies previously had not taken the specific genre of reading text as this current study. This current study also is not only classifying students' metacognitive awareness of reading strategy used in reading scientific article, but also finding out students' perceptions about reading in English.

Therefore, this study is necessary to analyse: (1) How are students' perceptions about reading in English? (2) What are students' metacognitive strategies used in reading scientific article? To know students' perceptions about reading in English and their ways to overcome the problems by assessing their own metacognitive strategies.

## **Method**

This study applies case study of qualitative approach in which the data are elaborated using form of words. Case study is used in increasing people's knowledge about individual, groups, social, political, and related to phenomena to understand the complex issues and conditions in real world settings (Sitorus, 2021). Presenting qualitative will commonly result in multiple interpretations because it fully shows the data in words (Ryandini et al., 2024). This research is aimed at knowing Management students' perceptions of reading activity in English in which it is not their primary major to learn for and analyzing in-depth about the metacognitive strategies used in reading scientific article.

There were 39 first year of undergraduate students from one big class in one of STIE in Surabaya as the participation of Management students in this study. Students are in the age range of 18 to 19 years old with no experiences in reading English scientific articles previously because they are in Management major and most of them find difficulties in reading English text. In meeting 4, they firstly were exposed and given reading activity of scientific article such as find the main ideas, inferences, references, and some new vocabulary.

Afterward, in the next meeting of reading comprehension, they were asked to read another text of scientific article from website of National Geographic in the themes of animals, travel, history and culture, health, science and nature, and lifestyle and they were given some questions as previous activity to answer from the text. National Geographic website provides various and easy themes and students

can choose theme they like to trigger students triggered to read and understand the text. After the activity, students showed and discussed the article in front of the class by reading the text they choose.

The data collection techniques applied were semi-structured interview and documentation by asking them permission and approval for these research processes. Semi-structured interview using questions that are formulated by the interviewer but the format or questions can be modified during the interview process. Whereas documentation focuses on analyzing and interpreting recorded material to learn about human behaviour and it usually starts with a question that the researcher can get the answer by studying the document (Ary et al., 2010). Students were interviewed regarding their perceptions of reading activity in English using mobile phone recorder (*Do you like reading in English? Why?*) while the documentation was for analyzing metacognitive strategies used in reading scientific article using MARSIS Version 1.0 from Mokhtari and Reichard (Mokhtari & Reichard, 2002) with 30 strategies provided in which this is for large subject populations ranging from middle school to college.

Validity and reliability values were good to use for subjects by observing the processes of students' perceptions about reading in English using the interview guidelines used to know students' perceptions about reading in English; and students' metacognitive strategies used in reading scientific article which the results are by documentation using MARSIS 1.0. The instruments applied had answered the research questions in which the data were analysed into three broad categories of strategy namely (1) Global Reading Strategies (*Glob*), (2) Problem-solving Strategies (*Prob*), and (3) Support Reading Strategies (*Sup*) with 30 strategies from scale 1 to 5 and the results were presented in percentage. All instruments were accurate since it related to the objective and problems observed which can strengthen this study to answer the research questions.

The data were firstly analyzing the students' recorded perceptions about reading in English. The next, the researcher analyzed the document of students' metacognition awareness (MARSIS 1.0) after reading scientific article related to three broad types or categories Global Reading Strategies (*Glob*), Problem-Solving Strategies (*Prob*), Support Reading Strategies (*Sup*) and strategies that were mostly used by Management students by looking up the scale from 1 to 5 which describes:

- 1 means "I never or almost never do this."
- 2 means "I do this only occasionally."
- 3 means "I sometimes do this." (About 50% of the time.)
- 4 means "I usually do this."
- 5 means "I always or almost always do this."

for analyzing difficulties, identifying, choosing solutions, and evaluating the whole problem-solving processes of themselves in reading.

## Results

### *Students' Perceptions about Reading in English*

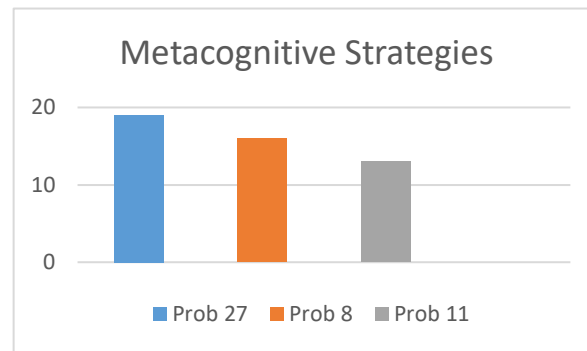
From reading of various scientific articles from various themes, students declared the perceptions of reading scientific articles as Not Really Like Reading and Like Reading shown in Table 1. below.

**Table 1.** *Students' Perceptions about Reading in English*

Like	Percentage	Not Really	Percentage
Increasing vocabulary	2,6%	It is a bit difficult	7,7%
Learning about sentence structure	2,6%	It is better to read song lyrics	2,6%
Improving language skills	15,5%	Difficult pronunciation	12,9%
Supporting academic achievement	2,6%	I need to understand some words	25,7%
Being able to speak English properly and remembering it in mind	7,7%	My reading skill is not good	2,6%
English is International language, so reading is the best way to learn English	5,15%	English is difficult to memorize	2,6%
It is very fun and easy to understand	2,6%	Reading is boring	10,3%
Giving new language	2,6%	Although it is difficult, it is required in my job	2,6%

### *Students' Metacognitive Strategies Used in Reading Scientific Article*

Figure 1. will show the data about metacognitive strategies used by students in reading scientific article by using the scale and the type of the reading strategy. In this part, codes like *Glob*, *Prob*, and *Sup* will be used as the types of metacognitive awareness of reading strategies.



**Figure 1.** Students' Metacognitive Strategies

The Problem-Solving Strategy (Prob) type in strategy number 27 are mostly used by students from 30 strategies provided as below:

**Table 2.** Metacognitive Awareness of Reading Strategies Inventory (MARSI) 1.0

Type	Strategies	Percentage
Glob	1. I have a purpose in mind when I read.	23,1%
Sup	2. I take notes while reading to help me understand what I read.	17,95%
Glob	3. I think about what I know to help me understand what I read.	20,5%
Glob	4. I preview the text to see what it's about before reading it.	12,85%
Sup	5. When text becomes difficult, I read aloud to help me understand what I read.	28,20%
Sup	6. I summarize what I read to reflect on important information in the text.	12,82%
Glob	7. I think about whether the content of the text fits my reading purpose.	10,25%
Prob	8. I read slowly but carefully to be sure I understand what I'm reading.	<b>41,02%</b>
Sup	9. I discuss what I read with others to check my understanding.	23,07%
Glob	10. I skim the text first by noting characteristics like length and organization.	12,82%
Prob	11. I try to get back on track when I lose concentration.	<b>35,9%</b>
Sup	12. I underline or circle information in the text to help me remember it.	25,65%
Prob	13. I adjust my reading speed according to what I'm reading.	12,82%
Glob	14. I decide what to read closely and what to ignore.	15,4%
Sup	15. I use reference materials such as dictionaries to help me understand what I read.	12,82%
Prob	16. When text becomes difficult, I pay closer attention to what I'm reading.	20,5%
Glob	17. I use tables, figures, and pictures in text to increase my understanding.	23,07%
Prob	18. I stop from time to time and think about what I'm	17,95%



	reading.	
Glob	19. I use context clues to help me better understand what I'm reading.	15,4%
Sup	20. I paraphrase (restate ideas in my own words) to better understand what I read.	25,65%
Prob	21. I try to picture or visualize information to help remember what I read.	23,07%
Glob	22. I use typographical aids like bold face and italics to identify key information.	12,82%
Glob	23. I critically analyze and evaluate the information presented in the text.	5,12%
Sup	24. I go back and forth in the text to find relationships among ideas in it.	10,25%
Glob	25. I check my understanding when I come across conflicting information.	17,95%
Glob	26. I try to guess what the material is about when I read.	30,8%
Prob	27. When text becomes difficult, I re-read to increase my understanding.	<b>48,71%</b>
Sup	28. I ask myself questions I like to have answered in the text.	10,25%
Glob	29. I check to see if my guesses about the text are right or wrong.	17,95%
Prob	30. I try to guess the meaning of unknown words or phrases.	23,07%

## Discussion

### *Students' Perceptions about Reading in English*

In accordance with the results explained in Table 1, various perceptions emerged both like and not really like reading. 58,97% students like reading because it can boost their understanding in vocabulary and sentence structure "*it increases vocabulary and sentence structure*", language skills "*improve my language skills*", academic achievement "*can support academic achievement*", and proper speaking English "*by reading, I can speak English properly and I can remember it in my mind*". There are no difficulties with reading English since it is fun, easy to understand and give them new knowledge.

41,02% students experienced differently since they perceived reading English is a bit difficult "*the spelling is a bit difficult.*" for them. Reading English is difficult because Salsyabillah. M et al., (2025) confirmed that reading is a complex thinking process in deciding the meaning of printed materials. It is also because students have low motivation in literacy activity and English scientific literatures to read and inherent complexity of the text they have to read which can hamper their understanding and engagement with material (Salsyabillah. M et al., 2025). In line with Nation (2019), reading is difficult because the final goal reading is comprehension as also confirmed by (Pahrizal et al., 2025) that reading is fundamental skills in the process of language learning.

Besides having the final goal of reading for comprehension, Al Aziz & Yusanti, (2020) also added that EFL University students have to be able to summarize and retell what they have read and comprehended using their own statements. This causes students clarified that reading English is uninteresting in the statement of *“reading is boring”* because they do not have good skill at it and it is better to read song lyrics. Reading is not interesting if students rarely follow the process using the reading strategies as it is necessary for monitoring system which involves the reflection of readers’ reading processes, awareness of their interaction with text, and understanding on how reading strategies relate to text comprehension (Pahrizal et al., 2025).

Students have to increase the motivation of literacy activity such as initially reading books they like for instance short story books and then come up to English scientific literatures to make reading fun, not boring, and not difficult as it is highly recommended for college students to be the best references as the journals are trusted and it is the result of research (Novarita, 2023). They also can use the appropriate strategies in MARS1 1.0 such as

Other students claimed that they do not really like reading because of the pronunciation and vocabulary *“because the pronunciation is a bit difficult”, “because I need some words to understand”*. As highlighted by Salsyabillah. M et al., (2025) that reading is a complex thinking process, it is because reading involves most of reader’s intellectual action such as pronunciation and understanding, to collect ideas or information developed by the text. Pronunciation is seen as communication in reading as emphasized by Salsyabillah. M et al., (2025) that reading arranges communication, language learning, and the exchange of ideas and information.

The most common problem is students find difficulties in understanding some words or vocabulary in reading English. Thus, Kharisma et al., (2023) stated that reading comprehension is a synchronous process of extracting and constructing meaning, while interacting with texts which means understanding the whole text will help them understand the difficult words or vocabulary. It is also added by Bria & Mbato, (2019) that reading comprehension is a memory construction which classifies comprehension as the consistency for the reader to construct the idea based on one’s intention and the correlation between the reader’s interpretation and the interpretation intended by the authors. Therefore, students also need prior knowledge to understand various words or vocabulary in reading as written by Pahrizal et al., (2025) that accurate comprehension happens when the reader’s knowledge and skills match the characteristic of the text and reading activity.

The last perception is also mentioned by a student who declared that they do not really like reading English, but it is required in their job *“I don’t really like reading, but I must to because it is required in my job”*. Reading is difficult, but having good skill in comprehending readings will be helpful for someone to be successful in future as reading ability is considering and understanding the meaning, in written form because it is one of the basic language learning skills which needs to interpret the

meaning through context (Yudhodibroto, 2024). Therefore, appropriate strategies of MARS1 1.0 are necessary used to help them understand in reading English texts.

### ***Students' Metacognitive Strategies Used in Reading Scientific Article***

As various perceptions were conveyed previously by EFL University students regarding reading in English, it is important to know students' metacognitive strategies from Mokhtari & Reichard, (2002) used to evaluate themselves based on the difficulties they encountered as strengthened by Deliany & Cahyono, (2020) that metacognitive is one of the important aspects in determining reading comprehension.

The researcher utilized three big number of strategies used by EFL University students from MARS1 1.0 with 30 strategies provided in which it is useful for helping students to increase metacognitive awareness and strategy while reading and the information can make them evaluate about reading from the text (Mokhtari & Reichard, 2002). The type frequently used is Problem-Solving Strategies (*Prob*) in which students cope with their difficulties using the appropriate strategies to understand the readings as it is placing and focusing the problem-solving or repair strategies used when problems emerge in understanding textual information such as checking the understanding when encounter the difficult information and re-reading the text for better understanding (Mokhtari & Reichard, 2002). 48,71% students used *Prob* strategy 27 in which,

*"When the text becomes difficult, I re-read to increase my understanding".*

This is in line with students' difficulty in comprehending the reading which can affect to problems in pronunciation and vocabulary. In this type of *Prob*, students concerns on how they know what they know as stated by Hayat et al., (2023) that it can aid students to solve problems in reading. It is also similar to statement from Yudhodibroto, (2024) that students also were aware of how, when, where, and why to use certain strategies as the adjustment the student's learning performance and this can significantly predict their academic achievements after using the reading strategy (Irfan et al., 2019).

The next, 41,02% students used *Prob* strategy 8 in which,

*"I read slowly but carefully to be sure I understand what I am reading."*

The students placed and focused the problem-solving or repair strategies used when problems emerge in understanding textual information (Mokhtari & Reichard, 2002). EFL University students try to read the text slowly but carefully to understand the reading. It why that it is in line with a study revealed by Bria & Mbato, (2019) that metacognitive strategies and maturity in reading mostly used by postgraduate students rather than undergraduate students. Postgraduate students are highly exposed to various reading texts and they also occasionally exposed to English scientific article for submitting article as final project. They can control their own ability in reading similar to statement conveyed by Ijirana & Supriadi, (2018) that metacognitive skills is seen as someone's knowledge to control their ability in

arranging, monitoring, and re-examining their understanding and action in solving a problem.

The last, 35,9% students chose *Prob* strategy 11 with the strategy of,

*"I try to get back on track when I lose concentration."*

All strategies used by students showed the highlights of keywords "*re-read*", "*read slowly but carefully to understand*", and "*try to get back*" in which those related to the issue to choose solutions and solve the problems in comprehending the text as delivered by Safitri et al., (2024) that metacognition is required in the learning process to achieve good cognitive ability when analysing difficulties, identifying, choosing solutions, and evaluating the whole problem-solving processes.

Through the process of metacognitive strategies used in reading scientific articles, the results confirmed that individual activated the use of metacognitive strategies from MARSIS 1.0 and the types mostly used were Problem-Solving Strategies (*Prob*) in which it could help someone's awareness of cognition in reading scientific article, how its cognition works, and how to regulate it (Ramadhanti & Yanda, 2021). Those are clarified that they can choose appropriate strategies to help them in understanding the English reading. The students are able to create meanings from texts as well as to respond on these thought processes and recognize strategies related to reading using their intellectual activities, actions, aims, and experiences (Irfan et al., 2019).

From these findings, teachers and is necessary to consider the use of Metacognitive Awareness of Reading Strategies Inventory (MARSIS 1.0) for future development. Also, teachers or lecturers can implicate the use of MARSIS 1.0 for reading activities to help EFL students understand the English reading by looking at their own knowledge in arranging, monitoring, and re-examining their understanding and action in solving a problem (Ijirana & Supriadi, 2018).

## Conclusion

This study resulted various perceptions from EFL University students regarding reading in English such as like and not really like. 58,97% students like reading because it can boost their understanding in vocabulary, sentence structure, language skills, academic achievement, and speaking English properly. There are no difficulties with reading English since it is fun, easy to understand and give them new knowledge. While the rest, 41,02% students experienced different since they perceived reading English is boring and a bit difficult in case of pronunciation and words, but it is needed in doing student's job. It can be summarized that most students like reading because it supports their academic achievement.

Students frequently used MARSIS 1.0 type of Problem-Solving Strategies (*Prob*) in reading scientific article as the big percentage were found in Prob 27 (*when the text becomes difficult, I re-read to increase my understanding*), Prob 8 (*I read slowly but carefully to be sure I understand what I am reading*), and Prob 11 (*I try to get back on track when I lose concentration*) in which those reported the students' efforts in

choosing solutions and solving the problems in comprehending the reading text. Individual showed the activation in the use of metacognitive awareness which could help them in reading scientific article. Therefore, it is hoped that future researchers can probe the reading issues further by using MARSI 1.0 and various academic texts for evaluating EFL students' or EFL University students' ability in reading.

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