The Influence of the Scientific-Based Self-Regulated (SBSR) Bilingual Module in Improving Students' Knowledge

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Abstract

The objectives of this study were 1) to find out whether there was an influence of the learning of the scientific-based self-regulated (SBSR) bilingual module in improving the cognitive abilities of the tenth grade students of Biology subjects, and 2) to find out how the percentage comparison of the influence between the learning of scientific-based self-regulated (SBSR) bilingual module class with conventional learning class in improving cognitive of the tenth grade students of Biology subjects. The research method used the quasi-experimental using the non-equivalent control group design. The data was analyzed through paired sample t test and omega index. The results of this study showed that 1) there was an increase in cognitive ability of the tenth grade students through the use of the learning of scientific-based self-regulated (SBSR) bilingual module on Biology subject. 2) There was an increase in cognitive ability of the tenth grade students through the conventional learning on Biology subject, and 3) the percentage of SBSR bilingual module influence was higher (60%) compared with conventional learning class with discovery learning influence (4.7%) in improving students' cognitive.

Keywords: Module, Bilingual, Scientific-Based Self-Regulated (SBSR), Cognitive

INTRODUCTION

The implementation of good science learning in school has 3 main focuses, they are: 1) product; 2) process and 3) attitude and scientific value that are interrelated each other (Sumintono, 2010; Millah, Rubini, & Pursitasari, 2021). Achieving a good learning process is influenced by various factors, including: 1) student motivation; 2) learning material; 3) learning aid; 4) learning atmosphere and 5) learning subject conditions Hamalik (2008). A series of learning processes involving the dynamic elements above will be very helpful in achieving the expected goals, but in reality many elements are ignored, especially the use of teaching materials. Teaching material is still very rarely used in learning because of limited time and funds in making it. Even though, teaching material is very important for students to use as learning guideline to achieve the expected goals and competencies.

Teaching materials are divided into 2 groups, namely print and non-print. Print teaching materials are module, handout, and worksheet, while non-print covers video, audio, display and internet (Setiawan, 2007). The use of printed teaching materials such as module and handout is most widely used in classroom because the use of electronic media for students is limited especially when they are in the school. Based on this, the focus of this research is to provide development in making teaching materials in the form of module.

Module is independent learning package that covers a series of learning experiences that are planned and designed systematically to help students achieve learning goals (Mulyasa, 2004). Basically, the use of module can facilitate the learning process so that the teacher can find out: 1) increasing student motivation, because every time they do the lesson assignments that are clearly limited and in accordance with their abilities; (2 after evaluating, the teacher and students comprehend well what section in the module they have succeeded and where they have not succeeded; 3) students achieve results based on their abilities; 4) learning material is more evenly distributed in one semester; and 5) education is more efficient because of learning materials (Santyasa, 2009). Module really helps the learning process, especially for students, because the process done would be clearer and directed. Module is also often used by teachers as complementary learning after applying certain models or strategies.This condition often causes teachers to rarely use model and module in the same time in one class because it requires extra time and energy to prepare everything.This weakness needs to be overcome by combining module with model.

Each model has stages or steps that are different from one another. The stages of this model can also be applied to modules without reducing the components in the module itself, so that the learning process in the classroom becomes more focused and the goals can be achieved. The choice of model to be used also needs to be adjusted to the conditions and needs of students so that the implementation of the syntax in learning becomes easier and does not make it difficult for students. The learning model that is in accordance with the conditions of this study is a scientific-based self-regulated (SBSR) model.

SBSR is a model that combines the self-regulated learning strategy with a scientific approach with 9 syntax that are interrelated each other. SBSR research began with the development of learning instrument in the form of syllabus, lesson plan, and student worksheets in 2015. The results of the study showed that this model has the potential to improve cognitive and metacognitive abilities of the tenth grade of Biology students (Agusta & Djukri, 2015). After research in 2015, the SBSR model was developed in the form of flash media in 2018, but this study was still limited to preliminary field testing (Agusta, 2018). The research on the SBSR model was still very rarely done because it was relatively new and required more effective testing in various forms of teaching materials including module.

Based on this, the syntax in SBSR would be applied in the module, so that as long as students use the module they also indirectly implement the syntax. Module would also be equipped with 2 languages or bilingual. The advantages of bilingual learning were: (1) scholastic achievement; (2) linguistic equity; (3) multilingual proficiency; and (4) promotion of multicultural awareness (Beardsmore, 1993). In essence, the importance of mastering foreign languages is to facilitate students in terms of communicating, accessing information and participating in all foreign-language scientific and non-scientific activities. So that the combination of bilingual with the SBSR model syntax in a module has quite interesting potential to improve students' understanding of the material.

At one of the leading high schools in Palembang, Indonesia and has been accredited A but if seen from the result of an initial data collection through interview to Biology Teachers in the tenth grade at one of high schools in Palembang, Indonesia, student's cognitive ability in Biology subject was still relatively low and unstable. This is seen based on the average score of National Examination (UN) Biology in the last 3 years and final examination score of Biology in odd semester 2017/2018. The average score of Biology national examination in 2015 was 87.14. Meanwhile, there was a decrease in

2016 which showed 67.74 and the last in 2017 there was a slight increase in the average score which was 68.20.

According to Lembah, Tellu, & Mahpudz (2012), there are several factors that cause unstable UN score including management system, teacher, facility and infrastructure, and education. In addition, the cause of the unstable score of the Biology National Examination at one of high schools in Palembang, Indonesia was because the learning process is lacking in developing students' cognitive abilities. Students 'cognitive abilities need to be our concern together as an educator considering these abilities are closely related to students' ability to think and become a benchmark in the success of learning. This was also conveyed by Dewi (2005) that cognitive ability includes aspects of the intellectual structure used to know something. The cognitive development concerns the development of thinking and how the activity of thinking works. The cognitive factors have an important role for the success of children in learning, because most activities in learning are always associated with problems of remembering and thinking (Azzahra, & Simatupang, 2021; Al-Ansi, Garad, & Al-Ansi, 2021; Thongbunma, Nuangchalerm, & Supakam, 2021).

Based on the study of the SBSR bilingual module and the problems found at one of high schools in Palembang,

Indonesia, the researchers were interested to find out the influence of the SBSR bilingual module in increasing the knowledge of the tenth grade students on environmental pollution material at one of high schools in Palembang, Indonesia. This increase will be reviewed through a paired sample t test analysis combined with the Omega index. The results of this analysis will provide a different perspective in studying educational research with the quasi-experimental design that is commonly used. This perspective also provides more balanced information in assessing the effect of the treatment given in the research process. More clearly the following will be described about the method, result, discussion and conclusion of the research obtained.

Based on the background, this study aims to to find out whether there was an influence of the SBSR bilingual module in improving the cognitive abilities of the tenth grade students of Biology subjects and to find out how the percentage comparison of the influence between the leaning of the SBSR bilingual module class with conventional learning class in improving cognitive of the tenth grade students of Biology subjects.

METHOD

This study was a quantitative research in the form of quasi-experimental method using the non-equivalent control

group design consisting of the experimental class and the control class. The experimental class used the SBSR bilingual module, and the control class used conventional learning. This conventional learning in this study was conducted in accordance with the learning design commonly used by Biology teachers in the tenth grade at one of high schools in Palembang, Indonesia, using the Discovery Learning model.

The subject in this study is 72 students at one of high schools in Palembang, Indonesia. The sampling technique used purposive sampling, with the criteria for the average score of students' initial abilities. Class X used was X MIPA 1 (36 students) and X MIPA 2 (36 students). X MIPA 1 as the experimental class and X MIPA 2 as the control class. The selection of this class was based on the initial average sore of students which showed that class X MIPA 1 had a lower ability than X MIPA 2, so X MIPA 1 was used as the experimental class with the intention to find out whether the treatment given could really improve students' cognitive . Then, for X MIPA 2 class was chosen as a control class because the average student had a better initial ability.

Cognitive ability was measured using C1-C6 MCQs that had been validated and tested for reliability. The validation result showed that from the 25 questions tested there were 5 questions which were invalid, so there were 20 questions which could be continued for the study. Furthermore, the reliability value had reached 0.97 which was categorized as reliable, very good.

Test the normality of the data used the Kolmogorov-Smirnov One Sample test. Test the homogeneity of the data used the Levene Test. The inferential analysis in this study used paired sample t test for each experimental and control class. Then after the hypothesis was obtained, it would be followed by an omega index analysis to find out the differences between groups and the percentage of the influence and conventional learning in each class. The inferential analysis of paired sample t test was assisted by SPSS Ver. 16, while for the omega index used the formula below:

$$\omega^2 = \frac{t^2 - 1}{t^2 + N1 + N2 - 1} \qquad (1)$$

(Latan, 2014)

RESULTS AND DISCUSSION
Prerequisite Test Results Normality Test Results of Cognitive Ability in Experimental Class

The normality test of cognitive ability in experimental class used the Kolmogorov-Smirnov test. The results of the normality test can be seen in Table 1.

Table 1. Normality Test Results of Cognitive Ability in Experimental Class

	Pretest	*Posttest*	Result
N	36	36	Normal
Sig.	0.162	0.203	

Table 1 shows the score of Sig. pretest 0.162> 0.05 and sig. posttest 0.203> 0.05, meaning that the pretest and posttest score of the experimental class was normally distributed.

Normality Test Results of Cognitive Ability in Control Class

Test the normality of the cognitive ability in the control class used the Kolmogorov-Smirnov test. The results of the normality test can be seen in Table 2.

Tabel 2. Normality Test Results of Cognitive Ability in Control Class

	Pretest	Posttest	Result
N	36	36	Normal
Sig.	0.108	0.228	

Table 2 shows the score of sig. pretest 0.108> 0.05 and the sig score. Post-test 0.228> 0.05 meaning that the score of the pretest and post-test of the control class was normally distributed.

Homogeneity Test Results of Cognitive Ability in Experimental Class

Homogeneity test of cognitive ability in the Experimental class using the Levene Test. The results of the Levene Test can be seen in Table 3.

Table 3. Homogeneity Test Results of Cognitive Ability in Experimental Class

	Pretest	Posttest	Result
Sig.		0.072	Homogen

Table 3 shows the sig value of 0.072> 0.05, meaning the pretest and post-

test score of the experimental class was homogeneous.

Homogeneity Test Results of Cognitive Ability in Control Class

Homogeneity test of cognitive ability in control class using the Levene Test. The results of the Levene Test can be seen in Table 4.

Table 4. Homogeneity Test Results of Cognitive Ability in Control Class

	Pretest	Posttest	Result
Sig.		0.309	Homogen

Table 4 shows the sig value of 0.309> 0.05, meaning that the score of the pretest and post-test of the control class was homogeneous.

The Results of Inferential Analysis
The Result of Paired Sample t-Test in Experimental Class

The Paired Sample t-Test result of cognitive ability in the Experimental class can be seen in Table 5 below.

Table 5. The result of Paired Sample Test in Experimental Class

	Pretest	Posttest	Result
Sig.		0,000	H_0 was rejected

Table 5 shows the sig value of 0.000 <0.05, which means that H_0 was rejected and it could be concluded that there was an influence of using SBSR bilingual module in improving the cognitive of the tenth grade student MIPA I in Biology subject at one of high schools in Palembang, Indonesia.

The Result of Paired Sample t test in Control Class

The Paired Sample t-Test Result of cognitive ability in the Control class can be seen in Table 6.

Table 6. The Result of Paired Sample t-Test in Control Class

	Pretest	Posttest	Result
Sig.		0.039	H_0 was rejected

Table 6 shows the sig value of 0.039 <0.05, meaning that H_0 was rejected and it can be concluded that there was an influence of the conventional learning (discovery learning models) implementation in improving cognitive of the tenth grade MIPA 2 students in Biology subject at one of high schools in Palembang, Indonesia.

The Result of Omega Index in the Experimental Class

The omega index analysis results of the cognitive ability in the Experimental class can be seen in Table 7.

Table 7. Omega Index Results of the Experimental Class

	Pretest	Posttest
w^2		0,60

The calculation result of the omega index in the experimental class in Table 7 shows that the score is 0.60, then squared (0.60) x 100% = 60%, meaning that 60% of the variants in the score were influenced by the SBSR bilingual module. This score was also quite high when compared with the Cohen criteria (0.60> 0.14).

The Results of the Omega Index in the Control Class

The cognitive ability results of the Omega Index in the Control class can be seen in Table 8 .

Table 8. Omega Class Results of the Control Class

	Pretest	Posttest
w^2		0,047

The Omega Index result of the Control class in Table 8 shows the score 0.047, then it was squared (0.047) x 100% = 4.7%, meaning that 4.7% variants in the score were influenced by Discovery Learning. This score was categorized as low when compared with the Cohen criteria (0.047 <0.14).

Based on the results of the analysis above, it could be explained that the percentage of the treatment influence in the experimental class was higher than the percentage of influence in the control class. It could be seen from the percentage of success treatment in increasing students' cognitive ability in improving student's cognitive ability as 60%, while the percentage of success conventional learning treatment in improving cognitive ability was only 4.7%. Thus, even though as the acceptance of hypothesis both classes (experiment and control) showed H_0 was rejected. But in percentage, the treatment of SBSR bilingual module was higher in improving student's cognitive.

The Cognitive ability of the experimental class

The process of learning in the experimental class used the SBSR bilingual module. The results of the paired sample t test showed the sig value. 0,000 <0,05 means that there was an influence of using SBSR bilingual module in improving the cognitive of the X MIPA I students on Biology subject at one of high schools in Palembang, Indonesia. The SBSR bilingual module also provides a percentage of influence as 60% in improving cognitive ability based on the omega index analysis. The percentage of this influence showed that student's cognitive ability could be formed through a series of scientific activities according to SBSR syntax. This scientific activity involves students directly both individuals and groups. In the stages of observation and formulation of problems, for example, students were required to be able to analyze discourses that contain problems and information related to the material to be studied and then reveal questions related to problems that he understands (Ernawati, & Sujatmika, 2021). The ability to understand and analyze well would help students to achieve good learning outcomes, because understanding and analyzing were also included in the C2 and C4 cognitive process domains. Learners with more grounded SRL aptitudes were more likely to return to already considered course materials, particularly course

appraisals (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). This result was also reinforced by the opinion of Novita, Santosa and Rinanto (2016) that students who have good analytical skills will be able to achieve good learning outcomes, while students who have analytical skills that are less able to inhibit achievement of learning outcomes.

The next stages of learning using the SBSR bilingual module were planning, information gathering, and presentation. These activities involved students in groups to discuss in planning problem solving activities through practicum, digging information from the results of lab work and other sources, and conveying the results obtained to other friends. Discussion and communication activities can invite students to be able to communicate the results of thinking, respond each other and work together in solving problems, so that students are easier to understand the material being studied (Leikin and Zaslavsky, 1997; Easterday et.al., 2016; Thadani et.al., 2017). The presentation activity also directs students to be brave to convey their results, findings and opinions to other students for further feedback and input. This scientific activity will also help students to improve the cognitive ability as explained by Yusiran and Siswanto (2016), Zhang et.al. (2009), Anderson et.al. (1995), Hasanah, and Shimizu (2020), that

arguing will help students become more skilled to express opinions with the right reasons, so that they will improve cognitive ability. This is in accordance with the opinion of Chusni et.al. (2017), that science learning essentially requires students to cultivate curiosity. Science learning has improved the argumentation (scientific writing), creativity, and critical thinking students' too (Muhlisin, et. al., 2019; Nuntasane, Tawnonngiew, & Nuangchalerm, 2020; Pursitasari, Suhardi, & Putikah, 2019; Ping, Halim, & Osman, 2019; Sidek, et. al., 2020). This SBSR activity will also help students to improve the cognitive ability as explained by Graham, Harris, & Mason, (2005), that arguing will help students improve knowledge, and writing performance in the young writer.

The bilingual SBSR module also presents interesting images in it with the aim of increasing students' interest and learning motivation. Interest is also important in determining students' willingness to learn, especially to achieve maximum learning outcomes. This is in accordance with the opinion of Uzer (2001) that interest has a big influence on learning, as long as that interest will lead someone to do something in accordance with what they are interested in. Positive thinking may be used to enhance situational academic motivation, and academic commitment in students, with a

pivotal role for positive affect (Aberilla, et.al., 2021; Altintas et. al., 2020; Farwati, et.al., 2021; Juhanda, 2017; Rahmawati, Rahman, & Usman, 2021). This is in accordance with the opinion of Muro et. Al (2018) that positive psychology interventions are effective in increasing motivation to study and in enhancing the academic performance of poor performing high school students.

The high influence percentage of SBSR bilingual module (60%) in improving cognitive ability was also supported by the student's good initial ability. The initial ability of students also provided an overview of the readiness of students to receive new material and information, and follow a series of activities to be carried out. This was reinforced by the opinion of Uno (2011) that the initial ability plays an important role in increasing the meaningfulness of teaching, because this will have an impact in facilitating internal processes that take place in students when learning. That is, the initial ability of students will greatly help the continuity of students in learning. The initial ability of students in this school was quite good, so that in the implementation of learning students were easier to understand and absorb the material through the use of the bilingual SBSR module. This is in accordance with the opinion of Roeser & Peck (2009) and Mukhtar, et. al., (2021), that the

contemplative education as a set of pedagogical practices designed to cultivate conscious awareness in an ethical-relational context in which the values of personal growth, learning, moral living, and caring for others are nurtured. the regulation of motivation was used to show a variety of distinct strategies that students' can use to regulate their motivation within academic contexts (Wolters, 2003).

The Cognitive Ability of the Control Class

The learning process of the control class in this study was adapted to conventional learning activities that were often applied by Biology Teachers at one of high schools in Palembang, Indonesia. Based on the results of the interview, the information was obtained that Biology Teachers at one of high schools in Palembang, Indonesia often use discovery learning models. The results of the paired sample t test analysis showed the sig value was 0.039 <0.05, meaning that H_0 was rejected and it could be concluded that there was an influence of the application of conventional learning (discovery learning model) in improving the cognitive of the X MIPA 2 students on Biology subject at one of high schools in Palembang, Indonesia. Improving students' cognitive abilities was easier to do through learning according to the steps of discovery learning. During the implementation of conventional learning, the teacher applied methods, models and teaching materials that were often used in the classroom, this made it easier for students to learn because they already understand and were familiar with the series of activities carried out. The effect was that students no longer feel confused and needed adjustment again, so their cognitive abilities also improve well.

Syah (2014) explains that in applying discovery learning in the classroom, there are several procedures that must be implemented in teaching and learning activities, including: 1) stimulation; 2) problem statement (statement/problem identification); 3) data collection; 4) data processing; 5) verification. Systematic discovery learning in learning will facilitate students in learning. The learning process in the control class also takes place systematically and effectively so that it can help students improve the abilities expected in accordance with the instructional goals they want to achieve (Darsono, 2000; Rodiah, Komala, & Rusdi, 2020; Van Hien, Hai, & Van Bien, 2020). Other factors that also influence the maximum results are behavior, while the behavior includes: behavior in attending lessons, repeating lessons, behavior while reading books, and behavior when visiting the library and facing examinations. (Saryanti, 2011). Sriyana and Winarso (2018) also added that good cognitive abilities will play a role in helping students succeed in learning, because some learning

activities are related to problems of remembering and thinking.

The advantages of discovery learning model according to Hanafiah and Suhana (2009) were: a) helping students to develop, prepare, and master the skills in cognitive process; b) helping students to acquire knowledge individually; c) improving student learning motivation and passion; d) providing opportunities to develop according to their abilities and interests; e) strengthening and increasing students' confidence through the process of discovery. The advantages of this model were expected to be able to help students in learning, especially in improving understanding or cognitive ability by carrying out activities in accordance with the steps / syntax of the model. Based on the Omega index analysis, it was explained that the percentage influence of discovery learning model in increasing the cognitive abilities of students in the control class was 4.7%.

This percentage of influence was smaller than the percentage of bilingual SBSR module in improving cognitive abilities in the experimental class. This small percentage was influenced by various things, including the use of the same and repetitive model in each process of learning without concerning on student development, as well as the lack of opportunities given to students to think more creatively so that this would give an

influence of students' cognitive abilities. This was in line with the weaknesses of the discovery learning model delivered by Roestiyah (2008), among others: a) it needs to have mental readiness and maturity of students; b) it is not appropriate to use a class with a large number of students; c) discovery technique is difficult for teachers who are accustomed to use traditional learning; d) it has a less attention to the development / formation of attitudes and skills for students; e) it provides less opportunities for students to think creatively.

Based on some of the descriptions above, it could be concluded that the difference in the percentage of influence in increasing cognitive ability obtained by students in the experimental class and the control class was not all 100% came from the used of bilingual SLRBS module or derived from discovery learning. It gave the explanation that other factors such as the good initial quality of students could also be the determinant of improving students' cognitive outcomes. This could be a reflection of the research quality that has been conducted, and provided balanced information in telling the results of cognitive improvements that occurred. Other factors that also influenced students' cognitive abilities were interest, motivation and awareness of learning. Motivation could encourage students to do something as a form of achieving what

they expect. There are 3 motivational functions described by Winarsih (2009), they are: a) encouraging people to do the activities; b) determining the direction of the action to achieve the things to be achieved; c) selecting actions, namely determining what actions should be done to achieve the goal.

CONCLUSION

Based on the results of the paired sample t test in X MIPA 1 class (experimental class) obtained a significance value was 0.000 <0.05 (5%), meaning that H_0 was rejected and Ha was accepted. It could be concluded that there was an influence of using of the SBSR bilingual module in improving the cognitive of X MIPA I class students in Biology subjects at one of high schools in Palembang, Indonesia.

Based on the results of paired sample t test in X MIPA 2 class (control class) obtained a significance value was 0.044 <0.05 (5%), meaning that H_0 was rejected and Ha was accepted. It could be concluded that there was an influence of the conventional learning application (discovery learning model) in improving cognitive students of X MIPA 2 class on Biology subjects at one of high schools in Palembang, Indonesia.

Based on the Omega test results it could be seen that the percentage of the success of the SBSR bilingual module in improving students 'cognitive was 60%

while the percentage of success influence of the conventional learning using discovery learning in improving students' cognitive was 4.7%. Hypothesis test results showed the experimental and control classes showed H_0 was rejected, while the percentage influence showed that the application of the SBSR bilingual module was higher in improving students' cognitive compared to the application of conventional learning (using discovery learning).

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