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The Effect Of Multiliteracies Scientific Model Based On Self-Regulated Learning On Students' Self Efficacy Science

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ABSTRACT
In addition to equipping students with knowledge, education also aims to provide various valuable skills in entering the 21st century today. One aspect that is the focus of educators and researchers is self-efficacy. The concept of self-efficacy is a concept related to the belief of each individual to achieve the expected goals. Self-efficacy is considered an essential role because it is related to students' academic performance. This study aims to determine the effect of the scientific multiliteracy learning model on students' self-efficacy. This study used a quasi-experimental design involving 30 students from class X at the high school level. The instrument used in this study was a self-efficacy questionnaire consisting of 6 aspects, namely: (1) conceptual understanding, (2) high-level cognitive, (3) laboratory practicum, (4) application in daily life, (5) science communication, and (6) scientific literacy. The data collected from the pretest and posttest questionnaires were analyzed quantitatively using SPSS version 20 software. The results showed a significant positive effect of the scientific multiliteracy learning model on increasing students' science self-efficacy at the high school level.

Keywords: self-efficacy, Self-regulated Learning, Multiliteracy

INTRODUCTION

Self-efficacy is a concept related to the belief that each person must evaluate his ability to perform the tasks he receives to complete them successfully. (Zamfir & Mocano, 2020) explain that self-efficacy is a key concept that is part of cognitive social theory, which refers to a person's belief in his ability to achieve the desired results. (Razek & Coyner, 2014) state that self-efficacy is an individual belief that affects choices, performance, and the amount of effort made in achieving goals.

Self-efficacy is an important aspect that has many roles for every individual. Students with high self-efficacy are more likely to survive and succeed in facing difficulties at school (Widmer et al., 2014). (Harahsheh, 2017) that with high self-efficacy, students tend to be more persistent and vice versa. In addition, students with high self-efficacy will be more optimal in achieving their academic status (Arbabisarjou et al., 2016), show greater resilience (Sagone & De Caroli, 2016), and develop impulses in facing challenges so that they excel academically (Koseoglu, 2015).

To improve self-efficacy, especially in science, teachers need to use appropriate learning models in the classroom. One of the learning models that are considered appropriate is the scientific multiliteracy learning model. The concept of multiliteracy is a concept that views literacy as something continuous in improving literacy learning that is more established and does not seek to replace traditional practices (Rowsell et al., 2008). The model acknowledges the exixtence of the binding cultural and linguistic diversity in a global society (Bonhe & Benjamin, 2014). Multiliteracy can promote the idea that knowledge and meaning are historically and socially situated and are regarded as deliberately

designed artefacts (Cope & Kalantzis, 2000; Ganapathy, 2014).

In supporting the implementation of this learning model in the classroom, a supportive learning method is needed in improving students' self-efficacy. Self-regulated learning (SRL) is a learning method that affects human well-being, physical health, social achievement, education, to aspects of self-efficacy (Kizilcec et al., 2017). (Fernandez-Rio et al., 2017) stated that SRL in the learning process has a significant relationship with self-efficacy performance, learning motivation, and student awareness. In fact, apart from relating to self-efficacy, the SRL method can also support students' academic performance in achieving satisfactory learning outcomes (Everaert et al., 2017; Pascoe et al., 2018; Street et al., 2017). Some of these facts were later corroborated by the results of other studies, which found that self-efficacy, task strategies, and self-evaluation were key strategies of SRL (Li et al., 2018).

Regarding self-efficacy, there are several studies in education and learning that focus on learning science in schools. In learning natural sciences, several studies have stated that self-efficacy significantly influences student performance (Ghaffar et al., 2019; Tastan et al., 2018). Specifically, self-efficacy can also be a positive predictor of student learning performance in physics subjects (Gana et al., 2019; Kapucu, 2017). Furthermore, (Gana et al., 2020) found evidence that student physics learning outcomes are highly dependent on motivation, satisfaction, and self-efficacy.

There has been no research that integrates the multiliterate science learning model with SRL from these several studies. For this reason, the researcher wanted to know the effect of the learning model on the science self-efficacy aspect of high school students. The formulation of this problem is how effective is the multiliteracy learning model of science with SRL on students' science self-efficacy.

LITERATURE REVIEW

Self-efficacy

The concept of self-efficacy is one of the most useful theoretically, heuristically, and practically formulated ideas in modern psychology (Bartimote-Aufflick et al., 2016). In fact, in its development period, self-efficacy has become the core of research interest for the last three decades in the field of education, especially educational psychology (Cheng, 2020).

There are basic things that need to be understood that the concept of efficacy is not the same as the term ability or motivation. However, it should be emphasized that the two have an inseparable relationship. Self-efficacy is a belief in one's ability and strength to learn and achieve performance which is the main characteristic of one's academic success (Hill, 2002). (Gardner, 1983) illustrates a person with high self-efficacy as a person who believes in his or her own ability to organize and carry out the actions necessary to produce a given achievement.

There is positive support between academic self-efficacy, motivation, and success (Widmer et al., 2014). (Antonio et al., 2017) stated that self-efficacy and motivation/expectations were the essential psychological variables in an academic context. This means that there is an influence of these psychological variables on academic performance even in science, which has begun to be studied a lot. In line with the two studies, (Ugwuanyi et al., 2020) stated that motivation and self-efficacy positively and significantly affect student performance in learning physics.

Anggraini (2019) stated that students' positive attitudes towards science subjects were shown by great interest and wanting a long time in learning science. If the lesson hours are added, the students feel better to understand the concepts and formulas given by the teacher. In addition, interest in the allocation of increased science learning time is obtained from reading literature at home and accepted by students through watching videos on YouTube and looking for exciting things on the internet about science.

The essence of measuring student attitudes towards practical learning aims to determine students' feelings during the science learning process, both in the form of positive attitudes and negative attitudes. In addition,

another thing that needs to be considered is the students' expectations of a positive attitude towards science itself. Each student can assess for himself whether there is an optimistic attitude to plan action, try to act, spend a lot of time and energy trying, anticipate success with different strategies, and replace methods that fail to achieve goals.

Self-Regulated Learning

The term self-regulated learning (SRL) began to develop in the 1990s as a research problem for decades and continues to be of great importance to educators and researchers (Zimmerman & Schunk, 2011). According to the theory of social cognition, humans result from an interdependent causal structure from personal, behavioural, and environmental aspects (Beishuizen & Steffens, 2011). These three aspects are determinant and interrelated aspects that seek to self-regulate. This self-regulation impacts result from orientation in performance or behaviour that results in environmental changes (Latifah, 2010).

SRL is a form of individual learning that relies autonomously on students' learning motivation. It develops measurements (cognition, metacognition, and behaviour) and monitors their learning progress (Yot-Dominguez & Marcelo, 2017). In addition, another definition states that SRL is a combination of the ability and desire to plan, control, and evaluate cognitive, motivational, behavioural, and contextual processes (Ejubovic & Puska, 2019). Students know how to plan to motivate themselves, know their possibilities and limitations and the extent to which their knowledge functions to control and regulate the learning process to integrate or combine objective tasks and contexts in optimizing skills through practice (Mantalvo & Torrez, 2004).

SRL has an important role in the educational process, especially supporting students' self-efficacy and academic success. (Kingsbury, 2015) states that SRL is considered important because academic success is strongly influenced by students' ability to learn independently with the support provided by the teacher. In addition, (Latifah, 2010) has studied how the influence of SRL on academic emotions, which can ultimately affect the increase in academic achievement. This SRL strategy combines academic learning skills and self-control that makes learning easier so that students are more motivated.

Scientific Multiliteracy

In general, the concept of multiliteracy involves various forms of learning. Multiliterate pedagogy expands the range of the learning process by including what is considered new in the surrounding environment (Hoang & Hua, 2020). The multiliteracy learning model is a learning that is developed based on the diversity of students' abilities in terms of intelligence, learning styles and learning models (Utari et al., 2015).

(Abidin, 2015) describes that multiliteracy is the skill of using various methods to understand ideas and information using conventional text forms and innovative texts, symbols, and multimedia. Thus, teachers must have a multimodal learning experience for students. Multimodal learning facilitates the use of modern media and modes developed by utilizing different multimedia technologies and devices (Abrams, 2015; Butler, 2015; Nabhan, 2019; Serafini & Gee, 2017). In other words, multimodal classroom learning allows teachers to incorporate diverse approaches in different learning environments (Whyte & Schmid, 2019).

The concept of multiliteracy is designed to answer the skills needs of the 21st century. Multiliteracy learning is designed to connect four skills (reading, writing, spoken language, and digital technology) with 21st-century learning competencies (Thibaut & Curwood, 2018). Some of the skills referred to are (1) creativity and innovation, (2) critical thinking, problem-solving & decision making, (3) metacognition, (4) communication, (5) collaboration, (6) information literacy, (7) information and communication technology literacy, (8) citizenship attitude, (9) life & career, and (10) personal & social responsibility which includes competence and cultural awareness (Van Laar et al., 2020).

METHODS

Research Design and Participants

This research is a type of quantitative research by adopting a quasi-experimental design with a one-group pretest-posttest design. The purpose study analyzes the differences in students' science self-efficacy. It uses self-regulated learning (SRL)-based scientific multiliteracy learning. This is a non-experimental research design that is the same as the experimental conditions where participants are treated (Gopalan et al., 2020; Ng et al., 2020). In addition, the research subjects involved in this study were students of class XI at the high school level. As the subject of this research, thirty high school students are a group of students in a study group at Madrasah Aliyah Negeri (MAN) 3 Makassar, Indonesia.

Instruments

In collecting data, the researcher used a science self-efficacy questionnaire developed by (Suprapto et al., 2017). This questionnaire consists of six main aspects with 30 questions which include: (a) conceptual understanding with five questions, (b) high cognitive skill with five questions, (c) practical work with four questions, (d) everyday application with eight questions, (e) science communication with five questions, and (f) scientific literacy with three questions. This questionnaire consists of four answer choices: strongly agree, agree, quite agree, and disagree. Before being used, this questionnaire was tested to determine the level of reliability. The test results show that this questionnaire has high reliability of 0.97, which means that this questionnaire can and is feasible to be used in research.

Data Analysis

The data collected through questionnaires, both in the pretest and posttest sessions, is then analyzed quantitatively. Data analysis was carried out using the Statistical Package for The Social Science (SPSS) version 20 software. Researchers carried out descriptive statistical tests, paired sample correlations, and paired T-tests to see the effect of the scientific multiliteracy model using SRL on increasing students' science self-efficacy.

Procedure

This study uses a one-group pretest-posttest design where students are subjected to learning treatment using a scientific multiliteracy model with the SRL approach. Before the treatment was given, students were given a science self-efficacy questionnaire to fill out. After the treatment was completed, students were again given the same science self-efficacy questionnaire as the previous pretest session. The learning stages in this multiliteracy model are (a) orientation phase, (b) problem-solving phase, (c) predicting, (d) exploration, (e) confirmation, (f) determination, (g) producing works, and (h) show of work.

RESEARCH RESULTS

After the pretest and posttest, data were collected. Then the data were analyzed using SPSS software by running a fundamental analysis of the mean, standard deviation, and t-test. The results of the data analysis are presented in table 1.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	SE pretest	49.96	30	2.154	.393
	SE_posttest	81.75	30	4.495	.821

Based on table 1, a summary of the descriptive statistical results of the two samples studied, namely the pretest and posttest scores. The average student's self-efficacy in science, or the mean of 49.96, was obtained for the pretest score. In addition, in the posttest session, the average value of students' science self-efficacy was 81.75. That is, the average score on the posttest is higher than the average score on the pretest session. Since the average value of students' science self-efficacy at pretest 49.96 < posttest 81.75, it can be concluded that there is an average difference between pretest and posttest. To prove whether the difference is genuine (significant) or not, we

must interpret the results of the Paired Sample T-test in table 2.

Table 2. Test results of paired samples correlations

Paired Samples Correlations			
	N	Correlation	Sig.
Pair 1 SE_pretest & SE_posttest	30	.051	.791

Table 2 is an output table of paired samples correlations that test the correlation between the two data or the relationship between the pretest and posttest variables. Based on the table, it can be seen that the correlation coefficient value is 0.051 with a significance value (Sig.) of 0.791. Regarding the value of Sig. 0.791 is greater than the probability of 0.05. It can be said that there is no relationship between the pretest variable and the posttest variable.

Table 3. Paired Samples Test

	Paired Difference							
				95% confidence interval of the difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair-1 Pretest-posttest	-31.793	4.885	.892	-33.617	-29.969	-35.644	29	.000

Next, the researcher ran a t-test to determine the effect of the effectiveness of this learning model. The answers were obtained regarding whether or not to use a scientific multiliteracy learning model based on self-regulated learning to improve students' science self-efficacy. Before interpreting the numbers in the Paired Samples Test result table above, it is necessary first to know the formulation of the research hypothesis and the decision-making guidelines in this test. The formulation of this research hypothesis is as follows:

H0 = There is no average difference between the pretest and post-test science self-efficacy abilities. There is no effect of using a scientific multiliteracy model based on self-regulated learning to improve students' science self-efficacy.

Ha = There is an average difference between the pretest and post-test science self-efficacy abilities, which means using a scientific multiliteracy learning model based on self-regulated learning improves students' science self-efficacy.

The decision-making guidelines in the Paired Sample T-test based on the significance value (Sig.) of the SPSS output results are as follows.

a. If the value of Sig. (2-tailed) < 0.05, then H0 is rejected, and Ha is accepted.
b. If the value of Sig. (2-tailed) > 0.05, then H0 is accepted, and Ha is rejected.

Based on the table of Paired Samples Test results above, it is known that the value of Sig. (2-tailed) is 0.000 < 0.05. Then H0 is rejected, and Ha is accepted. Thus, it can be concluded that there is an average difference between students' science self-efficacy abilities on the pretest and post-test. That is, there is an effect of using a scientific multiliteracy learning model based on self-regulated learning to improve students' science self-efficacy at MAN 3 Makassar.

DISCUSSION

The topic of self-efficacy in education continues to receive the spotlight, considering that this aspect is closely related to student academic results. In social learning theory, self-efficacy is associated with developing behavioural competencies or skills in the context of deterministic interactions between humans and their environment (Gebregergis et al., 2020). This statement is also in line with several cross-cultural research reports, which claim that self-efficacy is positively and significantly related to socio-cultural adjustment (Mesidor & Sly, 2016; Yusoff, 2011).

A review stated that student learning outcomes, learning strategies, self-regulation, and metacognition correlated with self-efficacy (Wilde & Hsu, 2019). In addition, self-efficacy is also related to individual motivational constructions such as causal attributes, self-concept, optimism, achievement goal orientation, anxiety, values, and social cognition (Tsang et al., 2012). Several studies confirm that self-efficacy is a supporting factor in maintaining students' ability to stay focused on achieving higher academic excellence (Musa, 2020; Njega et al., 2019).

The results of this study indicate that the scientific multi-step learning model with the self-regulated learning (SRL) approach positively impacts the science self-efficacy of high school students. This can be seen from the study results, which stated that there was an increase in the average score of self-efficacies from the pretest and posttest sessions. This finding is in line with the results of previous research related to self-efficacy in the learning process (Ozkal, 2019). According to Ozkal, there is a significant positive relationship between self-efficacy and student academic performance.

According to him, there is a significant positive relationship between self-efficacy and student academic performance. Self-efficacy is an important aspect that must receive more attention from teachers and researchers today. This is based on the fact that self-efficacy impacts or influences that can be used as a form of strength. (Filippou, 2019) stated that students with self-efficacy tend to work harder, like challenging tasks and are stronger in facing difficulties. This is also corroborated by findings stating that students with high self-efficacy seem to set lofty standard goals and show more significant effort in realizing their goals (Gebregergis et al., 2020).

Researchers have widely stated the impact of self-efficacy on students. Zimmerman (2011) believes that self-efficacy has a close and positive relationship with self-regulation, high levels of motivation, and academic achievement. Sunarti (2008) states a significant relationship between self-efficacy and stress symptoms in private schools. Self-efficacy in the learning process is also considered vital because self-efficacy and learning strategies serve as good predictors of higher academic performance.

Various studies have explored the relationship and influence between students' self-efficacy with self-regulation and self-regulated learning (SRL). (Agustiana, 2016) claims that self-efficacy and SRL have a major influence on students' academic performance. According to him, self-efficacy affects several aspects of academic motivation, such as choice of activity, level of effort, persistence, and emotional reactions. (Alafgani & Purwandari, 2019) also found evidence of a relationship between self-efficacy, academic motivation, self-regulated learning, and student academic achievement in school.

Researchers have also conducted other studies investigating aspects of self-efficacy and self-regulation as part of SRL. Self-regulation and self-efficacy are a continuous construction that places self-efficacy as a sub-component of self-regulation (Wang et al., 2013). The study also found that individuals with high regulation tend to have high self-efficacy as well. That is, students

with self-efficacy tend to be motivated to carry out tasks to achieve the targeted goals. This fact is confirmed by a study conducted by (Sadi & Uyar, 2013) , which states that students with high self-efficacy are directly related to Cognitive Self-Regulation (CSR) and Metacognitive Self-Regulation (MSR).

With the results of this study, of course, it is hoped that it can provide additional references for teachers to design learning that prioritizes aspects of student self-efficacy. In other words, learning in this era should not only focus on aspects of learning outcomes. Still, it must consider aspects of self-efficacy, which are no less important and their role in the success of student education. In addition to teachers, this study is also expected to be input and advice for policymakers to give more portion to the self-efficacy aspect in the curriculum at the high school level.

CONCLUSION

This study aims to examine the effect of the scientific multiliteracy learning model with a self-regulated learning approach on student self-efficacy. The results of this study indicate a significant positive effect on students' science self-efficacy through the use of the scientific multiliteracy model with SRL. The test results showed an increase in the average self-efficacy score in the posttest compared to the pretest session. This indicates that teachers at the high school level must switch from using conventional learning methods to multiliterate models with SRL in increasing student self-efficacy. In the future, teachers and researchers must focus on this aspect because education in the current millennial era is not enough to rely on cognitive abilities/knowledge without giving portions to other aspects. Self-efficacy is considered an important aspect that supports academic success and positive attitudes and behaviours from an early age.

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