

The Effect of JiRQA Learning Strategy on Critical Thinking Skills of Multiethnic Students in Higher Education, Indonesia

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Abstract: *The purpose of this quasi experimental research 2 x 3 was to reveal the effect of JiRQA learning strategy on critical thinking skills of multiethnic students in higher education. This research conducted on zoology lecture, in the even semester of the 2015/2016 academic year. The samples of this research were 125 students consisting of ethnics of Dayak, Javanese and Malay. The data of the critical thinking skills were obtained from the pretest and posttest using essay test, and analyzed by using analysis of covariance (ANCOVA) at the level of significance 5%, followed by Least Significant Difference test (LSD). The results of the data analysis show that the strategy, ethnic and the interaction between the strategy and ethnic have a significant effect on the student critical thinking skills. The students' critical thinking skills in JiRQA strategy are 20.59% higher and significantly different than that of the conventional learning. The critical thinking skills of Javanese students are 11.56% higher than those of the Malay students. There is no significant difference of student critical thinking skills between Malay and Dayak students, as well as between Javanese and Dayak students. Student critical thinking skills in JiRQA learning strategy are not significantly different among ethnics, but those are significantly different among ethnics in conventional learning. All combination groups of conventional learning are significantly different among each other, where the combination group of Javanese is the highest one.*

Keywords: *critical thinking, higher education, JiRQA strategy, learning strategy, multiethnic*

1. INTRODUCTION

The current global competition has some consequences on every levels of education, particularly on higher levels of education to improve the quality of education in order to produce a superior and competitive quality of human. One of the characteristics of a qualified human in the 21st century is to have life skills, including the critical thinking skills (Greenstein, 2012; and Trilling and Fadel, 2009).

Critical thinking skills have an important role in improving the quality of human beings. Someone having the critical thinking skills will be able to ask the right questions, incorporate relevant, effective and efficient information, creative, has a plausible reason, as well as has consistent and credible conclusions (Paul & Elder, 2005; Carter et.al, 2006; and Facione, 2010). Critical thinking skills can also be used to determine what to be believed or what to be done (Ennis, 2001). Furthermore, Liliasari (2003) revealed that critical thinking skills could be used as the basis for the arguments analysis, as well as the bases for insights to each meaning and interpretation to develop logical reasoning. On the other hand, critical thinking skills can also contribute to the students' cognitive ability (Page, 2007; and Taghva et.al, 2014). The results of an experimental research in STKIP Persada Khatulistiwa Sintang, Indonesia by Bustami (2017) showed that critical thinking skills had a contribution on cognitive skills, as much as 1.40% for the experimental class and 7.90% for the conventional class.

Due to the importance of critical thinking skills, the improvement of the critical thinking skills of biology students became the focus on every level of learning. However, the problems related to the poor critical thinking skills are still found. Several research results revealed that the improvement of students' critical thinking skills is not yet optimal (Barzdzukiene et.al, 2006; Suliman & Halabi, 2007; and Utama, 2007). The low critical thinking skills are found from the results of observations in STKIP Persada Khatulistiwa Sintang, Indonesia by Bustami (2017) indicating that some students were not able to give arguments (74.56%), not able to ask questions correctly (59.65%), not able to answer challenging questions (86.84%) and not able to answer questions based on sources (79.07%).

The factors affecting the low critical thinking skills of biology students are the learning process which tends to be teacher-centered (Mangena, 2005; Barzdzikiene et.al, 2006; Azizmalayeri, 2012; and Garcha, 2015); consequently in this situation the role of students becomes passive (Barzdzikiene et.al, 2006). The research by Sutama (2007) revealed that the practice of learning in higher education nowadays had not been able to provide the opportunities for the students to learn intelligently, critically, creatively and to solve problems. The students are more often directed to memorize information (Sanjaya, 2008).

The results of the observation in STKIP Persada Khatulistiwa Sintang, Indonesia also showed that the low critical thinking skills were caused by the fact where the learning process was still dominated by the lecturer (teacher-centered); the students tended to be quiet, and teachers failed to give the students an opportunity to give their opinions or make arguments, so that their creativity and critical thinking skills were less developed. The learning processes were not able to produce innovative learning. In fact, according to Tan (2003), Innovative learning can better enhance active involvement and participation, collaboration, and self-directed learning. Innovative learning will be able to shift the paradigm of education, that is, from the teacher centered learning to student centered learning, or from the behaviorist approach to constructivist approach (Sidi, 2001).

Another factor that also has an effect on critical thinking skills is the ethnic characteristic (Facione, 2000; Maasawet 2009; and Ahmadi et.al, 2011). Ethnic characteristic, such as the ability to adapt to the surrounding community, can affect a person's critical thinking skills. The research by Maasawet (2009) revealed that the critical thinking ability of a person could not be separated from the ethnic characteristics that could adapt in their interaction during the learning process. The interactions that occur in the learning process will provide the opportunity for the students to have discussions and mutual communication and to give and receive arguments with the members of the group, so that it can stimulate the formation of critical thinking skills. Because of the correlation between ethnic characteristics and critical thinking skills, it is necessary to integrate ethnic characteristics in innovative learning process.

One of the learning strategies that can integrate the ethnic characteristic in the innovative learning process is cooperative learning strategies (Grafura, 2007; and Kusmarni, 2011), including the JiRQA strategy (Jigsaw, Reading, Questioning, Answering). JiRQA strategy is the result of the combination between the syntaxs of Jigsaw and of Reading, Questioning Answering (RQA) strategy, with seven stages as follows: (1) delivering the learning topic, (2) forming heterogeneous groups, (3) Reading, Questioning, Answering activities in the home group, (4) forming expert groups, (5) discussion in expert groups (6) discussion and peer tutors in the home group, and (7) the provision of quizzes and rewards as well as giving a homework, that is, by asking the students to read and to make a summary related to the learning material.

The activities of cooperative learning strategies, such as discussions and peer tutors, will be able to provide the opportunities for the multiethnic students to make arguments to each other in the learning process. According to Slavin (2010), the activity of making arguments in cooperative learning could trigger the formation of students' critical thinking skill. Some research finding related to JiRQA strategy also reveal that Jigsaw, Reading, Questioning and Answering activities have the potential to develop the students' critical thinking skills (Hassoubah, 2007; Alexander et.al, 2010; Al Odwan, 2012; and Widayati, 2015).

Based on the problems revealed in the background above, this research aimed at revealing the effect of Jigsaw, Reading, Questioning and Answering (JiRQA) learning strategy on biology critical thinking skills of multiethnic students in higher education. The benefit of this research are expected to be reference for the teachers of higher education to implement JiRQA learning strategy to increase critical thinking skills of the multiethnic students.

2. METHODS

2.1. Research Design

This research was a quasi experiment, conducted in STKIP Persada Khatulistiwa Sintang, Indonesia in the even semester of 2015/2016 academic year, using a pretest-posttest Non-equivalent Control Group Design of 2 X 3 factorial design. JiRQA strategy and conventional learning were as the first factor, and the student ethnic of Dayak, Malay and Javanese were the second factor. The research design can be seen in Table 1.

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Table1. *Research Design*

Pretest	Treatment	Posttest
P1	S1E1	P2
P3	S1E2	P4
P5	S1E3	P6
P7	S2E1	P8
P9	S2E2	P10
P11	S2E3	P12

(Modified from Fraenkel & Wallen, 1993)

Note: S1 = JiRQA learning strategy, S2 = conventional learning, P1, P3, P5, P7, P9, P11= pretest score, P2, P4, P6, P8, P10, P12= posttest score, E1 = Dayak ethnic, E2 = Malay ethnic, E3 = Javanese ethnic

2.2. Population and Sample of the Research

The population of this research was all students of biology education study program with the total number of 586 students and the samples of this research were the students who were taking zoology lecture with the total number of 125 students consisting of three ethnics. The students' composition of the Dayak, Javanese, and Malay ethnics were 49, 39, and 37, respectively. The class samples were selected by using simple Random Sampling technique. Those sample students had the equal academic ability based on placement test results.

2.3. Research Instrument

The instruments used to measure the biology critical thinking skills were in the form of essay test. The total number of the questions in the essay test was 10 items. The questions of the essay test were developed based on the indicators of critical thinking by Ennis (2001), namely formulating a problem, giving arguments, making deduction and induction, evaluating, deciding and implementing. The instruments of the critical thinking skills used had been validated by a team of experts and had been tried out. The results of the try out showed that all the items of critical thinking skills were valid and reliable with a range of score of product moment between 0.303 and 0.735 and the score of Cronbach alpha was between 0.883-0.896. These results indicated that the test items of the critical thinking skill were appropriate to be used in this experimental research.

2.4. Data Collection

The data of the critical thinking skills were collected by giving the essay test in the form of pretest and posttest to all of the research samples. The scores of the students' critical thinking skills were based on the rubric of critical thinking (score of 0-5) adopted from Ennis (2001). The scores obtained were then converted to a score range (0-100). The data of the biology critical thinking skills of each multiethnic student were then summarized and analyzed.

2.5. Data Analysis

The data were analyzed using inferential statistics. The normality and the homogeneity tests were carried out as the prerequisite test for the inferential statistic test. The inferential statistic used after the prerequisite test was analysis of covariance (ANCOVA) with the significance level of 5% ($p < 0.05$). If the results of the analysis were significantly different the post hoc analysis used further was the Least Significant Difference (LSD) test. All of the data analysis were assisted with SPSS version 16.

3. RESULTS

All the data are distributed normally and homogeneously. The mean scores of the critical thinking skills in the pretest in all strategy and ethnic groups were very low, while mean scores of the critical thinking skills in the posttest in all the strategy and ethnic groups ranged from low good category. Summary of all the mean scores are presented in the Table 2.

Table2. *Summary of Mean Scores in Pretest and Posttest of critical Thinking Skills of Biology Students*

Learning	Ethnic Groups	N	The Pretest Mean	Category	The Posttest Mean	Category	Increase (%)
JiRQA	Malay	18	41.82	very low	70.08	good	67.56
	Dayak	26	41.26	very low	70.28	good	70.31
	Javanese	20	41.43	very low	72.14	good	74.14
	Total	64	41.47	very low	70.80	good	70.72

Conventional	Malay	19	38.61	very low	52.93	low	37.10
	Dayak	23	40.16	very low	58.57	low	45.86
	Javanese	19	39.62	very low	65.04	sufficient	64.14
	Total	61	39.51	very low	58.83	low	48.90
Total	Malay	37	40.17	very low	61.27	sufficient	52.53
	Dayak	49	40.74	very low	64.78	sufficient	59.00
	Javanese	39	40.55	very low	68.68	sufficient	69.38

Note: N = Number of Students

The summary of the results of ANCOVA test related to the effect of strategy, ethnic and the interaction between strategy and ethnic on the critical thinking skills of biology students can be seen in Table 3.

Table3. Summary of the Results of ANCOVA Test on the critical Thinking Skills of multiethnic Students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6974.165 ^a	6	1162.361	16.545	.000
Intercept	14665.678	1	14665.678	208.751	.000
Xcritical	968.298	1	968.298	13.783	.000
Strategy	4435.429	1	4435.429	63.134	.000
ethnicity	938.112	2	469.056	6.677	.002
Strategy * Ethnic	482.605	2	241.302	3.435	.035
Error	8290.027	118	70.254		
Total	536780.000	125			
Corrected Total	15264.192	124			

Based on the results of ANCOVA in Table 3, it can be concluded that the strategy had a significant effect on biology critical thinking skills. The increase of the corrected mean score of critical thinking skills in JiRQA learning was 20.59% higher than that of those in the conventional learning (Table 4).

Table4. Summary of critical Thinking Skills related to Strategy Group

Learning	Average value		Difference	CriticalCor
	Pre critical	Post critical		
Conventional	39.508	58.829	19.321	58.383
JiRQA	41.472	70.803	29.331	70.395

Based on the results of ANCOVA in Table 3, it can be concluded that ethnics have a significant effect on biology critical thinking skills. Furthermore, the results of LSD test related to the ethnic group show that there is a difference in the corrected mean score of critical thinking skills among ethnic groups. The students of Javanese ethnic group have the corrected mean score 11.56% higher and significantly different from the students of Malay ethnic group. The corrected mean scores of biology critical thinking skills of the students of between Javanese and Dayak ethnic groups, as well as between the students of Dayak and Malay groups are not significantly different. (Table 5).

Table5. Summary of LSD Test Result of critical Thinking Skills related to Ethnic Groups

Ethnics	Average value		Difference	CriticalCor	LSD Notation
	Pre critical	Post critical			
Malay	40.172	61.274	21.102	60.748	a
Dayak	40.743	64.781	24.038	64.651	a b
Javanese	40.548	68.681	28.133	67.769	b

The results of ANCOVA in Table 3 related to the probability value of critical thinking skills in relation with the interaction between strategy and ethnic show that the interaction between strategy and ethnic have a significant effect on biology critical thinking skills. The results of LSD test in Table 6 show that there is a difference of critical thinking skills among ethnic groups in the conventional learning. Related to the conventional learning the critical thinking skills of Javanese ethnic are highest compared to those of Dayak ethnic as well as Malay ethnic; the critical thinking skills of Javanese ethnic is 22.46% higher compared to those of Malay ethnic, and 11.49% higher compared to those of Dayak ethnic. However, related to JiRQA learning, there is no difference of biology student critical thinking skills among the three ethnics.

Table 6. Summary of LSD Test Result of critical Thinking Skills related to the Interaction between Learning and Ethnic

Learning	Ethnics	Average value		Difference	CriticalCor	LSD Notation
		Pre critical	Post critical			
Conventional	Malay	38.608	52.932	14.324	52.705	a
	Dayak	40.155	58.571	18.416	57.896	b
	Javanese	39.623	65.037	25.414	64.549	c
JiRQA	Malay	41.824	70.079	28.255	68.791	d
	Dayak	41.428	72.143	30.715	70.990	d
	Javanese	41.263	70.274	29.011	71.405	d

4. DISCUSSION

Based on the results of ANCOVA the kind of learning has a significant effect on the increase of critical thinking skills of biology students. The increase of critical thinking skills in JiRQA learning is 20.59% higher compared to those of conventional learning.

The findings of the research provide information that JiRQA learning is more potential in improving biology critical thinking skills than conventional learning. The results of this research are consistent with some previous researches (Hussaini, 2009; Nezami et.al, 2013; Valdez et.al, 2015; Garcha and Kumar, 2015) stating that the implementation of several cooperative learning strategies will be able to improve critical thinking skills compared to conventional learning. In fact, the implementation of JiRQA strategy is able to engage the students to formulate, provide arguments, make deduction and induction, as well as evaluation, decide and implement the concepts of zoology compared to conventional learning

Conventional learning use lecturing method more often in the learning process. The use of the lecturing method may make the students tend to receive information only from the teachers. These conditions make the learning process tends to monoteneous causing the learning process to become ineffective. Ineffective learning can cause the students unable to develop their thinking process, and it can hinder the development of students' thinking skills, such as communication skills, critical thinking skills, problem solving skills, and decision making (Saguni, 2010).

On the other hand JiRQA learning strategy is one of cooperative learning strategies that has superior stages to the conventional learning in improving biology critical thinking skills. The stages of JiRQA learning, such as being an expert of the field, will be able to encourage the biology students to learn to think independently and in groups to solve the problems given. The learning activities will encourage the students to become independent learners. According to Corebima (2006), it is clear that in self-regulated learning the learner is conditioned to think and think.

JiRQA learning is also able to involve the students to have discussions both in the original groups as well as in expert groups. The discussion activity in JiRQA learning provides the opportunities for the biology students to argue with each other, ask questions and give answers, and draw conclusions related to the material being discussed. Lie (2008) and Slavin (2010) revealed that discussion and argument activities in the Jigsaw would bring expansion and cognitive conflict in students, as a result of, the students would be accustomed to thinking activity. Furthermore, the research by Ariyanti et.al (2013) revealed that the students who were often trained to brainstorm, argue, exchange information, and solve problems in small discussion groups would form their critical and creative thinking skills.

On the other hand, the peer tutor activity in the JiRQA learning will give the responsibility to each student to master the material being studied. Peer tutoring activities make the students think more so that, it trains their ability to analyze and interpret the material being discussed. This is in line with Saguni (2010) stating that the activities of peer tutors in the home group were able to train the students' skills of discussion, responsibility, and help each other in the learning process. This activity is able to hone the critical thinking skills of biology students.

JiRQA learning strategy also requires students to do reading activities, summarizing, making and answering their own questions. Such activities will have an effect on students' critical thinking skills. Hassoubah (2007) revealed that if a student read critically, their critical thinking skills would be trained. Furthermore, Sumampouw (2011) and Suhartono (2014) revealed that reading habit could

sharpen the critical thinking skill of a person. Related to making questions, the research of Alindada (1998) revealed that questioning was the most convenient way to challenge the patterns of creative and critical thinking. It is also expressed by Lubliner (2001) saying that question was a tool used to improve students' thinking skills.

The results of ANCOVA related to the effect of ethnic on critical thinking skills show that ethnic has a significant effect on biology critical thinking skills. The results of this research are consistent with results of previous researches conducted by Maasawet (2009) implementing cooperative learning strategy of Snowballing and Number Head Together (NHT) on the students of Javanese, Bugis, Banjar and Kutai ethnics and the research conducted by Haerullah (2012) implementing Thinking Empowerment by Questioning (TEQ) learning strategy and Think pair Share (TPS) strategy on the students of Ternate, Tidore and Maikian ethnics. Those researches showed that ethnic had a significant effect on students' critical thinking skills. On higher education level, the research of Maramba and Velasquez (2012) also revealed that ethnic identity in students had an effect on the development of critical thinking skills.

The result of this research, especially related to the effect of ethnic on the critical thinking skills of biology students is in line with some researches before. The research of Boleng (2014) revealed that the students having different ethnic backgrounds tended to have different cultures and characters. The differences in cultures and characters of every ethnic make the students to have different ways of thinking and acts, so that it affects the learning climate. Similarly, Jacobsen, et.al (2009) stated that what the students brought into the classroom will significantly affected the learning climate. Learning climate formed by the diversity of cultures and characters is able to affect the critical thinking of biology students.

Based on the LSD test results related to ethnic groups it is seen that there is a difference of the corrected mean score of critical thinking skills among the ethnic groups. The corrected mean score of Javanese ethnic students is 11.56% higher and significantly different compared to that of the Malay ethnic students, but it is not significantly different compared to the Dayak ethnic students. Thus, these results can be interpreted that the Javanese students have higher increase of critical thinking skills compared to Malay ethnic students.

As the immigrant ethnic the Javanese ethnic students have a character that can adapt more easily to the surrounding environment, so they interact more easily in the learning process. This characteristics can help the Javanese students to have discussions, communications and argumentations, thus, it can trigger the formation of critical thinking skills better. Maasawet (2009) also revealed that the critical thinking skills of a person could not be separated from the ethnic characteristics that could adapt to interact both in society and in the learning process.

On the other hand, the success of Javanese ethnic cannot be separated from the characters, such as hardworking, self-motivated, resilient and able to cooperate with anyone. The success of Javanese ethnic as immigrant ethnic was expressed by Salter (2009) and Rambitan (2012), that to be successful, immigrant ethnics usually had a strong character such as honest, hard work, responsible, pattiencie, and able to cooperate in the effort to have a more decent life in a new area that they lived in. In addition, Javanese ethnic as immigrant ethnic is required to think more in order to improve their quality of life to become more prosperous. According to Ahmadi et.al (2011), the success in improving the living standards is not solely dependent on physical ability, but it depends on the quality of non-physical ability, such as thinking skill. The characters, if taken in the learning process, will have a better effect on the biology critical thinking skills.

The characteristics of the local ethnic different that have lived in West Kalimantan will generally be more likely to rely on their physical ability to fulfill all their needs. The research of Sangalang and Darjosanjoto (2011) revealed that local ethnic in Kalimantan generally worked or got their livelihood from the natural surroundings, namely by hunting, fishing, animal husbandry, agriculture, and forest products. Similarly, the Malay ethnic as a local ethnic are who mostly live in the area near the water, having the livelihood as merchants, fishermen, farmers and artists, also would be more likely to use physical abilities to fulfill all their needs. The characteristics of the Malays students are thought to be one factor causing the underdevelopment of biology critical thinking skills, when compared to the Javanese students.

Related to the increase in the corrected mean score of the critical thinking skills of the students of ethnic Javanese and Dayak that are not significantly different, or higher than those of the ethnic Malay students, it is caused by the fact that Dayak students have similar characters compared to the Javanese students. The results of preliminary survey in STKIP Persada Khatulistiwa Sintang described that the Dayak students were highly motivated, tenacious in completing their college, disciplined, and able to interact, so that they can cooperate well in the learning process. Similarly, Ibrahim (2009) expressed that Dayak ethnic was the indigenous people who certainly had a friendly nature, honest, high cooperation spirit, and very respectful to guests from outside area. Furthermore, Miranda (2008) revealed that the Dayak students had the ability to collaborate in solving problems together. The similarity of the characters between of Javanese and Dayak ethnics makes both ethnics were not significantly different in their biology critical thinking skills, however, higher than that of the Malay students.

The results of ANCOVA on the effect of the interaction between strategy and ethnic on critical thinking skills show that the interaction of strategy and ethnic has a significant effect on biology critical thinking skills. The results of this research are consistent with the results of the research conducted by Maasawet (2009), by implementing cooperative learning Snowballing and Number Head Together (NHT) to multiethnic students of senior high school in Samarinda, showing that the interaction between strategy and ethnic had a significant effect on the critical thinking skills of biology students.

Based on the results of LSD test, it is seen that at conventional learning the critical thinking skills of students among the three ethnics are different among each other. On the other hand the critical thinking skills of students at JiRQA learning among the three ethnics are not different among each other.

Related to the difference of critical thinking skills among ethnics in the conventional learning maybe it can be explained that the conventional learning cannot accommodate the characteristics of each ethnic in influencing the biology critical thinking skills. The research by Boleng (2014) revealed that conventional learning could not give the opportunity for the multiethnic students to think, explain, and make conclusions. Conventional learning was more dominated by the lecturing activity, and the students tended to listen, record and rarely ask questions, so that the interaction and cooperation among multiethnic students in the group was still low. This fact shows that the conventional learning cannot improve the biology critical thinking skills of the biology students evenly.

Related to the similarity of critical thinking skills among ethnics in the JiRQA learning, it can be explained in relation with the potential of this learning strategy. JiRQA learning is believed having the potential to accommodate the characteristics of each ethnic in improving the critical thinking skills.

The characteristics of JiRQA strategy, such as becoming expert of the field, giving arguments to each other, engaging in discussions, peer tutoring, reading, summarizing and making inquiries on each ethnic, will be able to give the same effect on the critical thinking skills of each multiethnic student group. JiRQA learning strategy is also able to accommodate all ethnic groups to interact with each other in the learning process. The interaction in the JiRQA learning will trigger each ethnic group to adapt the learning environment. According to Maasawet (2009), the adaptation ability formed from cooperative learning strategy will allow each ethnic group to improve their critical thinking skills.

On the other hand, the combination between the characteristics of ethnics and the characteristics of learning strategy can affect the similarity of critical thinking skills in each ethnic group. The research of Maasawet (2009) revealed that the ethnic characteristics, such as honest, respectful, loyal, ideal, virtuous, responsible, team working, tenacious, hard working, polite, patient and intelligent, if combined with cooperative learning strategies, can help improve the critical thinking skills of multiethnic students. Thus, it is clear that the implementation of JiRQA cooperative learning has the potential to empower critical thinking skills of biology students having multiethnic backgrounds.

5. CONCLUSION

Strategy has a significant effect on the increase of biology critical thinking skills; the increase of biology critical thinking skills in JiRQA learning strategy is 20.59% higher and significantly different from the conventional learning. Ethnic has a significant effect on the increase of biology critical thinking skills; the increase of biology critical thinking skills of Javanese ethnic student group is

significantly different and 11.56% higher from that of the Malay ethnic. The interaction between strategy and ethnic has a significant effect on the increase of biology critical thinking skills. The increase of the biology critical thinking skills among ethnics in JiRQA learning strategy combination group is not significantly different, but in the conventional learning combination group it is significantly different. It can be concluded that JiRQA learning strategy is more suitable to be implemented in multiethnic students in improving biology critical thinking skills than the conventional learning, because the JiRQA learning strategy having the potential to accommodate the characteristics of each ethnic.

RECOMMENDATION

Based on the results of research and discussion, it is recommended that education institution implement cooperative learning strategies, especially JiRQA learning strategy at every level of education in order to improve the critical thinking skills of the students with multiethnic backgrounds. Furthermore, lecturers and researchers need to do similar research by implementing JiRQA learning strategy to measure other variables related to thinking skills, including metacognitive skills.

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