

The Effect of the RQANI Learning Model on Self-Efficacy of Pre-Service Biology Teachers in Ternate City, Indonesia

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Abstract: **The Effect of the RQANI Learning Model on Self-Efficacy of Pre-Service Biology Teachers in Ternate City, Indonesia.** **Objective:** The purpose of this study was to identify the effect of the RQANI model on the self-efficacy of biology students in Ternate City, North Maluku, Indonesia. **Methods:** The present study was a quasi-experimental study with a non-equivalent control group design. The study population contained all students from the Department of Biology Education in the city of Ternate, North Maluku, Indonesia. The sample consisted of 120 biology education students from IAIN Ternate and STIKIP Kie Raha, the city of Ternate, North Maluku. The data were collected through survey and observation. Data analysis involved descriptive and inferential statistics. **Findings:** The study results showed that the RQANI learning model had an effect on biology students' self-efficacy. **Conclusion:** RQANI learning model had an effect on biology students' self-efficacy

Keywords: self-efficacy, quasi-experimental research, pre-service Biologi teachers.

Abstrak: **Dampak Model Pembelajaran RQANI terhadap Efikasi Diri Calon Guru Biologi di Kota Ternate, Indonesia.** **Tujuan:** Tujuan dari penelitian ini adalah untuk mengidentifikasi pengaruh model RQANI terhadap Self-Efficacy Mahasiswa Calon Guru Biologi di Kota Ternate, Maluku Utara, Indonesia. **Metode:** Penelitian ini merupakan penelitian quasy eksperimen dengan desain Nonequivalent Control Group Design. Populasi penelitian merupakan seluruh mahasiswa pendidikan biologi di Kota Ternate, Maluku Utara, Indonesia. Sampel penelitian terdiri dari 120 mahasiswa pendidikan biologi di IAIN Ternate dan STIKIP Kie Raha, Kota Ternate, Maluku Utara. Instrumen yang digunakan adalah instrumen untuk mengukur self-efficacy mahasiswa melalui angket dan lembar observasi. Selanjutnya, data penelitian dianalisis dengan menggunakan analisis deskriptif dan inferensial. **Temuan:** Berdasarkan hasil penelitian dan analisis data, maka dapat disimpulkan bahwa terdapat pengaruh model pembelajaran RQANI terhadap self-efficacy mahasiswa biologi. **Kesimpulan:** terdapat pengaruh model pembelajaran RQANI terhadap self-efficacy mahasiswa biologi.

Kata kunci: efikasi diri, penelitian kuasi eksperimen, calon guru Biologi.

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■ INTRODUCTION

Self-efficacy is a psychological attribute that needs to be formed through the educational process at tertiary institutions. It is important not only to shape professional maturity but also to shape student character (Faiz, 2015). Self-efficacy is a person's confidence in their skills and using them to accomplish specific work behaviors (Cai et al., 2021). Individual self-efficacy depends on the environment and cognitive conditions surrounding them (Badrin et al., 2022). Someone with self-efficacy always desires to advance and develop (Dari & Putro, 2021). With self-efficacy, individuals can assess their ability and competition to perform tasks, achieve goals, and overcome obstacles (Kamsurya et al., 2022). When self-efficacy is high, learners can use specific responses to gain reinforcement and be always ready and alert when solving problems. Conversely, learners with low self-efficacy tend to feel anxious and unresponsive (Pajares & Miller, 1994; Elias & Loomis, 2002). Educators must change their learning strategies and techniques to increase student self-efficacy (Bandura, 2006; Schunk & Pajares, 2002).

The serious problem that the Indonesian government is currently facing is the education system, which is still oriented towards cognitive development and mastery of concepts/theories and pays little attention to the development of affectivity, empathy and feelings (Sahroni, 2017). Indonesian educational practices tend to focus on the development of cognitive aspects, ignoring soft skills and character building that affect the development of positive values in students (Setiawati, 2017). Social phenomena such as fights, drug use, depression, cheating, truancy serve as a mirror for teachers and educational observers that character education is important. Character building and self-efficacy improvement can be realized through learning processes at all levels of education. In interview sessions, several

biology lecturers from *IAIN* (Public Islamic Institute) Ternate, *STKIP KIE Raha Ternate* and *UIN* (Public Islamic University) Alauddin Makassar admitted that they did not teach science and biology thoroughly. Therefore, a learning model based on the integration of Islamic values is necessary to avoid these social deviations.

Based on observations and interviews with a group of students from the Biology Department at *IAIN Ternate*, *STKIP KIE Raha Ternate* and *UIN Alauddin Makassar*, it is known that biology lessons at the university have not integrated Islamic values. In other words, learning ends in the cognitive domain, where students have to study abstract, solid, and difficult-to-understand theories on biology. Also, they have not found any material presentation contextually related to daily life or Islamic values. These educational practices certainly affect student character formation and self-efficacy.

Self-efficacy is a person's belief in their ability to perform and be responsible for a task (Atoum & Momani, 2018). Self-efficacy is not innate or a trait inherent in every student, but is acquired through learning activities (Sahara et al., 2017). Learning experience also contributes to maintaining individual effectiveness (Flores, 2015). Students who believe in their abilities can increase their motivation to study simultaneously. Self-efficacy affects effort and persistence in interpreting tasks (Lunenburg, 2011). Self-efficacy is an important predictor of academic success, affecting student academic performance and retention (Honicke & Broadbent, 2016; Rooiji et al., 2017).

An effective learning process can provide a solid framework to improve the quality of science education, foster students' critical and creative thinking, and encourage student participation in science classes (Tastan et al., 2018; Amin et al., 2017). Self-efficacy is required

to produce graduates with good competence (Kurt et al., 2014). Educators play an important role in improving classroom management by encouraging students to complete tasks that challenge logical thinking and employing meaningful and effective models of learning (Cardenas & Cerado, 2016; Amin et al., 2020). Keeping students engaged in meaningful learning environments can enable them to improve their ability to practice science sustainably. Such a learning process may affect students' motivation and self-efficacy (Osborne & Collins, 2001).

In a science classroom that integrates Islamic values, students showed higher cognitive learning outcomes than those taught with conventional learning (Purwati et al., 2018). In addition, a study by Fayuni et al. (2020) found that millennial students can complete artificial projects and report very well on their meaningful learning activities by being more grateful for all of God's creation on earth. A study conducted by Fitriani & Fibriana (2020) reports that students' religious character scores in the "very good" category after learning using the Islamic values-integrated instructional materials. Likewise, their critical thinking skills are also high.

Instructional materials are integrated with the process experience. Therefore, it is necessary to change the teaching mindset, assuming that students are not passive but active subjects who can build their understanding through interaction with their learning experiences (Azhar et al., 2015). Education effectively controls student behavior, spiritual anomalies, and moral suprematism (Gani, 2019). Integrating Islamic values and science into the classroom is also important for developing knowledge and ethical character (Fahyuni et al., 2020). Character is a combination of attributes, patterns of attitudes and behavior to elevate one's identity and differentiate between every individual (Damon & Gregory, 2003). Cognitive and affective integration can be

achieved by creating an environment that allows everyone to experience satisfying achievement standards. Educators need to be aware of the importance of integrating cognitive and affective domains (Dunkel et al., 2018).

Integrating Islamic values into the classroom through Problem-Based Learning can increase the enthusiasm or motivation of students in learning, as well as provide opportunities for them to solve learning problems scientifically and more meaningfully (Anshori, 2021). The formation of the spiritual culture of students is one of the factors that determine the success of learning (Rusakova et al., 2017). This learning process creates a sense of sincerity and seriousness in students, especially when facing various life problems. Problem-based learning integrated with Islamic values has implications for improving the quality of learning outcomes (Ramadhani et al, 2019). Integrating science and religion must be implemented in an interdisciplinary integrated curriculum (Nasir et al, 2020). Student character can be shaped through education. Character education holds a higher meaningful position, where students better understand (cognitive domain) what is right, have positive values (affective domain), and have the will to complete tasks (psychomotor domain) (Khilmiyah et al. al., 2020).

The integration of science education and religious values should be developed so that students can fully and comprehensively understand natural phenomena (Belzen, 2019). During the knowledge acquisition process, the integration of science and religion plays a role in determining the results of theoretical knowledge and practical experience of nature about the oneness of God and its significance in everyday life (Soni & Klinar, 2010; Hong & Handal, 2020). Integrating Islamic values into learning implementation plans will make it easier for educators to build students' character because

Islamic values can be implemented in every step of learning (Listyono et al., 2018).

Research related to implementing the RQANI learning model in biology classrooms is rarely reported. Several previous studies implemented the integration of science and Islamic values but focused more on measuring character and thinking skills. Meanwhile, studies related to self-efficacy are still rare. RQANI learning model offers students the opportunity to actively participate in learning, develop knowledge, build understanding, deepen existing knowledge and understanding, and integrate Islamic knowledge and understanding from Al-Quran and Al-Hadith (Amin et al., 2022). We believe the RQANI model can overcome problems in biology classrooms and improve student self-efficacy. This study aimed to identify the RQANI model's effect on the self-efficacy of biology students in Ternate City, North Maluku, Indonesia. The results of this study should contribute to improving the quality of learning in the industrial age 4.0 and society age 5.0.

METHODS

Participants

The study population contained all students from the Department of Biology Education in Ternate, North Maluku, Indonesia. The sample consisted of 120 biology education students from IAIN Ternate and STIKIP Kie Raha, the city of Ternate, North Maluku. The investigation was

conducted in the odd semester of the 2020/2021 academic year, between August 2020 and February 2021. The study participants had undergone an equivalence test to prove that they were at the same level of academic ability.

Research Design and Procedures

The present study was a quasi-experimental with a non-equivalent control group design (Sugiyono, 2012). There were two treatment groups in this study, who received a pre-test, treatment, and post-test. The experimental group learned using RQANI, while the control group studied conventionally (without RQANI). The research procedures consisted of the following stages: (1) conducting a preliminary study to identify students' initial condition. At this stage, observation and interview with the course professor were conducted. A placement test was distributed to participants; (2) conducting a pretest for the control and experimental students; (3) implementing RQANI in the experimental class and conventional learning in the control class. There were 14 learning sessions; (4) distributing a post-test to participants; (5) recapitulating the research data and conducting data analysis; (6) writing the research report. The RQANI syntax consists of reading, questioning, answering, elaboration, and integration (Amin et al., 2022). Table 2 contains a detailed description of the RQANI syntax.

Table 1. The RQANI syntax (Amin et al., 2022)

Syntax	Learning Activities	
	Lecturer	Student
Phase 1 <i>Reading</i>	<ol style="list-style-type: none"> Motivates students Delivers the learning objectives Provides students with the opportunity to read relevant literature 	<ol style="list-style-type: none"> Pays attention to the lecturer's motivational session Takes notes on the learning objectives delivered by the lecturer Reads relevant literature about the topic being discussed

Phase 2 <i>Questioning</i>	Provides opportunities for students to make questions and ask questions related to the topic being discussed in the classroom	Creates and ask questions related to the topic being discussed in the classroom
Phase 3 <i>Answering</i>	Provide opportunities for students to answer questions related to the topic being discussed in the classroom	Provides effective answers to the questions being discussed in the classroom
Phase 4 <i>Elaboration</i>	Facilitates students to work together in groups to understand what they are studying, to discuss difficult-to-understand material with their classmates, and to solve problems related to everyday life	Works together in groups to understand what has been studied, discusses difficult-to-understand material with classmates, and solves problems related to everyday life
Phase 5 <i>Integration</i>	<ol style="list-style-type: none"> 1. Provides students with an opportunity to work with their peers or group partners to find verses from the Holy Al-Quran and Al-Hadith that are consistent with the material being studied and write them in their respective notebooks. 2. Summarize the material that has been studied. 	<ol style="list-style-type: none"> 1. Works with their peers or group partners to find verses from the Holy Al-Quran and Al-Hadith consistent with the material being studied and write them in the notebooks. 2. Pays attention to the lesson and summarizes the material that has been studied.

Instruments

Non-test instruments, namely a questionnaire and observation sheets were used to measure participants' self-efficacy. Bandura (1997) explains that self-efficacy consists of three dimensions: magnitude, strength, and generality. The self-efficacy questionnaire focused on three dimensions of measurement, namely (1) the magnitude or level related to student confidence in determining the level of difficulty encountered; 2) strength, associated with student confidence in their ability to overcome problems, (3) generality, associated with student confidence in generalizing assignments and previous experience. The magnitude dimension consists of (a) students' optimism about success; (b) students' ability to adapt to difficult assignments; (c) students' ability to avoid situations and behaviors that exceed their limits. The strength dimension consists of (a) the ability to survive; and (b) tenacity. The generality

dimension consists of (a) cognitive ability; (b) affective ability; (c) psychomotor ability. The self-efficacy questionnaire used in this study consisted of 30 statement items. Participants' alternative answers were evaluated at intervals of 1-100 starting from 0-49 (uncertain), 50-89 (quite certain), and 90-100 (very certain).

An R&D expert, an instrument development expert, and a biology learning expert then validated the instruments. Expert validation results showed a score of 3.68 (very valid) for the observation sheets and 3.76 for the self-efficacy questionnaire (very valid). Then, the instruments were then subjected to empirical validity and reliability tests. Empirical validation was done to thirty Tadris Biology students. The Cronbach Alpha value showed that all the questionnaire items were reliable. The results of the tests showed that the instrument elements were valid and reliable. The alternative

hypothesis explored in this study was that RQANI had an impact on the self-efficacy of biology students in the city of Ternate, North Maluku, Indonesia.

Data Analysis

Data analysis involved descriptive and inferential statistics. The inferential statistical analysis was conducted to examine the effect of the learning model on participants’ self-efficacy. The descriptive and inferential analyses were run in SPSS. The research data were analyzed using analysis of covariate (ANCOVA) with 5% level of significance.

Before conducting ANCOVA, data normality and homogeneity of variance were tested. Data normality was examined using the One-Sample Kolmogorov-Smirnov test, whereas homogeneity of variance was assessed using the Levene’s Test of Equality of Error Variances.

■ **RESULTS AND DISCUSSION**

The mean self-efficacy scores obtained by each treatment group were different. Table 2 and Table 3 shows the self-efficacy pretest and posttest scores of the experimental and control groups in this study.

Table 2. Self-Efficacy of students in the experimental group

No	Dimension	Indicators/Aspects	Pre-test	Post-test	N-Gain
1	<i>Magnitudo</i> /level (task difficulty)	1. optimistic about success	44.00	75.67	0.57
		2. ability to adapt to difficult tasks	42.33	73.11	0.53
		3. ability to avoid unusual situations or behaviors that exceed the limits of self-ability	43.67	72.03	0.50
2	<i>Strength</i> (Belief, confidence, hope)	4. the ability to survive/maintain	44.33	73.17	0.52
		5. tenacity	46.83	74.67	0.52
3	<i>Generality</i> (diversity and breadth of behavioral fields)	6. cognitive ability	45.93	74.17	0.52
		7. affective ability	46.64	75.77	0.55
		8. psychometric ability	45.33	75.63	0.55
Mean			44.88	74.27	0.53

Table 2 shows a mean score of 44.88 for the pretest and a mean score of 74.27 for the posttest with an N-gain value of 0.53. The analysis of the control groups’ self-efficacy is presented in

Table 3. Self-efficacy of students in the control group

No	Dimension	Indicators/Aspects	Pre-test	Post-test	N-Gain
1	<i>Magnitudo</i> /level (task difficulty)	1. optimistic about success	42.47	55.33	0.22
		2. ability to adapt to difficult tasks	41.67	55.67	0.24

		3. ability to avoid unusual situations or behaviors that exceed the limits of self-ability	41.67	53.67	0.21
2	<i>Strength</i> (Belief, confidence, hope)	4. the ability to survive/maintain	39.33	52.67	0.22
		5. tenacity	40.11	52.51	0.21
3	<i>Generality</i> (diversity and breadth of behavioral fields)	6. cognitive ability	39.67	54.71	0.25
		7. affective ability	43.57	56.67	0.23
		8. psychometric ability	44.17	57.92	0.25
		Mean	41.58	54.89	0.23

Table 3 shows a mean score of 41.58 for the pretest and a mean score of 54.89 for the posttest with an N-gain value of 0.23. Figure 1

describes the results of self-efficacy analysis of biology students in the experimental and control groups.

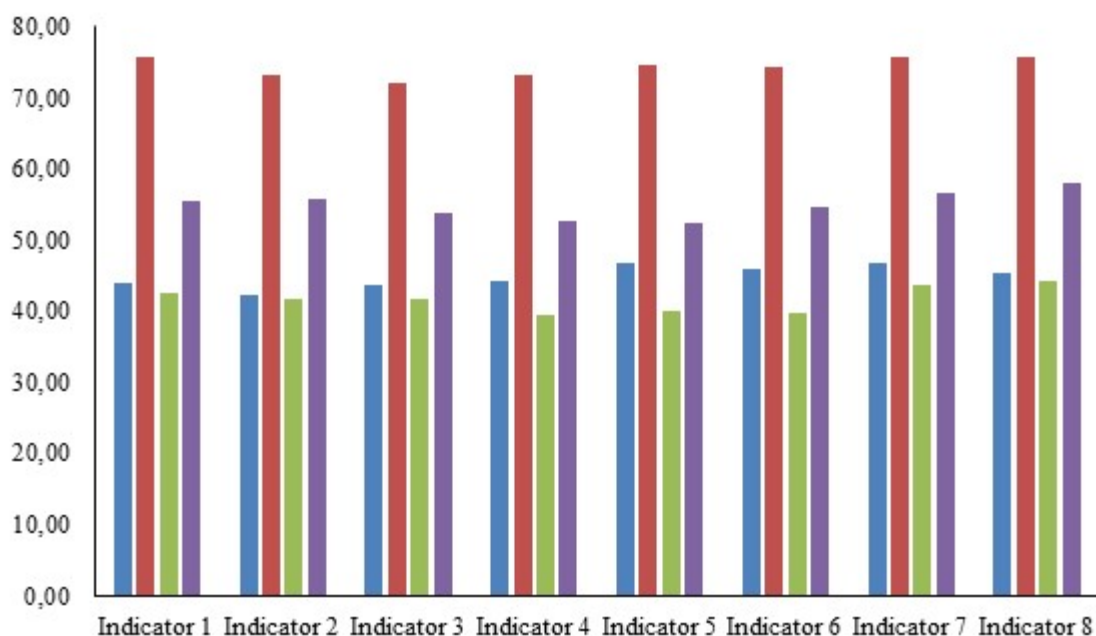


Figure 1. Self-efficacy of students in the experimental and control groups

Based on the Kolmogorov-Smirnov statistical analysis, the pretest and post-test data were distributed normally with $p > 0.05$. The test of homogeneity showed a significance value greater than 0.05. It means that the variance of self-efficacy data was homogeneous. Hypothesis

testing was performed to examine the effect of the independent variable (the RQANI learning model) on the dependent variable (self-efficacy). The research hypothesis was tested using ANCOVA (Table 6). The ANCOVA results in Table 6 showed F-calculated of 466.331 and a

significance value of 0.000, which is smaller than 0.05. These values indicated that H_0 (RQANI had no effect on self-efficacy) was rejected and H_a was accepted. Therefore, the RQANI (Reading, Questioning, Answering, and Integration) learning model was effective in improving biology students' self-efficacy.

The results of the SPSS data analysis suggest that the RQANI learning model can increase the self-efficacy of biology students and stimulate students' learning motivation to become lifelong learners. The RQANI model also improves students' questioning and answering skills, which are fundamental for improving

Table 6. The Results of the ancova on the effect of the learning model on self-efficacy

	Mean Square	F	Sig.	Finding
RQANI Model	9054.493	466.331	.000	H_0 is rejected

thinking, reasoning, communication, and scientific competence to meet the challenges of the 21st century. To be successful in science education, a learner must have higher levels of motivation and self-efficacy to learn and develop skills (Mazumder, 2014). Educators play a critical role in managing instruction, empowering students to find more meaningful assignments, and implementing effective learning models (Cardenas & Cerado, 2016).

The RQANI syntax can demonstrably stimulate increased self-efficacy in biology students. This study proved that the *Reading* phase in the RQANI can instill confidence in each student to engage in discussions. The implementation of RQANI can increase student self-confidence, since every student can read the material first before asking or answering questions, arguing, having dialogues, or discussing with other students. This phase also helps students understand the text by analyzing and interpreting it, so they gradually practice independent study. Their reading experiences significantly influence students' initial knowledge about topics covered or discussed in class (Hikmawati and Taufik, 2017). Increasing students' interest in reading not only increases students' cognitive abilities but can also develop their positive behavior towards the environment.

The *Questioning* phase in the RQANI model has the potential to stimulate students' ability to ask questions. In this case, students are

trained to get used to asking questions that encourage logical thinking and higher-level thinking skills. All students must be able to ask questions in front of the class. The questions asked can activate their previous knowledge, focus their learning efforts, and help to deepen existing knowledge. Organizing questions draws students' attention to the content and main ideas and ensures that the students understand the content being studied. Continued practice can build students' positive self-concept, making them more independent learners with high self-efficacy. Students with good self-concept and self-efficacy feel more challenged to complete tasks requiring thinking skills. Students with high self-efficacy usually perform better academically.

Next, the *Answering* phase in the RQANI model can improve students' ability to answer questions effectively and efficiently. This phase can train students' self-confidence in their opinions or arguments from their learning experiences. This phase encourages students to answer questions from both peers and faculty. This phase also provides students with an opportunity to build confidence and gives them comfort to engage in the academic process in class. In other words, this stage has the potential to increase student self-efficacy and provide students with more meaningful learning experiences.

The *Elaboration* phase in the RQANI model allows students to work together in groups to understand what they have learned, discuss

difficult-to-understand materials with their group peers, and solve problems related to daily life. This level trains students' collaboration skills and empathy to achieve learning success. Peer support can increase students' self-efficacy and motivation. With peer support, students with low self-concept and self-efficacy can slowly improve their self-concept and learning patterns. Researchers agree that a core element of pedagogy is the amount and intensity of student engagement in class activities and learning assignments (Cardenas & Cerado, 2016; Rink, 2013; Rivkin et al., 2005). Motivation and self-efficacy in learning science is one of the factors that can increase learning achievement (Beal & Stevens, 2011). Educators instill self-efficacy and learning motivation in their students so they can complete assignments and pursue academic success (Llbao, 2016).

The *Integration* phase in the RQANI model allows students to discuss with their peers to find verses from the Holy Al-Quran and Al-Hadith relevant to the topic discussed in class. This phase teaches students that all biology learning concepts can be applied to everyday life by integrating them with the holy verses of Al-Quran and Al-Hadith. This phase promotes a contextual and meaningful learning environment and can increase students' self-efficacy. Integrating Islamic values into science classes allows students to receive meaningful learning, where the important points in the Qur'an and Hadith can instill spiritual values (Sabki & Hardaker, 2013). Al-Qur'an reading and memorization activities indirectly improve students' ability to recall lessons about verses related to scientific material and vice versa, making it easier for students to achieve learning success (Baba et al., 2015). Islamic teachings can be used as a way of life to shape a physically, intellectually, spiritually and emotionally balanced personality (Kasim & Yusoff, 2014).

It is believed that motivation has a direct impact on self-efficacy (Shea and Bidjerawo, 2010). Self-efficacy influences a person's choices and effort to achieve a goal (Peter and Shepherd, 2008). Belief in one's ability to effectively manage and solve problems can determine success in life (Reivich and Shatter, 2002). Self-efficacy is a reliable indicator of success and academic achievement (Richardson, Abraham & Bond, 2012). Bandura (1997) defines self-efficacy as a person's belief in their ability to achieve specific achievements that affect their life.

Research by Mahyudin et al (2006) explains that self-efficacy is related to student learning outcomes. Furthermore, it is explained that students with high self-efficacy always show better skills and performance than students with low self-efficacy. Students with low self-efficacy tend to be shy, feel inferior, and lack confidence in the learning process. On the other hand, students with high self-efficacy have strong self-esteem and confidence to achieve desired goals. Therefore, self-efficacy can influence student learning outcomes and academic performance.

Good self-concept affects students' self-efficacy in problem-solving and academic performance (Hernawati and Amin, 2017). Self-efficacy can be trained through habituation. Students with a positive self-concept will better understand their potential and be able to act more independently. Self-concept influences one's personality formation and life satisfaction. Self-efficacy is guided by students' ability to organize and implement actions, and to achieve specific skills and abilities (Bandura, 1986). Students with high self-efficacy demonstrate positive self-existence (Hernawati and Amin, 2017).

According to Bandura (1997), there is a relationship between experience and action. Changes in a person's self-efficacy depend on the following factors: (1) self-perception of one's ability or potential; (2) task difficulty level; (3)

efforts made to achieve a skill/ability; (4) assistance received from someone; (5) the condition and circumstances of a person in acting; (6) the times when someone succeeded or failed; (7) the method used in managing enactive mastery experiences through cognitive processes. The higher the self-efficacy of the students, the higher the school performance that can be achieved, and vice versa, the lower the self-efficacy of the students, the lower the learning performance (Mahardikawati, 2011; Amin, 2022). Self-efficacy in certain scientific disciplines shows the strongest correlation with related career paths, for example, there is a strong relationship between self-efficacy and student interest in science (Panergayo et al., 2021). There is a correlation between students' academic self-efficacy and their learning success (Gavora, 2010). Motivation refers to the reasons underlying student learning behavior, characterized by the development of interest and willingness of students to learn. Motivation in learning science is a determining factor for learning achievement in class (Beal & Stevens, 2011; Amin et al., 2016).

■ CONCLUSIONS

Using descriptive and inferential statistics, the current study demonstrated that the RQANI learning model had an effect on biology students' self-efficacy. The experimental group achieved a mean score of 44.88 in the pretest and a mean score of 74.27 in the posttest with an N-gain value of 0.53, while the control group obtained a mean score of 41.58 for the pretest and a mean score of 54.89 for the posttest with an N-gain value of 0.23

The results of this study are intended to serve as a reference for implementing a learning model that integrates Islamic values into science education. The RQANI model is a learning model developed by the research team and therefore requires more extensive experimentation in different subjects or at earlier levels of education.

The development of this model can also be further explored to see the effect of the model on other variables such as scientific literacy, creative thinking, misunderstanding, etc. This study is limited to using a negative control class; therefore it is suggested that other studies can use a positive control class as a comparison.

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