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Effectiveness of PQ4R on Critical Thinking Skills and Learning Motivation

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Abstract

The research aim to determine the effectiveness of PQ4R learning strategy on students' critical thinking skills and learning motivation. This research used quasi-experimental research with nonequivalent control group design. Sampling was carried out using cluster random sampling technique. The results of the research showed that the critical thinking skills t-test obtained a significance value (Sig.) of 0.000 < 0.05, which means that there was a difference in critical thinking skills between the experimental class and the control class. Based on the results of the N-Gain test, critical thinking skills for the experimental class 0.4418 and than the control class 0.1483. The results of the t-test research on learning motivation obtained a significance value (Sig.) 0.001 < 0.05, which means that there is a difference in learning motivation for the experimental class and the control class. Based on the results of the N-Gain test, the learning motivation for the experimental class 0.3315 and than the control class 0.1529 The conclusion of this research is that the effectiveness value of using PQ4R learning strategy on critical thinking skills and learning motivation in the experimental class is higher than in the control class.

Keywords: critical thinking skills; learning motivation; PQ4R

Abstrak

Tujuan dari penelitian ini adalah mengetahui efektivitas strategi pembelajaran PQ4R terhadap keterampilan berfikir kritis dan motivasi belajar peserta didik. Penelitian ini menggunakan penelitian quasi eksperimen dengan desain eksperimen *nonequeivalent control group design*. Pengambilan sampel dilakukan dengan teknik *claster random sampling*. Hasil penelitian menunjukkan uji t keterampilan berpikir kritis didapatkan nilai signifikansi (Sig.) 0,000 < 0,05 yang artinya terdapat perbedaan keterampilan berpikir kritis antara kelas eksperimen dan kelas kontrol. Berdasarkan hasil uji N-Gain keterampilan berfikir kritis kelas eksperimen sebesar 0,4418 dan kelas kontrol sebesar 0,1483. Hasil penelitian uji t motivasi belajar diperoleh nilai signifikansi (Sig.) 0,001 < 0,05 yang artinya terdapat perbedaan motivasi belajar kelas eksperimen dan kelas kontrol. Berdasarkan hasil uji N-Gain motivasi belajar kelas eksperimen sebesar 0.3315 dan kelas kontrol sebesar 0,1529. Kesimpulan dari penelitian ini adalah nilai efektivitas penggunaan strategi pembelajaran PQ4R terhadap keterampilan berfikir kritis dan motivasi belajar kelas eksperimen lebih tinggi dibanding kelas control.

Keywords: berpikir kritis; motivasi belajar; PQ4R

Introduction

Education is an effort to plan appropriate student participation in various future conditions through mentoring and preparation (Abidin, Mulyati, and Yunansah, 2017). According to Augustine, Nizkon, and Nawawi (2020), education in the 21st century has implemented so that students have thinking, acting and daily living skills. The 2013 curriculum demands achieving 21st century competencies, all aimed at developing higher order thinking skills or HOTS (Tumewu, 2018). Critical thinking skills are one of the higher order thinking skills.

Faiz (2012) argues that critical thinking is an important skill for living, working and functioning effectively in all areas of life. From early education to higher education, the importance of developing critical thinking skills must be emphasized. From elementary school to college, the development of critical thinking skills needs to always be emphasized (Sawika, Laksmiwati, and Khoirunnisa 2018). The lack of critical thinking skills among students is one of the challenges facing the education system (Azmi, 2021). Application of learning models in learning is one of the factors causing low critical thinking skills (Dari and Ahmad, 2020). According to the research results of Windarti, Slameto, and Widyanti (2018), conventional learning can cause students to become passive and make the learning process less interesting and boring, which is the root cause of students' lack of critical thinking skills.

Based on pre-research data at the Kendal State MA, 71.4% of the 28 respondents indicated that learning still implemented a lecture or teacher-centered learning approach. Information obtained from an interview with a chemistry teacher at MA Negeri Kendal shows that the learning process rarely applies learning that can develop critical thinking skills. As a result, students' critical thinking skills tend to be low as evidenced by students' inability to solve problems well. Students' critical thinking skills must be improved because they affect students' ability to deal with problems in everyday life. Nurhudayah, Lesmono, and Subiki (2016) argue that to improve students' critical thinking skills, learning strategies are needed that maximize students' thinking processes and student-centered learning. Critical thinking skills raise students' motivation in learning, such as discussing, asking and responding to students' questions (Nurhudayah, Lesmono and Subiki, 2016). According to Fernanda et al., (2019), critical thinking skills are valuable skills that need to be prepared and instilled in chemistry learning.

Fernanda et al., (2019) argue that the principle of chemistry learning in schools is to emphasize detailed, orderly and systematic learning of chemical principles. Students will not be motivated to study chemistry if the material presented is monotonous and uninteresting (Nugrahaeni, Redhana, and Kartawan, 2017). Based on observations that have been made through observations, students are often not motivated to understand abstract chemical concepts. This was proven by 71.4% of the 28 student respondents at MA Negeri Kendal having problems learning chemistry because chemistry is complex, the learning process is less interesting and the learning strategies used are less effective. Buffer solutions are one of the chemical materials in the form of concepts, formulations and understanding of everyday applications. Buffer solutions are one of the learning materials that students must master, buffer solutions are a deepening of the previous Material, namely acids and bases which are closely related to everyday life (Ma'rifatun, Martini, and Utomo, 2014). The research results of Yunitasari, Susilowati and Nurhayati, (2013) show that the concept of buffer solution material is complex, so that many students experience difficulty in understanding buffer solution Material.

Based on observations that have been made, students learn only by memorizing theory, students tend to accept knowledge as it is without any motivation to try to think and respond critically. The result is that there is no motivational encouragement which has a huge impact on the learning process (Fernanda et al., 2019).

Based on pre-research data, 32.1% of 28 respondents considered buffer solutions to be material that was difficult to learn so that students were passive during the learning process. Based on the problems above, efforts are made to improve students' critical thinking skills and learning motivation in chemistry learning, one of which is the Preview, Question, Read, Reflect, Recite, Review (PQ4R) learning strategy. The PQ4R learning strategy that will be implemented can train students to find a concept or problem through all reading sources and be able to solve the solution themselves (Siregar, 2020). The PQ4R strategy is a useful strategy to help students remember what they read, remembering information from reading can help teachers activate students' skills in understanding learning material and improve mathematical solving skills (Fitriyanti, Masykur, and Putra, 2021).

The PQ4R strategy is able to help students express their knowledge and help students who have poor memory memorize learning concepts (Ratnawuri, Fikri, and Suprihatin, 2018). Based on the results of research conducted by Mitakhurrofi'ah, Prasetyo, and Roektiningroem (2018), it shows that the PQ4R strategy has an effect on students' learning motivation, the PQ4R strategy can change lesson patterns to student centered learning and facilitate students to be more active in learning by reviewing reading, asking questions, reading, reflecting, expressing ideas and reviewing again so that students' critical thinking skills and learning motivation can increase.

The research aim to determine the effectiveness of PQ4R learning strategy on students' critical thinking skills and learning motivation on Buffer Solution Material.

Method

The research design adopted in this research is quasi-experimental with nonequivalent control group design. The quasi-experimental method can be used to identify an increase in a variable due to the treatment given because the control group contained in this method cannot fully control external variables that influence the implementation of the experiment (Sugiyono, 2018). This research consisted of two randomly selected classes, namely the class using PQ4R (experimental class) and the class without using PQ4R (control class). Next, both groups carried out a post-test after completing the learning process. It can be seen in Table 1.

Table 1
Nonequivalent Control Group Design

Class	Pretest	Treatment	Postest
Experiment	O	X	O
Control	O	Y	O

The population in this study were students in class XI MIPA at MAN Kendal. Cluster random sampling is the sampling technique used. Class XI MIPA 3 was chosen as the control class and class XI MIPA 4 as the experimental class.

Result and Discussion

The aim of this research is to determine the differences in students' critical thinking skills and learning motivation on buffer solution material between classes that apply the PQ4R learning strategy and classes that apply conventional learning. Students' critical thinking skills and learning motivation are tested using test instruments prepared based on indicators of critical thinking skills and student learning motivation questionnaires. Indicators of critical thinking skills in this research are: providing simple explanations (elementary clarification), developing basic skills (basic support), drawing conclusions (inference), making further explanations or clarifications (advances clarification), determining or identifying strategies and tactics (strategies). and tactics) for problem solving. Indicators of learning motivation in this research are:

having a passion and desire to learn, encouragement and need to learn, having hopes or aspirations for the future, appreciation when studying, interesting activities while studying, and a conducive learning environment, thus making a student study well.

This research was conducted at MA Negeri Kendal with a population of 6 classes, namely class XI MIPA. Population analysis with normality tests and homogeneity tests was carried out before determining the sample. Before sampling, a population test is carried out to determine whether the data is normally distributed and homogeneous.

Normality and homogeneity tests are calculated using students' daily test scores. The results of the normality test can be seen in Table 2.

Table 2
Normality Test Results

Class	Signification Value
XI MIPA 1	0.400
XI MIPA 2	0.115
XI MIPA 3	0.142
XI MIPA 4	0.060

Based on Table 2, it can be concluded that the population significance value (sig) is > 0.05 so the data is normally distributed. The results of the homogeneity test calculation obtained a significance value (sig) of 0.776 > 0.05 so it can be concluded that the population data is homogeneous. The sampling technique in this research was carried out using a cluster random sampling technique. The sample for this research was class XI MIPA 4 as the experimental class and XI MIPA 3 as the control class. The two classes were given different treatment, the experimental class applied the PQ4R learning strategy while the control class applied conventional learning on buffer solution material.

Students in the experimental class and control class worked on pretest questions at the first meeting to ensure the students' initial level of knowledge. Ten questions with question types C3-C4 are given, and have been adapted to five indicators of critical thinking skills. Based on calculations, the average pretest score in the control class was 28.98, while the experimental class was 32.27. The pretest results obtained were tested for normality. The normality test results are shown in Table 3.

Table 3
Critical Thinking Pretest Normality Test Results

Class	Signification Value
Experiment	0.092
Control	0.180

Based on Table 3, it shows that both classes have a normal distribution. This shows that both the experiment class and the control class have the same initial skills.

The second meeting, the experimental class applied the PQ4R learning strategy to buffer solution material. Learning in the experimental class begins with students reading reading material that has been prepared by the researcher (Read). Then students create questions or formulate problems in groups from the reading material with the direction of the researcher (Question), so that at this stage students can develop critical thinking skills. One of the questions asked by students that is classified as critical is what causes blood pH to decrease (accumulation of acid in the blood).

Then the next step is for students to read actively and look for answers to

questions that have been prepared from reading materials and textbooks (Read). The next step is related to the Read step, namely when students read, students also process information and discuss to find the right answer (Reflect). Discussing here can make students interested in studying the material so that it can grow students' learning motivation. Asy'ari, Saefi and Cholid (2023) argue that critical thinking in learning motivates students to be active in learning such as discussions, asking and answering questions. The next step is for group representatives to present the results of the discussion in front of the class. Students from other groups respond to the results of the groups presenting, after completion each group makes an essence of the learning that has been carried out (Recite). Then the students read the essence that has been made and the researcher provides reinforcement or straightens out the overlapping things (Review).

Learning in the control class uses conventional learning. The learning process in the control class includes the researcher presenting buffer solution material using the lecture method, the researcher and students conducting questions and answers, then the students record the information obtained. Finally, students work on questions and make conclusions about the material they have studied. In the third meeting, students in both the experimental and control classes were given a posttest to measure the level of critical thinking skills and motivation of students in studying buffer solution material after being given treatment. After receiving treatment, students' critical thinking skills improved, and the experimental class that used the PQ4R learning strategy obtained a higher average score than the control class that used conventional learning. The average posttest score after the experimental class treatment was 62.19 while in the control class it was 39.52. It can be seen in Figure 1.

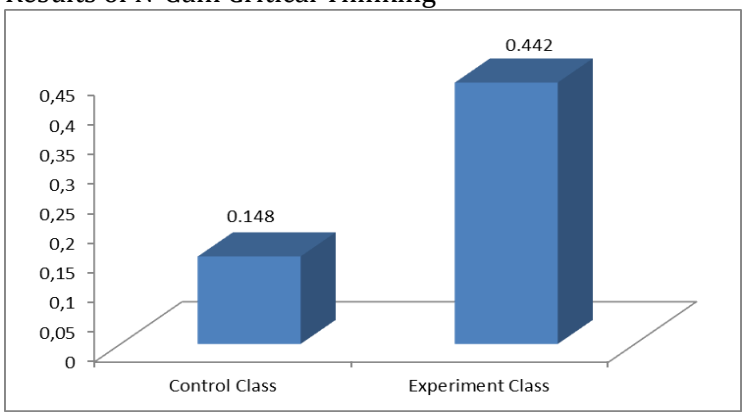
Figure 1
Graph of Average Critical Thinking

Based on Figure 1, the average critical thinking skills score of students in the experimental class is higher than that in the control class. The results of the t test calculation obtained a significance value of 0.000 < 0.05, meaning that there was a difference between the experimental class which used the PQ4R strategy and the control class which used conventional learning, so that H01 was rejected and Ha1 was accepted. The results of the N-Gain test strengthen the differences in critical thinking skills between the experimental class and the control class. The increase in students' critical thinking is shown in Figure 2.

Figure 2 shows that the experimental class has a higher N-Gain value than the control class. The experimental class with an N-Gain value of 0.441819 shows that the application of the PQ4R learning strategy in this research is effective in improving critical thinking skills in the medium category, while

the control class with an N-Gain value of 0.148383 shows that the application of conventional learning is not effective in improve critical thinking skills in the low category.

Figure 2
Results of N-Gain Critical Thinking

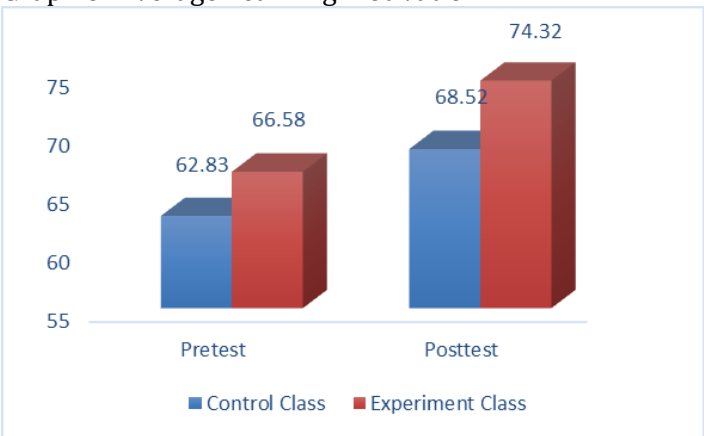


The factor that causes the implementation of PQ4R learning to be less effective in this research is time constraints, namely only one meeting, so if this research is continued, it will enable better critical thinking skills to be improved. According to Lestari, Mulyani and Susanti (2016), limited time is one of the inhibiting factors in developing students' critical thinking skills due to a lack of depth in the material.

The power of learning is closely related to students' learning motivation. Learning motivation can determine a student's learning success (Saptono, 2016). Motivation plays an important role in students' learning process (Lubis and Ikhsan, 2015).

The motivation questionnaire given was in the form of a Likert scale with 40 statements, including 21 positive statements and 19 negative statements. Motivational questionnaires were given at the first and last meetings. The average pretest score for students' learning motivation in the experimental class was 66.58 and in the control class was 62.83. Implementing the PQ4R learning strategy can increase students' learning motivation as shown by the difference in average scores in Figure 3.

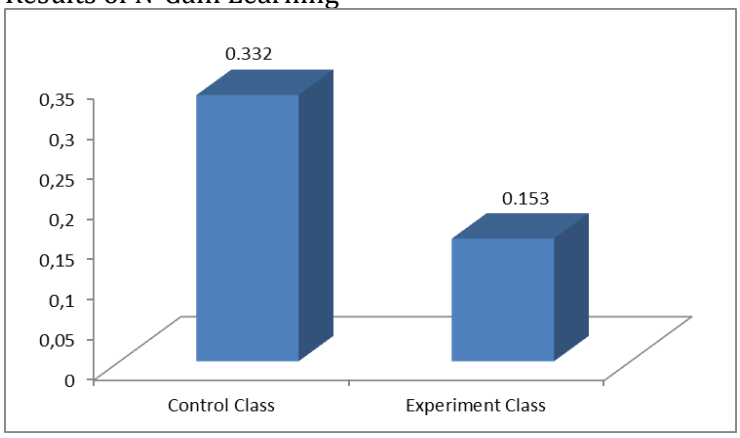
Figure 3
Graph of Average Learning Motivation



The average value of learning motivation in the experimental class experienced a better change compared to the control class. The average value of the experimental class increased after treatment by 66.58 to 74.32, while the control class was 62.83 to 68.52.

The difference in learning motivation between the experimental class and the control class after treatment is also shown by t test calculation. Based on the results of the t test, a significance value of 0.001 < 0.05 was obtained, so it can be concluded that there is a difference in the average value of students' learning motivation in the experimental class which applies the PQ4R learning strategy and the control class which applies conventional learning. Based on the results of the t test with a value of 0.001 < 0.05, it can be concluded that H02 is rejected and Ha2 is accepted. From the N-Gain results for both classes shown in Figure 4, it can also be seen that the PQ4R learning strategy is effective in increasing learning motivation.

Figure 4
Results of N-Gain Learning



Based on Figure 4, the N-Gain value for the experimental class is 0.331752 in the medium category and the control class is 0.152934 in the low category. shows that the application of conventional learning is not effective in increasing learning motivation. The application of PQ4R learning is better in increasing student motivation compared to conventional learning, seen from the higher N-Gain results. The learning motivation of students in the control class did not increase, because the learning implemented by the teacher was only focused on delivering the material. This situation does not benefit students because they cannot learn optimally and tend to be boring. According to Rahman (2021), boring learning will have an impact on poor progress and the quality of learning.

The learning environment in the classroom tends not to be conducive, which is one of the factors in students' low learning motivation, students tend to be engrossed in themselves and ignore the teacher's directions, teachers focus on the few students who listen to them. In the control class where the average student is male, it tends to be difficult to conducive. Suprihatin (2015) believes that an environment in which the learning process takes place that is fun, conducive and non-threatening can provide enthusiasm and an optimistic attitude for students in learning, which tends to encourage someone to be interested in learning. One of solution to increase students' learning motivation to the maximum is by providing grades, prizes, and can also be done by giving tests, announcing the results and giving praise (Sadirman, 2018).

Conclusion

There is effectiveness of the PQ4R learning strategy on students' critical

thinking skills, this is proven by the results of the t test which shows a significance value at the 5% level of 0.000 < 0.05, this shows that there is a difference between the experimental class and the control class. Based on the N-Gain test, the experimental class was 0.4418 in the medium category and the control class was 0.1483 in the low category. The use of the PQ4R learning strategy is better than conventional learning for measuring critical thinking abilities.

The effectiveness of the PQ4R learning strategy on learning motivation based on the results of the t test shows a significance value at the 5% level of 0.001 < 0.05. Based on the results of the N-Gain test for the experimental class it was 0.3315 in the medium category and the control class was 0.1529 in the low category. The use of the PQ4R learning strategy is better than conventional learning for measuring students' learning motivation.

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