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Increasing Interest And Learning Outcomes In Learning Basic Of Industrial Chemical Engineering Using Natural Materials In The Environment Through Experimental Method For Students Of Class X TKI 2 SMK Negeri 3 Kendal Semester 1 Academic Year 2022/2023

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Abstract

This study aims to increase interest and learning outcomes of the Basics of Industrial Chemical Engineering through the application of experimental methods in class X TKI 2 SMK Negeri 3 Kendal. The problems posed in this study are: "Is the application of the experimental method in learning the Basics of Industrial Chemical Engineering using natural materials in the surrounding environment can increase student interest and learning outcomes in class X TKI 2 SMK Negeri 3 Kendal?". This study uses an action research method which is divided into two cycles, where each cycle consists of four stages, namely:1) Planning, 2) Implementation, 3) Observation, and 4) Reflection. In this study, the researcher acted as a teacher in class X TKI 2 SMK Negeri 3 Kendal. Based on the results of the study, it can be concluded that the learning outcomes of Chemistry at SMK Negeri 3 Kendal can be improved by applying the experimental method. It is evident from the assessment of the student group that there is an increase in learning interest in cycle 1, namely 86.49% and in cycle 2, namely 100%. In addition to an increase in interest in learning, it is also proven that there is an increase in learning outcomes from cycle 1 with an average score of 86.44% and in cycle 2 the average value reaches 100%. This experimental method can be implemented by the Basics of Industrial Chemical Engineering teacher because it can increase student interest and learning outcomes, and change students' thinking that Basics of Industrial Chemical Engineering is boring and a difficult subject.

Keywords: experiment, natural materials, the surrounding environment, learning outcomes.

INTRODUCTION

The Basics of Industrial Chemical Engineering are the basic subjects of the Industrial Chemical Engineering program which today has grown rapidly, both in material and in use. Therefore, every study of the Basics of Industrial Chemical Engineering must try to consider the development of science, both the application of use and to solve everyday problems in the environment around us. But what is more important is how the concepts of science are used by students. Based on the syllabus for the subject of the Basics of Industrial Chemical Engineering at SMK class X in odd semesters, students are expected to be able to describe the nature of acidic and basic solutions. The acidity of the solution can be tested using acid and base indicators.

However, based on the observations made by the researchers, it turns out that some students of X TKI 2 still find it difficult to distinguish between acidic and basic solutions. This can be seen from the students' daily test scores of the material, which is 12 out of 36 students have not reached the KKM.

One of the causes of the low learning outcomes of students' Basic Industrial Chemical Engineering is due to monotonous and unattractive learning methods.

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The teacher only explains the concept of rote memorization without relating it to everyday life in the environment around us. Seeing this situation the researcher tried to carry out research using methods and media available in the environment around students. This is in line with the opinion of Sudjana (2008) that the media will help fluency, efficiency and effectiveness. Learning through the media will make students practice, play fun and work. Thus the media can help liven up the classroom atmosphere and avoid a monotonous and boring atmosphere so as to make the learning process more interesting. One of the media that can be used by teachers is natural materials in the environment around students through learning with experimental methods.

With regard to these conditions, so that problems can be formulated: 1) Can learning by experimental methods using natural materials in the surrounding environment increase interest in learning the Basics of Industrial Chemical Engineering on Acid and Base Indicators for students X TKI 2 at SMK Negeri 3 Kendal in 2022/2023 lessons and 2) Can learning with experimental methods using natural materials in the surrounding environment improve learning outcomes for the Basics of Industrial Chemical Engineering on Acid and Base Indicators for students X TKI 2 at SMK Negeri 3 Kendal for the 2022/2023 academic year.

The objectives of this study are to: 1) Describe the increase in interest in learning the Basics of Industrial Chemical Engineering for X TKI2 students at SMK Negeri Kendal in the academic year 2022/2023 on Acid and Base Indicators through learning with experimental methods using natural materials in the surrounding environment, and 2) Describe the improvement in learning outcomes of Basic Chemical Engineering students of X TKI 2 at SMK Negeri Kendal for the academic year 2022/2023 on Acid and Base Indicator materials through learning by experimental methods using natural materials in the surrounding environment.

METHODS

This Classroom Action Research was conducted at SMK Negeri 3 Kendal which is located at Jl. Boja Limbangan Km 1 Ds. Salamsari Boja Kendal, with the research subjects being all students of class X TKI 2. This research was carried out from August to October 2022.

This research is a Classroom Action Research which includes planning activities, implementing actions, observing, and reflecting. These four activities take place repeatedly in the form of cycles. This research was carried out in two main cycles, namely cycle 1 and cycle 2. The description of the implementation is in accordance with the design of classroom action research in the figure below.

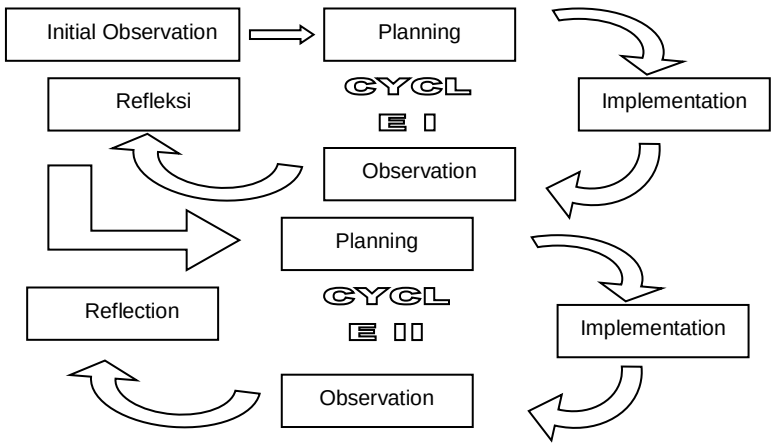

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Figure 1 Classroom Action Research Model (Arikunto, 2008:16)

Data collection techniques in this study used test and non-test techniques. The test technique is carried out at the end of each lesson in the form of a report on the results of the experiment. While the non-test technique was carried out with the aim of knowing student responses to learning with experimental methods using natural materials in the surrounding environment which included observations, diaries, interviews and photo documentation.

RESULTS AND DISCUSSION

A. Research Results

This classroom action research (CAR) was carried out in two cycles. The implementation of the learning model using the experimental method in cycle 1 begins with the planning process, which includes initial observations to determine the level of students' understanding of the material on Acid and Base Indicators. The next planning activity is making learning tools in the form of teaching modules, evaluation tests to measure students' cognitive levels, interview materials, observation sheets to observe students' affective and psychomotor as well as student diaries. After going through the planning process, then proceed with the implementation of research in the classroom. In the implementation of cycle 1, the teacher assigns students to bring natural ingredients that have been determined from home to be tested for acidity according to the Teaching Module, then students are guided to carry out experiments according to the work steps in the Student Worksheet (LKS). Furthermore, students make a report on the results of the experiment and interviewed in writing.

Planning in cycle 2 includes improvements to learning methods, namely the assignment of bringing natural materials is no longer determined by the teacher but is free. After going through the planning process, then proceed with the implementation of research in the classroom. In the implementation of cycle 2, all students can play more active roles because students are free to express, bring and test their own materials that they bring from home so that students are happy, their creativity and activities increase. In this case the teacher acts as a facilitator and observer of student activities in class. Furthermore, an evaluation test is given in the form of a report on the results of the experiment.

After going through the observation process, there is a reflection on the implementation of cycle 2. In the implementation of cycle 2, student learning outcomes have increased and have achieved classical completeness. This increase is caused by several factors including students who have played an active role in the learning process. The results of student interviews also showed an increase in their interest in learning the Basics of Industrial Chemical Engineering, so it can be concluded that the research objectives have been achieved, namely increasing student interest and learning outcomes after the learning process with experimental methods using natural materials in the surrounding environment.

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B. Cognitive Learning Outcomes

Data on cognitive learning outcomes in cycle 1 and cycle 2 are presented in Table 1 below:

Table 1 Cognitive Learning Outcomes Cycle 1 and Cycle 2

No	Criteria	Cycle 1	Cycle 2
1	Lowest value	70	76
2	Highest value	92	96
3	Average	78.75	82.22
4	Classical completeness (%)	86.44	100

Based on the results of data analysis, the application of experimental methods in learning can improve cognitive learning outcomes from cycle 1 to cycle 2. This increase includes increasing the average score and increasing students' classical mastery. In the implementation of cycle 1, students' cognitive learning outcomes have not reached classical completeness. This is caused by several factors including the assignment of bringing materials from home is still determined by the teacher so that students are less able to express themselves freely. Learning is still controlled by the teacher so that students are less able to explore and think creatively. Only certain students are active in learning. Whereas according to Dimyati (2006), the best learning is learning through direct experience.

In addition, there are several other factors that cause classical learning outcomes to be incomplete, one of which is the limitations of tools and practicum places so that learning with this experimental method must be carried out in groups and in class so as to allow students to be bored and not interested. Mahpudin (2018) revealed that making the learning process fun is very important because fun learning is the main key for individuals to maximize the results obtained in the learning process. To overcome the low interest of students in learning the Basics of Industrial Chemical Engineering, improvements were made to the assignment method so that students are more interested in the teaching and learning process and can generate student motivation in learning the Basics of Industrial Chemical Engineering.

Based on cognitive learning outcomes, for students who have not reached the KKM in cycle 1, various improvements are made so that students' cognitive learning outcomes in cycle 2 are increased compared to cycle 1. In cycle 2 the amount of classical mastery has reached the specified learning mastery indicator, which is 85%. This is due to the improvement of the Teaching Module in cycle 1. The impact obtained is that students become more interactive and interested in the learning process so that cognitive outcomes in cycle 2 have increased and meet predetermined indicators.

The increase in students' cognitive learning outcomes from cycle 1 to cycle 2 shows that the experimental method using natural materials in the surrounding environment in learning the Basics of Industrial Chemical Engineering can improve students' cognitive learning outcomes.

C. Affective Learning Outcomes

Data on affective learning outcomes in cycle 1 and cycle 2 are presented in Table 2 below.

Table 2 Affective Learning Outcomes Cycle 1 and Cycle

No	Criteria	Cycle 1	Cycle 2
1	Lowest value	70	75
2	Highest value	95	95
3	Average	79.65	82.85
4	Classical completeness (%)	91.89	100

Assessment of affective learning outcomes is used to determine student interest in the learning process of the Basics of Industrial Chemical Engineering which includes class attendance, orderliness of students in class, attention to following lessons, honesty and obedience of students in doing assignments from the teacher. Assessment of affective learning outcomes is done by direct observation during the learning process. In the learning process of cycle 1, the students' affective learning outcomes have high average scores and classical completeness and have met the established indicators. However, there are still some students who have low affective scores on certain aspects.

In the aspect of class attendance, there are still some students who are late in the learning process. This is because students do not know the learning model that will be implemented, so there is no initial interest in students to come on time. Dalyono (2007) revealed that everyone who wants to do learning activities must understand what the goals are, where are the goals and what are the benefits of learning to be carried out. Therefore, before carrying out learning, a teacher should provide an interesting picture of the learning that will be carried out with the hope that students have initial interest and will come on time because they do not want to miss the learning process.

In the aspect of attention to following the lesson, respecting the teacher's direction as well as the honesty and obedience of students in doing the assignments from the teacher for some students have a high enough value. This means that when the learning process in cycle 1 takes place, students are enthusiastic in listening to the explanations given by the teacher and appreciate the direction given by the teacher. Furthermore, after learning is complete, students work on assignments independently according to their understanding of the teacher's explanation.

In cycle 2 learning, there was a significant increase in aspects of affective learning outcomes assessment, especially in the aspect of class attendance. In the aspect of class attendance, almost all students came on time. This change was caused by several things, including students having an interest in learning that had been carried out in cycle 1, so that in cycle 2 students did not want to miss the course of the chemistry learning process carried out.

Overall, the affective learning outcomes between cycle 1 and cycle 2 show that students in class X TKI 2 have good affectiveness, because they have met the established indicators. However, there are still some students who individually still have low affective scores. This is because not all students like chemistry subjects, so when participating in the learning process these students do not show a positive attitude. This is in accordance with Triyanto (2007), that the affective domain determines one's success. Students who do not have an interest in certain subjects find it difficult to achieve optimal learning success.

In addition to individual factors for each student, student affective learning outcomes are also influenced by the atmosphere created by the teacher during the learning process. This is in accordance with the opinion of Sudjana (2008), that the increase in affective learning outcomes in each cycle is due to the creation of a new environment and atmosphere in learning. According to Wilda (2017), interest means a high tendency and excitement or a great desire for something. To arouse student interest in learning, there are many ways that can be used, including by making the material to be studied as interesting as possible and not boring. If students' interest in learning increases after the teacher uses the media in learning, it can be said that one of the learning objectives has been achieved. This is what is done in the implementation of cycle 2.

D. Psychomotor Learning Outcomes

Data on psychomotor learning outcomes for cycles 1 and 2 are presented in Table 3 below:

Table 3 Psychomotor Learning Outcomes Cycle 1 and Cycle 2

No	Criteria	Cycle 1	Cycle 2
1	Lowest value	68	76
2	Highest value	92	96
3	Average	83.46	85.74
4	Classical completeness (%)	86.49	100

Assessment of psychomotor learning outcomes is used to determine the attitudes shown by students during the chemistry learning process. This assessment includes the preparation of the experiment, during the experiment and after the experiment.

In the preparation of the experiment, the aspect that is assessed is the ability of students to prepare tools and materials. When conducting the experiment, the aspects that were assessed were the skills of students using tools and materials and the accuracy of the actions according to the worksheets, while the post-experimental assessment was by evaluating the practicum report which included objectives, theoretical basis, tools and materials, working methods, observational data, questions, discussions and conclusion.

In the implementation of cycle 1 for the aspect of experimental preparation, students seem to have been able to prepare tools and materials in groups. Tools are provided by the school, while some materials are brought from home. In one group there were several children who had not yet completed the materials assigned to them. Only a few children are enthusiastic and eager to experiment. In fact, according to Inayah (2013) that in order to know something, students must be active themselves in constructing through their experiences.

In the implementation of cycle 2, there was a significant increase in aspects of assessing psychomotor learning outcomes, both aspects at the preparation stage, during the experiment and in the post-experiment, namely when making a practicum report.

Based on the results obtained regarding psychomotor learning outcomes in several aspects, it can be concluded that psychomotor learning outcomes in cycle

1 to cycle 2 have increased significantly. This significant difference can be seen in the classical completeness value in each cycle. In cycle 1 the student's psychomotor learning outcomes are low compared to cycle 2. This is because in the implementation of cycle 2 students experience their own learning experience because the material tested is their own choice so that in conducting the experiment they are very enthusiastic. This causes a significant increase in student psychomotor learning outcomes cycle 2. With this experience, it requires students to be directly involved so that students feel happy in learning chemistry.

E. Student Interest Questionnaire Results

The data on the results of student interest in the subject of the Basics of Industrial Chemical Engineering on Acid and Base Indicators are presented in Table 4 below.

Table 4 Results of the Questionnaire of Students' Interests in the Basics of Industrial Chemical Engineering

No	Criteria	Cycle 1	Cycle 2
1.	Very High	4	8
2.	Tall	17	21
3.	Currently	14	7
4.	Low	1	0
5.	Very low	0	0

The student's interest questionnaire in this study was used to determine the level of student response to the Basics of Industrial Chemical Engineering in general and to learning the Basics of Industrial Chemical Engineering on Acid and Base Indicators using experimental methods using natural materials in the surrounding environment in particular. Based on interviews about student interest, there was an increase from cycle 1 to cycle 2. This increase was caused by differences in learning scenarios. In cycle 1, the material to be tested for acidity is determined by the teacher while in cycle 2 the material to be tested is the student's own choice so that they are free to be creative.

Improving student learning outcomes is supported by student responses to the learning carried out. Student responses in this study relate to student responses to experimental methods in learning. These student responses were taken through interviews. From the results of student interviews, information was obtained that students had a great interest in the learning carried out. The amount of interest in learning will ultimately affect student learning outcomes, when interest grows it will affect student psychology which will later foster student curiosity, attention and motivation in learning. Therefore, according to Mahpudin (2018), making the learning process fun is very important because fun learning is the main key for individuals to maximize the results obtained in the learning process.

CONCLUSION

Based on the results of research and discussion, it can be concluded that: 1) The experimental method using natural materials in the surrounding environment can increase students' interest in learning. This can be seen from the increase in

students' interest in the subject of Basics of Industrial Chemical Engineering on Acid and Base Indicators, and 2) Experimental methods using natural materials in the surrounding environment can improve student learning outcomes. This can be seen from the increase in students' cognitive, affective and psychomotor learning outcomes which in this study experienced an increase in each cycle.

Based on the research that has been done, the suggestions that can be given include learning the Basics of Industrial Chemical Engineering on Acid and Base Indicator materials, it is better to apply an experimental method using natural materials in the surrounding environment so that students are interested, play an active role and enjoy learning in a pleasant atmosphere so that student learning outcomes increase and then students are able to apply their knowledge in everyday life.

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