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Improving Student Learning Outcomes using E-Module Media Based on Book Creator on Basic Chemical Laboratory Work Techniques Material for Class X Industrial Chemical Engineering Students of Vocational High School

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ABSTRACT

This study aims to enhance student learning outcomes by utilising the E-Module media, specifically the Book Creator application, in conjunction with the Basic Laboratory Work Techniques material for class X of the Industrial Chemical Engineering Department at SMKN 1 Tapen. The research instrument used was a knowledge test sheet. E-module media based on Book Creator is declared effective if there is an increase in student learning outcomes before and after treatment. The study's results showed that an increase in student learning outcomes was observed in the average class value and the percentage of completion after students were given learning materials using E-Module media, specifically the Book Creator application, for the Basic Laboratory Work Techniques material. Before the action was taken, the percentage of completion reached 45%, with an average value of 66. In cycle I, the percentage of completion reached 72%, with an average value of 76. Then, in cycle II, the percentage of completion reached 91%, with an average value of 88.

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INTRODUCTION

Teachers play a strategic role in improving the quality of education to form the golden generation of 2045. The demands of improving the quality of education require teachers to continually strive for innovations that are essentially aimed at enhancing the quality of learning. This awareness of responsibility guides teachers in continually striving to develop their competence and professionalism through classroom action research, which ultimately impacts the improvement of teaching in the classroom. Through Classroom Action Research (CAR), teachers have indirectly innovated in their education to address problems in their classes, thereby creating a more enjoyable learning environment and achieving the desired outcomes (Husna et al., 2020).

Based on the results of observations and the problems faced by teachers in the classroom, one area that needs improvement is student learning outcomes in Basic Chemical Laboratory Work Techniques for class X Teknik Kimia Industri (TKI) or

Industrial Chemical Engineering 1 at SMKN 1 Tapen. The low learning completion rate of the material needs to be improved by teachers, considering that the material is fundamental and includes understanding the types, functions, and how to use chemical laboratory equipment, as well as basic techniques for making solutions. According to Handayani et al. (2023), the knowledge and practical activities presented in this chapter will help support the practical activities in the subsequent chapters on introductory chemistry, microbiology, and laboratory analysis. The characteristics of this material are quite complex, with numerous details that students need to understand. So far, the media used by teachers primarily consists of textbooks. The use of textbooks in the learning process often results in low student interest in learning, partly due to a lack of interest in reading. This is because the learning process tends to be monotonous and boring, which has an impact on the low completion of student learning outcomes. One way to improve the quality of learning is through the use of learning media. Learning media is a means of conveying information from teachers to students as recipients (Saleh et al, 2023). The development of learning media that follows technological developments is considered more effective and efficient than delivering material that is only verbal (Kristanto, 2016).

The selection of appropriate learning media, taking into account students' abilities, local environmental conditions, and social factors, can optimize the teaching and learning process, ensuring that the desired learning objectives are achieved. In developing teaching materials, it is necessary to follow the development of the era, where students prefer to use information technology and are more practical in utilizing gadgets that students often use. Based on the characteristics of the Basic Chemical Laboratory Work Techniques material, a suitable learning medium for increasing students' interest in learning is the development of E-Modules that can be accessed using gadgets. E-modules are expected to be one of the new learning resources for students, further enhancing their understanding of concepts and learning outcomes. E-modules offer colligative solutions that encompass four key aspects: scientific context, process, content, and attitude (Najuah et al., 2020). One application that can be used to develop E-Modules is Book Creator. Users can utilize book creators to create digital books that incorporate interactive images, audio, and video, making the display more engaging and increasing user interest in reading (Puspitasari et al., 2020).

According to Seprianingrum et al. (2024), E-modules developed using the book creator application have various advantages, namely. Notably, these e-modules can add video and audio animations, can be accessed offline, are more economical, and are also more interactive, thereby increasing student learning appeal. E-modules based on Book Creator, which in the Basic Chemical Laboratory Work Techniques material will contain material, images, audio, and video about the functions and how to use chemical laboratory equipment and basic techniques for making solutions. Based on previous research conducted by Farkhana (2021), there was an increase in student interest and learning outcomes after implementing learning activities that utilized book creators to create creative products and explore entrepreneurship in SMKN 1 Wonosari's class XI OTKP 2. The percentage of student learning outcomes completed from Cycle 1 to Cycle 2 was 19.44%. The results of a similar study by Lailiyah (2023) indicated that the application of book creator-based e-modules in PPKn subjects was

highly effective in improving the learning outcomes of class XI students at SMAN 1 Lamongan. Thus, it is hoped that the use of book creator-based e-module media in the Basic Chemical Laboratory Work Techniques material can improve the learning outcomes of class X Industrial Chemical Engineering students at SMKN 1 Tapen.

METHODS

This research method is a classroom action research (CAR) conducted at SMK Negeri 1 Tapen in the odd semester of the 2024/2025 academic year. The subjects of the study were students from Class X Industrial Chemical Engineering (TKI) 1 at SMKN 1 Tapen, consisting of 22 students. The independent variable in this study is the use of E-module media based on Book Creator, focusing on the subject matter of Basic Chemical Laboratory Work Techniques, and the dependent variable is the improvement in learning outcomes of students in class X TKI 1 SMKN 1 Tapen.

This study implemented two cycles of CAR stages, referring to the Kurt Lewin Model of classroom action research, which consists of four stages: planning, action, observation, and reflection. The planning stage involves preparing teaching modules according to the independent curriculum and designing E-Module media using Book Creator based on the Basic Chemical Laboratory Work material. Then, the action stage involves implementing learning improvements according to the learning plan, along with the media developed. The Observation stage consists of observing the actions carried out during the learning process. The next stage of reflection involves reviewing or evaluating the actions applied in learning towards the desired results, which can then be used as a basis for implementing follow-up actions or improvements. The following is a picture of the Classroom Action Research (CAR) cycle stages, as outlined by Kurt Lewin, in Figure 1.

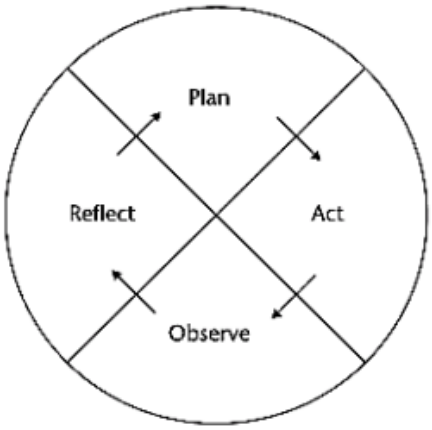

Figure 1. Kurt Lewin's CAR model in Husna et al (2020)

The data collection technique in this study uses a test technique to measure student learning outcomes. The data analysis used is quantitative descriptive, which focuses on the average value and percentage of completion. To obtain the average class value using the following formula (Purwanto, 2013).

$$Average\ score = \frac{\sum total\ scores\ of\ all\ students}{\sum number\ of\ students\ who\ took\ the\ test} \quad (1)$$

As for the percentage of completion, a class is typically declared successful if at least 80% of the students in the class have achieved the KKM. Based on the KKM of SMKN 1 Tapen, students are considered complete if their score is 75 or higher. To calculate the percentage of completion, use the following formula (Purwanto, 2013).

$$\%\ Level\ of\ learning\ achievement \frac{n_1}{n}\ x\ 100\% \qquad (2)$$

with n1 = number of students who completed (obtained a score of ≥75), n = total number of students who took the test.

RESULT AND DISCUSSION

Classroom Action Research (CAR) is situational and contextual, meaning that a strategy employed by a teacher in a particular class may not be applied efficiently in another class by another teacher to address learning problems (Fahmi, 2021). This Classroom Action Research (CAR) was conducted in class X TKI 1 SMK Negeri 1 Tapen by implementing two cycles of CAR research stages. The cycle stages in Classroom Action Research refer to the Kurt Lewin model, namely the planning, action/implementation, observation and reflection stages. At the planning stage, the teacher prepares learning tools in the form of teaching modules, along with assessment instruments that align with the independent curriculum. The sub-topic of the Basic Chemical Laboratory Work Techniques material covered in this Cycle 1 research is understanding the types, functions, and use of chemical laboratory equipment. The teaching module developed for one meeting is 4 x 45 minutes (4 sessions of 45 minutes each). In addition to compiling learning tools, the teacher also creates or develops learning media, specifically E-Modules designed using Book Creator, which serve as a benchmark for learning success by improving learning outcomes. According to Anni (2004), learning outcomes are one of the indicators of the learning process, which is marked by changes in behaviour obtained by students after experiencing learning activities. The following is a graph of the results of the Teacher Performance Assessment Tool, Cycle 1, on the ability to plan learning improvements, as shown in Figure 2.

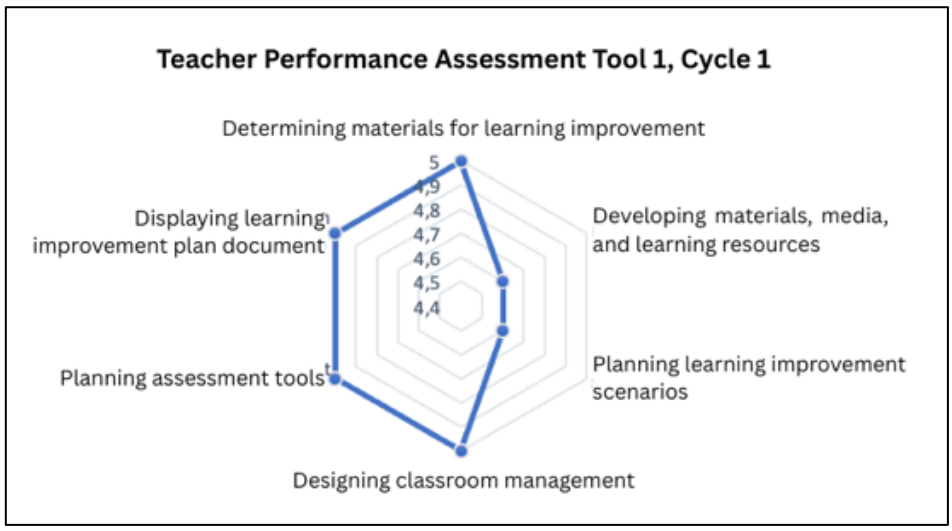

Figure 2. Teacher Performance Assessment Tool 1, Cycle 1

Based on Figure 2, overall, teachers possess excellent abilities in determining learning improvement materials, designing classroom management strategies, planning assessment tools, and displaying improvement plan documents. However, they are still lacking in terms of developing materials, media, and learning resources, as well as planning scenarios for learning improvement.

In Cycle 2 research, the planning stage also involved preparing learning devices in the form of teaching modules, along with assessment instruments that align with the independent curriculum. The sub-topic of the Basic Chemical Laboratory Work Techniques material taken in this cycle two research is understanding the basic techniques of making solutions. The teaching module developed for one meeting is 4 x 45 minutes (4 sessions of 45 minutes each). In addition to compiling learning devices, similar to Cycle 1, teachers also create or develop E-modules based on book creators, focusing on the sub-material of fundamental techniques for creating solutions. The following is a graph of the results from the Teacher Performance Assessment Tool, Cycle 2, regarding the ability to plan learning improvements, as shown in Figure 3.

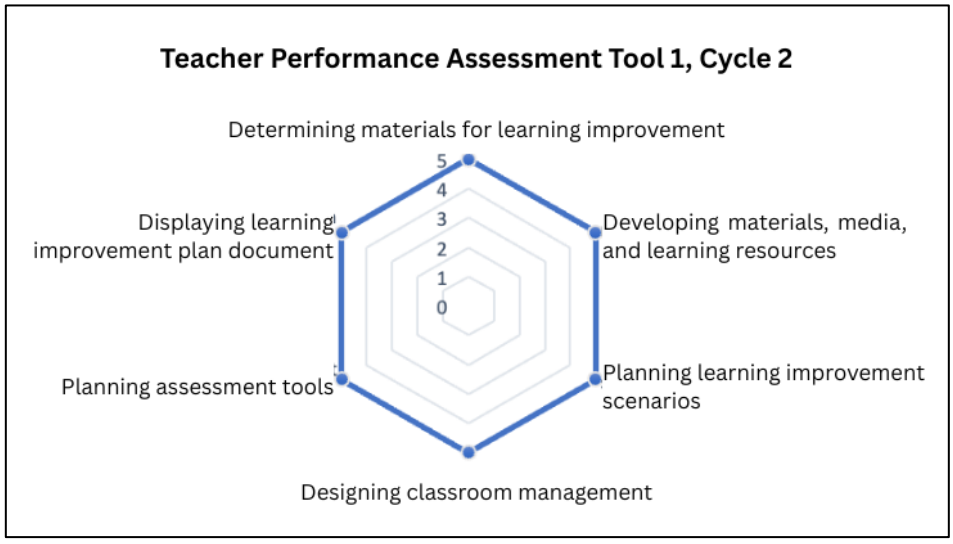

Figure 3. Teacher Performance Assessment Tool 1, Cycle 2

Based on the results of the Teacher Performance Assessment Tool cycles 1 and 2, the data showed a better increase in results in Cycle 2 compared to Cycle 1. The components assessed include determining learning improvement materials, developing learning materials, media, and resources, planning learning improvement scenarios, designing classroom management systems, planning assessment tools, and displaying learning improvement documents. A significant difference lies in the development of materials, media, and learning resources, as well as in planning learning scenarios.

In Cycle 1, the assessment point for developing materials, media, and learning resources received a score of 4.6. In Cycle 2, there was an improvement, resulting in a score of 5. The same thing happened at the assessment point for planning learning scenarios; in Cycle 1, it obtained a score of 4.6, while in Cycle 2, it obtained a score of 5. This indicates that an evaluation or reflection process was implemented, resulting in a more refined planning stage for Cycle 2. A comparison of the results of the assessment of learning improvement planning in cycles 1 and 2 is given in Figure 4.

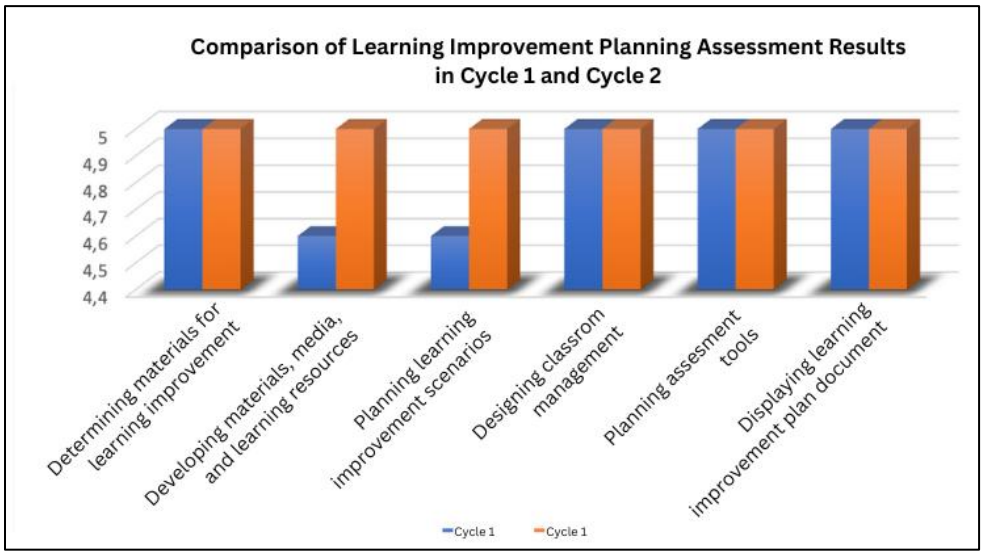

Figure 4. Comparison of improvement planning assessment results in cycle 1 and cycle 2

The next stage is implementation. In Cycle 1, the action or implementation stage was carried out on Wednesday, October 31, 2024, with the research subjects being Class X TKI 1, totalling 22 people. The learning process lasted for 4 JP (4 x 45 minutes), with the sub-material taught, namely understanding the types of tools, their functions, and how to use chemical laboratory tools, by implementing learning using E-module media based on Book Creator. Overall, the learning process using E-module media based on Book Creator has been evaluated against the indicators to be achieved, and it has improved the learning process compared to before the implementation of classroom action research, thereby yielding maximum results in the form of increased student learning outcomes. During the learning process, teachers can carry out learning improvements by indicators/objectives, students, situations and environments, use learning aids (media) by indicators, good management of class interactions that can develop students' positive attitudes towards learning, an impressive chemistry learning process, can carry out assessments of the process and learning outcomes well. The following is a graph of the results from the teacher performance assessment tool (APKG 2) regarding the ability to implement learning improvements, as shown in Figure 5.

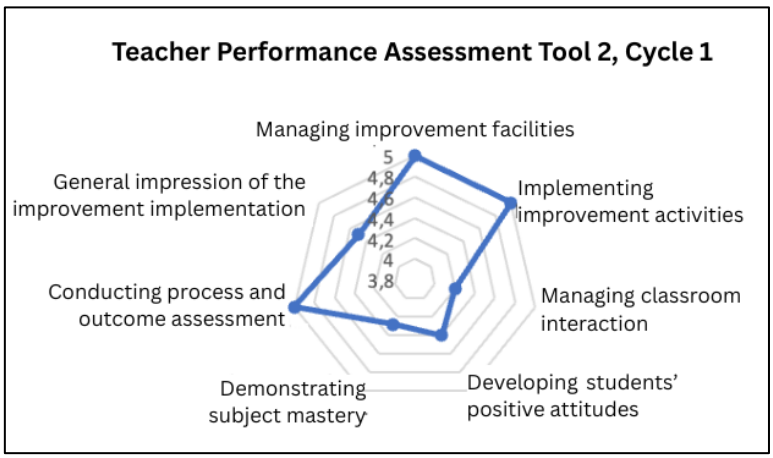

Figure 5. Teacher Performance Assessment Tool 2, Cycle 1

Meanwhile, in Cycle 2, the action or implementation stage was carried out on Friday, November 15, 2024, with the same research subjects, namely Class X TKI 1. The learning process lasted for 4 JP (4 x 45 minutes) with the sub-material taught, namely understanding the basic techniques of making solutions by implementing learning using E-module media based on book creators. At the end of Learning Cycle 1 and Cycle 2, a posttest was administered to assess student understanding and analyse the improvement in student learning outcomes. During the learning process it was also evaluated by observers to observe the teacher's ability to implement learning improvements. The following is a graph of the results from the teacher performance assessment tool (APKG 2) regarding the ability to implement learning improvements, as shown in Figure 6.

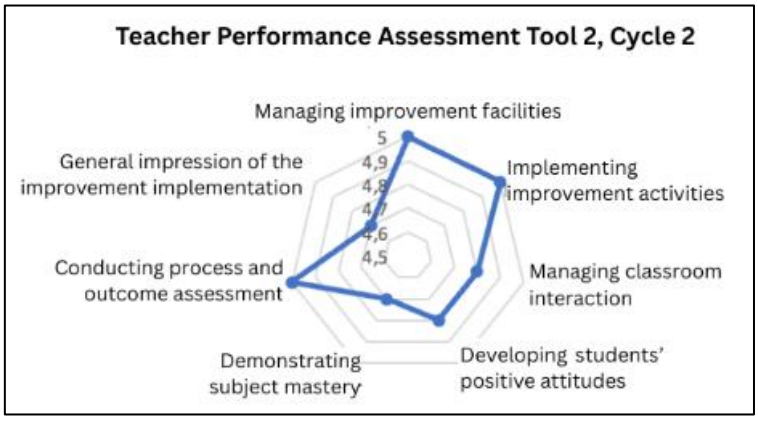

Figure 6. Teacher Performance Assessment Tool 2, Cycle 2

Based on the results of APKG 2, Cycle 1, and Cycle 2, there are assessment points in Cycle 1 that received low scores, indicating a need for evaluation to improve learning in Cycle 2. The assessment points include managing class interactions, developing positive student attitudes, and demonstrating special abilities in enhancing understanding of chemistry material. A comparison of the results from the assessment of learning ability in cycles 1 and 2 is presented in Figure 7.

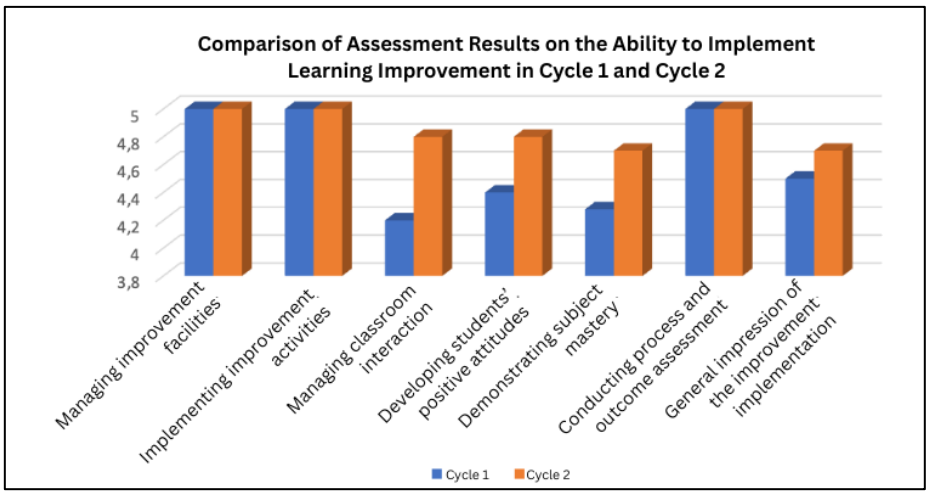

Figure 7. Comparison of the results of the assessment of the ability to implement learning improvements in cycle 1 and cycle 2

The observer conducted the next stage of observation during the learning process in cycles 1 and 2. The assessment tools used are the Teacher Performance Assessment Tool (APKG) 1, which focuses on learning improvement planning, and APKG 2, which evaluates the ability to implement learning improvements, as well as observation sheets. The last stage is the reflection stage. At this stage, analyze the notes and data from the observation sheets collected during the learning process in Cycle 1. These results serve as a basis for determining follow-up planning, specifically revisions to the previous plan, to ensure the implementation of cycle two runs more effectively. Based on the results of the reflection on Cycle 1, several areas were identified that needed improvement. Namely, student learning motivation was still lacking, student involvement in class was still lacking, and students' curiosity and courage to ask questions were still lacking. Answers were also still lacking; the lack of interactive practice questions in the developed e-module meant the form and method of assessment needed to be changed to ensure the accuracy of improving student learning outcomes through the applied media. The suggestions for improvement in Cycle 2 include adding more engaging stimuli to encourage students to be more actively engaged. For example, by connecting the material to be studied with everyday life, conducting practical activities in the learning process, providing time and opportunities by appointing students to ask or answer questions, offering numerous practice questions on the E-module that utilise the book creator application, and conducting offline assessments or written tests. Based on the CAR stages in Cycle 1 and Cycle 2, a process has been implemented to improve learning in the Basic Chemical Laboratory Work material. This is also supported by the results of the posttests administered at the end of cycle one and cycle two, which show an increase in student learning outcomes in terms of classical completeness from the pre-cycle to cycle one and cycle two. Data on the increase in learning outcomes are given in Figure 8.

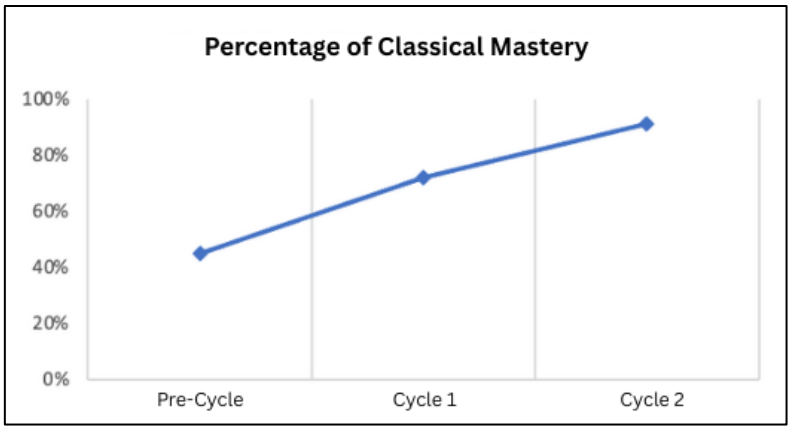

Figure 8. Comparison of % of classical completion of class X TKI 1 Basic Chemical Laboratory Work Techniques learning

Based on the figure, it is evident that there was an increase in the percentage of completion in the pre-cycle, Cycle 1, and Cycle 2. This indicates that there was an increase in individual learning outcomes in learning the Basic Chemical Laboratory Work Techniques material. Before the implementation of learning using the E-module

based on the book creator, the percentage of completion of class X TKI 1 in Basic Chemical Laboratory Work Techniques learning was 45%. After CAR was implemented in Cycle 1, the completion rate increased to 72% and further to 91% in Cycle 2. In addition to the increase in the percentage of completion, there was also an increase in the average class value, as shown in Figure 9.

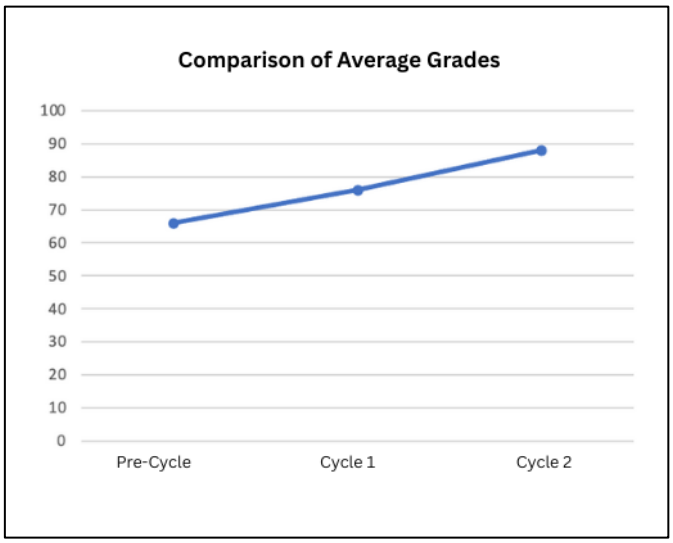

Figure 9. Comparison of average grades of class X TKI 1 Basic Chemical Laboratory Work Techniques learning

Based on the graph in Figure 9, it is known that there was an increase in the average class value in Basic Chemical Laboratory Work Techniques learning before and after the implementation of CAR. In the pre-cycle, the average class value was 66; after the implementation of Cycle 1 learning, it increased to 76, and then further increased to 88 after the implementation of Cycle 2 learning. This finding is similar to research conducted by Ardani (2015), which demonstrated that the application of the Joyful Learning method, based on Interactive e-books, can enhance student learning achievement in Chemistry subjects. The learning achievement of students who applied the Joyful Learning method based on Interactive e-books was higher than that of students in classes that used only conventional methods. It can be said that the application of the Joyful Learning method, based on Interactive e-books, affects student learning achievement in Chemistry subjects.

CONCLUSION

This study concludes that the process of improving the learning of Basic Chemical Laboratory Work Techniques material can be achieved by implementing the use of an E-module based on Book Creator in the learning process in class X TKI 1 SMKN 1 Tapen. The increase in student learning outcomes evidences this. In the pre-cycle, the average value was 66, with a percentage completion of 45%. There was an increase in Cycle 1, where the average class value was 76, with a percentage of classical completion of 72%. In Cycle 2, the average class value was 88, with a completion rate of 91% in classical terms.

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