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IMPLEMENTATION OF THE HERO WASTE APPLICATION TO INCREASE ENVIRONMENTAL AWARENESS OF *MI AT-TAUFIQ* STUDENTS IN THE MERDEKA CURRICULUM

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ABSTRACT

The lack of action and deep understanding of waste management makes schools somewhat passive in addressing waste issues. This research aims to enhance environmental awareness by implementing a Project to Strengthen the Profile of Pancasila Students or *Proyek Penguatan Profil Pelajar Pancasila* (P5) with the integration of the *Hero Waste* application in managing waste in their life. The research was conducted at MI AT-Taufiq with 79 fourth-grade students as research subjects. The type of research used was classroom action research consisting of four stages: planning, implementation, observation, and reflection. Data were collected through observation and then analyzed using quantitative analysis techniques. The results of the study indicate that there was an increase in environmental awareness attitudes among students at MI AT-Taufiq. The calculation results of the N-Gain formula show an increase from cycle I to cycle II amounting to 0.45. The N-Gain value in the range of $0.3 \leq g \leq 0.7$ is classified as moderate. This is indicated by students beginning to separate their waste into three categories: organic waste, inorganic waste, and residue, as well as taking action to recycle waste into artwork.

INTRODUCTION

The global environmental crisis is a major concern, including in Indonesia. Negative impacts such as environmental pollution, climate change and degradation in biodiversity can threaten the preservation of nature and human life. The future of the environment lies on the younger generation, one of the efforts to protect and preserve the environment is by instilling environmental awareness from an early age through education. An attitude of awareness and concern for the environment needs to be developed from an early age by instilling character, values and practices that will stick with them into adulthood. Based on observations and interviews with the principal of MI At-Taufiq, it can be seen that the environment at MI At-Taufiq is classified as clean and beautiful and some of the students already aware of environmental cleanliness, but the lack of action and in-depth understanding of waste management makes schools somewhat passive in dealing with waste problems.

The merdeka curriculum is seen as a more flexible curriculum, while focusing on essential material, character development and student competence (Wiguna & Tistraningrat, 2022). It gives opportunities to integrate environmental education in learning. Projects are an effective approach to building active involvement and awareness of students to environment. The Project to Strengthen the Pancasila Student Profile or *Proyek Penguatan Profil Pelajar Pancasila* (P5) is co-curricular learning, with interdisciplinary learning principles oriented towards character development and general competence (Pratiwi, et al., 2023). P5 is a place for students to learn, observe and think about solutions to problems in their environment (Hamzah et al., 2022). According to data from the Ministry of Education and Culture, Research and Technology in 2022, there were 143,265 schools at various levels that had implemented P5 (Ministry of Education and Culture, Research and Technology, 2022).

In research conducted by Maulida, U., & Tampati, R. (2023) stated that the P5 on the theme of sustainable lifestyles, students were invited to have morals with nature and work together to create a beautiful environment, Beside that, it fosters a character that cares about the environment. P5 has flexible time allocation, so that teachers can prepare a complete project design so that students can implement actions at school and at home. The research findings are consistent with research conducted by Holil, H., et al. (2023) P5 activities provide opportunities to carry out project-based learning that can be done form students' character, one of character is the environmental awareness through training and practices to plant trees at SDN Ciawet.

P5 contains a sustainable lifestyle in terms of the United Kingdom, GSSL in (Saraswati: 2012) is a lifestyle that has the environment awareness and the consequences of the choices made where the students make the choice that will have the minimum negative potential. Implementing sustainable lifestyle projects can be integrated with technology. In the Merdeka curriculum, one aspect of appropriate learning media is using technology-based media because today's young generations are familiar with technology. Good learning media must adapt to background and environmental conditions place where the students learning (Novike, et al ., 2023:49), therefore, the *Hero Waste* Application is suitable for use as a learning media. Educational applications can provide interesting information, interactive activities and simulations for the students to study about the environment and how to preserve it.

Hero Waste application is packaged as an innovative learning media by combining technology and the environment, so that the students can be more interested in learning about waste management and increasing environmental awareness. Based on this description, this research was conducted through P5 with the theme of a sustainable lifestyle using the *Hero Waste* application to increase environmental awareness by managing waste in the school environment.

METHOD

The type of research used is classroom action research. Classroom action research is research that explains the causes and effects of a treatment. In this case, it also describes the incident when the treatment was given and describes the entire process from the beginning of the treatment to the consequences of the treatment given to the subject who was given the action (Arikunto, 2015). The research subjects used were 79 students of the fourth grade of MI At-Taufiq, including 26 students in the A class, 26 students in the B class and 27 students in C class. The data collection techniques used are interviews, tests and documentation. The test instrument used consisted of a pre-test and post-test in the form of a written test which was carried out in two cycles, namely cycle I and cycle II. The documentation instrument used is in the form of activity photos.

According to Kurt Lewin (in Pahleviannur, 2022), in each cycle there are four main steps carried out as a classroom action research design, namely (1) Planning ; (2) Acting ; (3) Observing ; (4) and Reflecting. The following is a flow diagram of classroom action research.

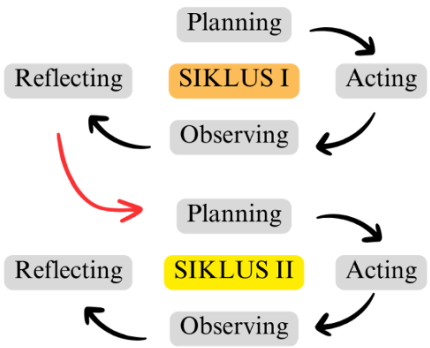

Figure 1. Classroom Action Research Flow Diagram

The following is a description of each stage carried out.

1. Planning
   At this stage, researchers conducted initial observations of students through interviews and pre-cycle tests to determine their level of understanding and awareness of waste management. Next, researchers prepared a P5 teaching module with the theme of sustainability and also test for cycles I and II.
2. Acting
   At the implementation stage, researchers carried out activities to raise awareness of waste management using the *Hero Waste* application based on P5 teaching module that had been prepared.

3. Observing
   At this stage, researchers took values in cycles I and II for observation.
4. Reflecting
   Researchers evaluate the activities that have been implemented and determine progress and weaknesses as a basis for improvement in the next cycle.

The data analysis technique used in this classroom action research is quantitative analysis. According to Creswell (in Jailani, 2023), quantitative research is research whose data analysis is based on numbers and also numerical measurements which aim to describe, explain and test the relationship between variables using statistical analysis.

The data analyzed came from the test results of cycles I and II using the average value of the entire class in both cycles. The percentage of students' completion and improvement in grades is calculated using the Gain Test (N-Gain). The following is the formula used.

$$N - Gain\ Score = \frac{The\ average\ score\ of\ cycle\ 1 - \ The\ average\ score\ of\ the\ pre\ cycle}{Ideal\ score - \ The\ average\ score\ of\ the\ pre\ cycle} \quad (1)$$

The results of the formula calculation will be interpreted into the N-Gain value category in table 1.

Table 1. Student Learning Outcome Scale

Value g	Category
g > 0.7	High
0,3≤ g ≤ 0,7	Normal
0.3 < g < 0.7	Low
g ≤ 0	Fail

RESULTS AND DISCUSSION

Based on interviews conducted together with the head and teachers of class IV at MI At-Taufiq Surabaya, the results show that students' understanding of good waste management is still lacking, the waste management habits at MI At-Taufiq that have been implemented so far only adhere to the '*kumpul-angkut-buang'* or collect-convey-waste. In the end, school waste ends up piling up in the local landfill because there are no parties who support waste management until the end. Beside that, this is also because MI At-Taufiq feels that students still need to be educated about waste management, especially in implementing the concept of *Reduce, Reuse* and *Recycle (3R)*. In implementing waste management habits, creative and innovative education is needed to suit the needs of students in order to provide a fun learning experience so that good waste management practices can be established.

In response to this problem, the action that has been agreed upon with MI At-Taufiq is to hold learning activities related to waste management in the P5 Merdeka Curriculum Programme with the theme Sustainable Lifestyle using the *Hero Waste* application developed by the PKM-PM Hero Waste Team of UNESA. In developing this application, the PKM-PM Hero Waste Team of UNESA collaborated with partner MI At-Taufiq Surabaya to carry out lesson plan by analyzing materials, developing applications which included creating teaching materials and learning media, designing P5 teaching modules, students' worksheeets and test assessment sheets for cycles I and II. Next, P5 activities was held by using the *Hero Waste* application. There are some steps to provide learning activities using the *Hero Waste application,* including socialization, holding pre-tests, learning activities using "Belajar" feature on the *Hero Waste application* and then continued with conducting *a post-test* as the end of cycle I of this Classroom Action Research. Based on the pre-test results, the learning outcomes of students in the pre-cycle can be seen in the following table:

Table 2. Pre-Cycle

Data	Mark
Total of Pre-Cycle Score	5045
Average of Pre-Cycle Score	63.9
Minimum of Passed Criteria	75
The Lowest Score	30
The Highest Score	95
Not Passed	57

Passed	22
The Passed Score Percentage	27.8 %

Based on table 1 above, it can be seen that there are still many students who do not understand material related to waste management using the 3R concept approach. The data obtained from the pre-cycle test results shows that of the 79 students who took the pre-cycle test, only 22 students had reached the minimum of passed criteria. This number represents 27.8% of the total students, so that 72.2% of the total students or 57 students have not yet reached the minimum of passed criteria. The results of this scoring are in line with the results of interviews with teachers and head of MI At Taufiq, that waste management practices have not been understood and applied optimally.

Starting from the low percentage of passed score, the implementation of the *Hero Waste application* in learning is a solution to attract students' interest. It has been proven by the enthusiasm of students in application socialization activities carried out in the computer laboratory where students can explore all the menus in the *Hero Waste application.* Beside that as an introduction, students are presented with problems related to waste in Indonesia, it is aimed at increasing their sense of ownership of responsibility in solving waste problems together.

Cycle I of Class Action Research was carried out over three meetings for each class, which is related to the topics in the "Belajar" feature in the *Hero Waste Application*, including *Pengenalan* (Introduction), *Penggolongan* (Classification) and *Pengolahan* (Processing), so that each topic was taught in one meeting. In the *Hero Waste application,* one topic is taught through 1 teaching material in the form of reading text and 3 types of learning media, including animation videos, comics and also digital games. In studying teaching materials, students are accompanied by the teacher and the PKM-PM *Hero Waste team*. Furthermore, students are allowed to choose one of the 3 learning media according to their individual interests and needs. This cycle I activity will be carried out in August 2023 based on the weekly schedule for each class. And in the third week, at the end of learning the last topic, data on student learning outcomes was collected using 16 multiple choice questions. The following is data from the assessment results of class IV students at MI At-Taufiq in cycle I.

Table 2. Cycle I

Data	**Mark**
Total of Cycle 1 Score	5670
Average of Cycle 1 Score	71.8
Minimum of Passed Criteria	75
The Lowest Score	25
The Highest Score	90
Not Passed	29
Passed	50
The Passed Score Percentage	63.3 %

Table 2 above shows the increase in student assessment results regarding understanding and habituation of waste management with the 3R approach as a whole. Of the 79 students who took the first cycle test, 50 students had reached the KKM with an average score of 71.8. This shows an increase in the percentage of completion by 35.5% from pre-cycle to cycle I. The results shows the success of waste management learning assisted by the *Hero Waste* application*.* towards understanding and practice of waste management with 3R . However, based on the results of observations, the implementation in cycle I was still not optimal because the goal of good waste management practices was still not running optimally. The result of its practice can also be seen in one of the *Hero Waste* application *menus*, namely the "Beraksi" feature. In cycle I, many of the students had not shown progress in their waste management practices in the "Unggah Aksimu" menu, so as a reflection in cycle II, the use of the *Hero Waste* application accompanied by practical assistance in learning waste management.

In cycle II, the PKM-PM team together with MI At-Taufiq partners carried out planning by preparing Lesson Plans and students' worksheet that were adapted to the topics in the "Beraksi" menu of the *Hero Waste* application. Similar to cycle I, cycle II was also held for 3 meetings in September every Saturday. In cycle II, assistance is carried out with 3 main topics, namely managing organic waste, inorganic waste and creating works as a form of waste recycling action and the output of P5 activities. The teaching sequence for these 3 topics is carried out alternately based on each class, and at the last meeting, data is collected as an assessment of the results of this activity regarding understanding and practices of waste management using the 3R approach. Data on student assessment results in cycle II are presented in the following table.

Table 3. Cycle II

Data	**Mark**
Total of Cycle 2 Score	6675
Average of Cycle 2 Score	84.5

Minimum of Passed Criteria	75
The Lowest Score	60
The Highest Score	100
Not Passed	7
Passed	72
The Passed Score Percentage	91.1%

Based on table 3 above, data is obtained which shows that students as a whole understand and apply the good waste management. There were 72 of the 79 students who took the cycle II test who obtained results that exceeded the minimum of passed criteria, which is the minimum score of 75. This result shows an increase in the percentage of passed score by 27.8% in the assessment results from cycle I to cycle II.

Learning about waste management at P5 by the *Hero Waste* application has been carried out in 2 cycles and is in accordance with the 4 stages of Classroom Action Research which include (1) Planning, (2) Implementation (3) Observing, and (4) Reflecting. The planning stage in cycle I includes material analysis activities, application development which includes making teaching materials and learning media, designing P5 teaching modules, students worksheet and test assessment sheets for cycles I and II. Meanwhile, in cycle II, preparation is carried out by compiling a Lesson Plan and students' worksheet that is adapted to the topic in the "Beraksi" feature of the *Hero Waste* application. During planning, the PKM-PM *Hero Waste* team of UNESA also collaborates with partner MI At-Taufiq.

The implementation phase of cycle I was held in August for three meetings for each class. Meanwhile, cycle II was held in September every Saturday for three meetings. Each meeting has a time allocation of 2 x 45 minutes. In cycle I, learning is carried out in a computer laboratory by utilizing the "Belajar" feature in the *Hero Waste* application, so that this learning focuses on theoretical knowledge of good waste management. Meanwhile, in cycle II, learning was carried out in an outdoor place by utilizing the "Beraksi" feature in the *Hero Waste* application which focuses on practical knowledge of good waste management.

At the end of each meeting in each cycle, data collection is also held using a test sheet for each cycle which has been prepared as an observation or *observing stage.* Beside that, the "Unggah Aksimu" feature in the *Hero Waste* application also accommodates the observations. In the implementation of the pre-cycle to cycle I, the results of students' assessments regarding their understanding and practices of waste management appeared to have improved. The increase of the results in this assessment can be seen in table 4 below.

Table 4. Recapitulation of Results from Pre-Cycle to Cycle 1

No.	Data	Pre-Cycle	Cycle 1
1.	Score Average	63.9	71.8
2.	Passed Score Percentage	27.8 %	63.3 %

Based on table 4 above, the recapitulation of results shows that the average score is increased by 12.3%, where in the pre-cycle the average was 63.9 with the passed score percentage of 27.8% and in the first cycle the average was 71.8 with the passed score percentage of 63.3%. These results can be observed in the following diagram.

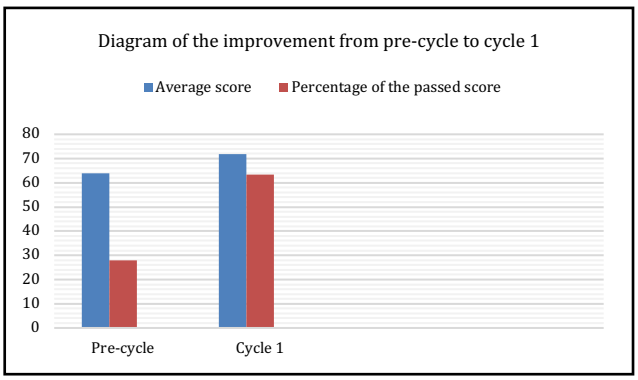

Figure 2. Diagram of Pre-Cycle Improvement to Cycle I

The following N-gain formula will be used to determine the increase in assessment outcomes from pre-cycle to cycle I.

$$N - Gain = \frac{Avarege\ Scores\ Cycle\ I - Average\ Score\ Pre\ Cycle}{Ideal\ Score - Rata - Average\ Score\ Pre\ Cycle}$$

$$N - Gain = \frac{71{,}8 - 63{,}9}{100 - 63{,}9}$$

$$N - Gain = \frac{7{,}9}{36{,}1}$$

$$N - Gain = 0{,}22$$

Calculations using the N-Gain formula above produce a value of 0.22 which shows the N-Gain range at 0 < g < 0.3 so that the increase from pre-cycle to cycle I is still in the low category. This is also supported by the lack of optimal waste management activities which can be seen in the action features of the *Hero Waste* application. From the results above, reflection was carried out for the implementation of cycle II in this activity. From the implementation of learning in cycle I which focuses on theoretical understanding, in cycle II the use of the *Hero Waste* application accompanied by practical assistance in learning waste management to get maximum results. From the implementation of cycle II, a recapitulation of the assessment results was obtained as follows

Table 5. Recapitulation from Cycle I to Cycle II

No.	Data	Cycle I	Cycle II
1.	Score Average	71.8	84.5
2.	Passed Score Percentage	63.3 %	91.1%

The increase of the average score and the percentage of passed score can be seen in the results in table 5 above. It proves that the improvements in cycle II have positive results for students. Based on table 5 above, the recapitulation of results shows an increase in the average score of 9.7%, where in cycle 1 the average was 71.8 with the passed score percentage of 63.3% and in cycle 2 the average was 84.5 with the passed score percentage of 91.1%. This result can be observed in the following diagram.

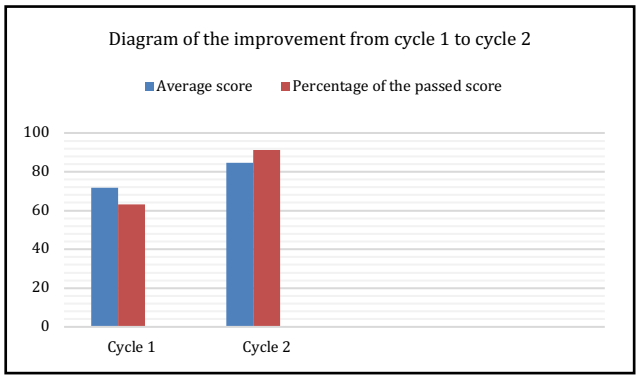

Figure 3. Diagram of Improvement from Cycle I to Cycle 2

Then, the increase in the assessment results from cycle I to cycle II will be calculated using the N-Gain formula as follows:

$$N - Gain = \frac{Avarege\ Scores\ Cycle\ 2 - Avarege\ Scores\ Cycle\ I}{Ideal\ Score - Rata - Average\ Score\ Cycle\ 1}$$

$$N - Gain = \frac{84{,}5 - 71{,}8}{100 - 71{,}8}$$

$$N - Gain = \frac{12{,}7}{28{,}2}$$

$$N - Gain = 0{,}45$$

The results of the N-Gain formula calculation above show an increase from cycle I to cycle II of 0.45. The N-Gain value in the range $0.3 \leq g \leq 0.7$ is included in the medium category.

CONCLUSION

The results show that there has been an increase in the attitude of concern for waste management among class IV MI At-Taufiq students through the *Hero Waste* application which is integrated into the P5 with the theme of a sustainable lifestyle. This is shown by the attitude of students who begin to sort their waste based on three categories, namely organic, inorganic and residual waste. Students can also recycle organic waste into compost, recycle paper and plastic waste into items that have further use value. Based on the observation results, it is known that increasing the pre-cycle test to cycle 1 with the N-Gain formula above resulted a value of 0.22 which shows the N-Gain range at $0 < g < 0.3$ so that the increase from pre-cycle to cycle I is still in the low category. Then, the recapitulation of the results from cycle 1 to cycle 2 showed an increase in the average score of 9.7%, where in cycle 1 the average was 71.8 with the passed score percentage of 63.3% and in cycle 2 the average was 84.5 with the passed score percentage of 91.1%. The results of the N-Gain formula calculation show an increase from cycle I to cycle II of 0.45. The N-Gain value in the range $0.3 \leq g \leq 0.7$ is included in the medium category.

Based on the research that has been carried out, the following are several suggestions that can be conveyed, namely (1) Teachers are advised to continue implementing the P5 by using the *Hero Waste* Application at other grade levels, (2) Students are advised to always apply learning and attitudes towards good waste management not only at school but also at home, (3) Schools are advised to re-equip existing facilities to continue to support good waste management such as rubbish bins and also posters on how to do waste sorting correctly, (4) Future researchers are advised to carry out research related to the P5 activities with other themes.

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