The Implementation of STEAM in Teaching English to Enhance Critical Thinking Using the Pancasila Student Profile Concept

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Abstract: This study aims to investigate the implementation of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning approach in English teaching to enhance critical thinking using the Pancasila student profile. This study used a qualitative methodology involving 9th-grade students who participated in STEAM activities designed to enhance their critical thinking skills and the Pancasila student profile. The research uses Classroom Action Research (CAR), a qualitative approach to solve learning problems and improve outcomes. The process of implementing this research was carried out as planned, which consisted of two cycles. In the first cycle the strategy used was the delivery of learning in general, while the second cycle was a specific and specially designed learning strategy using the STEAM approach (Science, Technology, Engineering, Art, Math). Each cycle consists of four stages, planning, action or implementation, observation and reflection. The results show a significant improvement in critical thinking after participating in the STEAM activities, indicating that this teaching approach can enhancing communication and critical thinking abilities. These findings can be used to inform policies related to STEAM education in Indonesia and improve education quality through STEAM initiatives.

Keywords: Implementation, STEAM, Teaching English, Critical Thinking, the Pancasila Student Profile

Introduction

In the 21st century, students must possess critical thinking, creativity, communication, and collaboration skills (4Cs) to succeed in the digital world. STEAM (Science, Technology, Engineering, Art, and Mathematics) is an effective learning approach that integrates these disciplines to encourage problem-solving, logical reasoning, and creativity. Although STEAM generally focuses on science and technology, this approach can also enhance English language learning by increasing student engagement, reducing the fear of making mistakes, and building confidence. (Cicilia Wahyu Wening Purwaningsih, 2022) ; (Anastasiia A. Tytarenko, 2021). Research shows the need for further exploration of the application of STEAM in various educational contexts, especially in developing countries, and more effective integration of the arts into the STEAM curriculum (Kuchkarova Y.D., 2021) In Indonesia, STEAM is currently used and adapted to the independent curriculum. In this study, STEAM is explicitly applied to English language teaching. This approach aligns with modern educational goals to prepare students for complex global challenges and shape the character of Pancasila student profiles following the independent curriculum.

(Ali Bicer, 2015) conducted the first relevant study and published it in the *International Journal of Contemporary Educational Research (IJCER)*. The research investigated the impact of STEM Project-Based Learning (PBL) on 8th-grade students' vocabulary mastery in mathematics and science. Using a quantitative approach, students participated in a two-week summer camp that featured STEM PBL activities designed to enhance vocabulary in these subjects. The findings revealed significant improvements in students' mathematical and scientific language, demonstrating that STEM PBL effectively enhances communication skills and conceptual understanding. The study recommended further research during regular school sessions and with larger groups to better understand the broader benefits of STEM PBL for

vocabulary and conceptual learning (Ali Bicer, 2015)

The second study is (A Hikmawati, 2020) from the journal *IOP Publishing*. The study aims to develop and implement digital teaching materials on Earthquakes to enhance STEM literacy among class VIII students. The methodology used in this study is a combination of both qualitative and quantitative approaches. The research method employed is research and development using the ADDIE model, which includes Analyze, Design, Develop, Implement, and Evaluate stages. The study took place at SMP Negeri 1 Cipanas over three months, involving a team of experts, teachers, and students as samples for validation and testing of the teaching materials developed. The study results showed that the developed digital teaching materials on Earthquakes effectively improved STEM literacy among class VIII students. Experts and teachers validated the materials, and when tested on students, STEM literacy levels showed a noticeable increase.

The third study was by (Ratna Farwati, 2021) from the journal International Journal of STEM Education for Sustainability. The study aims to map all research themes related to the implementation of STEM education in Indonesia in the science field and the scientific clusters of science from 2015-2020, starting from elementary school to tertiary education levels. The study also aims to conduct data collection on research locations to see the distribution of research on STEM implementation throughout Indonesia. The methodology used in this study is a scoping review, which is a qualitative research method. The study has shown potential in developing various skills in students and can serve as a trigger for educational renewal. Its findings can be used to inform policies related to STEM education in Indonesia and to improve the quality of education through STEM initiatives. The results are expected to describe the development of research on STEM implementation from year to year, the education level of the participants involved, the research location, and all research themes on STEM education in Indonesia that have been carried out.

The fourth study was by (Malika YunusovaMiralimovna, 2022) from the journal international Journal on Integrated Education. The objectives of the study include integrating STEAM in English language classrooms, emphasizing the interdisciplinary nature of STEAM education, promoting teamwork and project-based activities among students, and activating the creative and emotional components of students' personalities through project activities. The methodology used in this research is qualitative, this approach is seen from the use of descriptive analysis, case studies, and literature reviews to understand and describe the phenomena that occur rather than using statistical data or quantitative methods. The results of the study emphasizes the importance of integrating STEAM education in English language classrooms to promote interdisciplinary learning and project-based activities. It underscores the benefits of connecting STEAM subjects with language learning and literature, highlighting the significance of modern pedagogical technologies and the development of key skills for the 21st century.

The fifth was by (Kuchkarova Y.D., 2021) from the journal ISJ Theoretical & Applied Science. The study's objectives are to investigate the notion of STEAM, its main principles and components, the ways to design STEAM curricula, and the learning theories behind it. This research uses a qualitative methodology to investigate the notion of STEAM, its fundamental principles and components, ways of designing the STEAM curriculum, and its learning theories by describing the data analysis without using numerical statistics. The results from the study are that STEAM education, with a focus on interdisciplinary learning and problem-solving skills, is essential in preparing students for a highly technological world. Integrating science, technology, engineering, art, and mathematics through the STEAM approach enhances students' abilities to tackle real-world problems and develop critical thinking skills. Various instructional methods, such as cooperative and problem-based learning, ensure effective learning outcomes in STEAM education. The study emphasizes the importance of integrating STEAM content, problem-based inquiry, and lifelong learning habits in educational practices to foster a holistic understanding

and prepare students for future challenges. Based on the review of previous research above, previous researchers suggested exploring more deeply how STEAM integration can be implemented in the curriculum and how this approach can affect student learning outcomes. So, in this study, the researcher developed a STEAM approach with an independent curriculum to strengthen Pancasila's learner profile.

Research Methodology

Research Design

This study employs a descriptive qualitative method to systematically describe data and understand social or educational issues (John W Creswell, 2018). The research uses Classroom Action Research (CAR), a qualitative approach to solve learning problems and improve outcomes. CAR involves iterative planning, action, observation, and reflection cycles, with researchers directly participating as teachers throughout the process (Hanum, 2008, cited in (Ahlan Syaeful Millah, 2023). This method allows for real-time intervention and observation within classroom settings to enhance learning quality. To improve critical thinking students and character building about Pancasila student profile. Classroom Action Research supports teachers in teaching by allowing them to track student progress at every stage of the learning process. The implementation process of the research consists of two cycles. In the first cycle, the strategy used is general teaching delivery, while the second cycle involves a specific teaching strategy designed explicitly using the STEAM approach (Science, Technology, Engineering, Art, Math). This study involves 9th-grade junior high school students, with a sample of 29.

Technique of collecting the Data

In this part, the researcher about instrument.

1. Observation

   Observation is the foundation of all knowledge. Based on the above opinion, through observation, the writer can obtain more accurate or clearer data about the problem being researched and can provide a description of the general overview of the object to be studied. (Sugiyono, 2015)

2. Test (pre-test and post-test)

   a. Pre-test

This test is used when teaching material to determine the extent to which the students have mastered the material or content. (Magdalena, 2021)

   b. Post-test

   After learning, the post-test evaluates students' understanding of the material, focusing on the critical points taught. It helps the teacher determine if learning improved students' comprehension, with better post-test results indicating a successful teaching program. (Magdalena, 2021)

Findings and Discussion

In this part the researcher explained and analyze the data after was implementing STEAM in the classroom Through classroom action research, this research focuses on implementing the STEAM (Science, Technology, Engineering, Art, and Math) learning approach in junior high school. The goal is to create an effective learning system, inspire quality teaching, and help improve educational practices. It aims to enhance students' critical thinking in English, aligned with the Pancasila learner profile in the independent curriculum. The study was conducted in two cycles, with the first cycle using general teaching strategies and the second implementing a specially designed STEAM approach. Each cycle involves four stages: planning, action, observation, and reflection.

CYCLE 1

Planning:

The researcher prepared a teaching module, student worksheets for practice, observation sheets to monitor student activity, and pre-and post-test questions. The pre-test assessed students' prior knowledge, while the post-test evaluated learning after instruction.

Action/Implementation:

The teaching and learning activities focused on procedural text with the theme "How to Plant Medicinal Plants." The steps were:

I.   **Pre-Activity:** Students completed pre-test questions to gauge initial understanding.
II. **Material Presentation:** The teacher explained procedural text using PowerPoint, with interactive discussions after each slide.
III. **Collaboration:** Students were divided into five groups to analyze a procedural text image, recording observations with their peers.
IV. **Critical Thinking:** Groups discussed the text's purpose, structure, and language elements with teacher guidance.
V.   **Creative Thinking:** Students collaboratively completed and presented worksheet tasks, applying innovative thinking.
VI. **Closing:** The session ended with post-test questions, feedback, and a summary of learning outcomes. It also provided motivation for future activities in Cycle II.

a.   **Observation**

i.   **Result of discussion score**

Table 1.Observation Of Group Discussion Results Cycle I

No	Name group	Aspects Being Evaluated			Total Score
		student activeness	student compactness	Discussion Results	
1	Red Ginger	1	1	2	4
2	Turmeric	2	3	3	8
3	Galangal	2	2	2	6
4	Pandanus Leaf	2	2	2	6
5	Rosemary	1	1	2	4
Total		8	9	11	28

Score Average	1.6	1.8	2.2	5.6

Description

Not Good   : 1

Not Good Enough   : 2

Good Enough   : 3

Good   : 4

Category of Total Assessment

Not Good Enough   : 5 – 7

Good Enough   : 8 – 10

Good   : 11 – 12

In Cycle I, students were divided into five groups (6-7 members each). The group discussion assessment revealed poor performance across all aspects, including activity, teamwork, and presentation, with a score of 2 (not good). Many groups needed more active participation, cooperation, and effective teamwork, as students often worked individually instead of collaborating.

The lack of collaboration hindered the purpose of group activities, which aimed to foster cooperation, mutual respect, and the exchange of ideas. This resulted in emotional gaps, resentment among members, and a high degree of individualism, leading to disengagement and a lack of collective effort. These challenges undermined the learning goal of promoting critical thinking and aligning with the Pancasila student profile envisioned in the independent curriculum.
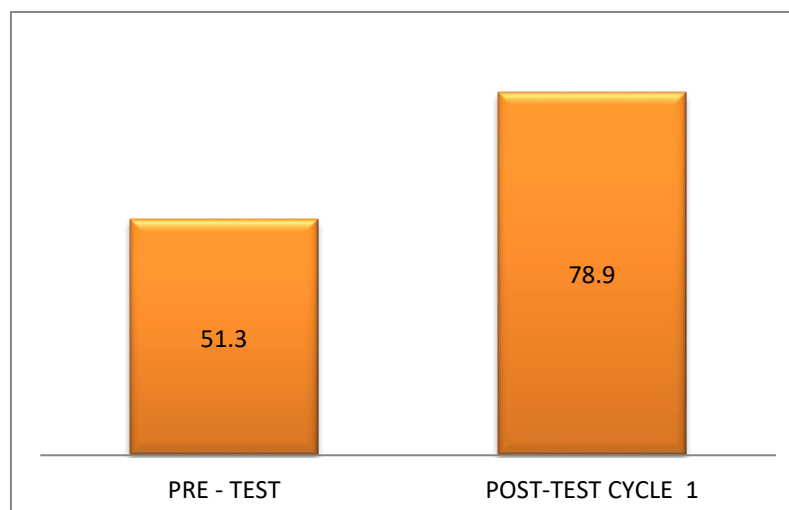
ii.Result of student learning

Graphic 1. Average score before and after action Cycle I

Table 3. Student's Cayegories Score Based on Standar Limit Score of School

Score	Categories
75 – 100	QUALIFIED
0 – 74	UNQUALIFIED

Based on the data above, student learning outcomes improved in the post-test of cycle 1. However, the average post-test scores differ slightly from the school's completeness standard. Thus, the learning process will continue in cycle 2 with a unique learning design, the STEAM method (Science, Technology, Engineering, Arts, and Mathematics), to enhance critical thinking and the Pancasila spirit profile, as evidenced by the pre-test, post-test, and discussion results. This process aimed to improve critical thinking.

b. **Reflection**
The reflection on Cycle I revealed the following observations:
i.Initially, students were passive and hesitant to form groups, but the teacher's motivation sparked curiosity and engagement.
ii.Many students remained inactive during group discussions, with only a few participating in answering worksheets.
iii.With teacher guidance, some students began exchanging ideas, though most required significant support to analyze and answer questions.
iv.Critical thinking skills could have been more developed, and students needed assistance forming simple English sentences.

To address these challenges, the researcher identified the need to enhance students' critical thinking and collaborative skills. For Cycle II, a new learning design incorporating the STEAM method (Science, Technology, Engineering, Art, and Math) was planned to foster critical thinking and support the development of the Pancasila student profile.

1.   **CYCLE 2**

a.   **Planning**
Like Cycle I, Cycle II utilized teaching modules as a guide, focusing on integrating the **STEAM** approach into English language learning. Key preparations included:
i.Developing teaching modules for Meetings 2 and 3, including student worksheets for analysis, discussion, and presentation.
ii.Creating observation sheets to monitor student activity during the learning process.
iii.Designing post-test questions to assess students' understanding of the material after the learning activities.
These tools aimed to enhance student engagement and evaluate their progress in applying the STEAM method to English learning.

Table 4 Plan to Demonstrate STEAM Activities

Science	Planting medicinal plants
Technology	Tools are used to support this activity
Engineering	The technique of using tools that support this activity
Art	decorating pots to encourage the use of artistic skills to make the pots look attractive
Math	conducting a hypothesis test on plant height measurements from the time of planting until 7 days after planting

b.   **Implementation**

Cycle II consisted of two meetings focused on using the STEAM learning model. Key activities included:

First Meeting

i.**Introduction:**
The teacher outlined objectives and activities and reviewed previous lessons.
ii.**Collaboration:**
Students were divided into groups and provided with procedural text, tools, and materials for planting activities.
iii.**Creative Thinking:**
Groups painted plant pots creatively using acrylic paint.
iv.**Presentation of Material:**
The teacher introduced comparison degree concepts to help students create comparison sentences for observations.
v.**Critical Thinking:**
Groups prepared planting media, planted medicinal plants, and planned to observe their growth over a week.
Students received worksheets to document and analyze their activities.
vi.**Closing:**
The teacher appreciated student efforts, provided motivation, and outlined the next meeting's activities.

Second Meeting
i.**Introduction:**
The teacher motivated students, reviewed prior activities, and discussed their feelings about the process.
ii.**Critical Thinking:**
Groups measured plant growth after a week and recorded observations on worksheet 2.
iii.**Communication:**
Groups presented and discussed their worksheet findings and received feedback from peers and the teacher.
iv.**Closing:**
The teacher concluded with a post-test and a questionnaire to evaluate the STEAM activities and encouraged students to summarize their learning outcomes.

This cycle emphasized collaboration, creativity, critical thinking, and communication to enhance

learning engagement and foster STEAM-based skills.

c.   Observation

i.   Result of discussion score

Table 5. Observation Of Group Discussion Results Cycle II

| No	Name group	Aspects Being Evaluated			Total Score
		student activeness	student compactness	Discussion Results	
1	RED GINGER	3	3	3	9
2	TURMERIC	4	4	4	12
3	GALANGAL	4	4	4	12
4	PANDANUS LEAF	3	4	4	11
5	ROSEMARY	4	4	4	12
Total		18	19	19	56

Based on data the above, students collaborated effectively to answer worksheet questions, though some groups lacked cohesion, potentially due to mixed-gender dynamics causing shyness. The average discussion score improved to **4 (good)**, reflecting better teamwork and confidence. Students demonstrated emotional growth and a deeper understanding of the material, indicating overall progress compared to Cycle I.

ii.   Result of student learning

Graphic 2. Average score before and after action Cycle I
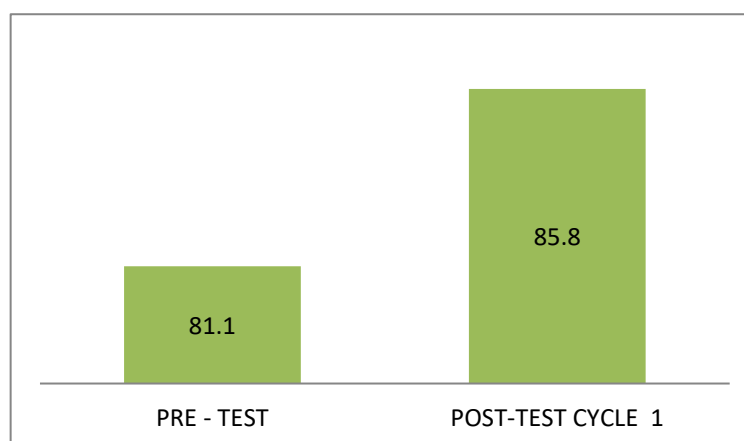
Based on the data above, the student's average cycle II pre-test score was 81.1. After implementing the learning process actions, the average score increased to 85.8. In this second cycle, students' critical thinking is sharper, and the enjoyable STEAM learning model makes it easier for students to understand the material.

d.   **Reflection**

No.	Aspects Being Evaluated	Cycle 1	Cycle 2
1	Student activeness	8	18
2	Student compactness	9	19
3	Discussion results	11	19
Total		28	56
Score Average		9.3	18.7

In the implementation of learning in meetings 2 and 3, the following observational results were obtained:

i. Students' excitement increased, making them enthusiastic about STEAM activities in English learning.

ii. Some groups began to work together cohesively, collaborating on STEAM activities and completing group worksheets.

iii. There was an increase in students' confidence to present the results of their discussions.

iv. The STEAM method significantly helped students understand the material and improved their critical and creative thinking skills.

v. Overall, students' interest in learning English using the STEAM teaching method was quite good. There were no signs of fatigue or exhaustion after the activities, and they were even excitedly looking forward to these activities being implemented in their school.

Based on the reflection above, implementing the STEAM learning method can provide good input for each student. The presence of the STEAM learning method and group worksheets that can be completed by solving a problem stimulate students to think critically and creatively. It can also instill democratic attitudes, self-confidence, and mutual respect among peers so that the learning process for students in English subjects can proceed smoothly. So they were able to solve the problems quite well.

2. **Group Score in Cycle 1 and Cycle 2**

Table 6. The Value Of Improvement In Group Discussions For Each Cycle

Description

Not Good   : 1

Not Good Enough   : 2

Good Enough   : 3

Good   : 4

Category of Total Assessment

Not Good Enough   : 5 – 7

Good Enough   : 8 – 10

Good   : 11 – 12

From Table 1, based on the overall observation results, it can be seen that student activity in group discussions has improved quite well. This is marked by the increased average student activity from cycles I to II. Observations show that students' responsibility towards the assigned tasks has also increased.

3.   Students average score

Graphic 3 . Comparison of the average scores of students in cycle 1 and cycle 2
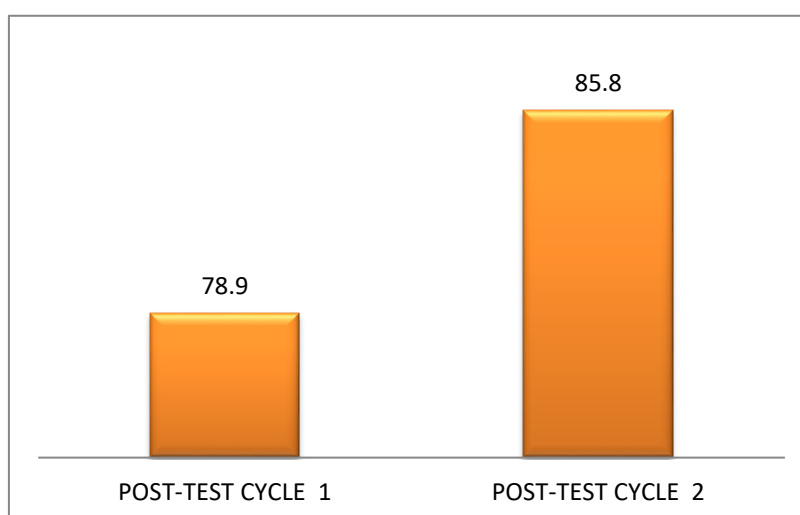
In cycle 1, the average score was 78.9; in cycle 2, the average score was 85.8. In cycle 1, the average score had already passed the qualification but was nearly close to the maximum score standard set by the school. The difference between the average score in cycle 1 and the maximum score standard set by the school was 3.9. Meanwhile, the difference between the average score of students in cycle 2 and the maximum score standard set by the school was 10.8, twice the difference between the average score in cycle 1 and the maximum score standard set by the school. Based on the student's learning outcomes, it cannot be said that 100% of the students meet the school's standard score above 75. The students' learning outcomes reached 97%, meeting the school's standard score. The aim of the implementation of the STEAM method in high school English learning is to enhance critical thinking. The test questions given to students, whether pre-test or post-test, are designed to encompass the HOTS or higher-order thinking Skills achievement level, which will test the student's critical thinking abilities.

CONCLUSSIONS

Based on findings and discussion above,it can be concluded that STEAM approach helped students to enhance critical thinking and developing the Pancasila student profile character. The average test scores show that helping students improve their critical thinking can aid in developing the Pancasila student profile character, as shown by the group discussion scores.

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