Implementation of the Sciencepreneur Approach through Project-Based Learning in Making Natural Shampoo to Improve Critical Thinking Skills of SD UMP Students in the 2024/2025 Academic Year

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ABSTRACT

This study aims to examine the implementation of the Sciencepreneur approach through project-based learning in making natural shampoo to improve the critical thinking skills of fourth-grade students at SD UMP in the 2024/2025 academic year. 21st-century education demands an innovative and interdisciplinary learning process that integrates science concepts with entrepreneurship to develop students' critical thinking and entrepreneurial skills. The research method used is quantitative with a pre-test and post-test design involving 28 students. Project-based learning requires students to actively work in groups through stages of literacy, production, packaging, and promotion of environmentally friendly and healthy natural shampoo products, as an alternative to commercial products containing harmful substances and associated with socio-political issues. The results show a significant improvement in students' critical thinking abilities, with the class average score increasing from 60 in the pre-test to 92.124 in the post-test, and the percentage of students passing the Minimum Competency Criteria (KKM) rising from 35.7% to 100%. These findings support the hypothesis that the implementation of the Sciencepreneur approach in project-based learning effectively improves students' critical thinking skills. It is recommended that future research assess the product evaluation and its utilization through promotion on social media and school activities.

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1. INTRODUCTION

Education in the 21st century demands a more innovative and interdisciplinary educational process. The learning process must prepare the younger generation to face increasingly complex global challenges. Solving problems in everyday life is now more complicated than in the past, requiring the ability to integrate knowledge from various scientific disciplines. The current approach in education emphasizes the integration of science concepts with entrepreneurship, known as Sciencepreneurship. This approach includes life skills, providing students with opportunities to develop critical scientific thinking skills while also engaging in stages of economic processes.

Students can learn how to transform science ideas and concepts into entrepreneurial products, which can serve as alternatives or even solutions for the economic needs of society (Cholifah & Purwandari, 2021). Project-Based Learning (PjBL) is an effective method for integrating both concepts from these disciplines. Students are actively and directly involved in the learning process, which requires them to think critically, solve problems, and

collaborate. A project such as creating shampoo from natural ingredients provides students with the opportunity to apply their scientific knowledge from the classroom while also developing entrepreneurial skills. (Ali et al., n.d.).

The public is increasingly exposed to many commercial products that contain harmful chemicals. One example is shampoo, which is now known to often contain hazardous substances such as Sodium Lauryl Sulfate (SLS), parabens, and silicones. Scientific journals have reported that these chemicals can potentially damage hair and scalp health if used over a long period of time. On the other hand, the public is also faced with a growing number of household and personal care products being boycotted due to their association with global political issues. Some shampoo products and brands are allegedly linked to support for Israel.

These two concerns, at the very least, have made consumers more selective in their purchases. It is undeniable that people are now seeking shampoo products that are not only beneficial for hair health and beauty, and have a pleasant fragrance, but are also environmentally friendly and socially responsible. This study aims to explore the learning process and outcomes related to entrepreneurship.

It examines how learning is managed and how the integration of science and entrepreneurship concepts (Sciencepreneurship) is implemented in the process of making natural shampoo, within a Project-Based Learning framework. The primary focus is to assess students' critical thinking skills. It is expected that this research will provide benefits for students and teachers, as well as contribute positively to the development of a more relevant and applicable curriculum.

2. RESEARCH METHODOLOGY

2.1 Type of Research

Quantitative research is a type of scientific investigation that systematically examines parts of a phenomenon and the causal relationships among them. Quantitative research is defined as a systematic investigation of phenomena by collecting measurable data and applying statistical, mathematical, or computational techniques. (Saputra, n.d.2022).

According to Emzir (2009:28), The quantitative approach is an approach that primarily uses the post-positivist paradigm in developing scientific knowledge through research strategies such as experiments and surveys, which require statistical data. As the name suggests, quantitative research relies heavily on the use of numbers ranging from data collection, interpretation of the data, to the presentation of the results. (Saputra, n.d. 2022).

2.2 Research Subjects and Data Sources

The target of this research is the fourth-grade students of Al-Qomar Elementary School, Universitas Muhammadiyah Purwokerto, in the 2024/2025 academic year. The class consists of 28 students, including 12 boys and 16 girls. The research data were obtained from the learning process and outcomes of the Natural Science (IPA) subject, conducted in April. The stages of the research used as the data source are explained in the table below:

Tabel 1. Student Learning Stages and Objectives

Research Stages	Activities	Target
Pre-test	1. Students complete the pre-test worksheet. 2. The test consists of 10 Natural Science questions.	Initial measurement of critical thinking ability
Literasi	1. The teacher divides the class into 5 groups 2. Reading an article on the benefits of organic shampoo 3. Reading an article on the boycott of pro-Israel products 4. Reading about the natural shampoo production process	1. Initiating critical thinking 2. Designing problem-solving activities
Production and Promotion	1. Creating the step-by-step process of shampoo production according to the recipe and work procedures 2. Making the shampoo 3. Packaging the shampoo 4. Promoting and presenting the shampoo product	1. Implementing ideas/critical thinking 2. Enhancing collaboration 3. Observing critical thinking skills 4. Digging creativity
Post-Test	1. Students complete the post-test worksheet 2. The test consists of 10 questions	Measuring the difference between students' initial and final critical thinking abilities

2.3 Research Instruments

Data collection was carried out using pre-tests, post-tests, and observation, with the aid of observation sheets that allowed the researcher to record behaviors, events, and activities observed during the learning process. The observation sheet included indicators of student interaction and the teaching and learning process. The pre-test was administered before the learning activities, while the post-test was conducted after the learning process. Both tests were used to measure changes, particularly in students' critical thinking abilities, before and after the intervention or treatment. The purpose of this data collection process is to measure the effectiveness of the intervention, identify changes, and provide quantitative data to support the findings.

2.4 Hypothesis

Data processing was conducted using simple statistics by comparing two sets of numerical data. The comparison is expressed as a percentage (%) difference between the pre-test and post-test scores to test the research hypothesis. The research hypothesis states: "The implementation of the sciencepreneur approach in project-based learning through the natural shampoo-making project can improve the critical thinking skills of elementary school students at UMP in the 2024/2025 academic year."

The hypothesis is accepted if the data show an increase in the students' average scores and an increase in the number of students who pass the Minimum Competency Criteria (KKM). Significant learning outcomes are indicated by either an increase of at least 25 points in the class average score or at least 85% of the students passing the KKM.

3. RESULTS AND DISCUSSIONS

3.1 Definition and Benefits of Sciencepreneur

The implementation of sciencepreneur education requires a project as a means for students to produce a product. The easiest and most accessible project for students, closely related to their environment, is an agricultural project. For schools with limited land, an appropriate agricultural project is one that uses urban farming techniques. (Cholifah & Purwandari, 2021). The utilization of aloe vera plants, some of which come from cultivation in the school garden, is considered in this project.

Mature aloe vera plants are usually left to naturally decompose and become organic fertilizer in the UMP elementary school garden. Through literature review, it is known that aloe vera is a natural plant that can be used as a base ingredient for natural shampoo. The use of aloe vera is considered to have greater economic value if further developed and serves as the foundation of this project due to its health benefits.

The final product intended to be produced in this learning process is simple, easy to obtain, economical, and of course, has added value. This added value lies in the practice of making natural shampoo as an alternative solution to commercial shampoo products that are being boycotted. One of the goals is to provide a product that improves the health of shampoo users while also offering a socially responsible product.

The function of the Natural Science project subject is to equip students with the ability to solve real-life problems in the 21st century related to natural and social phenomena around them scientifically, by applying science concepts and acquiring the skills to make appropriate scientific decisions, so that they can live more comfortably, healthily, and better. (Roshayanti & Hayat, 2023).

Life skills education is packaged within project-based learning and applied through the making of natural shampoo. It is hoped that the students involved can develop independence and creativity. The independence and creativity of students in science and entrepreneurship education can be referred to as sciencepreneurship.

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3.2 Project-Based Learning
3.2.1 Characteristics
The Merdeka Curriculum has three main characteristics: Project-based learning aimed at developing soft skills and character, which include faith, piety, noble character, mutual cooperation, global diversity, independence, critical reasoning, and creativity. A focus on essential materials to allow sufficient time for in-depth learning of basic competencies such as literacy and numeracy; Flexibility for teachers to conduct learning tailored to students' abilities and to make adjustments based on local context and content. (Hidayati et al., 2023).

3.2.2 Characteristics of Project-Based Learning
Project-based learning is an educational approach that uses projects as the medium in the learning process to achieve soft skills, hard skills, and character development. The emphasis in this learning method lies in student activities that involve producing a product by applying skills such as researching, analyzing, creating, and presenting the learning product based on real-world experiences. (Khoerunnisa, 2023).

Project-based learning is a term that defines learning with several characteristics, namely: Interdisciplinary learning, where there is a connection between one subject and another; Project-based learning is application-oriented and not text-based. The main objectives are to solve problems, address issues, and produce works or products; The implementation of project-based learning is conducted in groups, not as individual assignments. (Hidayati et al., 2023).

First, the project-based learning carried out by the fourth-grade students of SD UMP is essentially Natural Science (IPA) learning, but it is integrated with approaches from both Science and Economics, namely entrepreneurship. If examined more deeply, there are several subjects implicitly included by the teacher but not made the main focus during the process. For example, identifying the main ideas in the Indonesian Language subject, and Mathematics in calculating profit and loss from the selling price minus the costs of materials and shampoo production.

Second, the learning process is not based solely on the information domain. It encourages students to actively engage in the process. They collaborate with their peers by working in groups cooperating in preparing materials and work steps, cooperating during the shampoo production process, collaborating on packaging and labeling, and finally working together to promote the product through group presentations.

Third, the main objectives of project-based learning, as explained above, are to solve problems, address issues, and produce works or products. Below is a table of the learning outcomes that emerged.

Table 2. Achievement of Objectives in the Form of Products and Activities

Aspect	Product Form	Activity
Solving problems related to products that are safe for health	Making Shampoo from Natural Ingredients	Literacy and Group Practice
Responding to Issues Regarding Pro-Israel Products	Showing that the shampoo is made from local ingredients	Literacy and Group Practice
Producing Work	Shampoo product packaging and shampoo package labeling	Production and Promotion

3.3 Students' Critical Thinking Ability
3.3.1 Characteristics of Critical Thinking Students
Characteristics of students who are capable of critical thinking include understanding the problem presented in the given question, providing reasons based on relevant facts or evidence, thoroughly examining or rechecking from the beginning to the end, and making accurate conclusions. (Sani, 2019). Critical thinking skills need to be developed through learning so that students are encouraged to think independently and solve problems both at school and in their daily lives. (Asri, 2022). Based on the observation results, the majority of students have shown enthusiasm for learning, which is reflected in their presentation performances. This is especially evident in their responses to issues related to commercial shampoo products that support Israel.

3.4 Pre-test and Post-test Results
The Natural Science (IPA) subject has a Minimum Competency Criteria (KKM) score of 70. All 28 students in Grade VI Al Qomar at SD UMP participated in the pre-test and post-test. The pre-test results showed that only 10 students passed the KKM, with a passing percentage of 35.714%. The post-test results indicated an increase in the passing percentage by 64.286%, reaching 100%, as all 28 students passed the KKM. The class average score increased from 60 in the pre-test to 92.124 in the post-test, an improvement of 32.124 points.

4.   CONCLUSIONS

The Sciencepreneur approach can be applied in project-based learning. Project-based learning predominantly involves group activities. Observations and assessments reveal the characteristics of learning within the project-based approach. Notably, it encourages critical thinking, as demonstrated by students' abilities to solve problems related to producing safe products, address issues concerning pro-Israel products, create works, and promote them.

The research results show significant outcomes. The learning results indicate an increase in the class average score by 25 points, from 60 points, and the number of students passing the Minimum Competency Criteria (KKM) is greater than or equal to 85%, reaching 100%. Therefore, the research hypothesis, "Through the implementation of the sciencepreneur approach in project-based learning for making natural shampoo, the critical thinking ability of SD UMP students in the 2024/2025 academic year can be improved," is accepted.

Suggestions for future research include assessing the results and benefits of the products. Since the shampoo is made from natural ingredients, it is important to maintain standard quality control of the materials and composition. It is hoped that the project can be continued by promoting the product through social media platforms such as class WhatsApp groups, the school cooperative, or even at higher-level expos.

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