

Learning Science Through STEAM Approach (Science Technology, Engineering, Arts, and Mathematics) Integrated Ethnoscience in the Context of Batik Culture for Pre Service Teachers of Primary Education

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Abstract—The exoticism of Ciwaringin batik has a different appeal and privileges compared to other Cirebon written batik, in addition to the unique motifs depicting flora meaningful hereditary historical philosophy it also has a soft batik colour because it is produced from natural dyes. STEAM learning is believed to equip students to be able to adapt to the changes they will face later. This paper presents the design of science learning through the integrated STEAM approach to ethics in the cultural context of Ciwaringin batik for prospective elementary school teacher students. In this paper, we will examine and examine the elements of science, technology, art, engineering and mathematics that are contained in ciwaringin batik culture lectures for prospective elementary school teacher students. Science learning based on local wisdom fosters a love of indigenous knowledge as part of the nation's culture that has implications for the conservation of the surrounding natural resources and environmental balance that is acted out through STEAM learning. In This research We Use method uses a research and development (R & D) approach. Thus, the development is more directed at efforts to produce products ready for real use in the field, not just finding knowledge or testing certain hypotheses or theories. The results obtained from this research are the design of lecture activities using STEAM approach (Science Technology, Engineering, Arts and Mathematics) for prospective elementary school teacher students in learning.

Keywords: 21st century skills, Ciwaringin batik, STEAM learning

I. INTRODUCTION

The multi-dimensional and identity crisis in Indonesia in the last decade requires evidence-based solutions, especially from the scientific disciplines and the humanities, including education and teaching that underlie the emergence of Ethnopedagogy. The need for tertiary institutions in Indonesia to develop their excellence based on cultural values that become national identity. In this context, the need for LPTKs to develop teacher education that prioritizes the process of producing and reproducing local wisdom through an approach known as Ethnopedagogy. This means the need to explore the

meaning of ethnopedagogy, especially in the context of teacher education. The meaning will later serve as a foundation or correction of teacher education and education practices which so far Indonesian education does not have a philosophy of education. Thus it is hoped that Ethnopedagogy can function as a foundation for the education and development of teachers who have the primary goal of building the nation's character and culture.

Related to the nature of education, education cannot be separated from social and cultural aspects. Education is deliberative in the sense that the community transmits and perpetuates the idea of a good life that comes from fundamental community beliefs about the nature of the world, knowledge and values [1]. In addition there are other factors that play a role such as ethics, human values, mutual respect, care for the environment and the glorification of knowledge. Therefore, it is necessary to reorient the scientific foundation of education that is concerned with human values, something that has not gone unnoticed due to the lack of studies on the cultural foundation of education. The virtue of education should not be reduced, as is happening now in the standardization regime, so that it ignores the lofty goal of education itself, namely civilizing education.

For this reason, it is necessary to develop a cultured education and not just the development of education but free of culture. Education must be able to carry out its function as a tool to develop development and be able to transform the cultural values that exist in culture. In connection with cultural values in society and the importance of using local culture for learning, an indignation process has been developed recently.

Batik and its making procedures are a nation's cultural heritage that does not exist and the younger generation now participates in batik activities. Ciwaringin Batik has special features compared to other Cirebon batik. Besides motifs that have plant drawings and have a historical philosophy and also have batik colours produced from natural dyes. Ciwaringin

Batik grew from the pesantren cultural community. This can be seen from the design of motifs that have Islamic values. Islamic aesthetics which became a reference in the creation of Ciwaringin batik motifs [2]. Through learning activities about the culture of batik in Ciwaringin students are able to deepen the real utilization of natural resources (scientific concepts), and changing perceptions the original knowledge of the people who are impressed as only cultural heritage knowledge, become a scientific knowledge that can be accounted for [3-4]. Learning this local wisdom-based science fosters a love of authentic knowledge community as part of the nation's culture that has implications for conservation surrounding natural resources and environmental balance [5].

The vision of the Gunung Jati National Self-reliant University as a university of national repute, global networking, and contributing to the enhancement of the nation's dignified competitiveness. In an effort to make this happen, this research establishes collaboration between Gunung Jati University Swadaya and Semarang State University related to entrepreneurship development for PGSD students through learning Biotechnology with the integrated STEAM approach of ethnics. The STEAM approach is an integration of science, technology, engineering, and mathematics in a real context, linking material on campus, the world of work, and the global era, with the aim of students being able to compete in the 21st century. The STEAM approach and ethnics have been developed at Semarang State University (UNNES), where the university has a vision of being a conservation-oriented and internationally reputed university.

One learning approach that can be used to practice 21st century skills is the STEAM learning approach. STEAM education provides an opportunity for teachers to show students how the concepts, principles and techniques of science, technology, engineering, art and mathematics are used in an integrated way in the development of products, processes and systems used in their daily lives.

Current learning trends need to follow 21st century developments, one of which is by integrating Science, Technology, Engineering, Art and Mathematics (STEAM). Some of the benefits of the STEAM approach make students able to solve problems better, innovators, inventors, independent, logical thinkers, and technological literacy. STEM learning needs to emphasize several aspects in the learning process [6].

From the background that has been explained, it is necessary to develop lecture activities through an integrated ethnocentric STEAM approach for prospective elementary school teacher students in a culture of learning, values, science and technology as well as artistic elements from Batik Ciwaringin. The renewal of this research is to design and implement the STEAM approach in the context of Ciwaringin batik culture for science lectures of elementary school teacher candidates

II. METHOD

The development phase is carried out by creating, validating and testing lecture designs using the STEAM

approach through the context of batik culture for prospective elementary school teacher students. Feedback for the design of lectures using the STEAM approach is obtained through expert validation and limited testing of students. Validation of experts involved to provide validation of lecture design with STEAM approach through the cultural context of batik making for prospective elementary school teacher students. Qualifying experts consist of two experts who have expertise in the fields of Science and basic education and one expert in the ethnopedagogic field. In assessing, the three experts were asked to provide corrections and comments that would be used to improve the design of lectures using the STEAM approach through the context of batik culture for prospective elementary school teacher students.

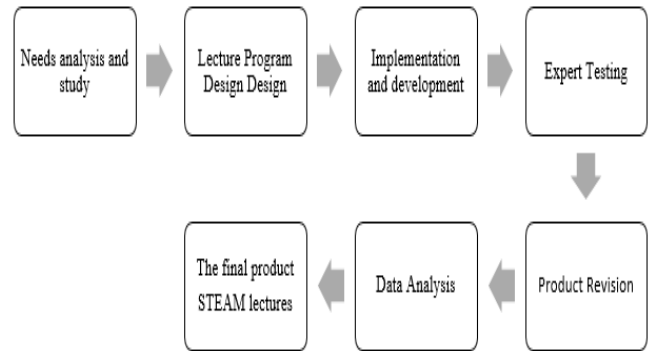


Fig. 1. Research flow.

III. RESULTS AND DISCUSSION

The results obtained from this research are the design of lecture activities using STEAM approach (Science Technology, Engineering, Arts and Mathematics) for prospective elementary school teacher students in learning culture, values, science and technology as well as art elements from Batik Ciwaringin. The more detailed activities of each approach will be explained as follows:

A. Element of Science

- Students can understand the types of plants that can be used as dyes on batik cloth.
- Students can understand the use of natural materials that produce secondary metabolites as natural dyes such as tannin (chocolate), flavond (yellow), anthocyanin (light brown)
- Students can understand the extraction techniques, fixation and colouring techniques in making Ciwaringin written batik

B. Elements of Technology

- Students can understand the slamming technique
- Students can understand the technique of waxing
- Students can understand the mordanting process to produce quality batik colours
- Students can understand the use of fixation

- Students can understand the use of computers to design batik motifs
- Students can understand the use of the internet in marketing batik science products

C. Engineering Elements

- Students can determine the tools and materials that will be used to extract natural materials
- Students can Design a mixture of natural material colours and differences in fixation so that it becomes a unique blend of colours
- Students can Evaluate product results and design improvements
- Students can Determine the length of time the boiling process is in the extraction stage
- Students can Design the right formula in dyeing fabric according to the desired colour strength

D. Elements of Art

- Students can develop original ciwaringin batik designs that are combined with science motifs. Here is one of the batik motifs successfully designed by students

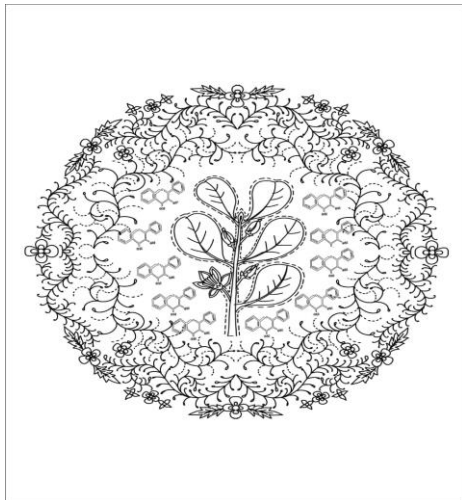


Fig. 2. Batik designs made by students.

E. Mathematical Elements

- Students can calculate the distance and size in the design patterns of science batik motifs
- Students can measure the composition of materials needed for each colour extraction
- Students can calculate the amount of extraction produced on the need for the amount of fabric
- Students can measure the distance during the waxing technique
- Students can calculate the number of material and technology needs if the scale of manufacture is enlarged and reproduced

- Students can calculate capital and business calculations to determine the selling value of science batik products produced

Documentation on the completeness of STEAM's approach to the implementation of prospective elementary school teacher students in learning Batik Ciwaringin can be accessed on page https://www.youtube.com/watch?v=WssJrCqDqN0&feature=s_hare

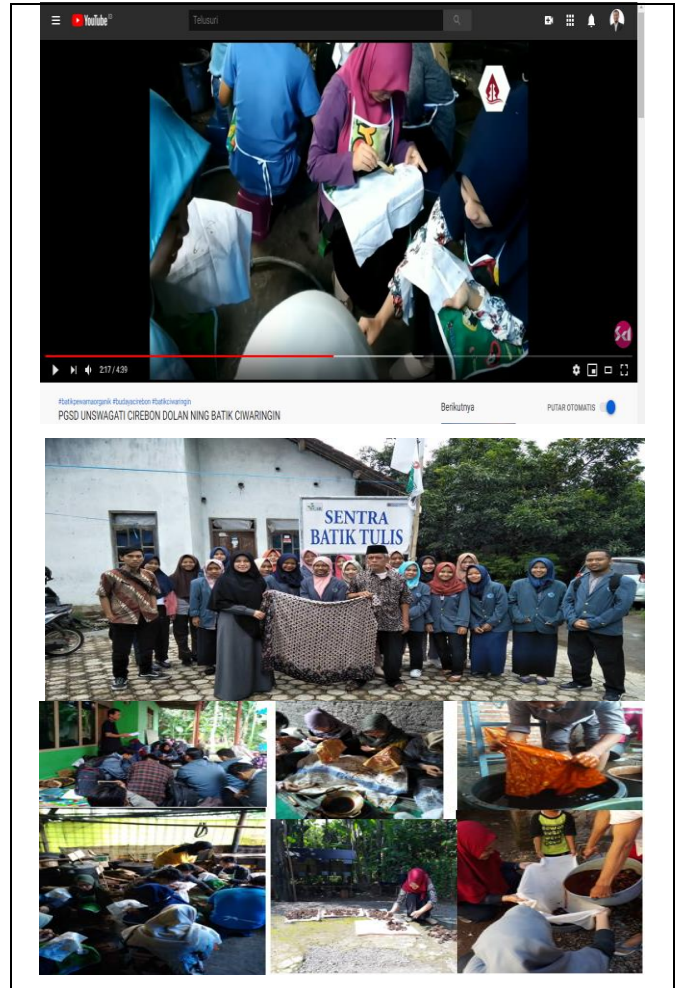


Fig. 3. Documentation of Batik Ciwaringin learning.

F. Discussion

This activity forms a caring attitude towards the preservation of Ciwaringin batik culture by using natural dyes. The results of the presentation were presented by several groups of prospective elementary school teacher students that the culture of Ciwaringin batik must be maintained, because the results of exploration that have been carried out reveal the direct truth of the relationship of public knowledge with science knowledge in schools in the local utilization of natural resources in Cirebon. Local wisdom-based learning is expected to increase awareness of the importance of local culture and the conservation of living natural resources in the Cirebon region.

IV. CONCLUSION

STEAM is an integrated learning approach that encourages students to think more broadly about real-world problems. STEAM also supports meaningful learning experiences and problem solving, and believes that science, technology, engineering, art and mathematics are interrelated. In STEAM, science and technology can be interpreted through art and engineering, including the mathematical component.

The STEAM component consists of: Solving problems through innovation and design, The relationship between assessments, learning plans and learning standards, the combination of more than one subject in STEAM and its usefulness in the arts, a collaborative learning environment and process based learning, focus on things that are occur in life, In the STEAM education model, art is not only considered as a separate subject, but as an access point to all other subjects, and also as an innovation.

The following are some of the advantages of incorporating art in science and engineering as in the STEAM model. Helps remove inhibitors of ideas (because there are no wrong words in art), Focuses on processes that help lead to innovation, Teaches the power of observation, people and the environment in learning, Helps to sharpen visual-spatial intelligence and mathematical concepts such as geometry.

The foundation of STEAM actually lies in inquiry learning, critical thinking, and process-based. Process-based here means the process of asking questions, arousing curiosity, and being

able to find solutions to a problem. The essence of STEAM learning is to make learners more creative in finding solutions to problems.

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