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Use of Physics Collaborative Learning with Geography, History, and Sociology Subjects to Produce Scientific Papers and Diorama Models on Developed and Developing Nations

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ABSTRACT

This study is an evolution of joint research on the Indonesian educational system during the pandemic, when students need to be able to use interactive technology to enhance teaching and learning activities in the classroom. The goal of this study is to create and execute collaborative learning that culminates in a model and paper that are used in the 12th grade at SMA Bina Dharma. This study combines descriptive research with interviewing professors of relevant courses including history, geography, physics, and sociology. The findings of this study include the development of a model for physics talks on the construction of electrical installations in the model, geography, on the shapes of buildings in developed and developing countries, sociology on social inequality in developed and developing countries in the form of a paper, and history discussing technological advancements in developed and developing countries. The research results with collaborative learning showed that 89 percent of students were able to create electrical installations in developed countries, specifically Japan, and 100 percent of students were able to create posters depicting the form of electricity in developed and developing countries. In conclusion, students can understand collaborative learning and comprehend the concept of electrical installation.

Key word: collaborative learning, Project, diaroma

PENDAHULUAN

Techniques are required to make sure that education becomes a way to open students' mindsets capable of changing attitudes, knowledge, and abilities for the better. A nation's pride and dignity may be preserved by a high-quality education. Enhancing the quality of learning through teaching models is a component of efforts to increase the quality of educational materials. Alongside the quick development of science and technology, a number of fresh ideas and perspectives about the teaching and learning process in schools have surfaced.

Students' knowledge, abilities, growth, and environmental conditions are some of the elements of learning activities that we must consider. Teachers are far better able to assist

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pupils in attaining their best outcomes when they are able to read the prominent traits that they possess. Since every student has a unique learning style, this is one of the factors that must be taken into account.[1]

One of the subjects that plays an important role in efforts to enhance knowledge, skills, and produce quality and competent human resources in facing the development of the times is Physics. Physics has become one of the sciences that holds an important role in the current technological development.

Physics, according to Prasetyo, as a branch of natural science or science, essentially has the same essence as science itself. Science can be viewed as a body of knowledge, as a way of thinking, and as a method of investigation. Science as a body of knowledge is the result of discoveries from the creative activities of scientists over centuries, science as a way of thinking is a human activity characterized by the thought processes that occur in the minds of those involved in the field, while science as a method of investigation illustrates the approaches used by scientists in constructing knowledge.[2]

Concept-based physics education necessitates a high degree of comprehension. There are instances when a single teacher is unable to accommodate the entire class. In contrast, learning will become disorganized and distracted if two teachers are present during a single lesson. To make up for this, students might be found learning together, conversing, and exchanging knowledge in some settings. When compared to needing to add more study time at tutoring centers, this condition is thought to be the most effective. For learning to be more successful and efficient, students must collaborate with one another.[3]

Since many aspects of physics are applied in everyday life, such as technology, which advances society and makes life easier for people, physics education is strongly tied to real-world applications. Because the current Indonesian educational system frequently divides courses, learning takes place independently and creates the illusion that there is no link, physics education itself confronts numerous challenges. In contrast, all knowledge is interconnected in real life. The educational process does require facilities or equipment. However, all facilities or equipment must be provided according to need. If all equipment and facilities already exist, they must be utilized and managed properly and correctly. Management activities include: planning, procurement, supervision, storage, inventory and deletion, as well as structuring. Good facilities and infrastructure can create a pleasant atmosphere, both for teachers and for students. [4]

By combining physics with other topics, researchers have started to improve the learning process. This leads to collaborative learning where students construct the final output.[5]

Collaborative learning is not merely a method of instruction in the classroom; it is a personal philosophy. He claims that cooperation is a structure of interaction created to support group efforts to accomplish shared objectives, and that collaboration is a philosophy of interaction and a way of life. Collaboration is a means of interacting with others in a group setting in any circumstance while showing respect for each other's skills and contributions. Within it, members of the group accept responsibility for carrying out group actions and divide authority.[6]

In order to achieve a common goal, team members must: (1) develop and share something; (2) provide input to better understand the problems faced; (3) ask questions, gain deeper understanding, and find solutions; (4) react and work to understand other questions, deeper understanding, and

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solutions; and (5) empower others to speak, provide input, and consider their contributions. Collaboration is the essence of collaborative learning.[7]

Establishing the same fundamental skills is the first step in this collaborative learning process. The researcher then maps the syllabus to identify the sub-themes, which are primarily developed and developing nations, to begin the discussion session. The final output, which is a diorama model with electricity installations and multiple student-made journals on developed and developing nations, is then decided by the researcher.

One of the appropriate learning models in mathematics education is project-based learning, which is what the researcher used to build the project. Bie defines project-based learning as "a learning model that focuses on the central concepts and principles of a discipline, involving students in problem-solving activities and other meaningful tasks."[8]

Project-based learning is an approach to education that combines problem-based project work with experience-based knowledge collection. Regarding the nature and procedures of Project Based Learning, the 2013 curriculum training materials state that its goals are to, among other things, increase students' motivation to learn and support their capacity to complete significant tasks, improve their problem-solving abilities, make them more proactive and capable of handling complex problems, foster collaboration, encourage the development and practice of communication skills, improve their resource management abilities, and offer learning experiences that engage students in a complex way and are intended to change in response to real-world situations.[9]

Geography classes, which are crucial in defining the surroundings, are a part of the project design process itself. Because geography education shouldn't be limited to the classroom. To comprehend the social and natural phenomena that are present in daily life, however, individuals must venture into the field. ... order for geography classes that examine the mutual links of Earthly phenomena to have meaning for the pupils. Geography is the science that examines the similarities and contrasts of geospheric events from the viewpoint of the environment and regions in the context of space, according to the definition given at the 1988 Indonesian Geographical Association (IGI) workshop seminar in Semarang.[10]

The meaning of studying sociology is that social phenomena are directly tied to the subject of study during the learning process. Teachers might invite students to learn directly from their experiences and to see how people interact in society. There are undoubtedly many advantages to using the community as a learning resource. Pupils can study social conditions and acquire tangible knowledge. Through observation, investigation, field studies, and outdoor exploration, among other activities, they will learn how to evaluate society according to social factors. This initiative uses children's literature to analyze the social structures of developed and emerging nations, including topics such as norms, stratification, social institutions, social processes, social cultural change, and more. [11]

It is believed that studying history opens doors to wisdom and knowledge gained from past events. Studying history is a way to learn about all facets of humanity. The learning outcome known as historical consciousness is the awareness of the nature of cultural and civilizational evolution that arises from studying history. Through written work that will be presented later, the project's learning examines the nation's technical advances.[12]

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In general, educational media are tools that support the teaching and learning process. Furthermore, everything that can be used to stimulate a learner's ideas, feelings, attention, and abilities or skills in order to promote the learning process is considered learning media. The understanding of resources, the environment, people, and techniques used for training and learning are all included in this deep and wide description.[13]

A model is three-dimensional representation of an item or entity. Typically, models are employed to explain a situation. Models are therefore employed to illustrate the current situation in relation to the one that will be produced. A river water type model was made for this study so that students could explain the traits of each type of river water. Since there are many different kinds of river flow patterns, students can quickly visualize the 3D shape of these patterns and, by understanding their features, can illustrate them. The proper learning system design model is experimental in the creation of this model.[14]

A scientific work written or conducted in accordance with scientific principles is referred to as scientific writing. The first prerequisite for authoring a scientific work that can be held to scientific accountability is the application of scientific principles. Therefore, in order to meet the criteria of conformity with scientific principles, it is required to prepare oneself with the fundamentals of knowledge relevant to the topic of the Scientific Paper to be undertaken when writing it.[15]

RESEARCH METHODS

In order to find facts with proper interpretation, this study use qualitative approaches, which include investigations that accurately portray the nature of various phenomena, groups, or individuals [16]. Understanding how physics education is applied, developed, and implemented with various learning styles in the form of models is the goal.

The author highlights the information gleaned from observation and field note [17]. Interviews are used as the primary method in conjunction with observation, not as a supplementary method or to simply supplement the data. A product will eventually be created based on the interview's findings.

The process of gathering data and the analysis of that data are inextricably linked. Data gathering, presentation, reduction, and conclusion-making are all included in the data analysis process.

The first stage of data analysis is data reduction. Its goal is to make the gathered data easier to grasp. Reducing data entails condensing, picking the key ideas, concentrating on significant elements, and seeing trends and themes.

Data presentation, or showing the data, comes next once it has been reduced. Rewriting structured and categorized data or information so that inferences can be made from it is known as data presentation.

Based on the examination of the gathered materials, including field notes and interviews, conclusions are drawn. As a result, the conclusion can subsequently ascertain the research's findings.

RESULTS AND DISCUSSION

The end product of collaborative research is a diorama model, which incorporates natural aspects pertaining to the architecture of both established and developing nations. The division starts with the diorama's actual composition, beginning with how the buildings

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look before moving on to a geographical analysis. After that, there must be electrical installations in metropolitan areas, which will be examined from a physical standpoint. Additionally, the structures' shapes will be examined from both a geographical and physical standpoint.

Other outcomes of collaborative research include written works that explain social structures or disparities that exist in both industrialized and developing nations. We'll look at these social disparities later to see how they can occur. Students will examine the reasons and effects they have encountered. The technological factors causing the disparities between industrialized and developing nations will be covered later in history. History will examine how these disparities arise, and students will look for sources to consult in order to draw conclusions.

Since electricity is a key component of technology in both developed and developing nations, the research starts by combining the essential skills that each discipline possesses to produce physics connected to electricity. The structural forms of structures in developed and developing nations will then be covered by geography, social issues like inequality in developed and developing nations will be covered by sociology, and the historical evolution of technology in both developed and developing nations will be covered by history. Japan and India are the two example nations chosen by the researcher to represent developed and developing nations, respectively.

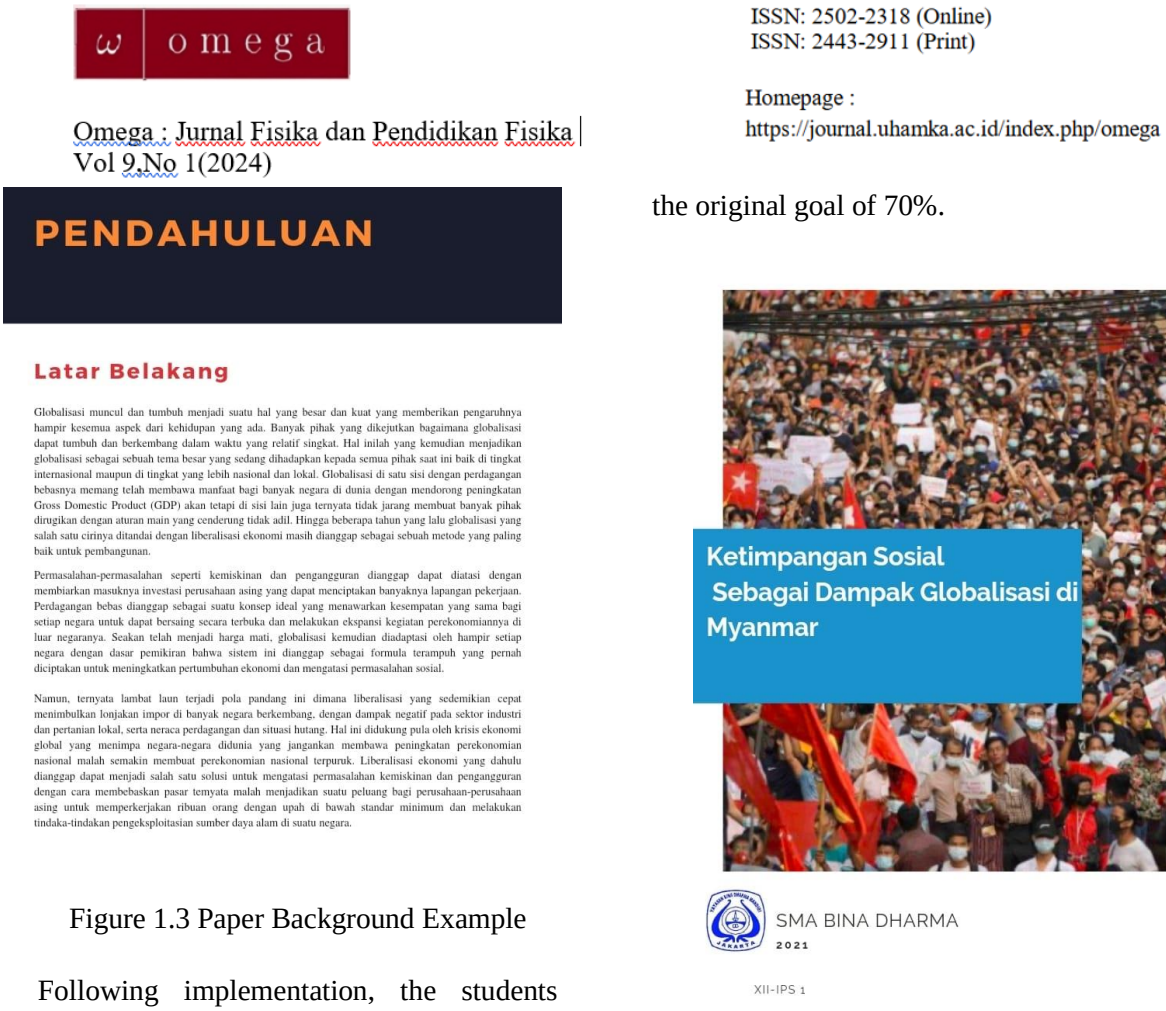
Socialization, which will take place in the 12th grade at SMA Bina Dharma, is the next step. The socialization will take place in accordance with each teacher's timetable, during which they will describe the fundamentals of model-making at the school as well as the procedures involved in producing written works and models.

Figure 1.1: Model Example

A model is an illustration that will be created for students in the future, emphasizing the seaside and architectural features that are typical of geography as well as the electrical systems that will eventually be found in urban buildings.

Figure 1.2 Cover Paper

The topic teacher will assign students to create a document that will eventually be turned into a scientific article or a piece that discusses social phenomena and the nation's history.



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PENDAHULUAN

Latar Belakang

Globalisasi muncul dan tumbuh menjadi suatu hal yang besar dan kuat yang memberikan pengaruhnya hampir kesemua aspek dari kehidupan yang ada. Banyak pihak yang dikejutkan bagaimana globalisasi dapat tumbuh dan berkembang dalam waktu yang relatif singkat. Hal inilah yang kemudian menjadikan globalisasi sebagai sebuah tema besar yang sedang dihadapkan kepada semua pihak saat ini baik di tingkat internasional maupun di tingkat yang lebih nasional dan lokal. Globalisasi di satu sisi dengan perdagangan bebasnya memang telah membawa manfaat bagi banyak negara di dunia dengan mendorong peningkatan Gross Domestic Product (GDP) akan tetapi di sisi lain juga ternyata tidak jarang membuat banyak pihak dirugikan dengan aturan main yang cenderung tidak adil. Hingga beberapa tahun yang lalu globalisasi yang salah satu cirinya ditandai dengan liberalisasi ekonomi masih dianggap sebagai sebuah metode yang paling baik untuk pembangunan.

Permasalahan-permasalahan seperti kemiskinan dan pengangguran dianggap dapat diatasi dengan membiarkan masuknya investasi perusahaan asing yang dapat menciptakan banyaknya lapangan pekerjaan. Perdagangan bebas dianggap sebagai suatu konsep ideal yang menawarkan kesempatan yang sama bagi setiap negara untuk dapat bersaing secara terbuka dan melakukan ekspansi kegiatan perekonomiannya di luar negaranya. Seakan telah menjadi harga mati, globalisasi kemudian diadaptasi oleh hampir setiap negara dengan dasar pemikiran bahwa sistem ini dianggap sebagai formula terampuh yang pernah diciptakan untuk meningkatkan pertumbuhan ekonomi dan mengatasi permasalahan sosial.

Namun, ternyata lambat laun terjadi pola pandang ini dimana liberalisasi yang sedemikian cepat menimbulkan lonjakan impor di banyak negara berkembang, dengan dampak negatif pada sektor industri dan pertanian lokal, serta neraca perdagangan dan situasi hutang. Hal ini didukung pula oleh krisis ekonomi global yang menimpa negara-negara didunia yang jangankan membawa peningkatan perekonomian nasional malah semakin membuat perekonomian nasional terpuruk. Liberalisasi ekonomi yang dahulu dianggap dapat menjadi salah satu solusi untuk mengatasi permasalahan kemiskinan dan pengangguran dengan cara membebaskan pasar temyata malah menjadikan suatu peluang bagi perusahaan-perusahaan asing untuk memperkerjakan ribuan orang dengan upah di bawah standar minimum dan melakukan tindaka-tindakan pengeksploitasian sumber daya alam di suatu negara.

Figure 1.3 Paper Background Example

Following implementation, the students were able to finish creating diorama models and papers or scientific works. These are the outcomes ;

Figure 1.4 Student Model

Japan has a nuclear-powered electrical system that can light up entire cities, and the model is taken from one of those cities. The conclusion was excellent, with 32 out of 36 pupils (89%) successfully creating a diorama model with an electrical installation, surpassing the original goal of 70%.

Figure 1.5 Student Paper

The theme of the students' paper is social issues facing Myanmar. The governing structure of Myanmar itself is flawed, which contributes to a number of societal problems.

Figure 1.6: Student Paper Background

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Out of the 36 students who created posters, 36 were able to meet the criteria 100% or very well and make posters in the designated category.

CONCLUSION

Collaborative learning is not merely a method of instruction in the classroom; it is a personal philosophy. He claims that cooperation is an organized interaction intended to support group efforts to accomplish shared objectives, and that collaboration is a philosophy of interaction and a way of life. History, geography, sociology, and physics are all included in collaborative learning.

Establishing the same fundamental skills is the first step in collaborative learning. The researcher then maps the curriculum to outline the subtopics, which are primarily developed and developing nations. The final product, a diorama model with electricity installations and multiple student-made journals about developed and developing nations, was then determined by the researcher.

During the actual project creation process, the researcher employed a method in which each subject teacher offered advice on how to create the diorama and paper. The students would then exhibit the finished products.

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