



Needs Analysis of SCROLY (Case Study and Role Playing) in Science Learning: Environmental Issues of Global Warming

¹Linda Kusumawati, ²Nuris Fattahillah, ³Hanis Pramudawardani

^{1*,3} Elementary School Teacher Education Study Program, Faculty of Teacher Training and Education, Universitas Pattimura, Indonesia

² Science Education Study Program, Faculty of Teacher Training and Education, Universitas Sultan Ageng Tirtayasa, Indonesia

Abstract

Science education at the junior high school level often lacks functionality and meaningfulness due to minimal student engagement and the absence of relevant scientific context in classroom activities. This study aims to identify (1) students' prior knowledge and awareness of environmental issues and (2) the teaching methods commonly employed by science teachers. Data were collected through questionnaires distributed to 47 students and 32 science teachers from various schools. Results showed that 70.2% of students had read about environmental issues, 57.4% had discussed them with peers, and 85.1% expressed concern for the environment, indicating strong awareness and interest. However, 71.9% of teachers reported relying on the lecture method, leading to monotonous instruction. To address this gap, the SCROLY model—an instructional approach combining case study and role playing—was designed to enhance learning experiences. In this model, students are positioned as investigative teams, scientists, and policy makers to explore and respond to global warming issues. This approach encourages active participation, critical thinking, and contextual understanding of science. The findings suggest that integrating relevant real-world issues through interactive methods like SCROLY can significantly increase student engagement and make science learning more meaningful and applicable to students' everyday lives.

Keywords: Environmental Awareness, Interactive Science Learning, Model SCROLY, Environmental Issue, Need Analysis

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*Corresponding Author: linda.kusumawati@lecturer.unpatti.ac.id

Introduction

Law No. 20 of 2003 concerning the National Education System Article 1 paragraph (1) states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character and skills. what is needed by himself, society, nation and state. Based on this, currently teaching activities are no longer an attempt to convey knowledge only, but create an environmental system that teaches students so that teaching objectives can be achieved optimally ([Pentury, 2017](#)).

According to [Sugiharti \(2009\)](#), factors that affect the quality of education include curriculum, teachers, educational facilities and infrastructure. The teacher's ability and eligibility factors in teaching are one of the most influential factors. Some teachers currently use monotonous learning methods that cause students to be bored, not enthusiastic during the learning process and this makes students think that science lessons are difficult to understand. Therefore teachers are required to be active, creative in conveying information messages, developing existing knowledge skills in the curriculum as actively as possible.

Science learning is learning in it there is a lot of material related to the surrounding environment, so that science learning should be fun learning for students. Based on the diagnosis from previous research conducted by [Anom \(2001\)](#), that isnatural science learning seems monotonous is only limited to book and pen preparation, listening to and recording teacher explanations and some students

answering teacher questions. This shows that the lack of application of learning that involves student activeness and the creation of a pleasant learning atmosphere.

In science learning students are also required not only to understand relevant scientific concepts but also to understand how these concepts can emerge and be known by students so that learning is carried out more functional and meaningful ([Gregor et al., 2017](#)). Learning by raising problems that exist in the environment or contextual is considered to be more productive in students because they tend to be involved and participate in providing scientific criticism and debate in a learning activity so that they will be more active and challenged in science learning ([Osborne, 2014](#)).

Environmental problems or environmental issues can be raised in learning because this can facilitate students to connect their experiences with new information they get ([Irwandi et al., 2019](#)). One of the environmental issues that can be raised is global warming because this event is very complex involving many types of pollution, one of which is air pollution. Global warming is currently a worldwide issue and its impact affects almost all aspects of life. Global warming is a natural phenomenon that is currently happening which can be seen and felt from the increasing heat of the air, causing water sources to dry up. The use of motorized vehicles, small to large factories, and disposal of organic fertilizers by farmers, resulting in global warming ([Iasha et al., 2013](#)). The importance of awareness of preserving the environment needs to be instilled in students from an early age so that students are more preventive, understand the causes of environmental damage, and understand how to provide solutions to issues that occur.

So far, students feel interested in studying environmental issues but lack of facilitation and the lack of teachers' ability to link learning material with environmental problems. Natural phenomena and events that exist in the environment are actually very amazing, full of diversity, all of which can raise many questions about why and how it all happened ([Hendrayana, 2017](#)). Science here serves to offer a way to answer existing questions and teach students to be actively involved in observing, evaluating what is in their environment. The case study learning method can be applied to facilitate students to be more critical and productive in addressing environmental issues. Based on these problems it is interesting to research (1) How are the learning methods currently applied in schools?; (2) How are students interested in environmental problems?; (3) How to design a learning model that can be used as a solution to overcome these problems?

Method

This research is a descriptive study in the form of a qualitative needs analysis to obtain primary data. The purpose of this needs analysis is to collect a variety of information about the learning used in school by teachers, as well as to find out the teacher's opinion on the important abilities that students should master in science learning. The data collection technique was conducted using a survey using a questionnaire. Surveys are an alternative method of communication by asking questions to respondents and recording their answers for further analysis ([Cooper et al., 1995](#)). Respondents who participated in filling out this questionnaire were 37 science teachers with schools scattered in several different areas.

At a later stage conducted with library research namely research which carried out using literature, in the form of books, notes, and research reports from previous research to obtain secondary data ([Hasan, 2002: 11](#)). The literature used in this study is in the form of a science syllabus and teacher lesson plans, with the aim of knowing the distribution of material in science learning which is often associated with environmental issues, and then one of the materials that can be developed using new learning methods is selected.

Research Results and Discussion

Results

The results of the research needs analysis obtained in the form of the use of learning methods, integration that is included in learning, experience of applying learning methods, and teacher opinions on student mastery of several important aspects of science learning below.

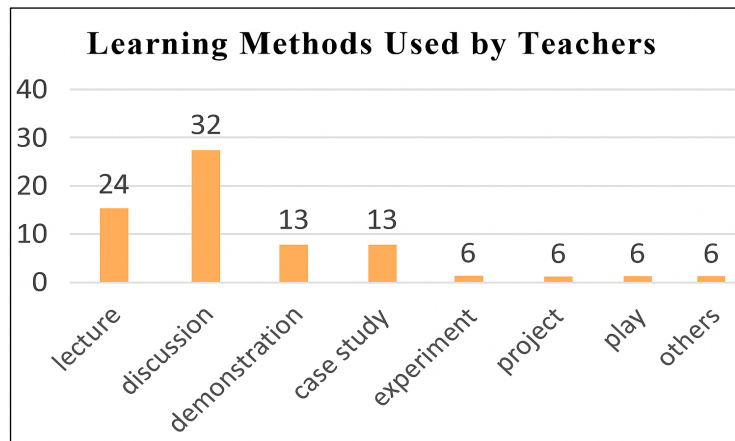


Figure 1. The learning methods used by the teacher

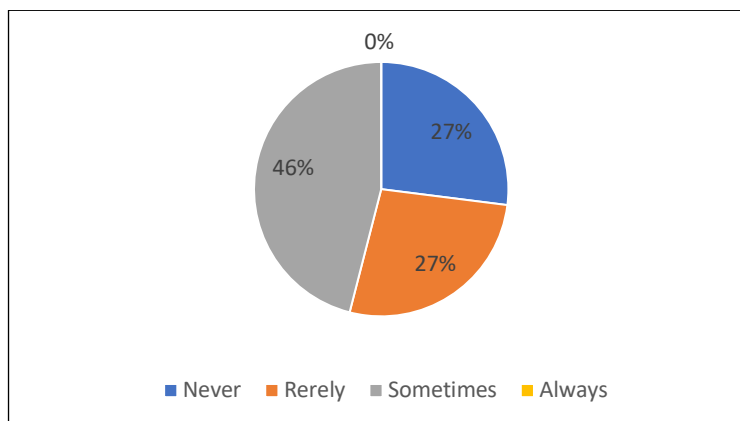


Figure 2. Application of The Case Study Method in Learning

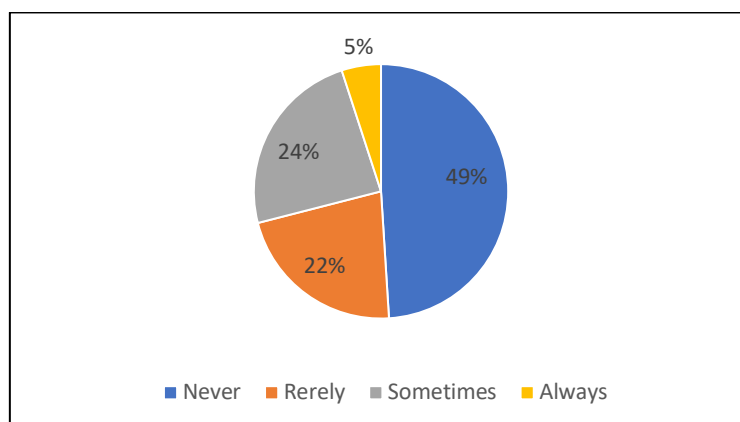


Figure 3. Use of Role Playing Learning Methods

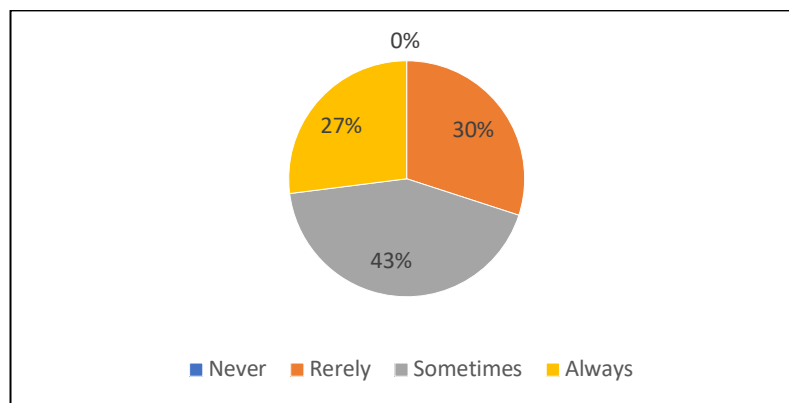


Figure 4. Integration of Environmental Issue in Learning

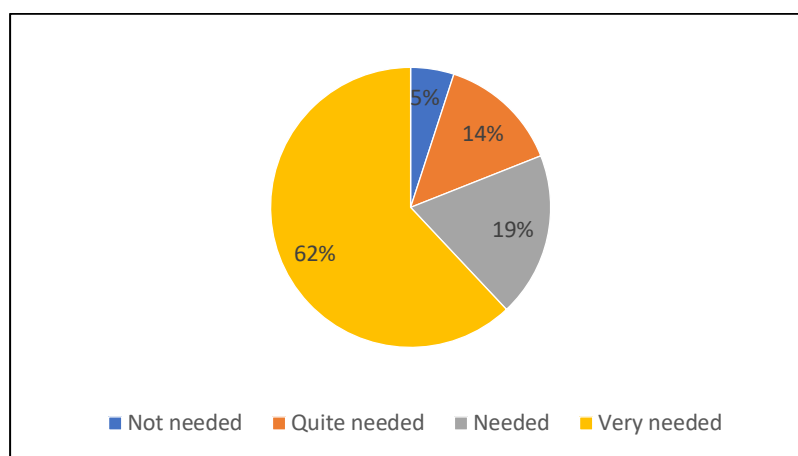


Figure 5. Need Analysis of the case study method and role playing (SCORLY)

In Figure 1, which is the result of filling out a questionnaire by 37 teachers, it is stated that the learning method most often used is the lecture and discussion method. In addition, 27% of teachers stated that they had never conducted learning using case studies, and 49% of teachers stated that they had never conducted learning using the role playing method. In addition, 30% of teachers stated that when learning was rarely related to the integration of environmental issues and based on the teacher's opinion it was necessary to apply the SCORLY learning method (Study case and role play).

Figure 2 shows that 46% stated that teachers only sometimes use case studies, even though the case study method encourages active learning, allowing students to engage deeply with the subject matter. For example, using the case method in engineering education helps students identify and analyze real-world electrical disturbances, thereby enhancing their ability to design protective systems (Sriadhi et al., 2023). This hands-on approach is reinforced by findings from Bonney, who indicate that case studies promote interdisciplinary learning and make academic content more relevant to societal issues, simultaneously improving student motivation and performance (Bonney, 2015).

Figure 3 shows that 49% of teachers never use role-playing, even though role-playing learning. One of the primary advantages of role-playing is its ability to create a dynamic and engaging learning environment. The role-playing method makes learning enjoyable and memorable, leaving a lasting impact on students' recollection of material (Zakia et al., 2024). Similarly, emphasize that experiential learning through role-playing motivates students, aligning with contemporary educational trends that prioritize active participation over passive knowledge acquisition (Saptono et al., 2020).

There is data about teacher opinions on student abilities in several aspects, including; 41% of teachers think that students are less able to understand the causes of environmental issues, 38% of

teachers state that students are less able to provide solutions to environmental issues. In learning 24% of teachers stated that students were less able to discuss and express opinions, 43% of teachers stated that students were less able to collect observations, 41% of teachers stated that students were less able to analyze observations, 40% of teachers stated that students were less able to report results observation.

Table 1. Data on students' opinions about environmental issues

No	Aspects of interest in environmental issues	Percentage (%)
1	Students read environmental issues in the mass media	70.2%
2	Students and their themes are concerned with environmental problems	85.1%
3	Students and their themes often discuss environmental issues	57.4%
4	Students feel disappointed with air pollutants	78.7%
5	Students who feel disappointed with the pollution that occurs in the river	74.5%

As supporting data, there is a questionnaire filled in by 47 students about students' interest in environmental issues or problems. 70.2% of students read environmental issues in mass media, one of which is through online, 85.1% of students feel concerned about environmental problems, 57.4% of students often discuss environmental issues with their friends, 78.7% of students feel disappointed with there are air pollutants and 74.5% feel disappointed with river pollution. The high number of students' concern regarding environmental issues will make students interested in studying environmental issues, one of which is global warming.

Discussion

One of the lessons that can invite students to actively participate in learning is a case study. Learning using this method will focus on students, where they will play an active role in decision making and have an opinion on the problems or issues that are being raised in learning. According to WS Winkel & Sri Hastuti (2004) with case study learning, it can be learned about the student's condition completely and comprehensively because it will gain understanding physically and psychologically. Based on the results of the research, the analysis of the teacher's opinion on several aspects of the student's ability to process data indicates a relatively low percentage. Learning this case study method can be used as an alternative to improve aspects that are lacking for students, because in case studies students are not only expected to be able to answer all problems correctly but are also expected to be able to find out how to get the right answers (Wardhono, 2004). Students' abilities in discussions, collecting data, analyzing data, and making reports are very important for students to have because this can be used by students to solve problems they encounter.

Global warming, driven by human activities such as pollution and deforestation, is a crucial environmental issue often neglected in education. Handayani and Putra (2019) highlight the importance of schools in raising awareness and understanding of its causes. Lin (2016) advocates for integrating climate topics into activities to foster critical thinking. Scott and Sulsberger (2019) emphasize the role of classrooms in shaping students' attitudes toward sustainability, while Puspita et al. (2022) promote eco-friendly behaviors. Almeida et al. (2016) stress the need for students to understand systemic environmental issues. Educating about global warming is essential for developing environmentally responsible citizens.

Teaching role playing which is usually used to emphasize the concept by providing understanding to students about the concept of a material. But the role playing method can also be used for learning such as in the social field, where role simulation learning in science is rarely done even though this learning will make students better understand the nature of learning. Role playing learning designed

similar to MUN (The United National Model), can be adopted for science learning, especially in global warming material so that students can play roles in having mutual responsibility in assessing environmental issues. Learning using a method that resembles the MUN simulation can be beneficial for students ([Duchatelet et al., 2021](#)). Role-playing is an innovative pedagogical tool in environmental education, simulating real-world policy decision-making. A structured role-playing framework should focus on stakeholder representation, scenario realism, and reflective learning. [Truchet-Aznar et al. \(2024\)](#) emphasize that local environmental issues and stakeholder dynamics are crucial in regional policy formulation, and role-playing helps students understand these complexities. Assigning students diverse roles, such as government officials, NGOs, and activists, enables them to appreciate multiple perspectives, as [Dong \(2024\)](#) notes, with NGOs playing a key role in promoting regulations and public participation. Scenarios reflecting current environmental issues allow students to learn how to balance sustainability with socio-economic demands ([Monteiro & Ribeiro, 2017](#)). [Zhang and Chen \(2018\)](#) highlight the importance of public participation in enhancing policy effectiveness, and role-playing provides students with firsthand experience of advocacy challenges. Debriefing sessions, as suggested by [Weible and Heikkila \(2016\)](#), facilitate reflective learning, helping students connect their experiences to broader environmental policy theories.

Based on the acquisition of supporting data about students' very high interest in learning by raising environmental issues, it can be used as one of the bases for basic competency analysis to be selected in science learning to be applied in learning designs using the SCROLLY method (Study case and role play). The basic competency chosen was 3.9 analyzing climate change and its impact on ecosystems and 4.0 writing about the idea of adaptation / mitigating climate change problems. Actually this learning method can also be applied to environmental pollution material, but in this method design uses global warming material because it is considered more complex for any global warming, most of the problems are preceded by environmental pollution, especially air pollution.

The design of this learning method is designed to provide a different learning experience for students, and based on the needs analysis 62% of teachers stated that this method needed to be developed. In learning using the SCROLLY method, it is carried out sequentially, namely; The teacher gives an overview of the problem of global warming, with topics on global warming such as the greenhouse effect, acid rain, and the depletion of the ozone layer. Furthermore, groups were formed with a heterogeneous manner so that students' overall learning abilities ranging from low to high were evenly distributed. The roles will be divided into three, namely the roles of scientists, investigative teams and policy makers. Scientists are tasked with identifying the process of the greenhouse effect, acid rain and depletion of the ozone layer. The investigative team whose role is to investigate the causes of the greenhouse effect, ozone layer depletion and acid rain. The solution team or policy makers play a role in making policies that are in line with the problem of acid rain, the greenhouse effect, or ozone depletion. In the division of roles, a kind of auxiliary media will be divided, namely cards or case where the card contains study questions from all the topics of global warming being taught, so that later each member in the group will get a different card, the card must be discussed and the problem resolved according to the type of group obtained (scientists, investigations, policies). After each student in the group has completed his task, it is the turn of the student to express their opinion and provide input, challenge, to other groups according to the role of the group material. In this activity the teacher functions to facilitate the learning process so that there is multi-direction. Facilitator is a fundamental aspect of modern education that enhances the learning experience for students. By embracing this role, educators not only support academic achievement but also nurture essential life skills in their students ([Garrison & Akyol, 2015](#)).

Learning using the SCROLLY model design will make students participate in scientific practice which is closely related to sociocultural theory where the learning process is seen as practical participation in

the community (Gregor et al., 2019). This method also offers children to practice and engage in the interaction of roles that are usually played by all scientists who practice making criticism, as well as solutions (Gregor et al., 2019). The method of playing roles by raising certain issues can offer students involvement in terms of cognition with scientific ideas, but the learning process like this must still be controlled by the involvement of the teacher.

Conclusion

Based on the results of this study, it can be concluded that the lessons that are most widely used by teachers today are lectures and discussions, where this learning method is felt by students to be more monotonous and make students less enthusiastic. Students' interest in environmental problems is very high, so that environmental issues can be contextualized as a stimulus or as learning material, one of which is science, this will make students enthusiastic because students will feel that what they are learning functions for their lives. The learning design designed is SCROLLY (Study case and role play) which can be used as an alternative learning method that can be used by teachers for learning by raising environmental issues which can then be solved by students by collecting data, observing, analysing and writing reports and results. from the report script can be used to play roles according to the instructions on the actor case card so that this learning will make students actively involved during the learning process in class.

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