ENTITA: Jurnal Pendidikan Ilmu Pengetahuan Sosial dan Ilmu-Ilmu Sosial http://ejournal.iainmadura.ac.id/index.php/entita



P-ISSN:2715-7555 E-ISSN:2716-1226

The Role of Students as Agents of Change Towards Climate Change Action for SDGs

Fadolul Ghafur^{(1).} **Riezky Alviansyah**⁽²⁾ MAS Mambaul Ulum Bata-bata, Indonesia ¹Ghafurfadolul@gmail.com, ²riezkyalviansyah69@gmail.com

Abstract

The increase in air temperature is one of the indicators that climate change has occurred in Indonesia, according to the historical air temperature data of the Meteorology, Climatology and Geophysics Agency (BMKG) from 1981-2018. The data shows an increase of around 0.03°C each year. Actions that can be taken related to climate change by involving the entire community to increase awareness of the environment. One of the ways to take action on climate change is through agents of change. Agents of change must have critical thinking and solution on every impact that causes damage and loss. This research uses qualitative methods and primary data collection with Focus Group Discussions (FGD), observations and secondary data with literature studies. The use of the STEM or Science, Technology, Engineering and Mathematics approach is carried out indoor and outdoor to foster the ability of students as agents of change. Students as agents of change will carry out several strategies in climate change action which includes the 13th goal in the Sustainable Development Goals. Activities that can be done by forming FGD to examine the problems that are being faced and how they will affect the future for students. Keywords: Climate, Agent of Change, STEM Method

Abstrak

Kenaikan suhu udara menjadi salah satu indikator yang menunjukkan telah terjadi perubahan iklim di Indonesia, sesuai dengan data suhu udara historis Badan Meteorologi, Klimatologi, dan Geofisika (BMKG) dari tahun 1981-2018. Dari data tersebut, terlihat kenaikan dengan kisaran 0,03°C setiap tahunnya. Aksi yang dapat dilakukan terkait perubahan iklim dengan melibatkan seluruh masyarakat untuk meningkatkan kesadaran terhadap lingkungan hidup. Salah satu cara untuk melakukan aksi perubahan iklim dapat melalui agent of change. Agent of change harus memiliki pemikiran yang kritis dan solutif pada setiap dampak yang menyebabkan kerusakan dan kerugian. Penelitian ini menggunakan metode kualitatif dan pengumpulan data primer dengan Focus Group Discussion (FGD), observasi serta data sekunder dengan studi literatur. Penggunaan pendekatan STEM atau Science, Technology, Engineering and Mathematics dilakukan indoor dan outdoor untuk menumbuhkan kemampuan siswa sebagai agent of change. Siswa sebagai agent of change akan melakukan beberapa strategi dalam aksi perubahan iklim yang termasuk tujuan ke-13 dalam Sustainable Development Goals. Kegiatan yang bisa dilakukan dengan membentuk FGD untuk mengkaji permasalahan-permasalahan yang sedang dihadapi dan bagaimana dampaknya di masa depan bagi para siswa.

Kata Kunci: Iklim, Agen Perubahan, Metode STEM

Received : 07-04-2025
; Revised 30-04-2025
; Accepted: 05-05-2025

© ENTITA: Jurnal Pendidikan IImu
http://doi.org/10.19105/ejpis.v1i.19139
Image: Colspan="2">Image: Colspan="2" Image: Colspa="2" Image: Colspan="2" Image: Colspan="2"

Introduction

Indonesia is currently facing quite serious problems due to extreme climate change. The increase in air temperature is one indicator that shows that climate change has occurred in Indonesia, according to historical air temperature data from the Meteorology, Climatology, and Geophysics Agency (BMKG) from 1981-2018 from the data, an increase of around 0.03°C is seen each year, both minimum, maximum, and average temperatures (Saepudin et al. 2023). Losses and damage caused by extreme climate change such as drought, heat waves, natural disasters, and so on. These negative impacts are felt by the community and follow-up actions must be taken to prevent significant losses. Indonesia as one of the countries vulnerable to the impacts of climate change has several impacts of climate change on existing priority sectors such as agriculture, water, health, and marine and coastal sectors.

Climate change also has an impact on extreme weather which causes changes in wind direction and speed and wave height so that it often causes storms. This change causes changes in the food chain in the marine ecosystem, changes in fishing seasons, and shifting fishing grounds. This has an economic impact on communities that rely on coastal and marine areas for their livelihoods. High waves and extreme weather cause fishermen not to go to sea so they do not get income. For fishermen who have gone to sea, their catch is decreasing and this condition can even threaten the safety of fishermen.

Actions that can be taken regarding climate change by involving the entire community to increase awareness of the environment and always maintain and take preventive measures so that climate change does not harm sustainable survival. This is important to do considering that generations of humans and other creatures will continue to continue their existence(Maulidna and Putra 2022). Therefore, there is a need for cooperation between individuals, governments, and the private sector in facing the challenges of climate change which is included in goal 13 of the Sustainable Development Goals (SDGs). Basically, change is changing the way humans think and behave. Agent of change in making decisions according to the direction desired by each individual. Agent of change can connect sources of change (innovation, public policy, etc.) with the social system that is the target of change. In the current era of globalization, change continues to move rapidly, whether in new products, new markets, new ways of thinking and competencies, and increasingly

sophisticated technology. These changes can be opportunities or challenges in facing some fierce competition.

Every individual is responsible for maintaining the surrounding environment so that it can create a sustainable environment related to climate change action. By changing behavior that is fully responsible for the environment, it will form changes and create a better environment so that agents of change are needed. Agent of change in the school environment involve all residents in the school, especially students who can train their thinking skills in solving problems in the surrounding environment. Students can become agents of change through a learning system that integrates Science, Technology, Engineering and Mathematics (STEM) (Setiawan et al. 2020). Through this learning system, students can improve effective learning to find the best solutions related to climate change action.

Based on this, one of the ways to take action on climate change is through agents of change. Agents of change must have critical thinking and solutions to every impact that causes damage and loss. Students as agents of change in climate change action can collaborate with other students in solving the problem. The learning system based on Science, Technology, Engineering and Mathematics can be applied to form students who are more active and have sensitivity to the school environment and its surroundings, so we made a problem formulation as follows: (1) What is the role of agents of change in climate change actions in the Sustainable Development Goals?; (2) How is the implementation of Science, Technology, Engineering and Mathematics to climate change actions in the Sustainable Development Goals? The objectives to be achieved are to determine the role of agents of change in climate change actions in the Sustainable Development Goals and to determine the implementation of science, technology, engineering and mathematics (STEM) to climate change actions in the Sustainable Development Goals.

Method

This study uses qualitative methods and primary data collection with focus group discussion activities, observations and secondary data with literature studies. The use of the STEM or Science, Technology, Engineering and Mathematics approach will be carried out with indoor and outdoor activities to foster students' abilities as agents of change who are more critical and sensitive to environmental conditions so that they can train critical thinking

and create problem solving that is in accordance with the problems faced by schools and the surrounding environment.

Result and Discussion

The Role of Agents of Change in Climate Change Action in the Sustainable Development Goals (SDGs)

Students as agents of change will carry out several strategies in climate change action which is included in goal 13 in one of the goals of the Sustainable Development Goals (SDGs). Agents of change can connect sources of change (innovation, public policy, etc.) with the community system that is the target of change. In the current era of globalization, change continues to move rapidly, whether in new products, new markets, new ways of thinking and competencies, and increasingly sophisticated technology. These changes can be opportunities or challenges in facing some tough competition. The efforts that must be made by students as agents of change are to develop several strategies in climate change action, namely:

a. Distributing a campaign to protect the school environment

This campaign can be created with print media and online media. Students can create pamphlets inviting people to protect the school environment and can also distribute them online on social media. We have carried out campaign activities, one of which is through socialization through classes and information media about increasing awareness and waste management in maintaining the sustainability of the school environment with several objectives, namely; 1) Socialization of environmental materials in educational activities in the school environment; 2) Creating a good, clean and healthy educational environment through waste management; 3) Solid waste management and implementation of the 5R principle (Reduce, Reuse, Recycle, Replace and Repair).

Environmental education is a way to increase a person's awareness in behaving in an environmentally friendly manner so that the sustainability of the ecosystem is maintained. Especially in the school environment which is the holder of teaching and learning activities with the aim of creating a conducive educational environment. Before the activity takes place, students are provided with education aimed at awareness to maintain environmental sustainability through the utilization of waste that can be reproduced into something that has benefits and economic value.

b. Intensifying Go Green in the school environment

This activity can be carried out in every corner of the school environment which can be directly carried out by each students' responsibility, so a beautiful and pleasant learning environment is created. In creating greenery in the school environment, there are several efforts that have been made, namely: (1) Carrying out a tree planting program in several areas of the school; (2) Planting plants in each area in front of the class to add greenery to the school environment. This activity introduces students to caring for the surrounding environment with green plants that can be used or processed into useful products such as medicinal plants, herbal tea and others.

c. Providing trash cans in every corner of the school

This is very important to do because the minimal number of trash cans triggers students to litter. The trash cans available in every corner of the school are trash cans that separate organic, inorganic and B3 waste. This aims to get students used to sorting waste according to type and benefits so that it is easier to collect or reprocess.

d. Organizing Deep Clean activities

This activity is carried out every week on friday which aims to clean all areas of the school and can be started by forming a group of students who have high initiative towards maintaining environmental conditions. The formation of a community of students who care about the environment as a pioneer in caring for and maintaining sustainability in the school environment so that all school residents participate in this activity.

e. Organizing the Eco Smart program.

This Eco Smart program refers to waste reduction and efficient energy use. Students are directed to produce works or products from organic and inorganic waste in the school environment. In addition, efficient use of energy is formed in schools, including; 1) Using sunlight as a natural light source can save energy; 2) Managing the time of energy use by turning off unused equipment; 3) Using computers that have energy-efficient processors and managing the time of use of equipment. This can develop student creativity and reduce the intensity of waste in the school environment.

The Implementation of Science, Technology, Engineering and Mathematics to Climate Change Action in Sustainable Development Goals

The implementation of Science, Technology, Engineering and Mathematics (STEM) encourages student engagement, critical thinking, and fosters a sense of social

Fadolul Ghafur. Riezky Alviansyah

responsibility. STEM projects must be adjusted to the grade level of each student so that the selection of problems to be studied and how to find solutions can be adjusted. Students will gain critical thinking skills, problem-solving skills, and a sense of concern for the environment, especially on climate change issues. This STEM method approach will provide deeper knowledge of scientific principles while developing skills and mindsets to address global problems (Maspul 2024). The use of the STEM learning system is carried out indoors and outdoors so that it will provide varied learning for students. The implementation of indoor learning is carried out by discussing several case studies that occurred in Indonesia related to climate change actions, while outdoor activities are carried out in the school environment by implementing several strategies that have been previously explained in climate change actions.

Referring to the case study of global warming caused by increasing concentrations of greenhouse gases and the earth's surface temperature mentioned by (Faisol, Pengkajian Teknologi Pertanian, and Sumatera Selatan JI Kolonel Barlian Km 2020). a study was carried out on this problem by compiling several strategies related to the problem. This will shape students to think more critically about the problems faced and find the best solutions in order to create a conducive school environment so that teaching and learning activities can be carried out properly. There are several implementations of the STEM Method that can be carried out to support climate improvement programs in the school;

a. Sciences

Providing socialization to students in the school environment can add new insights so that students know the dangers of the impact of climate damage if it continues to occur, and from existing problems it will provide stimulus to provide effective solutions from existing learning. STEM education is expected to form human resources who have high expertise according to their fields so that they can provide new innovations. The characteristics of STEM learning are 1) increasing students' ability to drawing up designs; 2) guiding students in solving problems; 3) increasing students' sensitivity to real-world issues; 4) involving students in inquiry learning; 5) giving students the opportunity to express their opinions; 6) guiding students to apply STEM understanding; 7) involving students in productive group work (Setiawan et al. 2020).The next activity in supporting the development of students' knowledge will be directed at increasing literacy and numeracy in writing scientific papers with environmental themes, so that students can have a work that can be published through writing and is useful for others.

b. Technology

Rapid technological developments can support student activities that can be carried out in the school environment. The socialization carried out is not only through verbal activities but also can be done by utilizing available applications in providing information. Using the role of social media to continue to campaign in maintaining the quality of the climate on earth to be better, and can use the role of satellite imagery (remote sensing). Research conducted by (Faisol et al. 2020), explains that the use of climate data based on satellite imagery (remote sensing) can be an alternative solution that can be used in providing climate data in West Papua Province because it has results with a high level of spatial representation.

c. Engineering

The ongoing climate problems make environmental education very effective as a solution in increasing the knowledge of young people as agents of change, so that from the increase in knowledge students are able to apply the mechanisms of the solutions given to existing problems. Some examples of applications that can be done in schools such as; 1) Renewable Energy Projects, students can create simple design and model projects from solar panels or wind turbines that aim to reduce carbon emissions. This activity can be done through learning in project classes and group discussions. The implementation of Project Based Learning can increase student participation, problem-solving skills and understanding of renewable energy concepts. In addition, this activity provides insight into the challenges that may be faced and strategies to increase the effectiveness of project learning in the school environment; 2) Sustainable School Gardens, the availability of green open spaces in the school environment will create a more beautiful school atmosphere and maintain the availability of natural oxygen produced from existing gardens. In addition, students are also taught the importance of sustainable gardens that can utilize compost from organic waste or those that can help reduce the use of chemicals.

d. Mathematics

Research activities carried out in studying climate problems are one way for us to find out the impact of damage that can occur in several sectors such as the environment, weather and ecosystems. Data analysis is very important to be carried out so that it can be a benchmark for the extent of the problems that occur and what solutions are appropriate to use. One of the main advantages of mathematical modeling in climate change studies is predictive ability. Mathematical models can help us in estimating an increase in carbon dioxide (CO2) concentrations that occur in the atmosphere which will affect global temperatures in the future(Ardianto et al. 2019). The results of this model can be the basis for governments and global organizations to formulate policies for mitigating climate change, such as reducing greenhouse gas emissions or reforestation. Efficiency in providing solutions to climate problems can help reduce the amount of bad emissions produced, by increasing the amount of green open space, environmental conditions can be better maintained.

Students as agents of change form focus group discussions (FGD) to examine the problems currently being faced and how they will impact the future. The formation of this FGD is very important because it gives students the opportunity to exchange more ideas between students and share many learning things based on science, technology, engineering, and mathematics to take action on climate change in the Sustainable Development Goals (SDGs). In addition, students conduct direct observations in the school environment and its surroundings so that it does not only involve school residents, but also the surrounding community.

Climate change is a long-term change in certain weather patterns in a region. This climate change is often associated with global warming. Education has an important role in increasing climate change literacy, which in turn provides a better understanding of the problem of climate change and inspires real action to deal with it. The importance of disaster prevention and climate change mitigation has become an urgent global issue. Natural disasters such as floods, landslides, droughts, and storms are increasingly frequent, while climate change continues to affect ecosystems and human life. Therefore, the implementation of effective mitigation actions in disaster prevention efforts is very important.

STEM (Science, Technology, Engineering, and Mathematics) learning has a significant role in understanding and dealing with climate change. In the context of climate change, STEM learning can provide students with an in-depth understanding of climate change science, related technologies, technical approaches, mathematics needed in analyzing data and solutions. Wilson & Hawkins point out that STEM learning makes students appreciate how science use many forms of critical thinking skills, creativity, and imagination as they try to understand real-world problems. Therefore, curriculum support is needed to foster transdisciplinary talents and skills, rather than the "traditional" way of looking at the domains and boundaries of certain disciplines. Such support will create more comprehensive and imaginative relationships.

Climate change has become one of the most significant and pressing environmental issues in the world today. This phenomenon has a wide and serious impact on various aspects of life, both for humans and ecosystems throughout the planet. Climate change is closely related to increasing global temperatures and changes in unstable weather patterns, which have an impact on rising sea levels, ecosystem damage, and threats to human life. With science, students can learn about climate change which can comprehensively describe the meaning of climate change, its causes, and its impacts on ecosystems and human life. The causes of climate change are human activities and natural variability. While the impacts of climate change are increasing global temperatures, changing weather patterns, rising sea levels, ecosystem damage and disruption to human life. The causes of climate change in Indonesia are greenhouse gas emissions, deforestation, and global warming. The impacts of climate change in Indonesia are decreased agricultural production, drought and forest fires, floods, and landslides.

Related to the implementation of climate action, it can be done by all agents of change by increasing awareness of the environment and always maintaining and taking preventive measures so that climate change does not harm sustainable survival with sustainable development. This is important considering that generations of humans and other creatures will continue to continue their existence. In this case, the need for cooperation between individuals, governments, and the private sector in facing the challenges of climate change is becoming increasingly urgent. Improvements in environmental education and the development of environmentally friendly technologies are also key in efforts to maintain the balance of the earth's ecosystem. Thus, awareness of the importance of protecting the environment and reducing the carbon footprint is an aspect that cannot be ignored in future development. All parties have a responsibility to contribute to maintaining the sustainability of this planet for future generations.

To address climate change, modern society needs to raise awareness and take action. This includes reducing waste, reforestation, reducing the use of motorized vehicles, disseminating information through technological media, holding environmental clean-up activities, reducing energy consumption, maintaining ecosystems, and participating in sustainable development. Governments, the private sector, and individuals all have a role to play in this effort and addressing climate change requires cooperation between individuals, governments, and the private sector. Increasing environmental education and developing environmentally friendly technologies are important to maintain the balance of

Fadolul Ghafur. Riezky Alviansyah

the earth's ecosystem. Thus, the main conclusion of the article is that climate change is a serious problem that requires collective action and shared responsibility to address it for the sake of the survival of the planet and future generations.

Conclusion

Students as agents of change have a role to take action on climate change in the Sustainable Development Goals by using a learning system based on science, technology, engineering and mathematics (STEM) that can be applied in the school environment. Environmental education is very important to increase students' awareness and concern in protecting the surrounding environment from damage that occurs. Based on several strategies, there needs to be cooperation not only between students but also the entire school community. Students are only agents of change and express ideas or concepts related to things that must be done in climate change action. However, for its implementation, supervision by teachers as companions is still needed so that the efforts made by students can be carried out properly and become a learning process that can be used not only now, but also in the future.

Suggestion

The implementation of climate change action by agents of change, especially students focus on the process that can be form the habit and critical thinking in the school environment and its surrounding. Focusing on the process will give a great mindset for students by teacher guidance and society around the school. All of the strategy practices mentioned above will be evaluated in a month, so it trains the sensitivity of students facing the problem in the school environment. In addition, students have to explore the other strategy to create improvement action for sustainable development goals.

References

- Ardianto, Didit, Harry Firman, Anna Permanasari, and Taufik Ramlan Ramalis. 2019. *Mathematics (STEM) Literacy*
- Faisol, Arif, Balai Pengkajian Teknologi Pertanian, and BPTP H. Sumatera Selatan JI Kolonel Barlian Km. 2020. "IGYA SER HANJOP 2(2) Potensi Pemanfaatan Data Iklim Berbasis Citra Satelit Untuk Pengembangan Lahan Pertanian Di Provinsi Papua Barat Potential Use of Satellite Image Based Climate Data for Agricultural Land Development in West Papua Province." doi: 10.47039/ish.2.2020.69-80.
- Maspul, Kurniawan Arif. 2024. "Exploring STEM Education for Real-World Climate Change Concerns to Empower Students as Change Agents." Journal of Physics Education and Science 1(2):12. doi: 10.47134/physics.v1i2.249.

126

- Maulidna, Firma, and Aprizon Putra. 2022. Peran Agen Perubahan Dalam Implementasi SDGs Untuk Aksi Perubahan Iklim: Tinjauan Kesadaran Dan Tanggung Jawab Masyarakat.
- Saepudin, Saepudin, Diding Ahmad Kodir, Fatimatuzzahroh Fatimatuzzahroh, Sukarna Sukarna, and Muhammad Mashuri. 2023. "Memahami Peran Pemimpin Sebagai Agen Perubahan." Jurnal Syntax Admiration 4(1):84–98. doi: 10.46799/jsa.v4i1.509.
- Setiawan, Nur Candra Eka, Sutrisno Sutrisno, Munzil Munzil, and Danar Danar. 2020. "Pengenalan STEM (Science, Technology, Engineering, and Mathematics) Dan Pengembangan Rancangan Pembelajarannya Untuk Merintis Pembelajaran Kimia Dengan Sistem SKS Di Kota Madiun." Lumbung Inovasi: Jurnal Pengabdian Kepada Masyarakat 5(2):56. doi: 10.36312/linov.v5i2.465.

Fadolul Ghafur. Riezky Alviansyah