



## 2024 SEAMEO-Japan

### ESD Award

Supporting Partner



# ESTABLISHING SUSTAINABLE SCHOOL THROUGH STEM LEARNING

**SAIM (SEKOLAH ALAM INSAN MULIA)  
SENIOR HIGH SCHOOL**

**SURABAYA, INDONESIA  
2024**

## PART I: DETAILS OF YOUR SCHOOL

1. Name of your school SAIM (Sekolah Alam Insan Mulia) Senior High School
2. Full address Jl. Keputih Tegal No. 54, Surabaya, East Java, Indonesia.
3. Postcode 601114. Country Indonesia
5. School's telephone number (country code+city code+telephone number) +6281252495834
6. School's Email Address: smasaim@saim.sch.id
7. School website (if available) www.saim.sch.id
8. Approximate number of teachers participated in this programme 17 teachers
9. Approximate number of students participated in this programme 116 students

## PART II: INFORMATION ABOUT THE SCHOOL'S PROGRAMME

The information of part II from no.1 to 14 should not be over five (5) pages long of A4 in total. The information should be written in **Times New Roman/Calibri font, font size 11.**

1. Title of the school's programme

Establishing Sustainable School through STEM Learning

2. Summary of the programme (maximum of 300 words)

SAIM Senior High School, as an educational institution, promotes STEM learning programs aligned with sustainable school initiatives. Committed to life sustainability, SAIM aims to educate smart, noble, creative, and innovative students who can use technology to protect nature and help others. Achieving these goals requires cooperation from various parties. Here's how STEM learning is implemented for sustainable schools at SAIM:

### 1. STEM Community Service Project

STEM learning at SAIM not only enhances students' knowledge, skills, and thinking but also teaches them to use their knowledge to benefit the community. Through STEM community service projects, students learn empathy and contribute to society. For example, they made lemongrass soap and distributed it to public facilities like terminals and mosques. This project promotes a healthy environment and sustainable living. The lemongrass soap-making project involves science (chemistry of saponification), biology (properties of lemongrass), and mathematics (ingredient proportions and measurements). Students also learn technology for soap production and engineering skills during the process, including pH testing and quality evaluation. Moreover, students also research a smokeless medical waste incinerator powered by solar energy. It has the potential to solve a major problem in Indonesia, where medical waste is often disposed of in a way that is harmful to the environment and public health. In addition, SAIM students also conduct project research with the theme "Waste Hawk: AI-Powered Waste Detection and Mapping Utilizing Aerial Footage from Drones". In this project, students explore an approach to waste management utilizing AI object detection and IoT. This program allows UAVs to detect and map trash in an area from an aerial point of view for further processing. This project is hoped to be used by the government and community to detect and manage waste.

### 2. STEM Entrepreneurship

STEM entrepreneurship at SAIM encourages students to become young entrepreneurs with innovative ideas. Through a design thinking approach, students focus on environmental issues, like

plastic waste, by creating tote bags, namely "FROBAG" from eco-friendly materials. These bags, available as sling bags, backpacks, and pouch bags, are designed for young people seeking stylish, versatile options to replace plastic bags. This project integrates science (material comparison for durability and biodegradability), technology (eco-friendly production), engineering (textile manufacturing and quality control), and mathematics (cost analysis and environmental savings). For making this product, SAIM students make "INSTURE (Insan Nature)" Student Company as a medium to develop students' entrepreneurship skills.

### 3. Objectives/goals of the school's programme

The objectives of "Establishing Sustainable School through STEM Learning" are:

1. To promote STEM learning for establishing sustainable schools.
2. To create a sustainable school that serves as a model for sustainable practices, influencing the broader community and contributing to long-term environmental.
3. To address community sustainability Issues, through STEM-based community service projects.
4. To enhance civic responsibility by encouraging students to take an active role in their communities, using their STEM skills to make a positive impact on society and the environment.
5. To build collaboration with Stakeholders: Foster partnerships between students, schools, local businesses, and community organizations to work together on sustainability initiatives.
6. To cultivate entrepreneurship skills of students. Offer students opportunities to turn their ideas into actual businesses, giving them experience in launching, managing, and scaling a business while considering its environmental impact.

### 4. Period of the time when the programme has been started

The whole STEM learning program at SAIM has been carried out for years. STEM Entrepreneurship has been carried out since 2019, however, tote bag production began in 2023. STEM Community Service program has been implemented since 2019, and the lemon grass soap-making project was conducted in 2024, then a smokeless medical waste incinerator powered by solar energy was conducted in 2024.

### 5. Activities (strategies/activities of implementation, and brief information of each activity)

#### **Establishing Sustainable Schools through STEM Learning:**

#### **1. STEM Community Service Project**

Through STEM community service projects, students learn to empathize and contribute their best efforts to society. One of the projects they have completed involves making lemon grass soap, which is distributed to public facilities such as toilets in transportation terminals, public gardens, and mosques. This program is a form of concern for a healthy environment and sustainable school through STEM learning. Lemon grass soap-making is a STEM study that implements a project-based learning approach. This activity is intended to introduce students to concepts of sustainability and apply the scientific principles behind soap-making. STEM focus for soap-making is to involve Science including Chemistry related to the saponification process, explaining the chemical reactions between oils and lye. In this project, the Biology learning is about the properties of lemongrass, and why it's a good ingredient for soap. Mathematics about proportions and measurements. Have students calculate the ratios of ingredients and measure them accurately. This activity helps students to learn how to use technology for making lemongrass soap and implement engineering skills during the process. For quality testing, students check how to test the pH of the soap and evaluate its quality in terms of texture, scent, and skin feel. This activity is in collaboration with UNAIR (Airlangga University) specifically in building projects in the field of Environmental, Social and Governance (ESG) to support sustainable development goals. Another activity of STEM learning is research on a smokeless medical waste incinerator powered by solar energy. It has the potential to solve a major problem in the community, where medical waste is often disposed of in a way that is harmful to the environment and public health. In addition, SAIM students also conduct project research with the theme "Waste Hawk: AI-Powered Waste Detection and Mapping Utilizing Aerial Footage from Drones". In this

project, students explore an approach to waste management utilizing AI object detection and IoT. This program allows UAVs to detect and map trash in an area from an aerial point of view for further processing. This project is hoped to be used by the government and community to detect and manage waste.

## 2. **STEM Entrepreneurship**

STEM entrepreneurship is a STEM learning implementation that promotes SAIM students as young entrepreneurs with innovative ideas- providing experience in entrepreneurship through STEM learning with a design thinking approach. Starting with students' empathy for environmental conditions, especially the large amount of plastic waste, SAIM students make tote bags namely "FROBAG" made from environmentally friendly fabrics with trendy designs. Tote bags are aesthetically designed with three styles including: sling bags, backpacks, and pouch bags. This bag style is elegantly designed for young people who want a versatile bag with a contemporary style so that it can be used as a substitute for plastic bags to reduce plastic waste. Creating a tote bag as part of a STEM learning project to address plastic waste reduction is a fantastic interdisciplinary approach. Here's how each subject can be incorporated: In Science, students explore different materials that can be used to make tote bags, comparing their durability, environmental impact, and biodegradability. Students can also explore the use of eco-friendly technologies in the production process. Learning about the engineering process includes textile manufacturing, sewing techniques, and quality control. Students also use mathematical modeling to calculate the cost of producing tote bags, including the long-term savings and environmental costs. In this activity, students invite parents to launch products and become investors in student companies. Students learn to manage companies and are responsible for managing and reporting results to investors in liquidation activities. As a medium to develop students' entrepreneurship skills, SAIM students make "INSTURE (Insan Nature)" Student Company. This activity collaborates with Junior Achievement (JA) worldwide and is supported by the Zurich Foundation.

## 6. Teaching and learning approaches/strategies that the school has integrated into the programme

Integrating STEM (Science, Technology, Engineering, and Mathematics) into a school program involves implementing specific teaching and learning approaches that emphasize interdisciplinary connections, hands-on learning, problem-solving, and real-world applications. Here are some teaching and learning strategies at SAIM that are integrated into a STEM program:

### 1. **STEM Community Service Project**

Community service programs utilizing STEM are implemented through project-based learning. Students are faced with real-world problems and encouraged to provide solutions with STEM learning. Project-Based Learning (PBL) is an instructional approach that engages students in exploring real-world problems and challenges through hands-on projects. Here's a step-by-step of the PBL process: identify the project focus, define learning objectives of the project, plan the project, launch the project, conduct research and inquiry, develop and implement the project.

One of the projects students have completed through the STEM program involves making lemongrass soap, which is distributed to public facilities such as toilets in transportation terminals, public gardens, and mosques. This project, which reflects the school's commitment to a healthy environment and sustainability, is an example of project-based learning in STEM education. The soap-making process introduces students to concepts of sustainability while applying scientific principles. The project integrates multiple STEM disciplines: Science, where Chemistry principles are taught through the saponification process, explaining the chemical reactions between oils and lye; Biology, where students learn about the properties of lemongrass and why it is a beneficial ingredient for soap; and Mathematics, where students calculate ingredient ratios and measure them accurately. Additionally, students use technology in the soap-making process and apply engineering skills to ensure the quality of the final product. To test the quality, students measure the soap's pH and evaluate its texture, scent, and feel on the skin. This activity is conducted in collaboration with UNAIR (Airlangga University), specifically in the area of Environmental, Social, and Governance (ESG) projects, to support sustainable development goals.

## 2. STEM Entrepreneurship

The STEM Entrepreneurship program is conducted to cultivate the entrepreneurship skills of SAIM students. Offer students opportunities to turn their ideas into actual businesses, giving them experience in launching, managing, and scaling a business while considering its environmental impact. This program applied a design thinking approach. The process is broken down into five key stages: Empathize, stage involves gathering insights about the problem from the user's perspective; Define, which involves synthesizing the information to create a problem statement or point of view that guides the design process; Ideate, which encourages thinking outside the box and exploring all possible avenues; Prototype, create scaled-down versions or models of the proposed solutions; Test, evaluate the prototypes with real users to gather feedback; Iterate, based on the feedback received, revisit the earlier stages as necessary to refine the solution.

One example of SAIM STEM Entrepreneurship is the tote bag project by SAIM Student Company. Motivated by students' concern for the environment, particularly plastic waste, they created tote bags from eco-friendly fabrics with trendy designs. The bags come in three styles: sling bags, backpacks, and tote bags, all designed for young people seeking versatile, contemporary alternatives to plastic bags. This STEM project integrates various disciplines: Science to explore materials and eco-friendly technologies, Engineering to focus on textile manufacturing and quality control, and Math to calculate production costs and environmental savings. The production process also involves collaboration with local home-based tailors, providing them with additional income opportunities. Students engage parents as product launch partners and investors, learning to manage and report on their company's results. The project is in collaboration with Junior Achievement (JA) worldwide and supported by the Zurich Foundation.

## 7. Engagement with the community and sharing of school practices to the community

STEM learning in SAIM is a series of programs that keep existing with various parties' support and participation. Schools and communities work together to plan and implement STEM learning for sustainable school programs.

For the STEM community service program, SAIM embraces subject teachers, student's parents, and project advisors to put together a learning plan and learning evaluation. The student's parents are involved in observing the student's academic progress, attitudes, behavior, and skills while at home. The teacher needs the data to find out student development, especially for STEM learning programs. The project advisor for this program is an expert lecturer from Airlangga University (UNAIR) which provides support and guidance for the Sustainable Development Goals Project through STEM learning implementation.

SAIM STEM Entrepreneurship program collaborates with Junior Achievement (JA) worldwide and is supported by the Zurich Foundation. Providing guidance and training to develop students' entrepreneurial skills and build student companies. Moreover, the production process of tote bags also involves collaboration with local home-based tailors, providing them with additional income opportunities. Students engage parents as product launch partners and investors, learning to manage and report on their company's results. As a promotional medium, SAIM students collaborate with JTV (Jawa Timur Television) and RRI Radio (Radio Republik Indonesia) as partners in SAIM student company activities. The SAIM STEM Entrepreneurship program also conducts sharing sessions of school practices with other schools, such as SMKN 10 Surabaya, SMAN 16 Surabaya, and SMAN 2 Surabaya. This activity promotes the entrepreneurial mindset of students and the community, especially by making tote bag products to reduce waste problems.

## 8. Monitoring and evaluation mechanisms

For the monitoring and evaluation program, SAIM teachers have to make teacher journals about certain activities in the STEM learning program. Moreover, the principal always supervises teachers' and students' performances while conducting such programs, through observation and interviews. The teachers also have to make an article, photo or video about information of students and teacher activities of certain programs that are held by SAIM. Through this method, it is hoped that the school can improve the quality of certain programs. The school also routinely requests feedback from parents, the community, and all parties involved in the implementation of the STEM learning program at SAIM, by filling out questionnaires and SAIM service customer satisfaction rubrics.

9. Measurable achievement of the school's programme to students, teachers, parents, and wider community

Measurable achievement of the school's program to students, teachers, parents, and wider community assesses through some instruments. Survey results of customer satisfaction (committees, parents, and students) on the implementation of programs at SAIM show good results. Besides that SAIM community services get positive feedback from institutions/partners from SAIM. The results of the teacher's assessment of student competency also show satisfactory results above the minimum student completeness criteria, including assessment of student knowledge, attitudes, and skills. In addition to this, SAIM high school students also received appreciation from Junior Indonesia's achievements as the best director of public relations in entrepreneurship activities, especially Student Company with the product Tote bag.

10. Plan for future

Plan for future:

1. Developing skills and being open-minded to the improvement of STEM learning program in SAIM, including adding a program for Sustainable Schools like green building and renewable energy;
2. Establishing interrelationships with schools abroad to improve STEM Learning understanding for Sustainable Schools;
3. Lifelong learning from various resources and experts to develop school programs

4. Interrelationship of the school's programme with other Sustainable Development Goals (SDGs) (Please refer to page 2 in the Information Note or <https://sustainabledevelopment.un.org/sdgs>)

The implementation of STEM Learning program in SAIM Senior High School ("Establishing Sustainable School through STEM Learning") has an interrelationship with other Sustainable Development Goals (SDGs) including:

1. End poverty in all its forms everywhere (SDG's No. 1);
2. Ensure healthy lives and promote well-being for all at all ages (SDG's No. 3);
3. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG's No. 4);
4. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development (SDG's No. 17).

5. Link(s) to the information of school's programme in social media platforms such as facebook, website, youtube

The following is the publication information of the school program in developing a sustainable school through STEM learning:

1. <https://www.instagram.com/reel/COLITF8rj3k/?igsh=ZHN4c3k1YWpvMXBh>  
Start-up business "IN-STURE" Student Company by SAIM Senior high school students. We invite parents to join us on this entrepreneurial journey by becoming investors. Purchasing company stocks and pre-ordering the exclusive 'Frobag.'
2. <https://www.instagram.com/reel/C2ykv26vCol/?igsh=bmtpcHhnbDZ0cHFk>  
Entrepreneurial Training, Sma Saim Students Conduct Insture Student Company Program
3. [https://www.instagram.com/p/C10\\_JyWvYLp/?igsh=MXJmZHK2NnN1ZnAy](https://www.instagram.com/p/C10_JyWvYLp/?igsh=MXJmZHK2NnN1ZnAy)  
"Cheers to our SMA SAIM students! They've rocked the airwaves on RRI PRO 2's 'Sore Ceria,' unveiling 'Insture Student Company.' Led by our entrepreneurial minds, they proudly introduced FROBAG, their standout product.
4. <https://www.instagram.com/p/C6-8cedPNim/?igsh=OWt5cTFnNzI3aHdq>  
Congratulations to Nimas Ayu Kencana W. on being awarded the Best Vice President of Public Relations in the Surabaya Zurich Entrepreneurship Program Regional Student Company Competition 2024!
5. [https://www.instagram.com/reel/C1EJlbyv\\_kx/?igsh=aDF6aTJ2OGt5YXpp](https://www.instagram.com/reel/C1EJlbyv_kx/?igsh=aDF6aTJ2OGt5YXpp)  
Congratulations, Alisha Farsya Mujahida and Muhammad Hafiz Fauzan!  
Your research on a smokeless medical waste incinerator powered by solar energy is amazing.
6. <https://www.instagram.com/reel/C1LXA7St7rc/?igsh=MWdwYnl0dDIlajA2cQ==>

Team from SMA SAIM bagged the gold medal in the lot and Its Applications category along with the prestigious IYSA Special Award at I2ASPO (Indonesia International Applied Science Project Olympiad), organized by IYSA (Indonesian Young Scientist Association), with the project research "Waste Hawk: AI-Powered Waste Detection and Mapping Utilizing Aerial Footage from Drones".

6. Photos related to the activity/programme (Maximum of five (5) photos with captions in English)



Picture 1. Launching a product of "Frobag" tote bag from "Insture" student company. As the implication of STEM Entrepreneurship program in SAIM

Photo 2



Photo 2. Liquidation of SAIM Student company, reporting product results to the investor including community, parents, and stakeholders.



Photo 3. Lemon grass soap-making project as one of the applications of STEM learning in SAIM.



Photo 4. Test the quality of lemongrass soap that students have made, before distributing it to the community and toilets in public facilities around the school.





Photo 5. The process of making a smokeless medical waste incinerator powered by solar energy was discussed with the expert.