



SCIENCE MAGAZINE

Issue No. 1 | November 2019



Regular Training

**TRAINING ON EARTH AND
SPACE SCIENCE 2019 –
MISSION TO MARS**

Science Fact

**CHALK IS MADE FROM
TRILLIONS OF MICROSCOPIC
PLANKTON FOSSIL**

Research Paper

**FOSTERING THE JOY OF
LEARNING THROUGH
PHYSICS INQUIRY**

ESTA



SEAQIS DECAFIESTA

ISSN 2579-7506



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EESD

Environmental Education for Sustainable Development



ESS

Earth and Space Science



SCS

Science Classroom Supervision



ATSE-STELR

STELR-STEM Education

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Our dearest readers, I am delighted to present the first edition of our new Q Science Magz. Inside this first edition of our new magazine, you will find news about our training programs such as ESS (Earth and Space Science), EESD (Environmental Education for Sustainable Development), NEQMAP Workshop: Assessment for Learning in Asia-Pacific; a collaboration with UNESCO Bangkok attended by 40 participants from Asia Pacific countries, and in-depth report on our SEAQIS Decafiesta Anniversary event. There are also review of the research paper from Ki Hajar Dewantara Award, Science Facts, Science Movie Reviews and more.

Whilst the majority of the materials in this magazine are inevitably come from our programme and activities, we are keen to respond to the interest of our readers and look forward to your feedback and comments on this edition using the contact address at partnership.qis@gmail.com.

Wishing you a pleasant read,

Director of SEAQIS,

Dr Indrawati, M.Pd.

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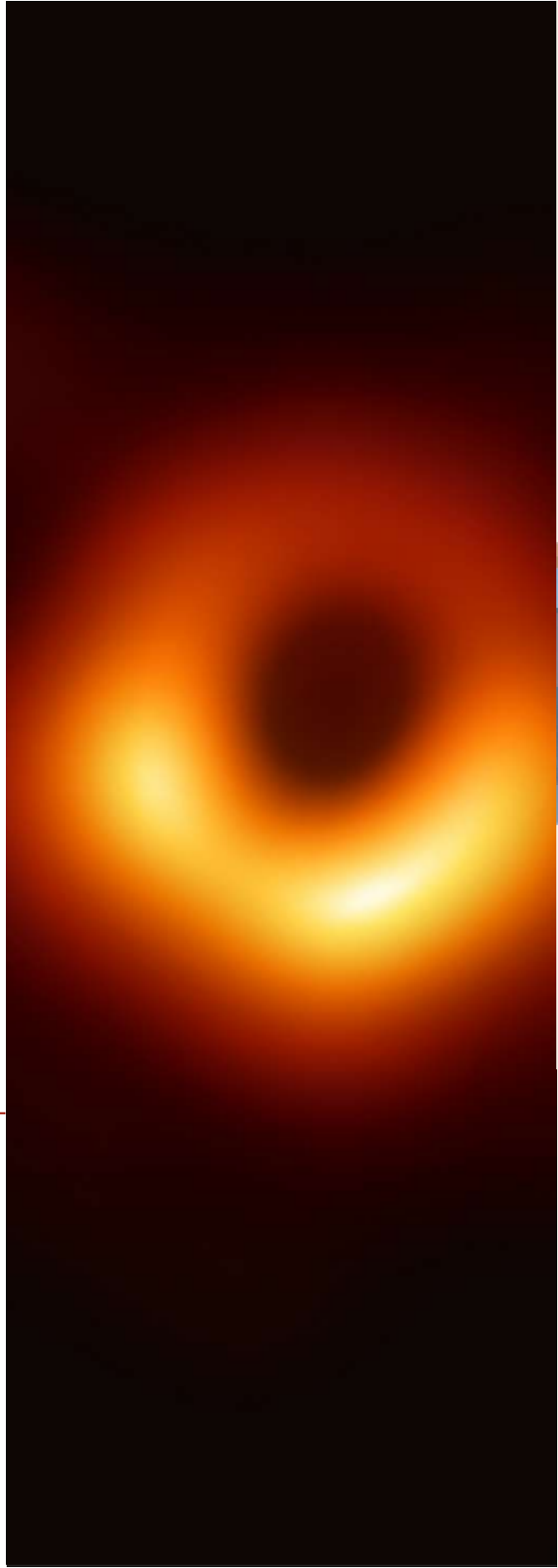
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the 3rd

Ki Hajar Dewantara Award
COMING SOON!

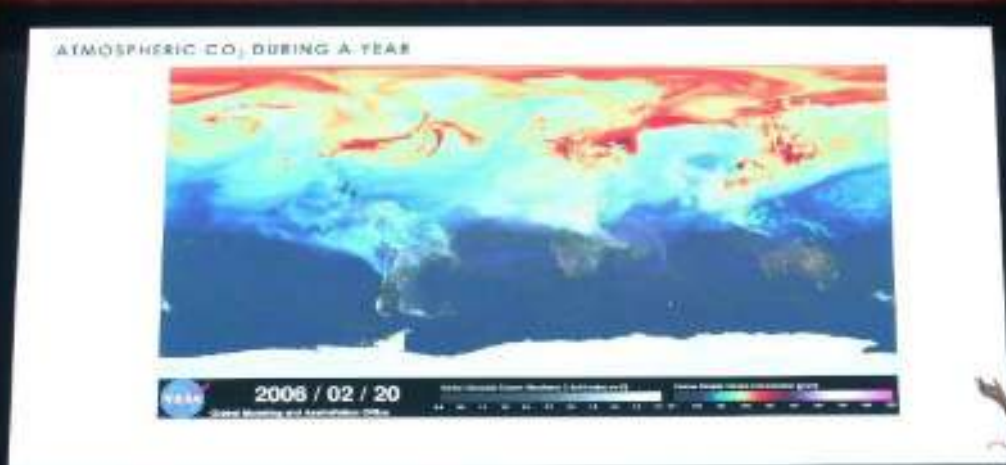


Hello SEAQIS Magazine readers,

First, we would like to express our gratitude to God Almighty for this first edition of Q Science Magazine. We also give thanks to all of the editorial staff and contributors who worked hard in the making process of this newsletter. Any faults or mistakes in this publication might exist, therefore any critics or input are very much welcome, as they will help us to improve the magazine's next edition. This edition's magazine contents include our regular training (ESS & EESD), detailed report on our SEAQIS 10th anniversary "DECAFIESTA" chain of events, summary of research grantees papers and many more. We hope the information in this new magazine will be acceptable to you and give you lots of benefits.

Have a good read everyone!

REGIONAL WORKSHOP AND TRAINING ON ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN COLLABORATION WITH OFFICE FOR CLIMATE EDUCATION, FRENCH



In 2015, countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals. With these new Goals that universally apply to all, countries will mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind. This declaration improves an interest for a new approach to integrate sustainable development with environmental education and the needs to define the concept of environmental education for sustainable development (EESD) have emerged over the past few years. Education is chosen because education systems can at least make the effort to promote sustainable development in what they teach and in efforts to make their own institutions “green” and eco-

friendly. Even less discussed education systems must do something to sustain themselves and be resilient in the face of, and to prevent, prepare for, mitigate the impact of, respond to, and recover from such emergencies.

Although taken up by enthusiasts, teacher education for environmental education and sustainable development has rarely been mainstreamed, and, where there are courses, is often approached within a disciplinary frame (Wals, A., 2009, in UNESCO, 2013). Concerning on the described issues, Training Course on Environmental Education for Sustainable Development (EESD) is one of the SEAMEO QITEP in Science (SEAQIS) efforts to increase teacher’s competence and encourage their real roles in school to overcome threats in







sustainable development.

Conducted in Bandung, from 7 to 16 July 2019, Training Course on Environmental Education for Sustainable Development (EESD) has been held successfully. The training course was attended by 30 participants from several Southeast Asian Countries. In the fiscal year 2019, SEAQIS made new innovation and collaborated with the Office for Climate Education (OCE)-French to organize this training course. The OCE and its partners produce education resources and provide professional development and support to teachers around the world, particularly in developing countries related to climate change. The arrival of OCE to this event was supported by Institut Français D'indonésie (France Embassy of Indonesia) provided the transportation fund for the OCE experts.

In general, the programme was divided into two main parts. The workshop facilitated by OCE, represented by Dr Lydie Lescarmontier and Dr Mariana Rocha as the science officer from OCE. They provided the participants with knowledge

on climate change and skills in inquiry-based science education. The four hands-on sessions were carried out on the topic of climate change, with a special focus on the link between climate change and ocean, climate change and agriculture, and climate change and biodiversity. Moreover, they also collaborated with Mr Parikesit Ph.D., as a local expert in presenting biodiversity in South East Asia. Session on Sustainable Development, Global Citizenship and Disaster Risk Reduction Education that organized by SEAQIS were also provided to enrich teachers understanding about global environment problem and encourage their real function in school to overcome threats in sustainable development.





TRAINING ON EARTH AND SPACE SCIENCE 2019 – MISSION TO MARS –

In 2019, SEAMEO QITEP in Science (SEAQIS) held the annual earth and space-themed training. This training was held on August 13-22, 2019 at PPPPTK IPA Bandung. The training was attended by 29 participants who were junior, high school, vocational school teachers, and education personnel who came from SEAMEO member countries, 1 from Cambodia, 1 from Laos, 1 from Malaysia, 1 from Myanmar, 1 from the Philippines, 1 person from Thailand, 1 person from Timor Leste, and 22 people from various cities and regencies in Indonesia. All participants received a full scholarship from SEAQIS to learn about the earth and space issues that currently exist and in accordance with the context of education in Southeast Asia.

The training was officially opened by the Director of SEAQIS, Dr Indrawati, on August 13, 2019 and then continued with training orientation from Mr Reza Setiawan. In the orientation of this training,

the participants got information about the general description of the training from beginning to end. The information included what materials will be given, what activities will be carried out, and what tasks must be fulfilled by the participants in order to graduate and be entitled to receive a training certificate from SEAQIS. The first day activities ended with a pre-test for all participants.

On the second day, the participants received materials from Dr Irwan Meilano, a Geodesy expert from the Bandung Institute of Technology. He explained about plate tectonics and the mechanisms that are associated with it. It started with the introduction of what tectonic plates are and the types of plate boundaries. In the last session, the participants worked in groups to find plate boundaries on a world map based on volcanology, geochronology, seismology and geodesy data. The lithosphere is broken down into what are called as tectonic







plates. Types of plate boundaries consist of three types: divergent, convergent, and transform.

The next session, on the second day, was the session of Mr Agus Fany Chandra Wijaya, M Pd, an Earth Science and Space lecturer from Indonesia University of Education. He explained about meteorology, the differences in weather, seasons and climate. Climate is a season pattern; season is a weather pattern. Some weather factors are wind, precipitation, temperature, and cloud cover.

The Space material was given on the third day by Dr Judhistira Aria Utama, an Earth Science and Space lecturer from Indonesia University of Education. He explained about the space characteristics, then guiding the participants to conduct experiments to calculate distances between stars using the Excel application. In addition, on this third day, the participants also received material about mitigation delivered by Dr Riantini Vitriana from Bandung Institute of Technology. There was also a group activity to analyse the map in determining the location of shelters.

The main speaker in this training was Dr Zartaj Waseem from Pakistan Space Science Education Center (PSSEC). He gave a material on the fourth and fifth days with



the theme of Mission to Mars. Mission to Mars is one method to make science more interactive, make every child have dreams, and they care about the future that will be faced. STEM is the learning approach used in this program. All subject teachers related to the theme can join together to make lesson plans. Technology is based on phenomena but engineering is based on problems. She explained why humans want to go to Mars because Mars is a planet like Earth that might be home to humans. There are two types of engine that will go to Mars, Mars Lander and Rover. The participants conducted activities to create miniature of landers, analysed Mars soil replication, and developed lesson plans. The group presentation was conducted at the end of each activity.

In addition to getting material in the class, the participants of the ESS training



also gained learning experiences from various places related to Earth and Space and Indonesian culture, especially Sundanese. They visited the Earth and Space Laboratory of the Indonesian University of Education to conduct various hands-on activities and star and planet observations at night, Bandung Geology Museum to see the history of the formation of the universe and other geological phenomena. Furthermore, they visited the Bandung Meteorology, Climatology and Geophysics Agency to gain experience on how to monitor climate and earthquakes around Bandung, then to the Boscha Observatory in Lembang, Indonesia to observe the largest telescope in Indonesia, and make observations of the sun using telescope, and

they visited Saung Angklung Udjo to enjoy special Sundanese culture namely Wayang Golek and Angklung.

The last night before the closing, the participants held Culture Night, a cultural exchange event among the participants. The participants wore traditional clothing from their respective countries and regions, and then they performed various kinds of entertainment such as singing and dancing. Then, it ended with a gift exchange event between participants.

The training was closed on Thursday, August 22, 2019 by Dr Indrawati and ended with the certificate awarding of all participants.

The whole series of training activities were attended by the participants with enthusiasm, the togetherness that was passed resulted in close family ties for the participants. Hopefully the participants can spread the knowledge and experience they have gained to many parties in their respective countries and regions.





NEQMAP Workshop: Assessment for Learning in Asia-Pacific

The Network on Education Quality Monitoring in the Asia-Pacific (NEQMAP) Secretariat at UNESCO Bangkok, in collaboration with the Southeast Asia Ministers of Education Organization (SEAMEO) Centre for Quality Improvement of Teachers and Education Personnel (QITEP) in Science, the Australian Council for Educational Research (ACER), and with the generous support of the Global Partnership for Education (GPE), organised four-day workshop from 24 to 27 June 2019 in Bandung, Indonesia. The theme of the workshop was ‘School-based, Classroom, Teacher and Formative Assessment – Assessment for Learning’. This workshop on school-based, classroom, teacher and formative assessment concerned with the big picture in that all of the following would touch on to some degree: Curriculum, Pedagogy, Assessment, Classroom and School, Culture and Climate, Policy Frameworks, Systems and Structures, and Context and Environment.

A premise of the workshop was that all teaching involves (or should involve) continuous and ongoing assessment of student learning and feedback to students.



Questions that would guide the participants through the workshop include:

- What was required and what was the usual practice in giving feedback about student learning to students and guardians in this school system? What should be encouraged and required from teachers in terms of feedback to students and guardians about student learning?
- Were school-based (SBA), classroom (CA), teacher assessment (TA) and formative assessment (FA) different words for the same things? What did we mean by the terms SBA, CA, TA, and FA? How might we define (and distinguish?) school-based, classroom, teacher and formative assessment?

The workshop was conducted at Grandia Hotel, Bandung, West Java, Indonesia from 23 to 28 June 2019. The participants of the workshop were 43 participants, consist of a policy

analyst, lecturer, researcher and teacher trainer from Asia-Pacific Region. Resource persons were experts from the Australian Council for Educational Research, such as Mr Douglas McCurry and Stewart Monckton, and also from UNESCO Bangkok Ms Maki Hayashikawa and Mr Mark Manns.

The workshop started with the introduction of NEQMAP from Ms Maki Hayashikawa. NEQMAP is a platform for exchange of knowledge, experience and expertise on the monitoring of educational quality. Focuses on learning assessment

while acknowledging its important linkage to curriculum and pedagogy. Secretariat at UNESCO Asia and Pacific Regional Bureau for Education (UNESCO Bangkok). It was launched in March 2013. NEQMAP has 54 members (50 institutions and 4 individuals from 29 countries) including Netherlands, United Kingdom, and United States of America.

The Conceptual question session was presented by Mr Douglas McCurry. This session aimed to clarify and understand the distinctions between different kinds of classroom assessment. Classroom



assessment movement encourages teaching that is conscious, deliberate, explicit, reflective, systematic. But these things are hard to do because classroom assessment is a big topic and it involves the integration of curriculum, pedagogy and assessment. The distinctive part of classroom assessment is best summarized by the phrase assessment for learning (AFL) because it is an idea that integrates assessment and learning. The term formative assessment has a clear function and purpose, but it would be best described as assessment for teaching. AFL integrates curriculum, pedagogy, learning and assessment. His session continued with different kinds of assessment. In this session, he mentioned several assessments, such as Statewide Summative Assessments, Interim Assessments, Classroom Summative Assessment, Formative Assessment, and Curriculum-Embedded Performance Assessments.

Mr Stewart Monckton presented the standardized assessment in the classroom. The topic covered the understandings, skills and knowledge covered in the questions are organised into three sub-strands: Contextual understanding (CU), Text location and interpretation (TLI), and Text and language knowledge (TLK).

- Contextual understanding (CU) relates to the text in its context, including cultural purpose, audience, backgrounds of writer

and readers, writer's intentions and reader's responses.

- Text location and interpretation (TLI) relates to the meaning of the text itself, including content, ideas, information, relationships and threads, development of arguments and plots.
- Text and language knowledge (TLK) relates to the way elements of the text's construction contribute to its meaning, including the effect of the generic structure, layout, language, grammar, visual elements etc.

During Classroom assessment, Mr Stewart Monckton explained that According to Andrade (2013), classroom assessment is a process of collecting, evaluating, and using evidence of student learning in order to monitor and improve learning. Effective classroom assessment establishes learning targets, provides feedback to teachers and students about where they are in relation to those targets, and prompts adjustments to instruction by teachers as well as changes to learning processes and revision of work products by students. Assessment terminology and ideologies that underpin current approaches to classroom assessment were discussed, such as formative and summative assessment, and developmental perspectives that recognise the progressive nature of learning.

During classroom assessment







techniques, Mr Stewart Monckton explained that 'Formative assessment refers to frequent, interactive assessments of students' progress and understanding to identify learning needs and adjust teaching appropriately' (Looney, 2005). 'A formative assessment is a tool that teachers use to measure student grasp of specific topics and skills they are teaching. It's a tool to identify specific student misconceptions and mistakes while the material is being taught' (Kahl, 2005).

Mr Mark Manns, during basic skills and/or higher-order thinking in the classroom topic explained that Authentic assessment is an assessment that is developed by teachers (referencing course curriculum) that:

- Require higher-order thinking skills
- Are based on real-world scenarios
- Provide students with a variety of means to display their skills
- Provide students with clear feedback and understanding about their strength and weaknesses

Critical Thinking is a collection of mental

activities that include the ability to clarify, reflect, connect, infer and judge. It brings these activities together and enables the students to question what knowledge exists. C21 skills and assessment as learning also taught in the workshop. This topic delivered by Mr Mark Manns. Our categories of 21st-century skills: ways of thinking (creativity, critical thinking, problem-solving), ways of working (communication, collaboration), tools for working (ICT and information literacy) and skills for living in the world (citizenship, personal & social responsibility, and life & career).



Some metals are so reactive that they explode on contact with water

There are certain metals – including potassium, sodium, lithium, rubidium and caesium – that are so reactive that they oxidise (or tarnish) instantly when exposed to air. They can even produce explosions when dropped in water! All elements strive to be chemically stable – in other words, to have a full outer electron shell. To achieve this, metals tend to shed electrons. The alkali metals have only one electron on their outer shell, making them ultra-keen to pass on this unwanted passenger to another element via bonding. As a result they form compounds with other elements so readily that they don't exist independently in nature.

Source: <https://www.scientiaeducare.com/metals-reactive-explode-contact-water/>

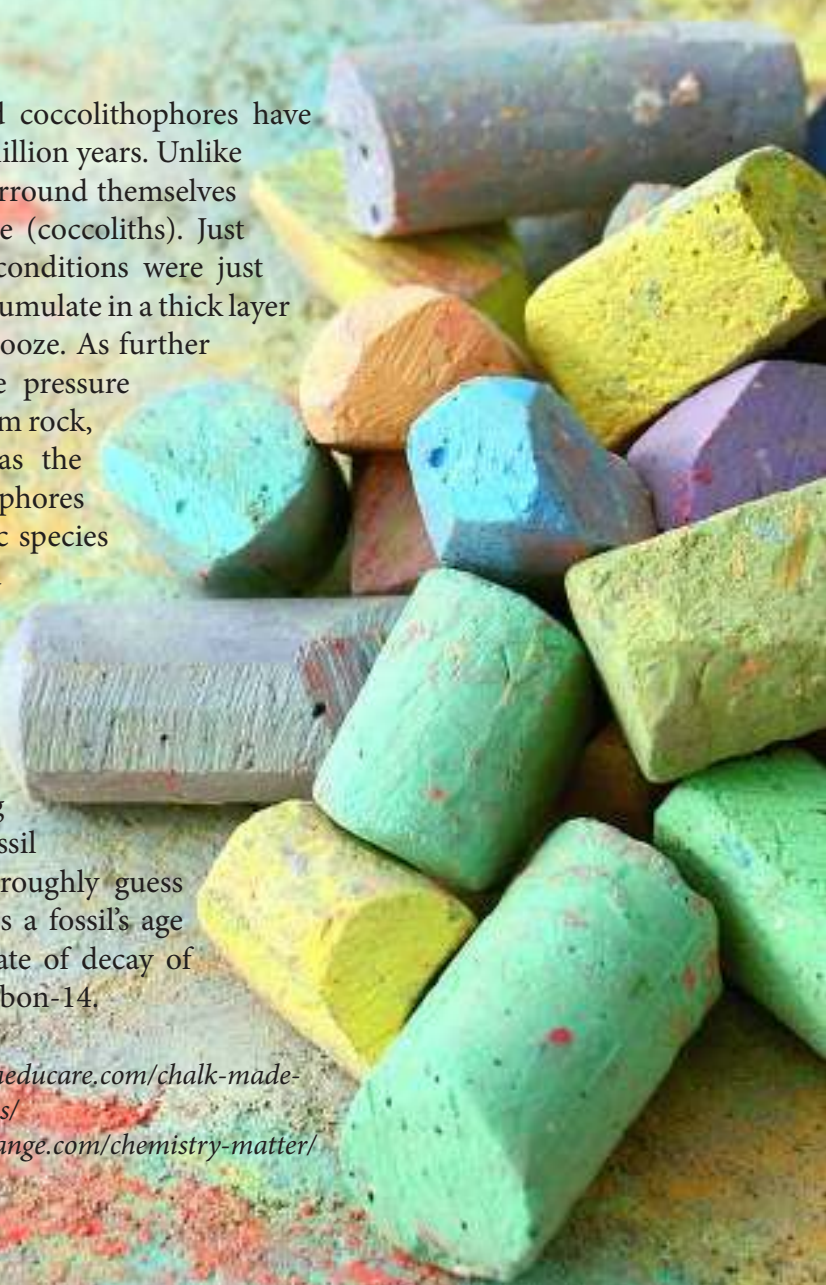
Pic source: <https://images.app.goo.gl/aMw5kgePSDeNt8o3A>

Chalk is made from trillions of microscopic plankton fossils

Tiny single-celled algae called coccolithophores have lived in Earth's oceans for 200 million years. Unlike any other marine plant, they surround themselves with minuscule plates of calcite (coccoliths). Just under 100 million years ago, conditions were just right for coccolithophores to accumulate in a thick layer coating ocean floors in a white ooze. As further sediment built up on top, the pressure compressed the coccoliths to form rock, creating chalk deposits such as the white cliffs of Dover. Coccolithophores are just one of many prehistoric species that have been immortalised in fossil form, but how do we know how old they are? Over time, rock forms in horizontal layers, leaving older rocks at the bottom and younger rocks near the top. By studying the type of rock in which a fossil is found palaeontologists can roughly guess its age. Carbon dating estimates a fossil's age more precisely, based on the rate of decay of radioactive elements such as carbon-14.

Source: <https://www.scientiaeducare.com/chalk-made-trillions-microscopic-plankton-fossils/>

Pic source: <http://experimentexchange.com/chemistry-matter/make-sidewalk-chalk/>





Cooling Sensation from Mint

Have you ever wonder why is mint leaves gives cooling sensation, especially when we bite it? The answer is in the menthol compound, one kind of the essential oil contained in mint leaves. The essential oil is secondary metabolite produced by some plants as protection from predators (e.g. pest) or from other plants.

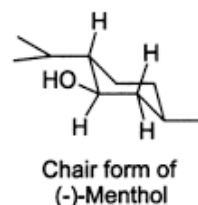
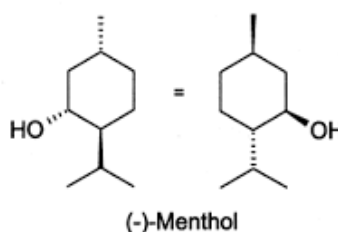
But how does menthol gives us cooling sensation? Menthol affects the sensory receptor system that is lay under the skin. These neuron sensors sense things like touch, temperature and pain. These neurons use special proteins that are embedded in cell membranes. These proteins manage the ion channels which can allow material to pass through cell membranes.

Once they detect chemicals or heat, proteins will ignite and allow ions to penetrate the

cell membrane. The cool, cold sensation ions that the body receives from the outside, trigger tiny electrical signals called action potentials, which are transmitted by neurons to the brain. Most receptors are designed to open their ion channels when they detect certain stimuli. One of them is TRPM8 protein, which associated with everything cold temperature.

<https://en.wikipedia.org/wiki/Mentha>

<https://en.wikipedia.org/wiki/Menthol>



SEAQIS DECAFIESTA



To celebrate its 10th anniversary, SEAQIS conducted a series of event from 8 to 12 July 2019. The event was started with a STEAM Wide Games for Youth. The programme was a fun activity where participants had to perform several activities related to STEAM Education. It was conducted on 8 July 2019 in which the location was divided into four locations. After accomplishing all the tasks, SMP Islam Cendekia Muda took the third place, while the second place was taken by SMP Tunas Unggul Bandung, and SMPN 1 Batujajar successfully achieved the higher total scores and grabbed the one million rupiahs as the first winner.

The second activity conducted during the SEAQIS Decafiesta was Robotic Workshop and Competition. It was conducted on 9 July 2019. Collaborated with Robotic Explorer, SEAQIS invited schools across

Java island to attend the workshop and join the competition. The workshop was conducted for half-day, followed by Robotic competition, and the event competed was Line Follower. The winners of the robotic competition were SMP Muhammadiyah 8 Bandung, SD Darul Hikam Bandung, and SMP Rimba Teruna Bogor.

On the same day with Robotic Workshop and Competition, SEAQIS also conducted Volley Ball Invitational Competition. The event was participated by five SEAMEO Centres in Indonesia and PPPPTK IPA, SEAQIS' host institution. The Centres who did not send representatives were SEAMEO QITEP in Language and SEAMEO QITEP in Mathematics. After competing in knock out system, PPPPTK IPA successfully grabbed the first prize after defeating SEAMEO BIOTROP in the final, and





SEAMEO SEAMOLEC took the third place after defeating SEAQS in the third-place playoff.

The next event was 2nd Inter-Centre Badminton Championship which was conducted from 10 to 11 July 2019 in GOR Merpati Pos, Cikutra, Bandung. There were three categories competed in this championship To celebrate its 10th anniversary, SEAQIS conducted a series of event from 8 to 12 July 2019. The event was started with a STEAM Wide Games for Youth. The programme was a fun activity where participants had to perform several activities related to STEAM Education. It was conducted on 8 July 2019 in which the location was divided into four locations. After accomplishing all the tasks, SMP Islam Cendekia Muda took the third place, while the second place was taken by SMP Tunas Unggul Bandung, and SMPN 1 Batujajar successfully achieved the higher total scores and grabbed the one million rupiahs as the first winner.

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The next event was 2nd Inter-Centre Badminton Championship which was conducted from 10 to 11 July 2019 in GOR Merpati Pos, Cikutra, Bandung. There were three categories competed in this championship namely, team event, men's doubles, and women's doubles. Conducted for two days, the tournament was concluded with SEAQIS became the most successful team since they grabbed all the first prizes.

The last event conducted during the Decafiesta was International Seminar. It was conducted on 12 July 2019 and attended by 237 science teachers, education personnel,



and students from several schools, educational institutions, and universities in Indonesia. The speakers of the seminar were Centre's former Governing Board members whose expertise are in education. The first speaker was Dr Lorna D Dino, the President of Teacher's Gallery, Department of Education, Philippines. The second speaker was Ms Irene Tan, a principal master teacher at the Academy of Singapore Teachers, Ministry of Education, Singapore. The third presenter was Dr Chong Kui Kian, a former Deputy Director, Department of School Inspectorate, Ministry of Education, Brunei Darussalam. The last speaker was Dr Sediono Abdullah, a Developer of Learning Technology, Technology and Information Centre of Indonesia.

The Celebration of Decafiesta concluded

the one-week event. The celebration was conducted in the main hall where all the winners of the competition were invited and presented the trophies. Besides, the celebration was also enlivened by live music performance performed by students of SMA BPI 1 Bandung, the winner of SEAQIS' Jingle Competition. Happy Anniversary, SEAQIS!



The 10th Governing Board Meeting



SEAQIS has successfully convened the 10th Governing Board Meeting (GBM) at Savoy Homann Hotel, Bandung, from 17th to 21st September 2019. The Meeting aimed to review the activities of SEAQIS and plans of future SEAMEO activities for further submission to the Centre Director Meeting, High Official Meeting and SEAMEC Conference. The 10th GBM also discussed various internal matters to seek possible solutions or improvement.

Seven out of eleven GB Members and representatives attended the meeting. They were 1) Dr Sediono Abdullah, GB Member from Indonesia, 2) Assoc Prof Vong Deuan Osay, GB Member from Lao PDR; 3) Prof Ni Ni Than, GB Member from Myanmar; 4) Mr Lau Chor Yam, GB Member from



Singapore; 5) Dr Supunnee Chanprasert, representative of Prof Sukit Limpijumnong, GB Member from Thailand; 6) Ms Veronica Moreira Correia, GB Member from Timor Leste; and 7) Prof Dr Pham Quang Trung, GB Member from Vietnam. The meeting was also attended by Dr Wahyudi, the Deputy Director (Programme and Development) of SEAMEO Secretariat and observers from Bureau of Planning and International Cooperation, the Ministry of Education and Culture of the Republic of Indonesia and Centre for Development and Empowerment of Teachers and Education Personnel (CDETEP) in Science.

The Meeting was officially opened by Mr Uu Ruzhanul Ulum, the vice governor of West Java Province. In his remarks, he pointed out the significances of SEAMEO Centres in improving the quality of education in West Java Province. He also highlighted that the majority of Indonesian citizen currently are the millennials and to survive in this era, education should be put in the first place. He then expected that the meeting could be a strategic move in developing the characteristics of the millennials to face the challenges in the era of industrial revolution 4.0 through programmes and activities conducted by SEAQIS. The opening was also enlivened by choir and dance performance performed by students of SMKN 1 Bandung.

In this year Meeting, there were 14 working papers discussed in which nine of them are matters for approval. SEAQIS proposed to establish the Regional Office for Climate Education and upscaled the training programme on integrating computational thinking to regional level. All the proposed programmes were approved by the Meeting. The meeting also decided that the next GB Meeting will be held in Lombok, Nusa Tenggara Barat.

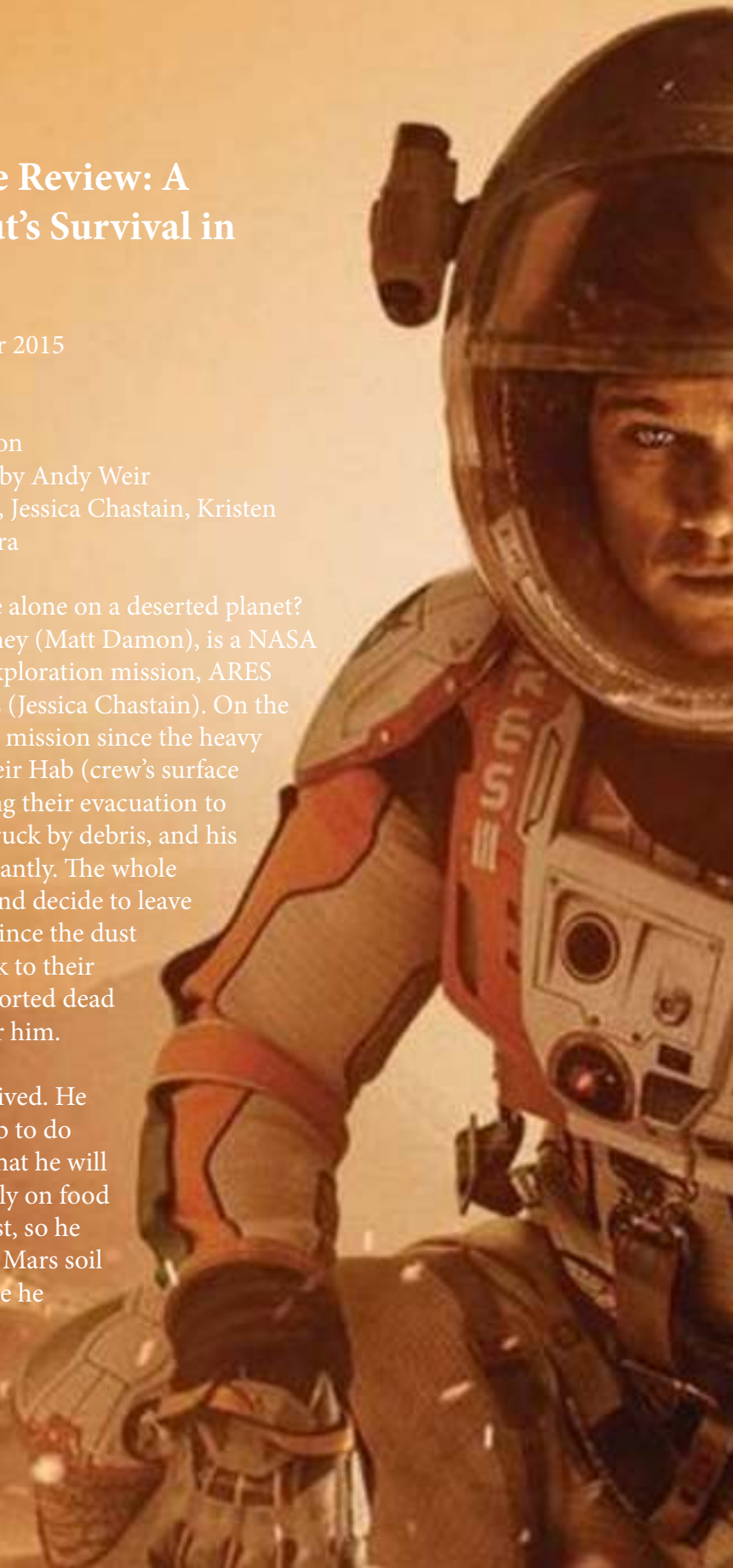


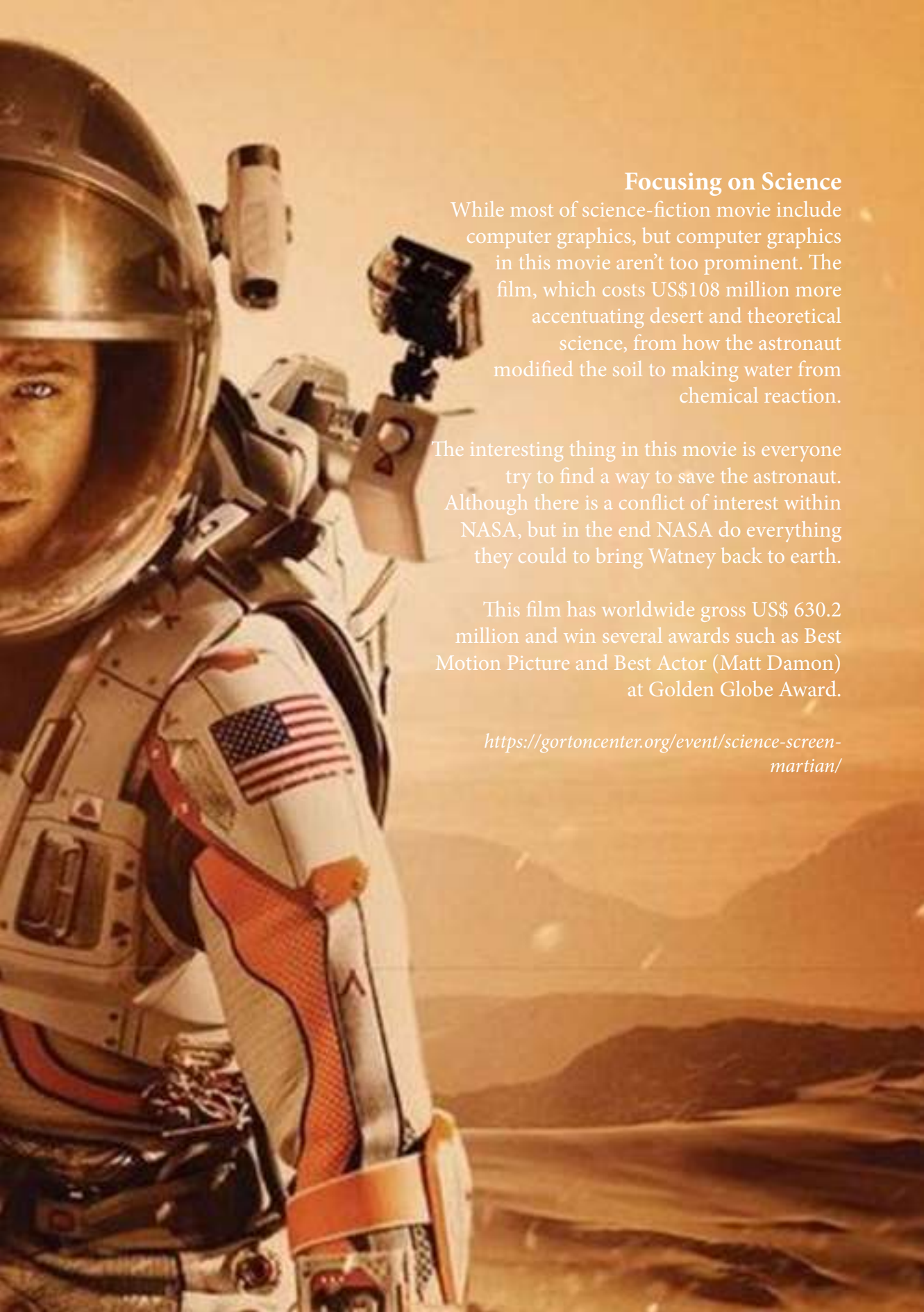
The Martian Movie Review: A Stranded Astronaut's Survival in Mars

Release date : 30 September 2015
Duration : 141 min
Directed by : Ridley Scott
Genre : Science Fiction
Based on : The Martian by Andy Weir
Starring : Matt Damon, Jessica Chastain, Kristen Wiig, Michael Pena, Kate Mara

Have you ever imagine to live alone on a deserted planet? Well, Watney did. Mark Watney (Matt Damon), is a NASA astronaut assigned in Mars exploration mission, ARES III, led by Commander Lewis (Jessica Chastain). On the 18 day, they have to abort the mission since the heavy dust storm is approaching their Hab (crew's surface habitat). Unfortunately, during their evacuation to the space ship, Watney get struck by debris, and his communication is cut off instantly. The whole crews assumed that he died and decide to leave the Red Planet immediately since the dust storm worsening and get back to their orbiting vessel. Watney is reported dead and NASA holds a funeral for him.

Fortunately, Watney has survived. He is injured and back to the Hab to do the self-surgery. He realizes that he will not survive long, if he only rely on food supply. Luckily he is a botanist, so he make his own field, modified Mars soil and plant some potatoes while he still looking a way to contact NASA on earth and tell them that he still alive.





Focusing on Science

While most of science-fiction movie include computer graphics, but computer graphics in this movie aren't too prominent. The film, which costs US\$108 million more accentuating desert and theoretical science, from how the astronaut modified the soil to making water from chemical reaction.

The interesting thing in this movie is everyone try to find a way to save the astronaut. Although there is a conflict of interest within NASA, but in the end NASA do everything they could to bring Watney back to earth.

This film has worldwide gross US\$ 630.2 million and win several awards such as Best Motion Picture and Best Actor (Matt Damon) at Golden Globe Award.

<https://gortoncenter.org/event/science-screen-martian/>

01

Fostering The Joy of Learning Through Physics Inquiry and STEM Activities

Koh Chee Kiang, Pang Jeng Heng

Introduction

Realizing the increase of job in the STEM field that will be very dashing in the future, the Minister of Education of Singapore feels the need to change the mind-set of students in the STEM field so that they have an interest in working in the STEM area.

In this regard, the Minister of Education also recommends the implementation of joy of learning which involves hands-on and experiential learning activities, so that it allows students to explore and discover

their interests and passions through applying their knowledge and skills in real-world contexts. The joy of learning is not only making learning more meaningful but also preparing students to become engaged learners and lifelong learners.

In carrying out the Minister's mandate, our school especially the physics unit designed several programs related to joy of learning, both formal and informal, which can inspire students to be able to engage in the world of STEM work, including:

Informal	Formal
<ul style="list-style-type: none">- Learning physics with Arduino coding media to train programming skills and produce various tools and robots such as: drones and Solar-powered environment monitoring stations,- Conduct Micro bits block programming workshops.- Participate in various science and technology competitions and exhibitions for students.	<ul style="list-style-type: none">- For engaged learning, use of 5E inquiry-based instructional model (Bybee et al, 2006) was used together with various learning tools such as ICT, mathematical graphing, data logger, and whiteboarding.- To foster meaning-making, students are given STEM-related problem-solving tasks to apply their conceptual understanding to real-world contexts.

The program design is then analysed through research in order to find out the quality of the program.

This research is one of the processes to review and refine our formal and informal instructional physics programs with the aim of exposing our students to varied applied activities involving Science, Technology, Engineering and Mathematics (STEM).

Methodology

Research method	Quantitative (questionnaire)
	Qualitative (focus group interview)
Respondents:	Secondary 3 students (n = 155)
Physics students	Secondary 4 students (n = 139)
Procedure: Inquiry-based activities and whiteboarding	<p>Nine inquiry-based activities, three activities in Secondary 3 and six activities in Secondary four. That are: Faraday's law of electromagnetic induction, Bouncing ball, D.C. motor, Tension Protractor, Speed of sound, Light-dependent resistor, Cartesian diver, Transformer and Force on cart.</p> <p>The instructional sequence of the inquiry-based activities followed closely the BCSE 5E inquiry model to enhance student learning (Bybee, 2006); Engagement, Exploration, Explanation, Elaboration, Evaluation.</p>
Instrument and analysis method	<p>Questionnaire: This six-item questionnaire based on a 4-point Likert scale of '1 for strongly disagree', '2 for disagree', '3 for agree' and '4 for strongly agree' was used to collect data on students' perception of their joy of learning covering three domains of 'engaged learner' (items 1 and 4), 'meaning-making' (items 2 and 6) and 'life-long learner' (items 3 and 5)..</p> <p>Analysis method: mean score for each item (\bar{x}) and average dimension mean ($\bar{\bar{x}}$), standard deviation (σ), and Coefficient of Variance (CV). This analysis will provide an indication of the impact the inquiry-based activities and whiteboarding have in fostering students' joy in learning that is meaningful, engaging and promotes life-long learning dispositions.</p> <p>Focus group interviews: interviewing three Secondary 3 and three Secondary 4 students using the guiding questions to gain deeper insights into students' perceptions of 'doing Science' and their learning through the inquiry- based activities.</p> <p>Analysis method: grouping the students' answers into positive or negative perceptions</p>

Table 1. Secondary 3 students’ feedback: mean, standard deviation and coefficient of variance

	mean	Stdev	CV	1	2	3	4	Total
Engaged Learner								
I have enjoyed this session of hands-on activities.	3.38	0.52	0.16	0	4	85	58	147
I learn to cooperate with my group mates through the activities.	3.22	0.57	0.18	1	14	90	43	148
average	3.30	0.55	0.17					
Meaning-Making								
I can relate better to real world application through this activity.	3.28	0.58	0.18	8	10	84	53	155
The activities help me to have a deeper or clearer understanding of the Physics concept taught in class.	3.38	0.58	0.17	1	5	84	58	148
average	3.33	0.58	0.17					
Life-long Learner								
I feel more confident to question, clarify and reflect on my learning through the activities.	3.22	0.57	0.18	0	16	93	39	148
The hands-on activities help to spur my interest in the topic(s).	3.13	0.70	0.22	6	23	74	48	151
average	3.18	0.64	0.20					

Chart 1. Secondary 3 Feedback Mean Score by item and dimensions

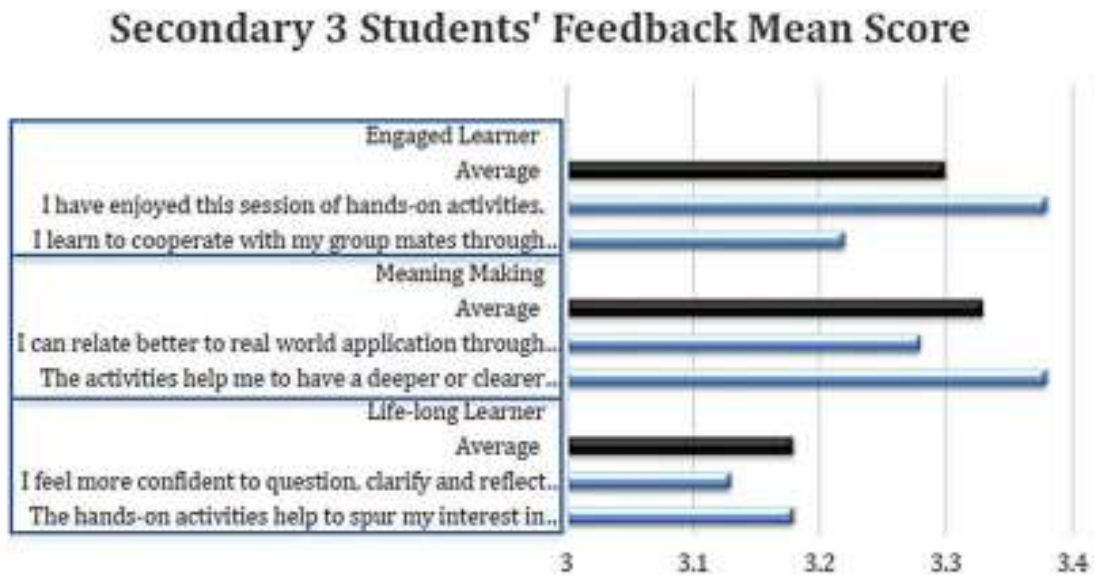
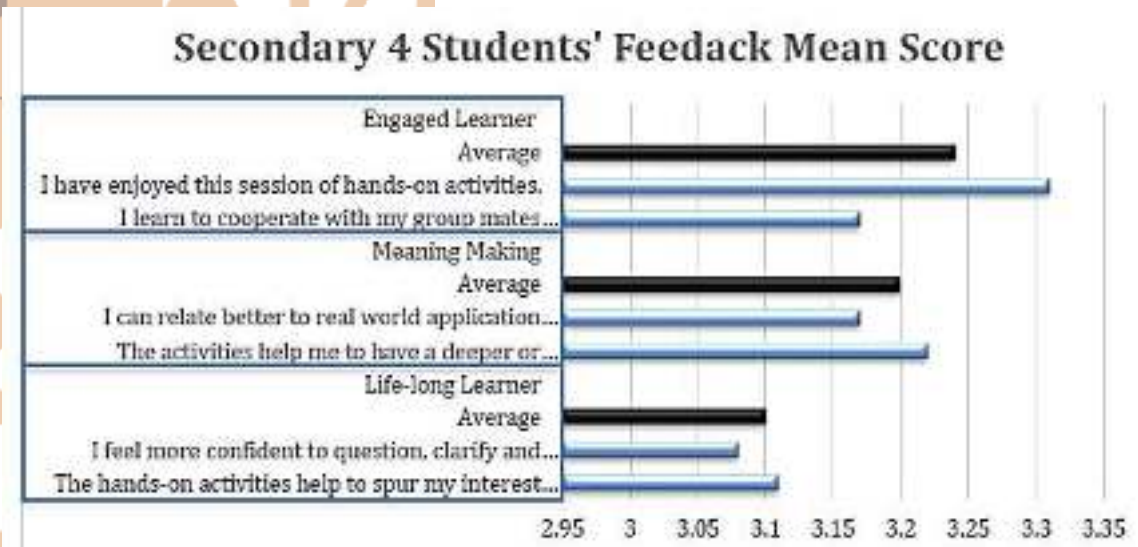


Table 2. Secondary 4 students’ feedback mean, standard deviation and coefficient of variance

	mean	Stdev	CV	1	2	3	4	Total
Engaged Learner								
I have enjoyed this session of hands-on activities.	3.31	0.59	0.18	1	6	81	51	139
I learn to cooperate with my group mates through the activities.	3.17	0.65	0.20	2	13	83	41	139
average	3.24	0.62	0.19					
Meaning Making								
I can relate better to real world application through this activity.	3.17	0.65	0.21	1	17	78	42	138
The activities help me to have a deeper or clearer understanding of the Physics concept taught in class.	3.22	0.58	0.18	0	12	85	42	139
average	3.20	0.62	0.20					
Life-long Learner								
I feel more confident to question, clarify and reflect on my learning through the activities.	3.08	0.55	0.18	0	16	96	27	139
The hands-on activities help to spur my interest in the topic(s).	3.11	0.70	0.22	2	21	76	40	139
average	3.10	0.63	0.20					

Chart 2. Secondary 4 Feedback Mean Score by item and dimensions



Results

The Secondary 3 students' feedback showed mean average of 3.18 and above for the three dimensions of 'engaged learner', 'meaning-making' and 'life-long learner' out of 4 where 4 is highly agreeable, with standard deviation of 0.55-0.64 and Coefficient of Variance (CV) of 0.17-0.20. The low CV indicates the data is highly reliable since it is significantly below 1.00, considered as low-variance.

The Secondary 4 students' feedback showed mean average of 3.10 and above for the three dimensions of 'engaged learner', 'meaning-making' and 'life-long learner' out of 4 where 4 is highly agreeable, with standard deviation of 0.62-0.63 and Coefficient of Variance (CV) of 0.19-0.20. The low CV indicates the data is highly reliable since it is significantly below 1.00, considered as low-variance.

The responses from the Secondary 3 and Secondary 4 groups of students shows that the mean scores for "I have enjoyed this session of hands on activities", "The activities help me to have a deeper or clearer understanding of the Physics concept taught in class" and "I can relate better to real world application through this activity" are the three highest item scores for both groups. This shows that our objective of creating a more meaningful and enjoyable experience of science learning for our students has been well received. It also suggests that the students can relate better

to how empirical data is being collected and analysed for more meaningful discussions to take place.

The responses from the Secondary 3 and Secondary 4 groups of students shows that the mean scores for "I feel more confident to question, clarify and reflect on my learning through the activities" and "The hands-on activities help to spur my interest in the topic(s)" are the two lowest item scores for both groups. This shows that our objective of fostering dispositions for life-long learning such as intrinsic motivation and self-reflection is less well received compared to engaging learning and meaning-making.

For analysis focus group interviews, Students reflected positively to being given the opportunity to engage with their peers and teacher in discussions and using their knowledge of Science in real-world and STEM-related applications. The following are some examples from the FGIs on students' perceptions of their learning:

"Actually I find it a good classroom environment to actually share ... more opportunity for you to discuss ideas in the whiteboarding activity, students can just shout out their ideas, their viewpoints then can start a new discussion."

"It is a step in the correct direction. Perhaps a bit more real life example like engineering applications. Then insert that into the questions."

Conclusion

With our inquiry activities and whiteboarding process to promote stronger link between theory and practice of the scientific approach, our students are more engaged in a collaborative environment to use questions to deepen their understanding. This classroom approach also serves as a basis for developing a greater interest in STEM. We have also observed an increase in participation in our informal STEM-related programme, with more students enrolling for our cohort

enrichment activities as well as for the various STEM competitions. Students have also expressed a greater joy in learning from these opportunities provided, were more confident in forming and communicating explanations and attained a higher level of interest, curiosity and motivation in learning. It is also encouraging to see them trying to draw connections between physics concepts and the physical phenomena happening around them.



02

Guided and Immersive Training Approach to Enhance Knowledge and Skills in Science Investigatory Project

Bryant C. Acar

Introduction

Science Investigatory Projects (SPI) have long been familiar events in public schools as a research endeavour to inculcate the scientific inquiry skills of the students in Asian countries, particularly in the Philippines. By participating in SPI, students will learn some scientific facts or principles and how to implement it into science projects. On the other hand, the primary objective for science project work is to teach students to think. However, public high schools in the Philippines, especially in Lapu-Lapu City, the research locale find it hard to train students to accomplish a science investigatory project for multitude of reasons: there are no trained teachers to

mentor the students; lack of budget; lack of facilities; and lack of extensive training program for the students.

Based on these conditions, it is necessary to roll out a comprehensive training program to benefit the students; the school; the division; the region and the nation and in order to make Science Research a fun and exciting endeavor to do.

The research determined the effectiveness of Guided and Immersive Training Approach to enhance the knowledge and skills of the Grade 11 Students in Science Investigatory Project, Science and Technology Education Center (STEC), Lapu-Lapu City, Cebu, Philippines.

Methodology

Quantitatives

Pre-post test experimental research design to determine the effectiveness of the Guided and Immersive Training Approach to enhance the knowledge and skills of the Grade 11 STEM Students in conducting SIP.

Qualitatives

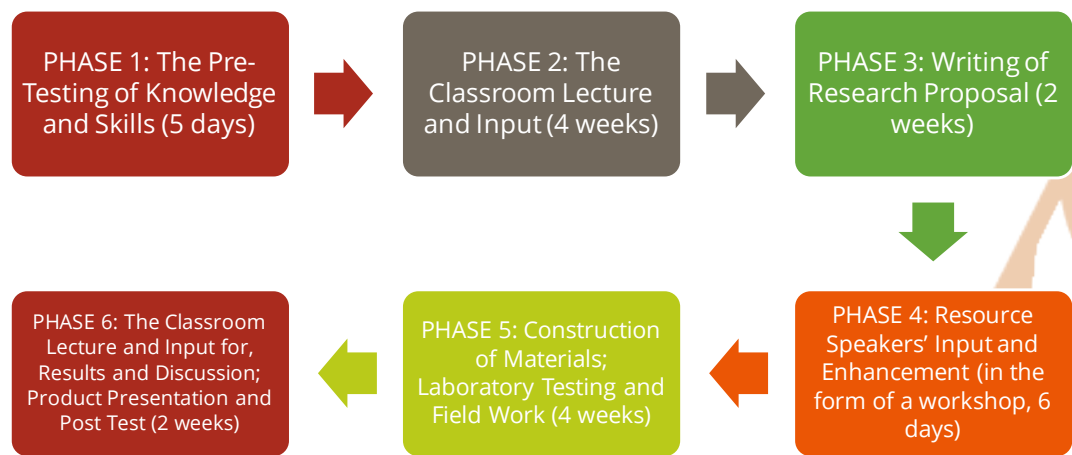
Focus Group Discussion (FGD) to gather the reflective responses of the students in the impact of the training approach to their behaviour and interest in conducting the SIP.

Research participants	Grade 11 students who are taking STEM (Science, Technology, Engineering and Mathematics) class in STEC SY 2017-2018 (31 students were grouped into 5 teams)
Duration of research	3 months' time from October 2017-January 2018

Instruments	50 items multiple choice examinations <ul style="list-style-type: none">to measure the level of knowledge of the Grade 11 students in their knowledge of the investigatory project making
	Science Fair Project Evaluative Tool (SFPET) <ul style="list-style-type: none">a standard evaluative tool derived from the International Science Research Fair Project Association (ISRFP)to to identify the level of skills of the Grade 11 students in doing investigatory projects
	Qualitative question <ul style="list-style-type: none">"How has the Guided and Immersive Training Approach contribute to your attitude as a student-researcher? The answers are categorized into themes and presented appropriately
Analysis Method	Simple Percentage <ul style="list-style-type: none">To present the level of knowledge of the Grade 11 students in conducting SIP before and after the implementation of guided and immersive training approach.
	Weighted Mean <ul style="list-style-type: none">To provide a data on the level of skills of the grade 11 students in doing investigatory project before and after the implementation of guided and immersive training approach.
	Z-test for Mean difference <ul style="list-style-type: none">To measure the significant difference on the level of knowledge and level of skills of the students before and after the implementation of the guided and immersive training approach in Science Investigatory project making.

Design and Implementation

There are 5 phases in the Guided And Immersive Training Approach developed, namely:



Result

Table 1 presents the level of knowledge in science investigatory projects of the grade 11 students before and after the Guided and Immersive Training Approach. The students were given a fifty-item matching type test. The examination covered the investigatory projects concepts from definition, types, procedure, sampling,

instruments, and presentation of data, analysis and interpretation of results and drawing conclusion and recommendations. The prepared examination was pre-tested to the 11th grade students which were not part of the study. The scores were categorized into five levels to measure the level of knowledge of the tenth-grade students.

Table 1. Level of Knowledge of Grade 11 Students in Science Investigatory Project Before and After the Implementation of the Guided and Immersive Training Approach

Range	Equivalent	Before		After	
		F	%	f	%
46-50	Excellent	0	0	19	61
36-45	Very Good	0	0	12	39
26-35	Good	13	42	0	0
16-25	Fair	11	35	0	0
1-15	Poor	7	23	0	0
Total		31	100	31	100
Average		24	Fair	45	Very Good

Table 2 presents the level of skills in investigatory science projects of the 11th grade students before and after the Guided and Immersive Training Approach. The

used research tool was a Science Fair Project Evaluative Tool (SFPET), a standard evaluative tool derived from the International Science Research Fair Project

Association (ISRFPFA). The tool is utilized in district competition for investigatory project contest. The SFPET is composed of four dimensions: Scope and Theoretical Dimension; Methodological Dimension; Interpretative and Output Dimension; Presentational Dimension.

Table 2. Level of Skills in Science Investigatory Project of Grade 11 Students Before and After the Guided and Immersive Training Approach

Indicators	Before		After	
	Mean	I	Mean	I
I.SCOPE & THEORETICAL DIMENSION				
Average	1.63	P	3.61	VG
II. METHODOLOGICAL DIMENSION				
Average	1.84	F	3.94	VG
III.INTERPRETATIVE AND OUTPUT DIMENSION				
Average	1.73	F	3.93	VG
IV. PRESENTATIONAL DIMENSION				
Average	2.66	G	4.00	VG
Weighted Mean	1.97	Fair	3.87	Very Good

Legend

3.26- 4.00
Very Good
Exhibits highest degree of skills in doing SIP.

2.51- 3.25
Good
Exhibits average degree of skills in doing SIP

1.76 - 2.50
Fair
Exhibits considerable degree of skills in doing SIP

1.00 - 1.75
Poor
Exhibits least degree of skills in SIP and needs improvement

Table 3 presents the test of difference in the Knowledge and Skills of Grade 11 Students in Science Investigatory Project before and after the implementation of the Guided and Immersive Training Approach. In Knowledge, the computed z is 4.826 which is higher than the critical value of 2.368 this means that the test scores in knowledge of SIP before and after the implementation is significant. In the same manner, the skills before and after the implementation also significantly differ with a z test of 4.242 and a critical value of 2.368. This means that the Guided and

Immersive Training Approach in teaching and learning Science Investigatory project is effective.

The approach has been very effective in augmenting the technical and scientific skills of the students. The Guided approach has set a clear direction on “what to do and how to do it” and the Immersive approach has provided a hands-on and experiential learning to students in a simulation room or laboratories. The inputs of the expert were very helpful in refining and mastering the concepts and producing the intended and expected outcomes.

Table 3. Test of Difference in the Knowledge and Skills of Grade 11 Students in Science Investigatory Project Before and After the Implementation of the Guided and Immersive Training Approach

Aspects	Test Scores		Computed Z	Critical value	Interpretation
Knowledge	Pre	24	4.826	2.368	Significant
	Post	45			
Skills	Pre	1.98	5.242	2.368	Significant
	Post	3.87			

Table 4 presents the impact of the Guided and Immersive Training Approach towards the attitude and interest of the Grade 11 students in conducting the Science Investigatory Project. The data was gathered through Qualitative approach using the Focus Group Discussion of the

team leaders of the five research teams. Based on the discussion, three (3) themes emerge and these are: Develops Inquisitive Mind and attitude; Develops creative mind and attitude and develops passion and excitement for research.

Table 4. Impact of the Guided and Immersive Training Approach towards the attitude and interest of the Grade 11 students in conducting the Science Investigatory Project

Themes	Number of Key Informants
Develops Inquisitive Mind and Attitude	5
Develops Creative Mind and Attitude	4
Develops passion and excitement for Research	5

On the theme “Develops Inquisitive Mind and Attitude,” five (5) key informants agreed that the implementation of the guided and immersive training approach has improved the inquisitive mind and attitude of the students.

On the theme “Develops Creative Mind and Attitude,” four (4) key informants agreed that the implementation of the

guided and immersive training approach has improved the creative mind and attitude of the students.

On the theme “Develops Passion and Excitement,” five (5) key informants agreed that the implementation of the guided and immersive training approach has developed the passion and excitement to conduct the research.

Conclusion

Research undertaking such as the Science Investigatory project Making can be effectively become fun; worthy; experiential opportunity for the students who are well-guided and exposed in an immersive training approach. The study is a proof that

there is Life in Science and that knowledge and skills in research can be honed in an environment most conducive in developing the inquisitive and creative minds as well as the passion and engaging attitude among the teachers and students

03

Integrating Engineering Design Process: An Effort to Improve Students' Problem Solving Skill Through STEM Learning

Dini Siti Anggraeni

Introduction

I have been teaching science for eight years in a regular public school. Based on my experience, I have found that during my lessons, the majority of my students are not able to identify problem, break down the problem into manageable parts, examine possible solution, and until act effectively and decisively to solve real-life problems. Many times students understand the science concepts, but they are confused to apply the concept to solve or to overcome the real-life problems.

The lack of students' problem solving skills may be because of implementing traditional teaching methods, such as lecturing, which sharpen rote and memory. It not fostered students to evaluate evidence, arguments, and alternative points of view before judging a decision and solving various types of problems. In other words, students were not able to apply their knowledge to solve real-life problems scientifically. Therefore, teaching and learning activities at this point were not preparing students to adapt and to survive as well as to success in work and life.

Numerous studies claimed that 5E model with STEM approach makes learning interdisciplinary can benefit students' learning and gives them opportunities to get 21st century skills such as problem solving, analysis, adaptability, communication and self-management. Furthermore, this model is students' centred; developing students' accountability, responsibility and lifelong skills. On the other hand, the uniqueness of implementing STEM approach is caused by the existence of engineering design process which required students to apply the knowledge from every field of STEM. Considering the benefits of this model and approach, I conducted classroom action research focusing on the integrating engineering design process to 5E instructional model with STEM approach.

The main problem formulation of the research is does integrated Engineering Design Process in STEM learning able to develop students' problem solving skills? How does the implementation of the engineering design in STEM learning?

Methodology

Research Method
<ul style="list-style-type: none">• Classroom Action Research (2 cycles, Figure 1)• Each cycle consisted of three meetings• Each meeting through the phases of Planning (Plan), Acting (Action), Observing (Observation), and Reflecting (Reflection) on 2 x 40 minutes of time allocation
Instruments
<ul style="list-style-type: none">• Peer assessment rubric• Self-assessment rubric• Observation rubric Interview
Data analysis
<ul style="list-style-type: none">• Descriptive• Quantitative
Research participants
<ul style="list-style-type: none">• X UPW 2 SMK Negeri 1 Bandung year of 2017/2018
Time of Implementation
<ul style="list-style-type: none">• April – June 2018



Implementation

Plan	<ul style="list-style-type: none">• Making lesson plan• Determining the topic with real-life problem (Figure 2)
Acting	<ul style="list-style-type: none">• Implementing the lesson plan• Integrating the engineering design process (EDP) in STEM learning with 5E's instructional model
Closing	<ul style="list-style-type: none">• Observing the specific elements of problem-solving skills that had been developed through engineering design process by using observation sheet.
Reflecting	<ul style="list-style-type: none">• Analysing the result of self-assessment, peer assessment, and observation.• Interviewing students in order to obtain the clear picture of the development of students' problem solving skills through EDP• Analysing the design solution and the product of the project.

SMKN 1 Bandung located in the centre of Bandung		
It has problems		
narrow area (5240 m ²)		canteen organic wastes
Developing cultivation system such as hydroponic and vertical garden to improve food selfsufficiency	Problems of cultivation system: the price AB Mix fertilizer is relatively expensive	Can still be a source of useful material to produce fertilizer

Figure 2. Problem Design of Stem Learning

Based on the two problems in the school (the high price of fertilizer for hydroponic plants and canteen organic waste) students are expected to create a solution that can utilize the school organic waste into products that can help the growth of vegetables,

especially hydroponic vegetables. Based on a deeper literature study, students can add another material to improve their product.

This activity is then carried out in learning with the 5E instructional model and EDP in STEM Approach.

Implementation

Target observation of this research is the development of students' problem solving skills through integrated EDP in STEM

learning on waste management topic. Result of the students' problem solving skills from the research is shown on the figure 3.

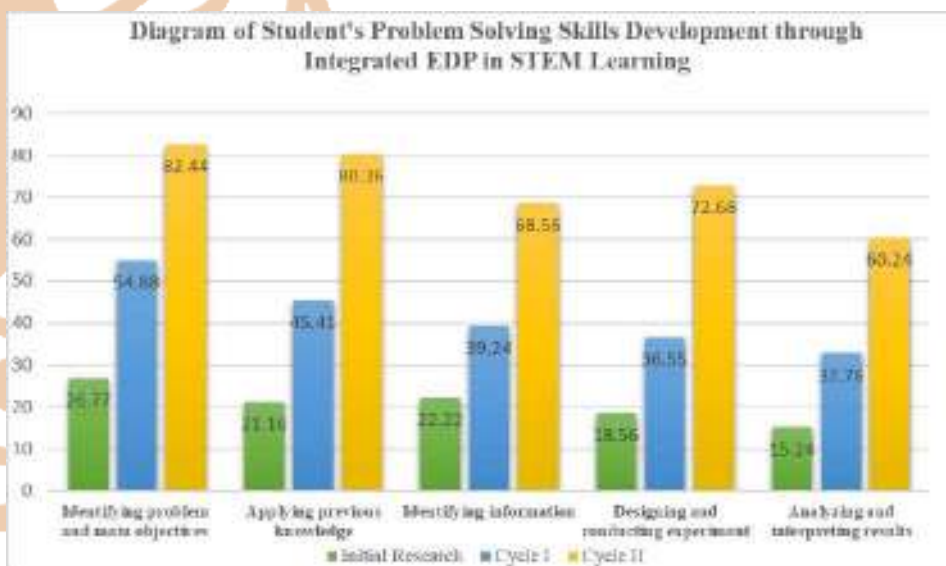


Figure 3. Diagram of Student's Problem Solving Skills Development through Integrated EDP in STEM Learning

Based on the graph in Figure 3 it is known that the problem-solving skills of students increase in each cycle. For cycle 1, the highest development of students' problem-solving skills is in "Identifying the problem correctly" with significant development from 26.77% to 54.88% (28.11% increased). For cycle 2, the highest is in "designing and conducting experiments" sub-skill with significantly develop from 36.55% to 72.68% (36.13% Increase).

For "Identifying the problem correctly" sub-skill in cycle 1, students only formulate a few questions that depend on others, and yet they do not understand the main problem. Furthermore, they also lack the

skill to define the problem correctly and do not seek the information source. Thus, students' identifying problem skill is low. After conducting the first cycle, students can formulate more questions than before. This thing still needs to be improved because they still have some difficulties formulating questions and they rely on a few sources.

In cycle 2, "designing and conducting experiment" sub-skill, students can describe planned experiments, relate hypotheses to previous knowledge, and identify necessary steps and timeline for the project. Besides that, most students can use results to refine plan continuously, and collect raw and summarized data comprehensively.

Conclusion

- Based on the results and discussion, it can be concluded that:
- The integration of EDP in STEM learning develop students' problem solving skills.
- The results showed that the use of EDP through STEM approach develop students' problem solving skills significantly from initial research to second cycle of research.
- The observation and interview showed EDP can develop student's problem solving skills, because it gave them a guideline to follow and it allowed them to break the problems down into smaller pieces to work on and allowed them to follow a flow chart method to help decide what step to take next. (based on the data of cycle I and II experiments)
- The role of teachers in science learning process using EDP through STEM approach is a facilitator and learning resources that can guide and direct students to find solutions with respect to the provided their real-life problems.
- The courage and the ability to solve the problem is the basis for students in using EDP through STEM approach to be more successful.



CECE SUTIA: Winner of National Teacher Olympiad Year 2019

- **Could you please mention your full name, teaching period and school where you are currently teaching at?** My name is Cece Sutia, 34 years old. My career as an educator started 13 years ago. I currently teach at SMAN 1 Parongpong, West Bandung Regency. Our school is located in the Northern Bandung, an agricultural area. The main commodities are vegetables, flower, tea and milk. Most our students come from low middle to low income families, farmers and freelancers.
- **Please tell me about the National Teachers Olympiad. How was the selection process until you were chosen as an outstanding teacher?** The National Teachers Olympiad was organized by the Directorate General of Teachers and Education Personnel. The Ministry gave announcements to each Provincial Education Office. Teachers who were interested in participating in the activities were required to take an administrative selection first and those who pass will receive an invitation to take the online written test selection. The



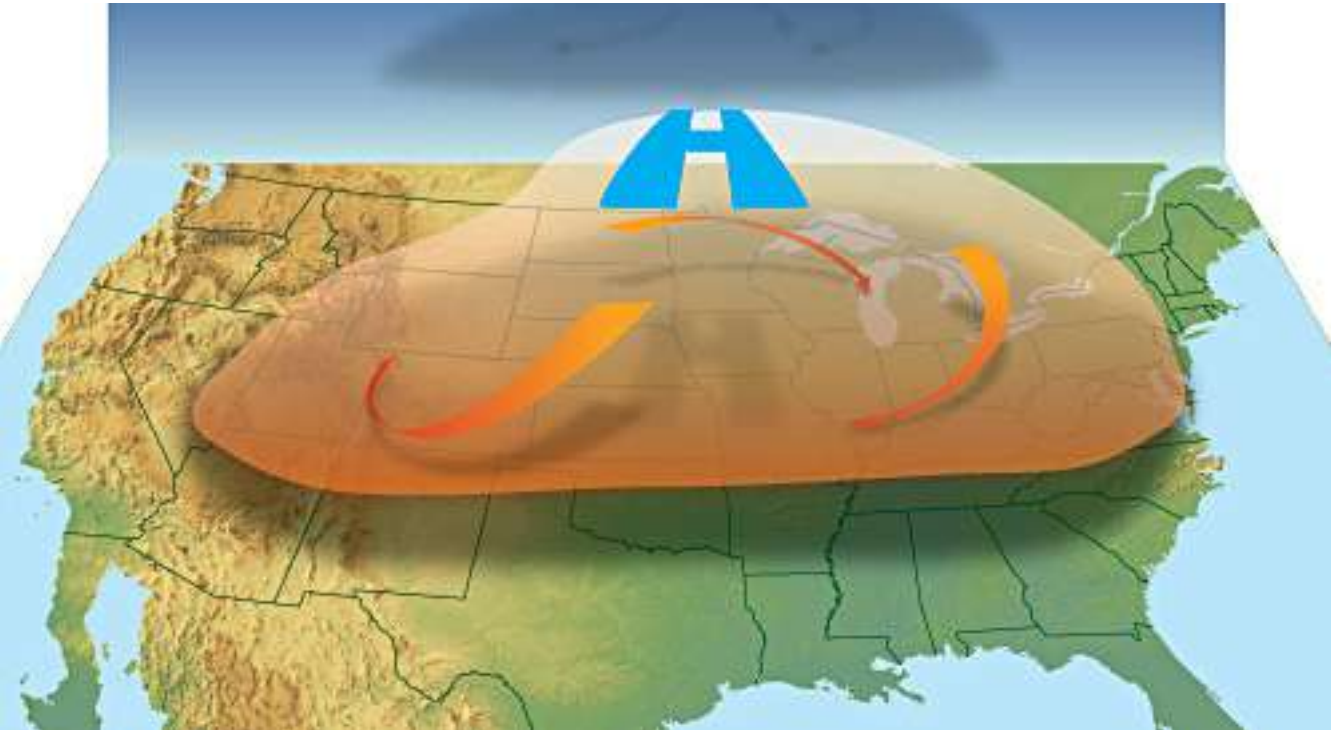
West Java Province Education Office conducted an online written test at SMKN 9 Bandung. The question items were made by the Ministry of Education and Culture. The number of questions were 100 questions with a duration of 120 minutes. The fifteen best teachers in each subject will be called as finalists. The 2019 National Teacher Olympiad was held in Jakarta on 29 April - 3 May 2019. The question items were 100 questions consisted of pedagogical tests, practical tests, workshop tests, teaching tests, and assessment of scientific works / patents. The participant with the highest score will be the winner.

- **Is there any advantage in your career after winning the Olympiad?** For me, competing in this kind of activity is basically to measure my own weaknesses compared to others. By competing, we can find out our weaknesses that must be improve, especially those related to learning. In

addition, we get insights from other school teachers that we can apply later on.

- **Do you know SEAMEO QITEP in Science (SEAQIS)? If yes, in which training did you involved?** I know with SEAMEO QITEP in Science and have been involved several times in its activities. Activities that have been joined include STEM training and seminars
- **Is there any impact in your career after participating in SEAQIS activities?** Of course beneficial to improve our competence. For example, I study Biology material from SEAQIS' training. The paper I made also the result from STEM Training that was conducted by SEAQIS.
- **What is your hope for education of Indonesia in the future?** My hope that Indonesian education will be more advanced and equitable. The implementation of the teaching and learning activity is expected to be in accordance with current development without forgetting the culture and local wisdom of each region

Heat Wave



Heat wave in 2019 was recorded as the worst heat wave in Europe. What is heat wave? What causes this can happen? According to the World Meteorological Organization, a heat wave is a period of five days or more prolonged hot weather where the maximum daily temperature exceeds the average maximum temperature of 5°C or more. However, some countries have different criteria in defining heat waves. For example, in Sweden, it is called a heat wave if at least 5 consecutive days with daily temperatures exceeding 25°C.

A heat wave is formed when high pressure is right above an area, pushing the air downward causing the air to “trapped” and stay on the ground. Measurement of heat wave is relative to prevalent weather in the region and it is a common phenomenon during the summer. In fact, cold regions such as Antarctica can experience heat waves, if the hot weather is classified as

unusual in Antarctica. It is estimated that 170 giga tons of ice has melted in Greenland on July 1 – 26.

Heat waves will get worse when the greenhouse effect as the atmosphere increases. In some areas, such as Europe, heat waves that worsened by climate change can be bad for health and can even kill humans. How can heat waves kill humans?

The human body can operate well at a maximum of 37°C. If our temperature rises to 38°C for more than couple hours, humans get heat exhaustion. If our temperature rises above 42°C, heat stroke and death can occur within few hours.

https://en.wikipedia.org/wiki/Heat_wave
<https://www.thejakartapost.com/life/2019/07/29/heatwave-threatens-to-accelerate-ice-melt-in-greenland.html>

pict:<https://www.thesun.co.uk/news/9383682/>



Adiwiyata School: A journey to be Eco-friendly School

Some of our alumni made a few environmental projects at their school. The first one is Edi Hidayat. As a teacher, he loves to study in order to enrich his knowledge and teaching skill. These past years he has been interested in environmental issues and its solution. He thinks that what the meaning of human life is if we are in the midst of an environment that is no longer worth living anymore. He teaches at SDN Unggulan, a public elementary school in

Indramayu, a sub-district in West Java. This school was built to be a model school for other schools in the local area. He was transferred to the school in 2017.

In 2017, the government of the the Indramayu Sub-district in collaboration with PT. Pertamina RU VI made a coastal-area-oriented educational programme, especially in Mangrove ecosystem. There were four schools chosen as the pioneer school to teach the mangrove ecosystem



education, and SDN Unggulan was one of them.

The mangrove ecosystem education received positive responses. The local government and Corporate Social Responsibility Division planned to develop the mangrove ecosystem education and made it as the local subject in Indramayu. He started interested in mangrove after participated in training on mangrove ecosystem education. He also participated in Training Course on Environmental Education for Sustainable Education (EESD) that was held by SEAQIS in 2018.

He gave a report to the principal, after completing the training. The principal assigned him to implement the output of the training in class and school as the added-value for National Level Adiwiyata Award since his school awarded as Adiwiyata School at Sub-district level.

He observed the environment and the school community in their daily activities at school. It turns out that most the students have a habit of using plastics. He decided to make a program, called Ecobrick. This programme made students collect plastic waste. The plastics were cut into small pieces and then put into bottles of mineral water with the same shape and size for each student. The small pieces of plastics were pushed inside the bottle until it is compact with plastics. The weight of a full bottle of plastic is around 200 to 300 grams. This Ecobrick can be used to build a chair, table or statue. This programme effective for reducing plastic waste. From 2 to 3 trash bin, to only one trash bin from each



classroom.

He brought the success of the Ecobrick to be disseminated to Mangrove teacher working group, and it received a lot of appreciation and positive feedback. This programme was applied to 26 schools where mangrove ecosystem education was taught. This eco brick was used as track to mangrove ecotourism.

Some other programmes were Bring Your Own Tumbler, bio-pore, food-waste fertilizer, and the class' garden. Another programme related to mangrove was mangrove seeding at school, in collaboration with Local Environment Office. With these environment programmes, this school awarded with National Adiwiyata in 2018. This achievement increasing environmental issues' awareness in the community around SDN Unggulan.

A similar impact also happened to Desy Merisa Susanti, a teacher at SDN 196 Sukarasa, Bandung, West Java. Enjoying learning new things that increase her knowledge and ability in teaching became her main reason to take the training course on Environmental Education for Sustainable Development (EESD) in 2018 organized by SEAQIS. After finished the training, she shared her knowledge with the principal. The plan that she had designed during the training was in line with the principal's thoughts. Their ideas have been put into school programmes, part of the school curriculum.

They divided teachers into several teams, including the garden team, seeding, hydroponics, composter, medicinal plants, greenhouse, school forest, administration, and others. Each team is responsible for their respective duties. Our activities continue with the socialization to parents, canteen owners, local government, and environmental services.



New policies are made for environmental improvement. These policies are summarized as school ICONS, namely BOTRAM. B is Bersihkan, means clean. It is not only the environment that is cleaned but also the body and soul. O is Optimalkan, means optimize. Optimize thematic learning that leads to 21st-century skills. T is Tertibkan, means discipline. Organize the use of school facilities and infrastructure including orderly traders. R is Rapikan, means trimming. Tidy up the school administration so that all activities are tailored to the program and good planning. A is Arahkan, means to direct. Direct students and educators into human beings who love the environment. M is Manfaatkan, means to use it. Take advantage of the environment as a source



of learning and inspiration.

They carry out this school program together with parents and other related parties. Included in the procurement of school needs and environmental maintenance. One program that is strongly supported by parents is Ngabaso. Every Tuesday students are escorted by parents to the assembly point which is spread in four directions. Not only the teacher who accompanied the students walk to school but the parents also accompanied them, the parents even made a scarf as the students' identity.

In addition to their other programs, it is botram (Sundanese, eat together). The students were recommended to bring their own lunch from home. The activity was initially held once a week every Wednesday. But now botram has become a habit in their school. Students bring their own lunch boxes and tumblers to reduce plastic waste. This program not only applied to the

students but also, we asked the owners of the canteen to provide a plate and glass that could be reused. This program significantly reduces our plastic waste.

In learning activities, one of the projects that they have developed is composting and planting in a hydroponic system. This activity becomes project-based learning. Children start from seedling, maintenance, to harvesting with the guidance of the teacher. When harvest time comes, they held an open house. Parents are invited to see the work of their children. Not only seeing, but they also appreciate the students' work by buying it. The students were so happy even though they still have many weaknesses.

They share this positive influence on several schools around. Having a beautiful, clean, well-maintained environment lead their school to be awarded Adiwiyata Mandiri School.

A teaspoonful of neutron star would weigh 6 billion tons

A neutron star is the remnants of a massive star that has run out of fuel. The dying star explodes in a supernova while its core collapses in on itself due to gravity, forming a super-dense neutron star. Astronomers measure the mind-bogglingly large masses of stars or galaxies in solar masses, with one solar mass equal to the Sun's mass (that is, 2×10^{30} kilograms/ 4.4×10^{30} pounds). Typical neutron stars have a mass of up to three solar masses, which is crammed into a sphere with a radius of approximately ten kilometres (6.2 miles) – resulting in some of the densest matter in the known universe.

<https://www.scientiaeducare.com/teaspoonful-neutron-star-weigh-6-billion-tons/>

Pic source: <https://images.app.goo.gl/zD2imBRreWLiTZyp6>

