



SCIENCE MAGAZINE

Issue no. 5 | October 2021

SEAQIS Training

Training Course on Science
Classroom Supervision

Event

The 12TH Governing
Board Meeting and SEAQIS
Consultative Meeting 2021

Science Fact

Tokyo Olympic Medals are
made From Recycles Electronic
Device



THE 12TH SEAQIS GOVERNING BOARD MEETING



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Dear readers,

The situation lately is getting better. The spread of the COVID-19 has decreased, but we must remain vigilant and continue to apply health protocols. SEAQIS have started its face-to-face programmes, even though the number of participants is limited. The blended mode is also still running.

This edition covers the Centre's activities in the last six months, including Training Course on Science Classroom Supervision, SEAQIS 12th Governing Board Meeting and Consultative Meeting, and popular science articles.

I wish the situation is getting better and better and everything gets back to the normal condition as we had before the COVID. Thank you very much, and have a pleasant reading.

Dr Indrawati
Director



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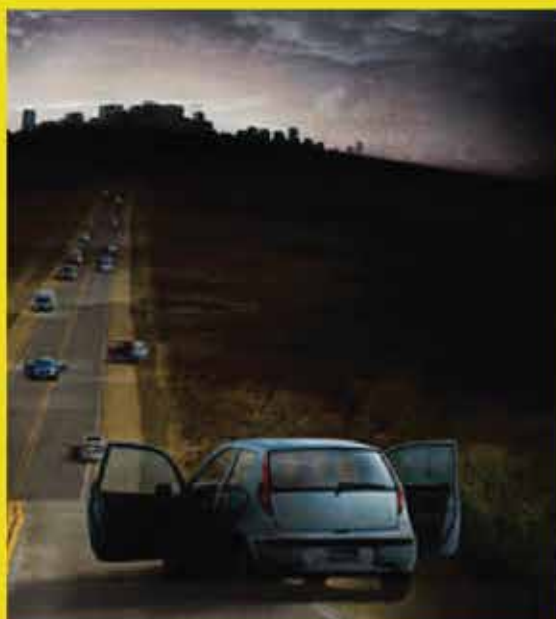
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Head of Divisions

Editor

Zuhe Safitra

Contributors

Zuhe Safitra
Amallia Yuliana
Nursidik
Aline Almandha
Acelyn A Orias
Yanti, M.Si.
Sharon M. Ananayo
Benny Yodi Sawuwu
Yueqi Wang

Layout & Design

Octo Reinaldy

Published by SEAMEO QITEP in Science
Jl Diponegoro 12, Bandung
West Java 40115, Indonesia

☎ +62 22 421 8739

☎ +62 22 421 8749

✉ secretariat@qitepinscience.org

🌐 www.qitepinscience.org

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find me at

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Hello Q-SCIENCE MAGAZINE readers!

Editor Message

Welcome to our fifth edition of Q Science Magazine. We would like to express our gratitude to God Almighty upon the publishing of this edition. We would also give our high appreciation to our editorial staff and contributors who had worked so hard to make this magazine publish.

Mistakes and errors in this publication might exist; therefore, critics, comments, and suggestions are very much welcome as they will help us improve the next edition. In this edition, we bring up our activities during the pandemic, including Training and events. We also have a contributor from our internship programme in collaboration with Globa Cultural Adventures, China.

We hope this magazine provides you with new information regarding the current issues in science.

Thank you very much, and have a good read.

partnership.qitepinscience.org



The New Paradigm in Education Supervision: The Training Course on Science Classroom Supervision



Quality assurance activities are needed to achieve educational management standards. It can be done through monitoring, supervision, and evaluation activities, which are carried out by supervisors and school principals. The capacity and commitment of principals and supervisors are very important to improve the quality of educational outcomes supported by teachers and education personnel in schools. One of the main roles of the school supervision system is to monitor the quality of education in schools.

To support the main role of the supervision system, SEAQIS held the Training Course on Science Classroom Supervision virtually using the synchronous and asynchronous modes for school principals and superintendents. This training was held for seven days, from 5 to 14 August 2021.

Through this training, school principals and superintendents were expected to improve the effectiveness of school management and quality assurance, so that they can contribute significantly in shaping the school environment into a scientific community. The participants of this activity consisted of 20 school principals and superintendents who had passed the selection process.

During the training, school principals and superintendents received knowledge from

various institutions, such as Prof Udin Saud (Indonesia University of Education), Ms Acih Suarsih (Primary School Superintendent of West Bandung Regency), Ms Nuraeni (Lower Secondary School Superintendent of Cianjur Regency) and also SEAQIS' Team: Dr Indrawati, Dr Poppy Kamalia Devi, Dr Elly Herliani, Dr Harry Firman, and Mr Lukman Nulhakim. The topics of the training were:

- Global education trends and issues, such as STEM Learning;
- the SEAQIS flagship programmes;
- the nature of science;
- the new paradigm of education supervision to increase the schools' performance quality; and
- academic supervision by school principals and superintendents during the pandemic



The basic concept of educational supervision is dominant in learning. Educational supervision makes schools a fun place for all parties. The steps of learning supervision expected to increase to build awareness of the professionalism of teachers are: paying attention, understanding, helping and guiding, fostering self-confidence, fostering self-evaluation, fostering and encouraging the development of initiative and creativity.

To strengthen participants' knowledge, Ms Achih Suarsih delivered how to conduct the academic supervision during the pandemic. According to her experience, several things need to be adjusted during the pandemic. One of them is the usual paper-based assessment instrument being converted to digital using the Google Form or Zoho application while maintaining the concept of the usual instrument.

FOUR LEVELS OF CHANGE IN PERSONAL BEHAVIORS

(Hersey & Blanchard, 1996)

Knowledge

Attitudes

Behaviour

Organizational Performance

1) PENDORONG TREN BARU DALAM PENDIDIKAN IPA³

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graph TD
    Globalisasi --> PerkembanganICT[Perkembangan ICT]
    Globalisasi --> RevolusiIndustri40[Revolusi Industri 4.0]
    RevolusiIndustri40 --> TuntutanSDM[Tuntutan baru terhadap Kualitas SDM (Keterampilan Abad ke-21)]
    TuntutanSDM --> ParadigmaBaru[Paradigma Baru Pendidikan IPA (Pendidikan IPA 4.0)]
    PandemiCOVID19[PANDEMI COVID-19] --> ParadigmaBaru
    PesertaDidik[Peserta Didik sebagai Generasi Z & Alpha] --> ParadigmaBaru
    ParadigmaBaru --> KecenderunganGlobal[Kecenderungan Global Pendidikan IPA Saat Kini]
  
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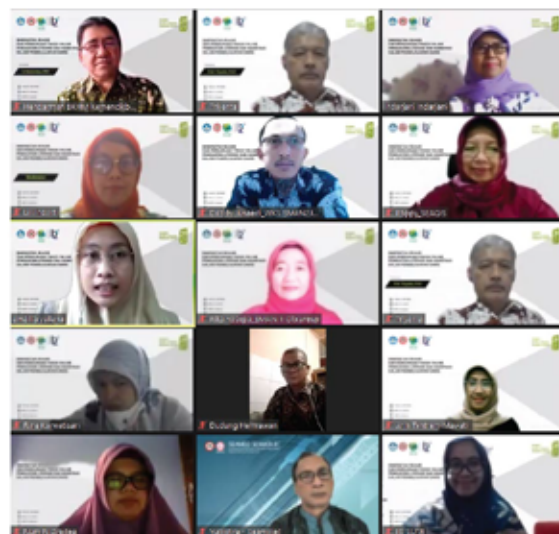
To celebrate its 12th anniversary, SEAQIS held a competition event to celebrate this event and closed with a webinar entitled Synergy between SEAQIS and Universities in Strengthening Literacy and Numeracy in Science Learning at the end of the celebration. The competition that was held was a Hands on Activity video making competition where the participants made a learning video in the form of a science experiment. The participants who were nominated as winners were also present online in the peak activity of the 12th SEAQIS Anniversary.

The announcement of the winners of the hands on activity video competition was carried out and witnessed directly through the zoom platform and the SEAQIS youtube channel. The three winners (1, 2 and 3) of the competition were Surya Arif Kartono for the third place, Mrs. Hanifah as the second winner, and Mrs. Septhy Dwi Jayanthi as the first winner in this year's SEAQIS birthday celebration competition. In addition, we also give appreciation to Mrs. Qurrota Ayun and Citra Roska Awaliyah as the 1st and 2nd favorite winners.

The highlight of the celebration of SEAQIS's birthday began with the signing of a memorandum of understanding between SEAQIS and the Faculty of Science and Technology, As-Syafiiyah University. This collaboration includes human resource competence, research and development, expert exchange, and community devel-

opment. After that, SEAQIS launched the first edition of the Journal led by Ir. Hendarman, PhD, Acting Head of the Bureau of Cooperation and Public Relations of the Ministry of Education and Research and Technology. The journal can later be accessed openly at the link journal.qitepinscience.org and can be downloaded for free.

At the end of the celebration, it closed with an interactive quiz using Kahoot. And the winner of the quiz also received an attractive souvenir prize from SEAQIS!





The 12TH Governing Board Meeting and SEAQIS Consultative Meeting 2021

SEAQIS have successfully convened the 12th Governing Board (GB) Meeting followed by Consultative Meeting from 15 to 17 September 2021. The meeting was conducted in online and offline modes. The offline mode was conducted in Grand Sunshine Resort and Convention, Bandung, West Java.

Mr Anang Risnanto, the acting Head of Bureau of Cooperation and Public Relations, Ministry of Education, Culture, Research, and Technology, opened the meeting officially. In his remarks, he stated that GB Meeting is an important moment for the Centre to report and shape its programmes and activities. He then further informed that the Ministry will keep supporting the efforts made by the Centre in leveraging the quality of education, culture, and science in the region. He also encouraged the Centre to synthesize the programmes with Ministry's strategic plan.

During the opening, SEAQIS conducted a Memorandum of Understanding (MoU) signing with two institutions, including HAFECs and Assemblr. This partnership is to improve the competence of science teachers and to develop learning resources in digital media.

Ten out of eleven GB Members were present in this meeting. Besides, there were also observers from the Bureau of Cooperation and Public Relations, Centre for Development and Empowerment of Teachers and Education Personnel in

Science. This year, the GB Meeting ran faster than before because the working papers had been sent to the GB Members weeks before the GBM, and they had sent the comments and inputs before the conduction of the GB Meeting. At this GB Meeting, ten working papers were presented, and the GB Members endorsed all the papers.

The GB Meeting was followed by a consultative meeting where SEAQIS proposed two programmes to be discussed. The programmes are Southeast Asia Climate Change Education Programme (SEA-CEP) and SEAQIS Alumni Empowerment Programme. At this meeting, the GB Members provided inputs and comments for the programmes to strengthen the implementation of the programme later on.

The GB Meeting and consultative meeting were concluded with the proceedings writing. The proceedings is a report contain detailed information during the meeting and will be submitted to the GB Members after the meeting to seek approval. During the event, SEAQIS implemented a strict health protocol where participants who attended were required to show a negative result on the antigen test, always wear a mask, and keep a distance during the meeting.





Tokyo Olympic Medals are made From Recycles Electronic Device




The recycled material was obtained as a result of a campaign to ask the public to donate their old electronic devices to the medal-making project.

Over the course of two years, the Tokyo Medal Project collected enough materials to be recycled into about 5,000 bronze, silver and gold medals. Up to 90% of cities and villages in Japan are participating in this project, by setting up collection points for used electronic equipment.

Hundreds of thousands of Japanese even donated old electronic devices that they no longer use. Overall, the recycling campaign yielded about 32 kilograms of gold, 3,750 kg of silver and more than 2,400 kg of bronze. The items collected in total weigh almost 80 tons.



Seahorse, The only male Animal That Gives Birth



Seahorse eggs are still produced by female seahorses. The eggs that have been produced by the female seahorse are released and then stored by the male seahorse in his stomach to be fertilized and guarded for 10 days to 6 weeks, until the eggs hatch. The male seahorse will lay the eggs in the brooding bag and simultaneously release the sperm to fertilize the eggs.

The egg is fertilized by a sperm, and then begins to develop into a baby seahorse. The incubation period depends on the temperature of the water and the type of seahorse. Generally incubation lasts 8 to 21 days. In one birth, a seahorse can give birth to between 15 and 1000 small seahorses.

We Can't See the Sun directly withour eyes



Sunlight that is right on the eye, will burn the eyeball. This process is very similar to how sunlight can burn the skin. The heat emitted by UV rays is concentrated so intensely on the cornea (the transparent outer layer of the eye) that the cornea begins to blister and crack. This damage is known as photokeratitis. Symptoms usually appear a few hours after the first exposure and begin with excessive tear production, red and inflamed eyes, then a gritty, gritty sensation like you are rubbing your eyes with sandpaper.



SEAMOLEC's Effort in Fostering Global Citizenship through Sales Competition

Global Citizenship is a broad concept and has a different layer of perspectives, one way is to see it as the practice of cultural empathy or intercultural competence, which are commonly articulated as a goal of global education. For students, becoming global citizens can benefit them in other ways—skills such as problem-solving, communication, collaboration, and cross-cultural awareness will benefit them immeasurably.

Another crucial field of globalization is sales and business that will grow global and demand high-skilled sales professional across the globe. Business to Business (B2B) marketing is believed to be very important in today's

business and online world. Meanwhile, there is a shortage of sales graduates, those with critical thinking combined with the relevant skillset.

However, in Southeast Asia, very few universities actually teach sales. Sales competitions address this need. They introduce the sales processes and ethical nature of professional selling skills to universities. Competitions allow individuals to learn valuable life-long skills, such as ethics, listening, building trust, and fulfilling client needs. It is a win-win for students as it raises their professional practices, and for the businesses as it creates a win for the client or customer.



Opening Speech Minister of Education and Culture of Indonesia NADIEM ANWAR MAKARIM



chandy soun

South-East Asian



SEAMOLEC has been involved in a cross-country project called the Southeast Asia Sales Competition (SEASAC). It is a three-year project (2019-2021) funded by Erasmus+ Capacity Building in the field of higher education. This project aims to strengthen Southeast Asian Universities' capability to provide highly skilled B2B sales professionals for the emerging international markets. Existing European knowledge and experiences in the development of pedagogy sales education will be utilized and being adapted into rich Southeast Asian cultures. The SEASAC consortium consists of 4 European universities (Finland, Austria, Scotland), 2 Thailand universities, 5 Indonesian universities, and SEAMOLEC.

At the beginning of the project, all activities were conducted face to face. Right after the pandemic hits in early 2020, all activities were forced to be changed into an online mode for alternative scenarios.

The South-East Asian Sales Competition (SEASAC) that was held from 3-5 March 2021 was the biggest event for the consortium members. Hosted virtually by Parahyangan Catholic University (Unpar) and technically supported by SEAMOLEC, this competition successfully invited 187 registered participants from 40 institutions: 81 students as competitors from 11 countries and also 106 lecturers/ educators/ business representatives as judges/ buyers. The competition was officially opened by H.E. Minis-

ters of Education of Indonesia and Thailand. This competition was held virtually by utilising the Talque platform integrated with Zoom.

The Next SEASAC will be held in early 2022. For more information related to the project please visit the official website:

<https://seasalescompetition.com/> or follow the social media accounts:

Instagram: @seasac_project

Facebook: @SeasacProject

Youtube: SEASAC Project South-East Asian Sales Competition

Twitter: @SeasacP



Performance Task: Making Science easy through Arts and Crafts

By: Acelyn A. Orias
(Fernando Ma. Guerrero Elementary School, the Philippines)

This past year has been rough for humanity. The crisis brought by COVID-19 pushed us to our very limit, changed the way we perceived life and made us put things into perspective. Negativity consumed every facet of our lives, which affected us a lot physically, emotionally, and mentally. As an educator, this posed an enormous challenge in keeping learning sustainable. Eliminating face-to-face interactions became the primary roadblock in delivering quality education for our children. Adjustments have been made, new teaching strategies were introduced, and specific action plans were put in place to ensure our students get the best education they deserve. But despite all of the efforts we have put in, and all the energy we exhausted, there is always a doubt in the back of our minds: have we done enough to fulfil our goals? What are we missing?

We kicked off the SY 2020-2021 following these learning modalities: blended, modular and distance learning. Though the methods were not fully recognized by the majority of the educational institutions here in the Philippines, these filled in the gap to allow continuance while we are struggling to keep ourselves safe during this pandemic. And it was great - we were able to reach out to our students remotely and share the lessons specifically designed to fit the current situation.

Weeks have passed, I noticed something odd during our online classes. Though the students were present, I felt like they never truly understood the lessons we discussed. I'm teaching Science at the Primary level, and traditionally our sessions are lively and full of interaction. Students would collaborate in group experiments, share their ideas and solve problems on their own. I realized this is what's missing - the limited time given for every online session doesn't drive motivation to learn; the materials we use are not enough to cover the most important part, which is discovering the magic of Science on their own. I thought to myself: there must be something I can do, at the very least, to turn this around, right?

I started experimenting with our lessons and materials. During our online meet, I would explain the topic as is, using videos/online educational resources to aid the discussion. Before we ended the class, I would remind my students about a performance task they need to do in their own time - an experiment they can work on by themselves. One activity I had them do was to replicate the different layers of soil. To make this interesting, I advised my students to use edible materials to represent the different layers - candies, chocolate bits, gummy worms, powdered milk, and many others. Then, they would put it all in a jar, arranging the edibles per layer, and labelling the outside of the jar per layer as well. The students were excited about this activity, not only because it incorporates art, but also because they can consume their work afterwards. They submitted photos of their output (which were very artistic by the way) and sent me messages like they can't wait to turn in the photos so they can eat their candies already. It was hilarious.



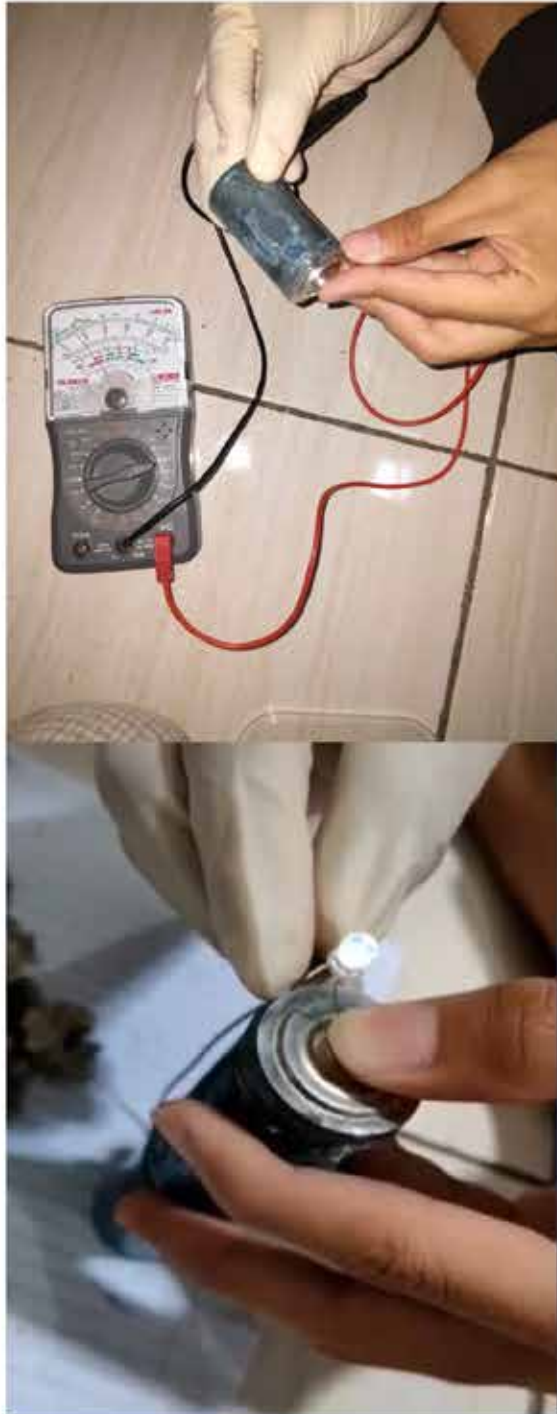
Another task I gave was to create an artwork about how solid materials are bent, pressed, or cut. This time, I asked my students to create an emoticon using the materials readily available at home, under the supervision of their parents. The emoticon should show or describe how they feel while doing the activity. I never realized that my students were descendants of Pablo Picasso. I admire how each of them came up with their ideas, and how they expressed their feelings through this simple task.



Another task I gave was to create an artwork about how solid materials are bent, pressed, or cut. This time, I asked my students to create an emoticon using the materials readily available at home, under the supervision of their parents. The emoticon should show or describe how they feel while doing the activity. I never realized that my students were descendants of Pablo Picasso. I admire how each of them came up with their ideas, and how they expressed their feelings through this simple task.

Physics Learning is Fun

Written by: Yanti, M.Si.
SMA Al Muttaqin Kota Tasikmalaya



The STEM (Science, Technology, Engineering, and Mathematics) approach is an approach that links and integrates STEM subjects to create learning based on problems of everyday life. The STEM approach in learning is expected to produce meaningful learning for students through the integration of knowledge, concepts, and skills systematically so that they can train students in applying the knowledge learned in school with phenomena that occur in the real world. Some of the benefits of the STEM approach are students become better at problem-solving, innovative, independent, logical, scientific, and technologically literate. The practice of science and engineering in the STEM approach is divided into eight components that can be chosen in solving problems in learning. The eight components consist of asking a question and defining the problem, developing and using a model, planning and conducting the investigation, analyzing and interpreting data, using mathematical and computational thinking, constructing explanation and designing the solution, engaging in argumentation and proof, and collecting, evaluating, and communicating information.

Making bio-battery as a source of renewable electrical energy can be applied in STEM learning. This learning can improve students' psychomotor abilities or skills in making bio-battery by utilizing battery waste and tofu solid waste. Science is viewed from the physics concept, namely renewable electrical energy; Technology is seen from making bio-battery by utilizing battery waste and solid tofu waste; Engineering is seen from designing bio-battery and characterizing electrical quantities, and Mathematics is seen from analyzing the results of current and voltage measurements in calculating power values and electrical energy generated. The integration of these several disciplines into one unit is expected to produce competent and qualified students not only in terms of concept mastery but also in applying them to life.

The biobattery has an electric current and voltage that is not much different from a new battery of the same type. The addition of vinegar caused the stable values of the current and voltage. This study shows that battery waste and tofu solid waste with the addition of vinegar can be used as biobattery. Biobattery produced from tofu solid waste with the addition of vinegar produced greater electrical energy than biobattery from tofu solid waste without the addition of vinegar. The values of current, voltage, electrical power and electrical energy of the biobattery are 0.5 A, 1.5 V, 0.3 W, and 108 J.

The bio-battery produced was joined a national competition, namely the STEMINC (Science, Technology, Engineering, and Mathematics Innovation Exhibition) competition and inter-

national competition, namely the Africa Science Buskers Festival (ASBF). Al Muttaqin Senior High School team with their work entitled The Utilization of Battery Waste and Tofu Solid Waste for Bio-battery as A Renewable Source of Electrical Energy won a gold medal at the international competition of Africa Science Buskers Festival (ASBF) in 2021. This team consisted of one male student namely Azhar Ahmad Fauzy, and three female students namely Tazkia Alfia Humaida, Ghenia Ghizwanya Kaffah, and Najma Arsyah Karima under the guidance of Mrs Yanti. Before this work won an international title, this work first became a national champion in the 2020 National Science Technology Engineering and Mathematics Innovation and exhibition (STEM INC) competition.



INNOVATION & RESEARCH - GOLD MEDAL

2021 Africa Science Buskers Festival



Azhar Ahmad Fauzy
Tazkia Alfia Humaida
Ghenia Ghizwanya Kaffah
Najma Arsyah Karima

SMA Al Muttaqin

Indonesia

How We Help in Restoring the Environment

Sharon M. Ananayo (San Antonio Integrated School)
YES-O adviser

Environmental issues have been a major concern globally. The worsening of climate change, the rise of pollution levels, ozone layer depletion, and loss of biodiversity are just among the environmental problems that threaten the existence of humankind. People have become careless about the environment. But with the effects of environmental issues that are being felt, some are taking action to provide solutions to these problems.

Being aware of these environmental issues, the Department of Education mandated the establishment of the Youth for Environment in Schools Organization (YES-O) through DepEd Order NO. 72, s. 2003. As a response, San Antonio Integrated School has been yearly organizing the YES organization to serve as a venue for students' actions and movements toward safeguarding, protecting, and conserving the environment. The organization spearheads the establishment of specific and doable programs, projects, and activities to raise awareness and to address issues and concerns about the environment.

The YES-O officers and members have been conducting clean-up drives inside and in the surrounding of the school, including the community. They lead the segregation of wastes per classroom and its transfer to the Materials Recovery Facility. In the MRF, the residuals are being collected monthly by the Municipal Environment and Natural Resources Office (MENRO) which the organization has partnered. Papers are being recycled to become papers again and are used by the students as activity sheets and in the making of their portfolios. Plastic bags are compacted in plastic bottles and are cemented forming structures just as a garden set. Some plastic bottles and junks are used in the making of lanterns to serve as entries to the Municipal Lantern-Making Contest which the municipal government unit conducts every December. These lanterns have been garnering awards and monetary prizes. Other plastic bottles and junks are sold to a nearby junk shop to generate funds for

YES-O projects. The biodegradables serve as food for the African Nightcrawlers which in return produce vermicasts for the school garden.

The organization has also been joining environment camps organized by the Division to heighten students' awareness of environmental issues. During September, which is proclaimed as National Science Month, the organization spearheads the conduct of a series of activities just like the conduct of culminating activity to showcase students' talents in recycling, poster and slogan making, essay writing, and jingle composition that focus on addressing environmental issues. A resource speaker is being invited to conduct a seminar related to the environmental theme. Tree planting is also done to increase the number of trees that would serve as lungs of the earth.

The emergence of the COVID-19 pandemic did not hinder the conduct of these activities. YES-O members have joined digital poster-making contests and garnered first place in the district and division levels. They also conducted tree planting activity within their areas and clean up drive on roads adjacent to their homes. Recycling was also done by them in addition to their use of recycled papers to serve as their answer sheets and in the making of their portfolio.

The YES organization, even if it is small, will continue to conduct activities as a contribution to restoring the environment. It's because the organization believes that "great things are done by a series of small things brought together" - Vincent Van Gogh.



Our entry to the annual Municipal Lantern-making Contest during the old normal which garnered first place. It is made up of recycled plastic stuffs.



Selling of junks to a nearby junkshop.



Plastics are compacted in plastic bottles and are cemented to form structures like the vermicom and garden set.



Tree planting, Recycling, Clean up drive in the new normal



collection of residuals for the Municipal Environment and Natural Resources Office which the YES organization has partnered with.



Community clean-up drive during the old normal.

From Writer-Director

M. NIGHT SHYAMALAN

Movie Review:

We've Sensed It.

We've Seen The Signs.

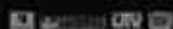
The Happening

Directed by : M. Night Shyamalan
 Produced by : Barry Mendel, Sam Mercer,
 Jose L. Rodriguez, John Rusk,
 M. Night Shyamalan
 Written by : M. Night Shyamalan
 Starring : Mark Wahlberg, Zooey Deschanel,
 John Leguizamo, Ashlyn Sanchez
 Genre : Science, mystery, disaster
 Running time : 91minutes
 Distributed by : 20th Century Fox de Argentina
 Release date : 13 June 2008

The strange and terrifying smell of death suddenly permeated every corner of major American cities, which completely destroyed the ability of human beings to control their behavior. Philadelphia high school teacher Elliot Moore (Mark Wahlberg) and his wife Alma (Zooey Deschanel), along with an eight-year-old girl named Jess (Ashlyn Sanchez), were desperate to escape this mysterious but deadly environment. They drove all the way for the farms in Pennsylvania, hoping to avoid this terrifying and growing attack. However, they also quickly realized that no matter where you fled to, you could never be truly safe. Elliot decided to help his shattered family survive until he got a glimpse of the truth that lied beneath the surface.

MARK WAHLBERG
 THE
 HAPPENING

FRIDAY THE 13TH · JUNE · 2008





The film is based on a series of real events: honeybees are disappearing in large numbers in the United States and Europe, and similar phenomena are said to be occurring in Japan and other regions. This seems an absurd event, but it really happened to our earth. Some scientists predict that the loss of bees will lead to the loss of many crops, leading to food shortages in the long term. Some scientists through some analysis identify that accidents in the development of genetic biological weapons by western countries caused this.

Plants, as different types of life from our communication systems, have their own powerful communication networks. They receive feedback from the air, the soil, and other living things all the time. Venoms, serrated teeth and other protective mechanisms are abilities that plants have evolved over millions of years of natural succession. They've evolved new defense mechanisms and even attack abilities to improve their chances of survival.

Urban plants are no longer equivalent to "nature". Different soil substrates, biodiversity, ultraviolet radiation, air pollution, and unhealthy interspecific competition all present new challenges for urban plants. I strongly believe that urban plants are developing new defense mechanisms. They are learning how to adapt to new environments and even fend off potential damage by learning new ways to attack. This is a normal and necessary evolutionary process for challenging plants. No matter how much we beautify our relationship of urban plants, urban plants are no longer truly natural, and this beautification of the relationship will not move the plants.

Life is difficult to live in isolation. Just as humans are social animals, plants to rely on intra-specific and inter-specific communication

and cooperation to constantly respond to their environment. The negative effects of people living in groups have been a threat to plants, which is the persecution of one group against of another. And it also means that the persecuted group needs to respond collectively to ensure its survival. In the film, the number of crowds will affect the release of poison gas, which may be the screenwriter's response to "the influence of human groups". In other words, I think the writer is emphasizing that people should realize that they are only one part of the ecosystem and don't try to overstep their authority to be the ruler.

In addition, what I really appreciate about this film is that it doesn't try to fight against this event, but constantly emphasizes the "unknown natural phenomenon", which seems to be a helpless compromise to this disaster, and also seems to emphasize the insignificant existence of human beings in the ecosystem. As a part of the operation of nature, human beings are only one of hundreds of millions of roles. Before the huge natural system, it is difficult to have the ability to reverse the operation. Just as when the red tide comes, fish can only choose to escape rather than fight.

It reminds me of the lines of the film which says "a warning, like the first rash on the skin." This is a warning against "human hegemony". Any creature that has been hegemonic in history will be dealt a fatal blow, such as an extinction, a new equilibrium or a new hegemony. The films received 17% rating from 185 reviews and certified as "rotten" by Rotten Tomatoes and grossed more than \$64.5 million in the US.

False Remembering and Overconfidence in Chemical Equilibrium Problem Solving

Benny Yodi Sawuwu

SMA Katolik Santu Petrus Pontianak, West Kalimantan, Indonesia

Corresponding author: benny@smapetrus.net

ABSTRACT

This study aimed to analyze the students' problem-solving in chemical equilibrium toward the metacognitive aspects in their remembering and their belief. This was a descriptive study. A number of 31 bilingual senior high school students (16 males and 15 females) has participated in this study. Data of chemical equilibrium problem solving were collected by a three-tier test and data of metacognitive aspects were collected by a self-assessment metacognition questionnaire. False remembering of students in the chemical equilibrium problem solving was analyzed by reduction of students' framework in their problem-solving. The overconfidence of students was a type of students' calibration in meta-cognitive judgment as a difference between their perceived performance and their actual performance. The result indicated that a false remembering in students' chemical equilibrium problem solving has been identified. Their unawareness about their false remembering was detected as their overconfidence increased, especially in male students.

Keywords: chemical equilibrium problem solving, false remembering, overconfidence

Keywords: STEM, chemical equilibrium problem solving, false remembering, overconfidence

INTRODUCTION

When problem-solving was conducted to students, investigated there were two errors: systematic error and random error [1]. A systematic error was due to learning difficulty in understanding the theories, concepts, or processes, or often mentioned as alternative conceptions or misconceptions, like in chemical equilibrium such as about equilibrium characteristic, constant, stoichiometry, equilibrium changing, and gas law [1-3]. The random error was due to the lack of relevant knowledge as the fixedness of reasoning such as hastiness, thoughtlessness, overcapacity of the memory, or the dependent tests, like about arithmetic relationship, reaction rate relationship, equilibrium approach, Le Chatelier application, the constant of the equilibrium constant, and heterogeneous equilibrium [4-6].

Problem-solving skill was a general researched metacognitive activity [7-10], even in chemistry education. In this activity, one will judge to decide for his/herself and calibrate self-ability measured as judgment accuracy [11-15]. There were two judgment accuracies, they are relative accuracy or resolution and

absolute accuracy or calibration [16]. Calibration was expressed by differences between actual performance and perceived performance [11, 16]. The resolution showed prediction about one's metacognitive judgment on one thing to something that was usually expressed by the correlation coefficient [16]. These judgment accuracies can classify self-calibration degree, what one was so overconfidence/overestimate, confidence-realistic, and underestimate [11, 14, 17].

This confidence judgment method and remember/know/guess method were strictly equivalent [18]. Subjects can adopt different methods for remembering plurality information, be more or less willing to engage in recall-to-reject reasoning, and have different interpretations of the "negative remembering" response [19]. A single-process signal-detection model has trouble accommodating high-confidence familiarity-based decisions made with high accuracy, whereas a dual-process signal detection model does not [20]. The one-dimensional signal-detection model of remember-know judgment showed about the schema

of judgment deciding to know or remember [21]. This model was commented [22] and defended by the authors who added their suggestion that no single criterion can be used to evaluate models, and perhaps the true model will contain the present ones as special cases [23]. The recollection was highly similar indicators of a single memory retrieval process, and the measures of familiarity are interchangeable measures of one [18]. Recollection and familiarity are the continuous processes that contribute to their recognition decisions [24].

For notions of memory accuracy, all memories are to some degree false and that the main role of memories lies in generating personal meanings [25]. False memories were affected by sleep deprivation on susceptibility, which can have dire consequences [26]. False memories can be the result of conscious recollection and not only of general familiarity [27]. False remembering was due to one does some effort to think or compare new knowledge to the knowledge he/she had before. Because he/she works hard to construct the memories, it made one became more difficult in remembering [28]. When difficult in remembering, the memory associated the familiarity of phenomenological experiences and elicited the false remembering [29]. According to the data above, a false remembering and confidence degree of students may occur during problem-solving activities of chemistry students. This research was conducted to rethink again in another perspective about chemistry problem-solving. Especially in, chemical equilibrium which was marked as a difficult topic for chemistry students. This study aimed to analyze the students' problem-solving in chemical equilibrium toward the metacognitive aspects in their remembering and their belief.

METHOD

Participant

This was a descriptive study of 31 bilingual senior high school students (16 males and 15 females) in XI grade. All participants were usually guided by their teacher especially in chemistry lesson to have guided problem-solving in every task or assignment. All participants were given the tests and the questionnaire sequentially.

Data Collecting

Data of chemical equilibrium problem solving were collected by three chemical equilibrium

problem-solving questions and data of metacognitive aspects were collected by a self-assessment metacognition questionnaire. The topics of the problems respectively were peroxide dissociation, ceramic production, and the bread-making process. The problems were arranged based on the chemical problem criteria of [31]. Content validity scores by Gregory Test were 1.00 for question 1, 0.89 for question 2, and 1.00 for question 3. The results of the preliminary field test of this instrument were of 100% relevance in both the language and the understandable statements and 78% relevance in the thinking and comprehension level in problem-solving.

The self-assessment metacognition questionnaire arranged with combination between the items of metacognitive knowledge dimension adapted from General Metacognitive Strategy Inventory planned by [30] and problem-solving steps M-IDEALS (motivation – identify – define the context – enumerate the choice – analyze – list reason – self-correct) that was planned with combination between [31] and [32]. Perceived performance based on the metacognitive knowledge: declarative knowledge (DK), procedural knowledge (PK), conditional knowledge (CK). Actual performance based on the problem-solving steps: motivation (M), identify the problems (I), define the context (D), enumerate the choice (E), analyze options (A), list the reasons (L), self-correct (S). There were 20 indicators measured in this questionnaire as mentioned in Table 1. The content validity score of the questionnaire by Gregory Test was 0,99. The results of the preliminary field test of this instrument were 95% relevance in both the language and the understandable statement and of 90% relevance in the assertiveness meaning. The reliability based on Cronbach Alpha was 0,75 for the whole items.

| <i>Perceived Performance</i> | <i>Indicator</i> | <i>Actual Performance</i> |
|------------------------------|-----------------------------------------------------------------|---------------------------|
| DK | Motivation to solve the problem | M |
| DK | Anxiety control | M |
| DK | Identify similar problem model | I |
| DK | Belief in the comprehension of the problem | I |
| DK | Identify important information | I |
| DK | Target determination | I |
| DK | Think the possible strategy | D |
| DK | Know how to organize the strategy | D |
| PK | Assumption determination | D |
| PK | Developing the plan from the strategy chosen | E |
| PK | Making chemical equation | E |
| PK | Analyze the factors engaged in the chemical equation | A |
| PK | Use the other knowledge to solve the problem | A |
| PK | Analyze quantitative aspects | A |
| PK | Think any possible ways that could be done to solve the problem | S |
| CK | Check the progress of problem-solving | A |
| CK | Effective time management | L |
| CK | Determining the assumption chosen has been correct | L |
| CK | Checking the method used has been correct | S |
| CK | Have a belief in problem-solving that has done | S |

TABLE 1. Indicator Measuring Perceived vs Actual Performance

DATA ANALYZING

All answers of students were transcribed as descriptions of their student problem-solving skill framework. False remembering of students in the chemical equilibrium problem solving was analyzed by reduction of students' framework in their problem-solving. In this step, some errors were identified and interpreted to students' understanding of the error identified.

The confidence degree of the student was a type of students' calibration in metacognitive judgment as a difference between their perceived performance and their actual performance. Every attainment of each indicator was the score as one so that the total was twenty for all indicators. Perceived performances were identified as students' judgment on the self-assessment questionnaire while the actual performances were identified as judgments made from the students' attainment of problem-solving steps score. Three categories were classified into under-confidence, realistic, and overconfidence. According to [11], the basis for classification was based on the margin of error. The margin of error of the scale was determined by multiplying the standard error of indicators' scores to z-score insignificance 0.05. The under-confidence categories were occupied by students having the calibration score of one scale under the negative margin of error. Realis-

tic students were categorized as a range between -1 to +1 of the margin of error. While the overconfident students were classified if the score was above one scale margin of error.

RESULT AND DISCUSSION

Transcription about students' framework in chemical equilibrium problem solving resulted in some error identification as shown in Table 2. On that table, there was identified two clusters of students' errors in chemical equilibrium problem-solving. The first part was about the question error perspective. The question error was identified as the error that was found in terminology in question given, the symbol used in question given, new information given on the question, and new word as unusual for students found in question given. The second part was about the answer error perspective. The answer error was identified as the model of answer students posed. The reduction of students' framework was classified as phenomenological and formalism answer.

Terminology in these problems given can trap the students to have another understanding of the terms used. As mentioned in Table 2, investigated that the similar words that students knew before, scattered the focus of students to select their memories about them. For example, about

the term 'dissociated', when students found this word, they recollect all data in their memories that related to the term. Analysis of the chemistry topics that students have learned before the chemical equilibrium topic, there were found some terms similar with this term, like dissociation degree in measuring the ionization/dissociation degree and dissociation reaction in enthalpy changing. The first meaning was older than the second meaning. And the first meaning was easier to be understood. This case made the

students have high confidence to select the memory about the first meaning. But the new item or the second meaning was nearer to be recalled. This difficulty was found when the students found the familiarity and recollecting the memory [29] in consciousness [27] and were difficult to reconstruct the recalled memories [28].

| Error Identification | Example | Students' understanding |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminology in question | Hydrogen peroxide (H_2O_2) is a reactive toxic liquid that will be <i>dissociated easily in a radical reaction</i> if exposed to light. | Dissociation mentioned means dissociation degree |
| | ... What will you do to dissociate peroxide effectively? | Effective means how to fold the product |
| Symbol in question | X in hydrated formula | Changing the X with metal or catalyzed |
| | Δ embedded in the arrow of the combustion reaction | Changing the X with the mole of hydrates Δ must be changed by catalyzed |
| New information | Gluten is the protein in wheat flour that yield elastic tissue to restrain gas CO_2 | Gluten is not contained in the flour |
| New word | "Peeled", "yield", "furnace", "restrain". | Using another word means another meaning |
| Phenomenological answer: Factor affecting the reaction | Catalyst | Ignoring the role of the catalyst A catalyst increases the shift of chemical equilibrium reaction |
| | Volume | Gas volume was the amount of the gases Gas volume was similar to the room volume Room volume was similar to the gas volume even after the addition of some solid in the room |
| | | Volume was similar to the pressure |
| | | An exothermic reaction was not related to the temperature |
| | Pressure | Every numerical data has to be calculated |
| | Temperature | Every equation and law should not follow some assumption or condition |
| Formalism answer | K_c and K_p | Every numerical data has to be calculated |
| | Using gas law in not gaseous condition | Every equation and law should not follow some assumption or condition |

TABLE 2. Error Identification in Students' Chemical Equilibrium Problem Solving

This explanation can be used to reveal other errors identified in question errors. There are so many symbols used in math and natural sciences, especially in chemistry. The non-understood memory in students minds about the use of every symbol will convey the errors in interpretation about the question. New information given was not about false remembering, but false prediction and false interpretation about the meaning of data given.

This case directs the students to have the misconception about their question understanding. Include the new word used, however, the meaning was similar to the old words used as common before. The errors in question automatically impacted the answer they posed. As mentioned in the introduction of this paper, some errors were identified in this students' answer. Analysis of their answer revealed the

rate reaction concepts were mixed and embedded to chemical equilibrium. The students found some familiarity with this similarity. According to the identification of the review before the test given, the students have known about the concepts in chemical equilibrium, even teachers taught or gave the review and enrichment of the concepts. From Table 2, the students' perspective in using the chemical equilibrium shift factors tended to convey them to do some errors. They were puzzled about the failure of recollecting caused by the familiarity identification in their mind. We found that the errors were identified in the inter-topics in chemistry like reaction rate and chemical equilibrium, for example, catalyst. The other was the error in the inter-subtopics in a chemistry topic like the use of calculated data combined with factors affecting the chemical equilibrium shift. The last found from intra-subtopic in a

chemistry topic, like the relationship among the factors affecting the chemical equilibrium shift.

Figure 1 found that the students tended to be more over-confident, and the male students were more over-confident than the female students. While there was a trend that the female students tended to be more under-confident. This was because of the differences in the characters between male and female students in learning chemistry. Results of research conducted by [33] indicated that epistemological beliefs contribute to students' purposeful choice of study strategies. These statements showed that a female always carried on her weakness by examining herself in everything she did. It was supported by the work of her optimum brain in sensing and managing what she did to be aware of where was her position in the solving frame designed.

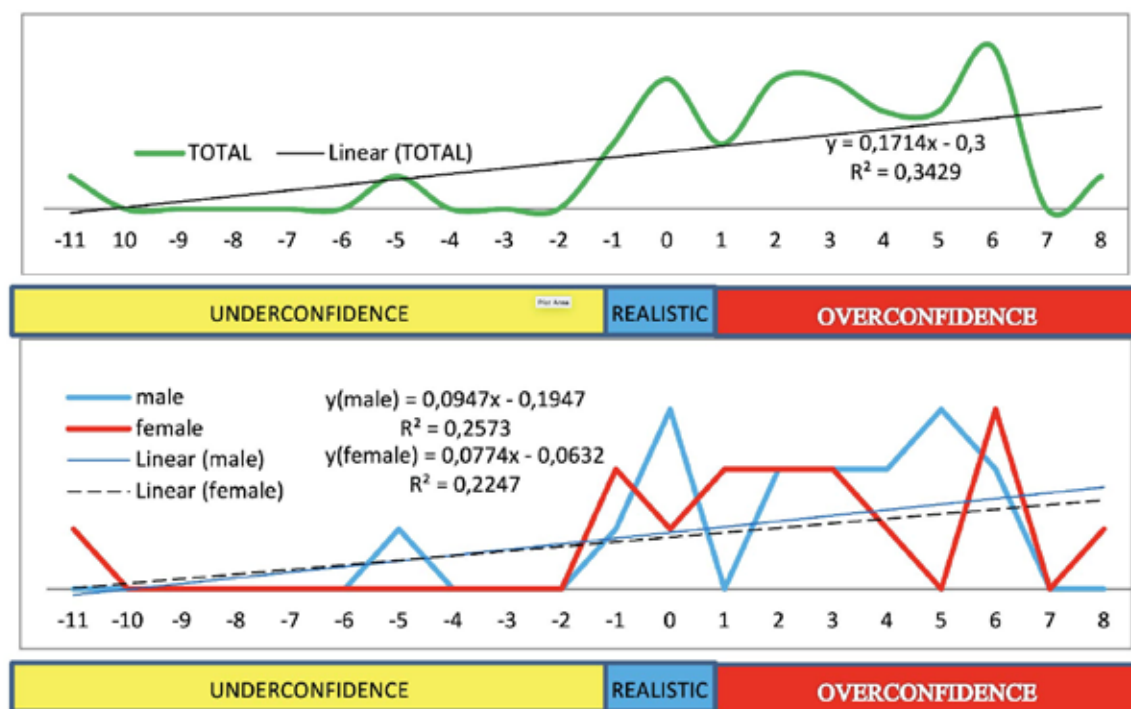


FIGURE 1. The margin of error scale in Students Self-Calibration of Chemical Equilibrium Problem Solving: [TOP] for the total of the students; [BOTTOM] for each male and female student

The male students tended to increase their confidence while their performance was lower than their expectation or their perceived judgment. This confidence became better when they had good conditional knowledge. The students having better conditional knowledge can make decisions better in the situation given, like limited time, the crowded of data,

and new application problems. Thus, if their conditional knowledge was better, they would be realistic to judge themselves and can predict the correct calibration about themselves. Through the determination of check-recheck activities, balancing their self-belief in judging their certainty or confidence during solving the chemical equilibrium problem, and selecting

the correct memories when they scanned for familiarity and recollecting between the knowledge they had before (like reaction rate and others), the students themselves would be better in realistic judgments.

CONCLUSION AND SUGGESTION

A false remembering in students chemical equilibrium problem solving has been identified as a predictor of advanced errors in their chemical equilibrium problem-solving skills. Their unawareness about their false remembering was detected as their overconfidence increased, especially in male students.

For educators who had the experiences like this problem in their chemistry class, I suggest some cases below.

1. Train your students to understand the different words, do not always use similar words in every question.
2. Train your students in self-assessment, exposing to them the point that they have to mastery.
3. Give feedback to your students about the wrong aspects they made.

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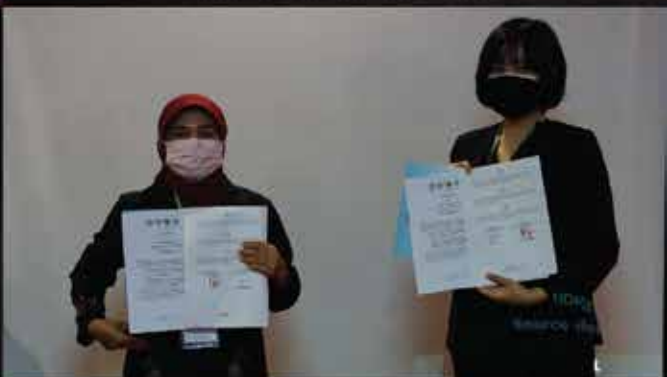
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Internship Programme

My name is **Yueqi Wang** from Capital Normal University. During the summer vacation, I officially started the online internship of international organizations. I thought there would be a lot of difficulties, but with the help of GCA teachers and heads of international organizations, everything went well.

From the previous interview, you can feel very professional. GCA teacher was also very good to help both sides communicate. During the internship, I communicated with the mentor through the DingTalk app, which was very convenient and greatly improved the work efficiency. Every 1 – 2 weeks, the mentor arranged some tasks for us. In this process, I gradually understand what news international organizations are paying attention to and increase my vision. The mentor was very enthusiastic and encouraging my work. I believe that this internship could increase my competence since I deal with an international organisation.

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The Eiffel Tower can be 15 cm taller during the summer

When a substance is heated up, its particles move more and it takes up a larger volume – this is known as thermal expansion. Conversely, a drop in temperature causes it to contract again. The mercury level inside a thermometer, for example, rises and falls as the mercury's volume changes with the ambient temperature. This effect is most dramatic in gases but occurs in liquids and solids such as iron too. For this reason, large structures such as bridges are built with expansion joints which allow them some leeway to expand and contract without causing any damage.

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