



Pandemi COVID-19: Inikah Hasil Pendidikan Indonesia Selama Ini?

Page 9

Test Less,
Learn More

PAGE 14

Belajar Matematika,
Belajar Peduli
Sampah Plastik

PAGE 30

How I Teach
My 7th-Grade Students
The Expansion of
Algebraic Expression
by Connecting Mathematics
Concept to The Local
Cultural Context

PAGE 38

Desain Didaktis
Luas Daerah Segi Empat

PAGE 41

Did you Know

8 The Lady with the Rose Chart

Focus

9 Pandemi COVID-19:
Inilah Hasil Pendidikan Indonesia Selama Ini?

25 Smartphone dan Covid-19

Reader's Voice

14 Test Less, Learn More

20 Teknologi dalam Belajar Mengajar Matematika:
Bermatematika Dahulu, Teknologi Kemudian

Best Practice

17 Shifting Multiplication Perspectives in Lower
Primary Level

41 Desain Didaktis Luas Daerah Segi Empat

Call for Submission

24

Development & Innovation

30 Belajar Matematika,
Belajar Peduli Sampah Plastik

You May not Know

33 A Quest for a New Settlement:
Where is the new spring?

Math Challenge

33 Tableclothing Arts

Math Around Us

34 Menaksir Tinggi: Membawa pramuka
dalam kelas matematika

36 Serving a Vietnamese traditional dish with a
mathematical concept

38 How I teach my 7th-grade students the
expansion of algebraic expression by connecting
mathematics concept to local cultural context

Hall of Fame

43 Math Conservation Project

44 Learning and Competing by Exploring
Mathematics Around the School

45 Parabolic Bridge Culminating Activity

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Message from Director **Dr. Sumardiyono**

Assalamu'alaikum wr wb.

I/ Salam buat semua pembaca SEAMETRICAL di mana saja berada di seluruh Asia Tenggara. Senang sekali, saya dapat menyambut peredaran perdana buletin dari SEAQiM ini.

Sudah menjadi komitmen kami, untuk membantu guru dan tenaga pendidik matematika untuk meningkatkan kompetensi terkait tugas tanggung jawabnya dalam membelajarkan pengetahuan, keterampilan dan sikap para anak didik yang dihadapi. Oleh karena itu, kami menyelenggarakan berbagai pelatihan dan workshop. Termasuk juga penelitian dan pengembangan sebagai upaya untuk lebih meningkatkan kualitas. Selain itu, untuk diseminasi dan publikasi, sudah ada jurnal SEAMEJ. Dan sekarang kita memiliki Buletin SEAMETRICAL!

Keberadaan Buletin SEAMETRICAL ini, dimaksudkan sebagai upaya yang lebih komprehensif dalam melayani guru dan tenaga pendidik matematika untuk menjalin kontak, menyumbangkan ide, dan memperkaya wawasan secara lebih populer dan mudah. Sebagai sebuah mode publikasi yang ilmiah populer, kami harapkan partisipasi para guru dan tenaga kependidikan dapat lebih masif untuk saling berbagai informasi, ide, dan praktik baiknya terkait pendidikan matematika.

Terimakasih atas partisipasi para penulis dalam edisi perdana ini. Kami juga menyampaikan apresiasi yang tinggi untuk tim satgas dan tim redaksi yang telah berhasil mewujudkan buletin SEAMETRICAL.

Mempertahankan keberlangsungan terkadang jauh lebih sulit daripada memulai sesuatu. Oleh karena itu, doa, dukungan dan kritik membangun dari semua pihak, kami harapkan agar Buletin ini dapat semakin baik dan bermanfaat maksimal, menjadikan pembelajaran matematika semakin mudah, menyenangkan, dan berguna!

Selamat menikmati,

Wassalamu'alaikum wr wb.

Assalamu'alaikum wr wb.

E/ Greetings to all SEAMETRICAL readers everywhere in Southeast Asia. I am very happy to welcome the inaugural publication of the new SEAQiM bulletin.

It has been our commitment, to help teachers and mathematics educators to improve competence related to their responsibilities, in supporting the learning of knowledge, skills and attitudes of the students. Therefore, we organize various training and workshops. It also includes research and development in an effort to further improve quality. In addition, for dissemination and publication, SEAMEJ journals are already available. And now we have the SEAMETRICAL Bulletin!

The existence of this SEAMETRICAL Bulletin is intended as a more comprehensive effort to serve teachers and mathematics educators in establishing network, contributing ideas, and enriching insights in an easier and more popular way. As a popular scientific publication platform, we hope to increase the participation of teachers and education staff to share various information, ideas, and good practices related to mathematics education.

Thank you for the participation of the authors in this inaugural edition. We also express our high appreciation for the task force and editorial team who have succeeded in realizing the SEAMETRICAL bulletin.

Maintaining sustainability of something is sometimes far more difficult than starting them. Therefore, we wish for prayers, support and constructive criticism from everyone. We hope that this Bulletin can be better and more beneficial, making learning mathematics easier, more enjoyable, and useful!

Enjoy,

Wassalamualaikum wr. wb.

Editor's Note

SEAMETRICAL stands for SEAQiM Tribune on Mathematics Education and Life. It was started as a newsletter to update everyone on SEAQiM's programmes and community. Since 2020, the newsletter was transformed into a magazine. The aim is to give a platform for teachers and education personnel to share their ideas and work to the education community in Indonesia.

The bulletin of SEAMETRICAL comprises several rubrics featuring contributions from teachers all over Southeast Asia. Each rubric is presented in English and the teacher's national language.

Focus, the headline of SEAMETRICAL bulletin, offer commentary on the hot topic in education. In accordance with the current issues faced by the education community not only in Indonesia but also all over the world, Merawati and Aniza Birawida share their thoughts on the valuable lessons we can learn from COVID-19 pandemic. In **Reader's Voice**, Enung Sumarni and Yosep D. Kristanto invite us to discuss "Freedom of Learning" and the use of technology in education.

In **Math Around Us**, there are Lim Yi Wei, Hening W., and Nguyen Thu Ha bringing us along into the journey of everyday mathematics found in their respective countries. In **Best Practice**, Bagus Ardi and Anisa N. share ideas on teaching multiplication and area of quadrilaterals.

There is also **Development & Innovation**, where Septiarini uses plastic bottle waste to both teaching mathematics and fostering the students' environmental awareness. Don't forget **Hall of Fame**, where you can find joyful and meaningful moments shared by teachers in the form of photographs.

On top of that, we also feature interesting facts and stories in **Did You Know** and **You May Not Know**. Readers who are interested can take up the challenge in **Math Challenge**, with a prize for lucky winners. Update on SEAQiM and partner institution can be found at **SEAQiM News** and **News from Partner**.

This first edition is the result of months of hard work, born out of a vision. We thank everyone involved in the process, including the editorial team, SEAQiM's staff, and the authors.



SEAMETRICAL adalah singkatan dari SEAQiM Tribune on Mathematics Education and Life. Berawal dari buletin yang diterbitkan sebagai sumber kabar terbaru terkait program dan komunitas SEAQiM, SEAMETRICAL diperbaharui di tahun 2020 sebagai buletin. Tujuannya adalah untuk memberikan platform bagi para guru dan tenaga kependidikan untuk berbagi ide dan karya mereka kepada komunitas pendidikan di Indonesia.

Buletin SEAMETRICAL terdiri dari beberapa rubrik yang menampilkan kontribusi dari para guru di seluruh Asia Tenggara. Setiap rubrik disajikan dalam bahasa Inggris dan bahasa nasional guru yang bersangkutan.

Focus, tajuk buletin SEAMETRICAL, menawarkan ulasan tentang topik hangat dalam pendidikan. Sesuai dengan masalah saat ini yang dihadapi oleh komunitas pendidikan tidak hanya di Indonesia tetapi juga di seluruh dunia, Merawati dan Aniza Birawida berbagi pemikiran mereka tentang pelajaran berharga yang kita dapatkan dari pandemi COVID-19. Dalam **Reader's Voice**, Enung Sumarni dan Yosep D. Kristanto mengundang kita berdiskusi tentang "Merdeka Belajar" dan penggunaan teknologi dalam pendidikan.

Dalam **Math Around Us**, ada Lim Yi Wei, Hening W., dan Nguyen Thu Ha membawa kita ke dalam perjalanan matematika dalam kehidupan sehari-hari yang bisa ditemukan di negara mereka masing-masing. Dalam **Best Practice**, Bagus Ardi dan Anisa N. berbagi ide tentang pengajaran perkalian dan bangun datar segi empat. Ada juga **Development & Innovation**, di mana Septiarini menggunakan limbah botol plastik untuk mengajar matematika dan menumbuhkan kesadaran lingkungan siswa. Tak lupa **Hall of Fame**, di mana Anda dapat menemukan momen yang menyenangkan dan bermakna yang dibagikan oleh guru-guru dalam bentuk foto.

Selain itu, kami juga menampilkan fakta dan cerita menarik dalam **Did You Know** dan **You May Not Know**. Pembaca yang tertarik dapat menerima tantangan dalam **Math Challenge**, dengan hadiah untuk pemenang yang beruntung. Berita mengenai SEAQiM dan lembaga mitra dapat ditemukan di **SEAQiM News** dan **News from Partner**.

Edisi pertama ini adalah hasil dari berbulan-bulan kerja keras, yang lahir dari sebuah visi. Kami berterima kasih kepada semua orang yang terlibat dalam proses ini, termasuk tim editorial, staf SEAQiM, dan penulis.

Russasmita Sri Padmi

SEAQiM Welcoming New Deputy Director for Programme



Yogyakarta – Following the termination of Dr. Ganung Anggraeni's service last year, SEAQiM was delighted to welcome Dr. Farida Nurhasanah as the new Deputy Director for Programme (DDP). She has been officially appointed by the Secretary-General, MoEC of Indonesia to serve under SEAQiM for three years since June 2020. Previously, Dr. Farida was working as a lecturer and researcher at Sebelas Maret University, Surakarta, Indonesia. She obtained her master and doctorate degree from the Indonesia University of Education.

Dr. Farida's concern for teachers' professional development is her main motivation to join SEAQiM. She believes that improving the education system is pivotal in building a better future, and one of the keys to education improvement is in teachers' quality. "I wish for future SEAQiM a wider outreach and impact for teachers, not only in Indonesia but also ASEAN," she said. One way to do that is through SEAQiM's online programmes on teacher development, which she is looking forward to.

Outside of her busy academic and professional life, Dr. Farida is a wife and mother of four adorable kids. She enjoys reading and swimming in her free time, as well as spending time with her family. (RSP)



The Festivities! Celebrating 11 Years of SEAQiM

Yogyakarta – On July 13, 2020, SEAQiM celebrated its 11th anniversary. The history of SEAQiM was started by SEAMEO High Official Meetings (HOM) in 2007, followed by a convention of 10 representatives from SEAMEO Member Countries in 2008, before the launching of the Centre in 2009 by the President of SEAMEO Council, Mr. Jurin Laksanawisit.

The theme of the celebration, "Inspiring Learning during Pandemic", took inspiration from the recent issues faced by the education community in Indonesia amidst the COVID-19 pandemic. The festivities included a two-day workshop themed "Mathematics Education during Pandemic", a potong-tumpeng ceremony, and teachers' competition.

The workshop was held with a mix of offline and online sessions. The offline session was participated by 30 participants, while 65 participants joined the online session via Zoom. The highlight of the celebration, teachers' competition "Inspiring Learning during Pandemic" contested five categories: video, photography, poster, digital learning media, and article. The prize money offered worth a total of USD1260. A staggering 341 teachers from five countries applied for the contest, out of which 3 winners were selected from each category. (LDP)

Our First Regular Course in 2020: SEA RME



SEAQiM Participating in APEC-Tsukuba International Conference XIV and SEAMEO-University of Tsukuba Symposium VIII

Tsukuba - SEAQiM representatives, Dr. Sumardiyono and Mr. Wahid Yunianto, were supported by CRICED (Centre for Research on International Cooperation in Educational Development), University of Tsukuba, to participate in APEC-Tsukuba International Conference XIV and SEAMEO-University of Tsukuba Symposium VIII held in Japan on 11 to 14 February 2020.

The conference aimed to clarify the emerging issues in education shaped by the Industrial Revolution 4.0, and to share educational reform, challenges, and issues within the scope of global citizenship beyond regions, education for sustainable development, human characters developed through school subjects, as well as soft skills and lifelong learning in this fast-changing Society 5.0 driven by Industry 4.0.

Dr. Sumardiyono presented SEAQiM research entitled Calculator for Critical Thinking: Experience with 4th Grade Mathematics Students, while Mr. Wahid Yunianto shared SEAQiM's current teacher training courses. Further, SEAQiM also presented a paper presentation on its community service programme "Kampung STEM Joho" to showcase the Centre's commitment to introduce STEM daily activities to its surrounding communities. (LDP)

Yogyakarta – In March 2020, SEAQiM successfully organized its first regular course in 2020 entitled Southeast Asia Realistic Mathematics Education (SEA RME). The event, held in PPPPTK Seni dan Budaya Yogyakarta, was participated by 26 junior high school mathematics teachers.

The Coronavirus Disease (COVID-19) pandemic, hit us all without exception, including SEAQiM. In response to the outbreak, some Ministries of Education from SEAMEO Member Countries had decided to withdraw their teachers from the course. As the official instruction from Ministry of Education of Indonesia was only announced halfway through the course, SEAQiM carried on with the course, but with several measures in place regarding the pandemic. For example, SEAQiM provided the participants with physical examination and COVID-19 prevention kit.

The participants were so happy to have Assoc. Prof. Maarten Dolk back with them. He is an expert in the field of realistic mathematics education of Freudenthal Institute, the Netherland, and has been a frequent facilitator in SEAQiM's programmes.

Considering the on-going pandemic and travel restriction, will this be the last regular course SEAQiM hold in 2020? Of course not! The remaining regular course programmes have been switched online and held entirely via video conference platform and learning management system. The courses offer sessions from renowned experts in their field. The first online regular course, Joyful Learning in Mathematics Education, was started on July 16. Interested in joining the course? Visit www.qitepinmath.org for further information. (LDP)



News from Partner

The Appointment of Dr. Rachmadi Widdiharto as High Official of the Ministry of Education of Indonesia

Yogyakarta – Great news was announced by SEAQiM's host institution, PPPPTK Matematika, on the designation of Dr. Drs. Rachmadi Widdiharto, M.A. as the new Director for Primary Education Teachers and Education Personnel, Directorate of Teachers and Education Personnel. Dr. Rachmadi has been previously serving at PPPPTK Matematika, first as a teacher trainer for 14 years and the Head of Division for Program and Information for the last 3 years.

Prof. Ainun Na'im, PhD., M.B.A., the General Secretary of Ministry of Education and Culture, representing Minister of Education and Culture inaugurated 13 High Officials, 1 Rector, and 5 Functionaries. Upon appointment, the General Secretary instructed the newly elected officials to embark on necessary coordination regarding the new normal. "Distance learning implemented due to the COVID-19 pandemic has led to various setbacks. Immediate solutions are necessary, which is the responsibility of everyone appointed here," stated Prof. Ainun.

The inaugural ceremony was broadcasted via YouTube channel of the ministry. (RSP) (source: <http://p4tkmatematika.kemdikbud.go.id/>)



SEAMEO Ministerial Policy e-Forum: Tackling COVID-19 Pandemic through Regional

Bangkok – On 18 June 2020, SEAMEO Secretariat has successfully conducted SEAMEO Ministerial e-Forum on COVID-19 Response. The forum was led by SEAMEO Council President/Senior Minister of Education of Malaysia, Dr. Radzi Jidin. Among the attendee are Education Ministers from SEAMEO Member countries or representatives.

The forum aimed to share best practices in dealing with educational setbacks in the wake of COVID-19 pandemic, as well as strategies and policies in adjustment to the pandemic mitigation effort. While each country progresses differently with the pandemic, all of them face tremendous crises in the educational sector. Through this forum, SEAMEO member countries are expected to share burdens and find solutions together. The forum identified seven key takeaways, mostly concerning the importance of infrastructure, skilled human resources, and collaboration in dealing with the crisis.

The forum was broadcasted online via CiscoWebex video conferencing platform. The recording can be

viewed on SEAMEO Secretariat's YouTube Channel by accessing this link: <http://link.seameo.org/webinar/smpef>. More than 20,000 participants from all over Southeast Asia have pre-registered for this activity and as of this writing, it has more than 21,190 views on YouTube. (LDP) (source: www.seameo.org)



Did you know?

The Lady with the Rose Chart

Data is the heart of 4th industrial revolution. Every sector in modern society such as business, health, and military, depends on analyzing massive amount of data to find answer and solve problem. **Did you know** that two centuries ago, a frail young lady already utilized data to do exactly that?

She was Florence Nightingale (Figure 1), a nurse in the 19th century United Kingdom, whose contribution and service in wars gained her the nickname "The Lady with the Lamp". Many of her contribution are supported by statistics, such as data visualization called Coxcomb or rose chart.

The following (Figure 2) is an example of coxcomb which depicts the cause of death among British soldier during Crimean war. It shows that the death by infectious disease (blue) far exceed death by wounds (red); information that made the British authority to prioritize sending more medicine and sanitary supplies, instead of gun, to the battlefield. The left graph is also smaller than the right one, showing that improved treatment decreased the death count significantly in the following year. With this graph, Florence showed that control epidemic disease is possible, which is a groundbreaking idea at the time. (RSP)



Figure 1 Florence Nightingale

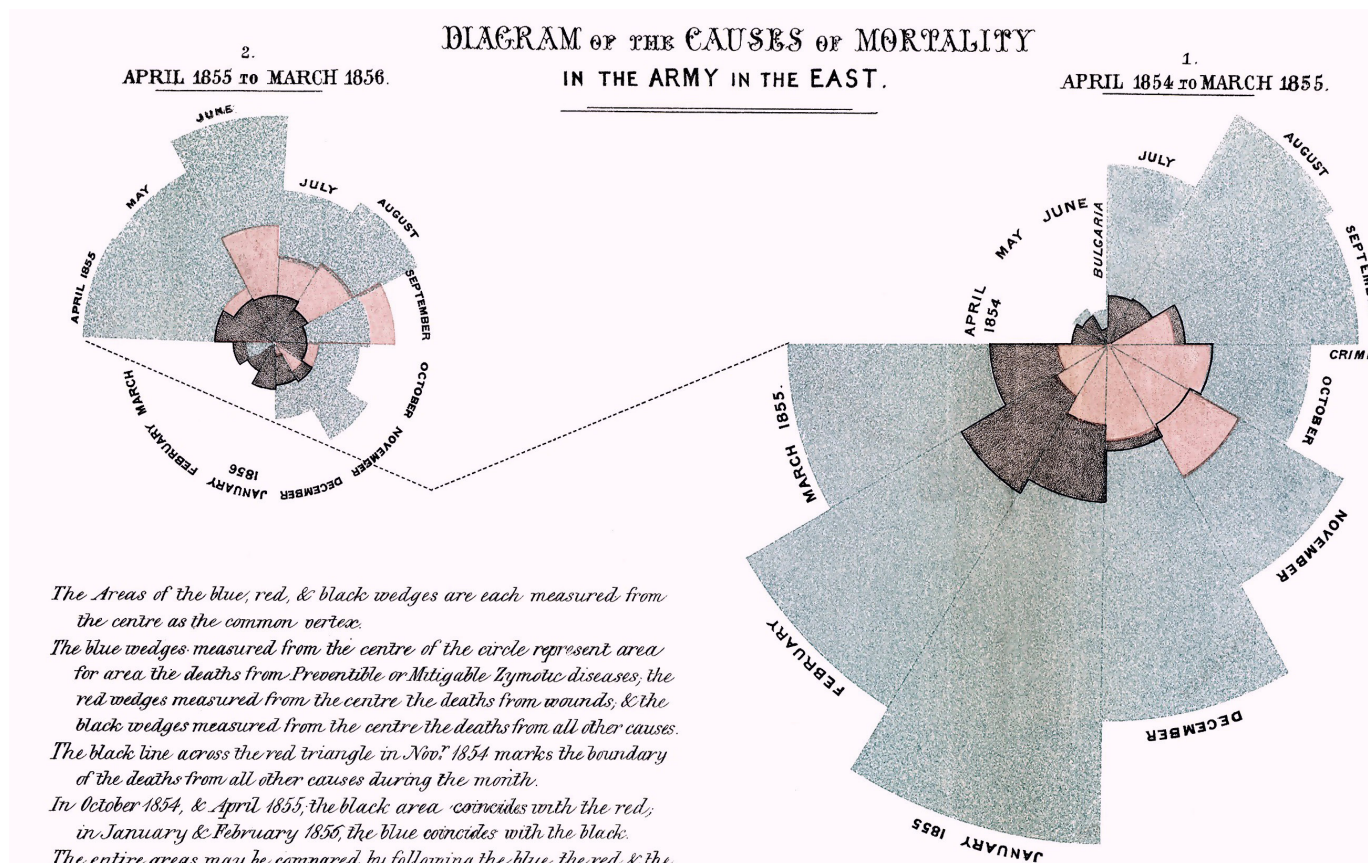


Figure 2 A coxcomb depicting cause of death among British soldiers

FOCUS

Pandemi COVID-19: Inikah Hasil Pendidikan Indonesia Selama Ini?

COVID-19 Pandemic: Is this the result of Indonesian education?

ANIZA AMBARWATI



Il Pandemi COVID -19 telah merebak hingga lebih dari 180 negara di dunia, termasuk Indonesia. Sejak kasus pertama diumumkan pada 2 Maret 2020, kurva kasus positif COVID -19 di Indonesia semakin meningkat. Upaya pemerintah pun sudah diterapkan dengan memberlakukan Pembatasan Sosial Berskala Besar (PSBB). Namun sejauh ini PSBB bisa dikatakan gagal karena di sejumlah daerah yang sudah menerapkannya, masih saja terjadi penambahan kasus COVID-19 di berbagai wilayah Indonesia.

Penyebab kegagalan PSBB salah satunya adalah perilaku masyarakat sendiri yang mengabaikan protokol kesehatan yang sudah ditetapkan, seperti menggunakan masker dan menjaga jarak. Salah satu contohnya adalah banyaknya warga zona merah yang nekat mudik sehingga penyebaran virus semakin luas hingga ke daerah-daerah yang semula nol kasus dan kepadatan Bandara Soekarno Hatta ketika masa PSBB yang menjadi perhatian masyarakat karena para pengunjung tidak memakai masker dan tidak menjaga jarak (Dharmastuti, 2020). Saat Lebaran banyak orang berbondong-bondong mendatangi pusat perbelanjaan dengan berdesak-desakan, bahkan melaksanakan ibadah berjamaah seperti kasus 73 jemaah

salat di Masjid Jami Tamansari Kebon Jeruk yang dites positif COVID-19 ("73 Jemaah Masjid ...", 2020). Belum lagi kasus kasus penolakan jenazah korban COVID-19 dan oknum yang memanfaatkan pandemi ini sebagai lahan bisnis dengan menimbun masker dan hand sanitizer.

Menurut Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional, tujuan pendidikan nasional adalah mengembangkan potensi peserta didik agar menjadi manusia yang beriman dan bertakwa kepada Tuhan Yang Maha Esa, berakhlak mulia, sehat, berilmu, cakap, kreatif, mandiri, dan menjadi warga Negara yang demokratis serta bertanggung jawab. Ini artinya pendidikan bukan semata-mata untuk mencari keterampilan dan pengetahuan, namun juga membentuk karakter. Ketidakpatuhan dan rendahnya kesadaran masyarakat selama pandemi COVID-19 ini menunjukkan gagalnya sistem pendidikan yang sudah berumur puluhan tahun dalam membentuk karakter dan tidak meratanya kualitas pendidikan di Indonesia.

Pendidikan karakter sebenarnya sudah menjadi ruh dari pendidikan itu sendiri, bahkan sebelum Program Pendidikan Karakter (PPK) dicanangkan oleh Pemerintah melalui Peraturan Presiden Nomor 87 Tahun 2017, yang menyebutkan lima nilai utama PPK yaitu religius, nasionalis, gotong royong, mandiri, dan integritas. Perilaku masyarakat yang masih menempatkan kepentingan pribadi sebagai alasan untuk melanggar aturan dalam masa pandemi dan rendahnya kepedulian sesama warga, sudah jelas bukan perwujudan nilai-nilai PPK. Padahal kita membutuhkan integritas masyarakat untuk bekerjasama menanggulangi COVID-19. Disinilah peran pendidikan karakter begitu terasa yang mana seharusnya kesadaran individu tumbuh untuk lebih memprioritaskan kepentingan bersama yang tercermin dalam perilaku.

Tidak meratanya kualitas pendidikan di Indonesia juga menjadi masalah pada kemampuan menyerap informasi. Paduan budaya literasi yang rendah dan konsumsi media sosial yang tinggi salah satu faktor utama dibalik sirkulasi hoaks di masyarakat (Soelistyarini, Setyaningsih, & Hapsari, 2019). Bahkan masyarakat kota dengan akses ke Pendidikan dan teknologi pun tidak luput menjadi korban misinformasi dan disinformasi terkait COVID-19. Menteri Komunikasi dan Informatika, Johnny G Plate, mengatakan ada 554 hoaks terkait virus COVID-19 yang tersebar melalui 1.209 media social seperti Instagram, Facebook, Twitter, dan Youtube (Nafi'an, 2020). Tidak hanya faktor kemampuan penyerapan informasi saja yang perlu diperhatikan, namun juga keberadaan oknum penyebar hoaks. Pendidikan selama ini ternyata tidak mampu menghidupkan daya pikir kritis (critical thinking) masyarakat untuk mengolah informasi dengan tepat, dan beberapa kelompok masyarakat justru menambah beban negara dan psikologis masyarakat dengan menyebar hoaks.



Kenyataan-kenyataan di atas seharusnya menjadi introspeksi diri bagi penyelenggaraan pendidikan di Indonesia. Kemana dan apa arah tujuan pendidikan kita selama ini? Sudahkah sesuai dengan amanat undang-undang dan cita-cita para pendiri bangsa? Apa yang salah dengan pendidikan kita selama ini?

Hal pertama yang harus direnungkan adalah kurikulum sebagai fondasi dasar pendidikan. Diakui atau tidak, kurikulum kita sangat bersemangat menjejali siswa dengan banyak hafalan, terutama pada jenjang pendidikan dasar, meskipun keadaan ini selalu dibantah oleh pemangku kebijakan. Guru paham betul kurikulum yang padat dan beban belajar yang tinggi. Ditambah lagi alat ukur kualitas pendidikan kita yang masih terpaku pada pilihan ganda; mau tidak mau banyak guru lebih memilih jalan pintas untuk mengerjakan soal-soal ujian dengan memaksa siswa menghafal dari pada memberikan pengalaman belajar yang utuh dan bermakna.

Kedua, kompetensi guru di Indonesia. Masih banyak guru yang enggan membuka pikiran dan mengubah paradigma tentang pendidikan. Banyak guru yang menganggap nilai adalah tolak ukur keberhasilan pendidikan. Ini terlihat dari banyaknya respon pesimistis terhadap kebijakan "Merdeka Belajar" dan penghapusan Ujian Nasional yang dicanangkan Menteri Pendidikan dan Kebudayaan. Pola pikir ini pun yang akhirnya berpengaruh



yaitu pendidikan sebagai daya upaya untuk “memajukan budi pekerti (kekuatan batin dan karakter), pikiran, dan tubuh anak, dalam rangka kesempurnaan dan keselarasan dengan dunianya.”

E/ The COVID -19 pandemic has spread to more than 180 countries around the world, including Indonesia. Since the first case was announced on March 2, 2020, the curve of COVID -19 positive case in Indonesia has been continuously increasing. Government has made an effort by imposing Large-Scale Social Restrictions (also known as Pembatasan Sosial Berskala Besar atau PSBB). But so far PSBB seems to be ineffective because in a number of regions that have implemented it, new COVID-19 cases keeps increasing.

One of the causes of PSBB failure is the people’s own behavior ignoring the regulations set by the government, such as wearing masks and keeping distance from each other. The example of such cases are the red zone residents who are so desperate to go home during the holiday that they spread the virus to areas that were originally zero cases, and the crowded Soekarno Hatta Airport during the PSBB which became massive public's attention because the visitors ignored health protocols (Dharmastuti, 2020). During Lebaran, many people flocked to shopping centers, even performing congregation prayer such as the case of 73 congregational prayers at the Jami Tamansari Kebon Jeruk Mosque which tested positive for COVID-19 ("73 Mosque Congregations ...", 2020). Not to mention in some areas people refusing the burial of COVID-19 victims and irresponsible people who take advantage of the pandemic to sell masks and hand sanitizers at severely inflated price.

According to the Constitution of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, the aim of national education is to develop the students’ potential to become human beings who have faith and are devoted to God Almighty, having good morality, healthy, knowledgeable, capable, creative, independent, as well as to be a democratic and responsible citizen. This means that education is not only a matter of seeking skills and knowledge, but also to shape character. Defiance and low public awareness during the COVID-19 pandemic shows the failure of the decades-old education system in shaping character and the uneven quality of education in Indonesia.

Character education has been the spirit of education long before the Character Education Program (also known as Program Pendidikan Karakter or PPK) was announced by the Government through Presidential Regulation Number 87 of 2017, which states five main PPK values, namely religious, nationalist, mutual cooperation, independence, and integrity. The behavior of the community which still

pada proses pembelajaran yang dilakukan oleh guru di sekolah. Tidak semua guru memprioritaskan pemahaman konseptual dan pengalaman belajar yang bermakna bagi siswanya. Contoh dalam pembelajaran matematika, masih banyak guru yang mengajarkan siswa untuk menghafal rumus, bukan mehamai konsep matematika sebagai dasar untuk pengembangan kemampuan berpikir kritis sehingga mereka bisa menemukan kesimpulan sendiri. Guru juga harus memiliki kemampuan bertanya dan mengarahkan siswa, baik dalam proses pembelajaran ataupun pembuatan soal, sehingga kemampuan berpikir kritis anak bisa berkembang.

Ketiga, paradigma masyarakat tentang pendidikan masih belum berubah sejak dulu, dimana keberhasilan anak hanya semata-mata tentang nilai dan piala. Keempat, kegagalan transfer informasi dari pusat ke daerah sehingga membingungkan guru dan masyarakat sebagai pelaksana di lapangan.

Tentunya, pandemi COVID-19 ini dapat menjadi pelajaran berharga untuk para pembuat ataupun pelaksana kebijakan pendidikan dalam menentukan dan mengarahkan pendidikan Indonesia. Seharusnya esensi pendidikan itu kembali pada gagasan Bapak Pendidikan Indonesia, Ki Hajar Dewantara (1962: 14-15),



places personal interests as an excuse to break the rules during the pandemic and the low level of concern among fellow citizens, are clearly not a realization of PPK values. Even though we need community integrity to work together to overcome COVID-19. This is why character education is important, which is to foster individual awareness so that it grows to prioritize common interests rather than personal, as reflected in their behavior.

The disparity in the quality of education in Indonesia also manifests itself in the ability to absorb information. The combination of low literacy culture and high social media consumption are one of the main factors behind the fake news circulation in the community (Soelistyarini, Setyaningsih, & Hapsari, 2019). Even urban communities with access to education and technology are not spared being victims of misinformation and disinformation pertinent to COVID-19. Minister of Communication and Information, Johnny G Plate, said there are 554 hoaxes related to COVID-19 spread through 1,209 social media such as Instagram, Facebook, Twitter and Youtube (Nafi'an, 2020). It is not only the ability to absorb information that needs attention, but also the existence of unscrupulous hoax spreaders. Education so far has apparently been unable to nurture people's critical thinking to process information appropriately, and some groups actually make things worse for the government and psychological state of the society by spreading fake news.

The above facts should be self-introspection for the implementation of education in Indonesia. What are the goals of education system and where has it been directed

to, so far? Is it in accordance with the mandate of the constitution and the ideals of the founders of the nation? What is wrong with our education so far?

The first thing to contemplate is the curriculum as the basic foundation of education. Whether people would like to admit or not, our curriculum is very eager to cram students with a lot of memorization, especially in elementary education, even though this situation is always denied by policy makers. Teachers understands very well how dense the curriculum is and the resulting heavy cognitive load experienced by the students. Plus, the quality measurement tools for our education are still fixated on multiple choice problem; inevitably many teachers prefer the shortcuts to deal with exam questions by forcing students to memorize facts and procedures, rather than providing a whole and meaningful learning experience.

Secondly, teacher competence in Indonesia. There are still many teachers who are reluctant to open their minds and change their paradigms about education. Many teachers still believe that grades as the ultimate measure of the success of education. This is evident in the many pessimistic responses to the policy of "Freedom of Learning" and the elimination of the National Examination launched by the Minister of Education and Culture. This mindset also ultimately affects the learning process orchestrated by teachers at school. Not all teachers prioritize conceptual understanding and meaningful learning experience for their students. For example, in learning mathematics, there are still many

teachers who teach students to memorize formulas, not mathematical concepts as a basis for developing critical thinking skills so that they can find their own conclusions. Furthermore, teachers must possess the skill of prompting and questioning the students, so that the students' critical thinking skills can grow.

Third, the paradigm of society about education has not changed since ages ago, where the success of children is solely measured by grades and trophies. Fourth, the failure to transfer information from the central to the regional authority causes confusion for the teachers and the community who are responsible for its implementation.

Of course, COVID-19 pandemic can be a valuable lesson for education policy makers or advocates in determining and directing the education system in Indonesia. The essence of education should go back to the idea of the Father of the Education of Indonesia, Ki Hajar Dewantara, namely education for the advancement of character, mind and body of the children, for the purpose of perfection and harmony with their world.

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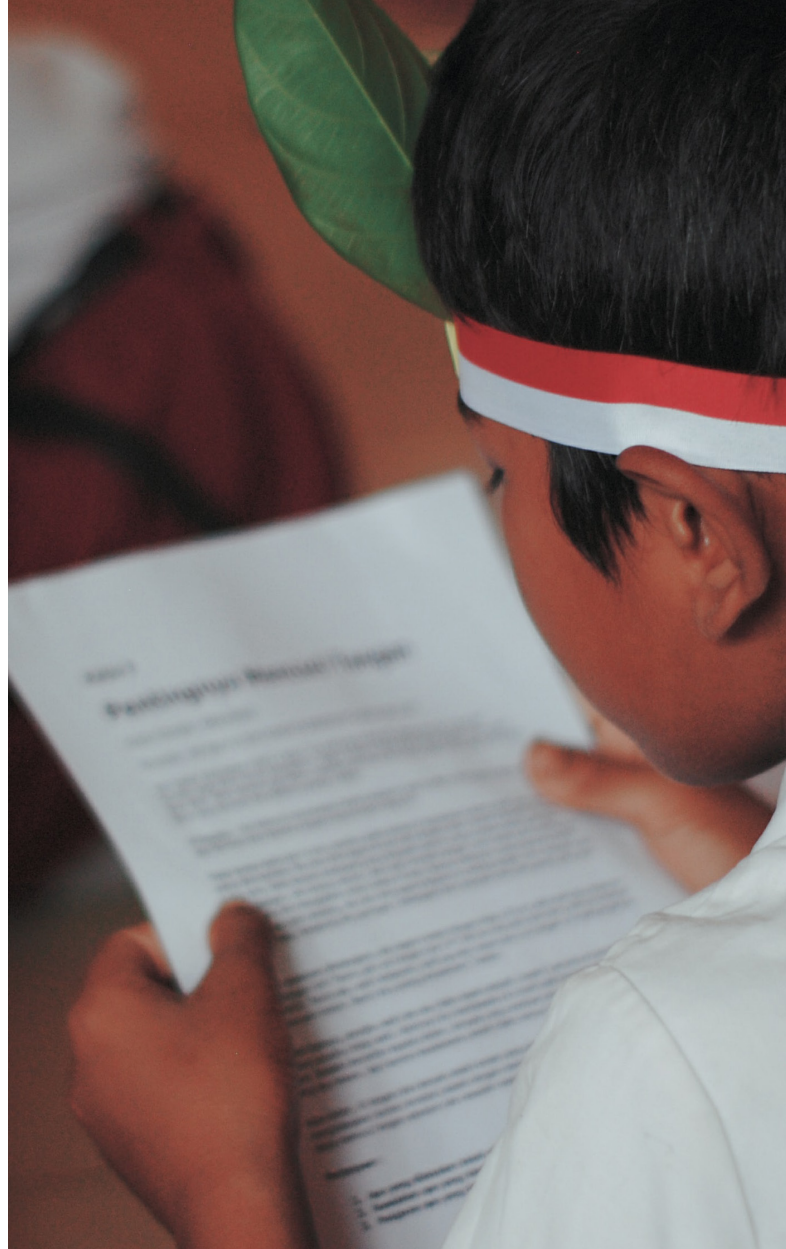
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TEST LESS, LEARN MORE

ENUNG SUMARNI

I/ Memasuki abad 21, kita harus bersyukur dengan adanya banyak perubahan baru di bidang pendidikan, terlepas dari pro-kontra yang ada. Perubahan terbaru yang disampaikan oleh menteri pendidikan adalah konsep “Merdeka Belajar”, yang diwujudkan melalui berbagai kebijakan, salah satunya adalah dihentikannya Ujian Nasional (efektif 2020). Tentunya perubahan ini sudah melalui berbagai pertimbangan dari pembuat kebijakan dan pemangku kepentingan terkait, dengan mengacu pada tujuan untuk mewujudkan pendidikan Indonesia yang lebih baik.

Disepakati atau tidak, pendidikan adalah investasi jangka panjang yang harus dimulai sedini mungkin, untuk mengantisipasi perubahan yang terjadi seiring perkembangan zaman. Untuk itu, kebijakan terkait pendidikan harus dipertimbangkan dengan hati-hati. Dylan dan Black (2005) menunjukkan bagaimana konsep dan keyakinan guru, yang mempengaruhi cara mengajar mereka, dipengaruhi oleh kebijakan yang berlaku. Walaupun guru yakin bahwa *assessment for learning* (penilaian yang dilakukan saat pembelajaran berlangsung, bersifat membangun dan berkelanjutan) pada pelaksanaannya lebih bermanfaat untuk siswa dibandingkan dengan *assessment of learning* (penilaian

di akhir pembelajaran, bersifat menghakimi dan final), guru tetap akan merasa galau dengan otonomi untuk melaksanakan penilaian tersebut di kelas.

Pandangan umum, yang juga didukung teori konstruktivisme, meyakini bahwa pengetahuan dan keterampilan siswa tergantung dari apa yang dipelajarinya. Namun, hal ini bertolak belakang dengan kebanyakan regulasi di beberapa negara, yang menilai pengetahuan dan keterampilan siswa semata-mata dari hasil ujian berskala besar (Dylan & Black, 2005). Hal yang sama juga terjadi di negara kita, dimana hasil dianggap segala-galanya sehingga mengabaikan proses.

Kebijakan terkait ujian dibawah wacana Merdeka Belajar digulirkan dengan harapan memberi pencerahan ke arah yang lebih baik, yaitu dengan mengurangi tes, terutama tes standar (*standardized test*) yang didasari oleh kebijakan atau agenda politik tertentu. Guru sebaiknya lebih diberikan kemerdekaan untuk melaksanakan tes, karena mereka yang lebih mengetahui kelemahan dan kekuatan siswanya. Hal ini diupayakan dengan berbagai perubahan besar yang diusung oleh Kemendikbud, salah satunya dengan menghapus ujian nasional. Kebijakan ini memberikan kesempatan kepada para guru untuk sepenuhnya menentukan kelulusan siswa, dengan

harapan memberikan kemerdekaan belajar kepada para guru.

Guru berperan sebagai orangtua di sekolah, yang memahami proses perkembangan siswa baik secara akademis maupun non-akademis, pengetahuan maupun keterampilan, serta karakter dan sikap. Melalui Merdeka Belajar, maka guru akan bisa sepenuhnya menentukan kenaikan maupun kelulusan siswa dengan berbagai bukti fisik yang dimilikinya. Guru juga lebih mengerti apa yang baik untuk keberlanjutan perkembangan seorang siswa, berdasarkan pengalaman belajarnya di sekolah. Guru akan lebih memberdayakan dirinya untuk meningkatkan kemampuan daya nalar siswa melalui literasi numerik serta literasi baca tulis yang dapat diintegrasikan dalam pembelajaran. Inilah salah satu indikator merdeka belajar untuk guru.

Belajar merupakan kata kunci untuk menghadapi perubahan di era ini, era yang menuntut kemandirian setiap orang untuk berkarya sesuai tugas pokok dan fungsinya. Dalam Merdeka Belajar, semua komponen penyelenggaraan pendidikan harus belajar, baik pendidik maupun peserta didik. Dengan demikian, guru pun harus belajar seiring siswa belajar. Belajar untuk menghasilkan karya yang lebih baik dalam keprofesian yang dimiliki oleh seorang guru, melalui peningkatan mutu pembelajaran bersama para siswanya.

Perubahan zaman menuntut manusia untuk tidak hanya memiliki keterampilan hidup namun juga kemampuan berpikir matematis yang mumpuni. Kemampuan berpikir matematis adalah kemampuan berpikir yang terbentuk melalui pembelajaran matematika dan akan bermanfaat bagi siswa tidak hanya di lingkungan akademis, namun juga sosial dan profesional. Dalam proses pembelajaran mulai dari perencanaan, pelaksanaan, sampai refleksi bertujuan untuk melatih dan mengembangkan kemampuan berpikir tersebut. Proses yang mengajak siswa berpikir menghasilkan pengalaman belajar, yang kemudian digunakan lagi sebagai pengetahuan prasyarat di pembelajaran selanjutnya. Dimulai dengan tahapan eksplorasi, dilanjutkan dengan membuat dugaan dari pola yang ditemukan. Proses dilanjutkan dengan tahapan generalisasi yaitu menemukan bentuk umum serta diakhiri dengan tahapan verifikasi memeriksa kembali penemuannya. Serangkaian proses tersebut menjadi modal bagi pembelajar sepanjang hayat untuk diimplementasikan dalam kehidupannya.

Dimulai dari mimpi, akan terlahir daya upaya untuk meraihnya. Kita memimpikan profil lulusan yang berani bermimpi untuk meraih kebahagiaan, yang lebih banyak memahami ketimbang sekedar mengetahui, yang menempatkan hidup yang bermakna sebagai nilai yang harus diperjuangkan.

Salah satu kunci utama dalam meraih mimpi tersebut adalah belajar. Siswa, guru, dan widyaiswara wajib belajar. Kita mampu memiliki impian besar dengan berpikir global

tetapi tetap bertindak lokal. Dimulai dari diri sendiri, dimulai dari yang dekat, dimulai dengan optimalkan langkah-langkah yang tepat. Semuanya belajar; *test less, learn more*.

E/ Entering the 21st century, we must be grateful for the many new changes in education, regardless of the pros and cons. The most recent change conveyed by the minister of education is the concept of "Freedom of Learning", which is manifested through various policies, one of which is the decision to eliminate National Examination (effective 2020). Certainly this change has undergone thorough considerations by policy makers and stakeholders, with a goal of making a better Indonesian education a reality.

Whether it is agreed or not, education is a long-term investment that must be started as early as possible, to keep up with constantly changing world. Therefore, policies related to education must be considered carefully. Dylan and Black (2005) show how the concepts and beliefs of teachers, which influence the way they teach, are affected by policies. Even though teachers genuinely believe that assessment for learning is more beneficial to students than assessment of learning, teacher will still feel overwhelmed by the autonomy of conducting the assessment in the classroom.

The common perspective, which is also supported by constructivism theory, believes that students' knowledge and skills depend on what they learn. However, this is in contrast to the existing regulations in some countries, which judge the students' individual knowledge and skills based on the results of large-scale examinations (Dylan & Black, 2005). The same is true in our country, where results are everything and the process are neglected.

Policies related to school-leaving examinations under "Merdeka Belajar" was advocated in the hope of providing enlightenment to a better direction, namely by reducing tests, especially standardized test based on certain policies or political agendas. Teachers should have greater freedom to carry out tests, because they understand the weaknesses and strengths of their students better. This has been the goal of various major changes carried out by the Ministry of Education and Culture, such as the elimination of national exam. This policy provides a full control for teachers in determining the students' graduation criteria, with the hope of providing learning freedom for teachers.

Teachers are the students' parents in schools, who understand the process of student development both academic and non-academical, knowledge and skills, as well as character and attitudes. Through Merdeka Belajar, the teacher will determine the students' progress with various concrete evidence they have. Teachers also better understand what is good for the sustainable development of a students, based on their learning experiences at school. Teachers will empower themselves further to



improve student abilities through literacy and numerical literacy that can be integrated into learning process. This is one indicator of independent learning for teachers.

Learning is the key word for confront change in this era, an era that demands the independence of everyone to be productive according to their duties and functions. In Merdeka Belajar, all components of education must learn, both educators and students. Thus, the teacher must also learn alongside the students. . Learning to perform better is part of the professionalism of a teacher, through improving the quality of learning with students.

The rapidly changing world require us not only to have life skills but also capable in mathematical thinking. The learning process, from planning, implementation, to reflection, aims to train and develop these thinking skills. A process that invites students to think produces learning experiences, which are then used again as prerequisite knowledge in subsequent lessons. It is started with exploration, followed by making conjecture from the pattern found. The process is continued with generalization, namely finding a general form and ending with confirmation to check the findings. These series of processes is essential for lifelong learners to be implemented in their lives.

This may start with a dream now, but a dream can be powerful enough to ignite efforts. We dream of the profile of graduates who dare to aspire for happiness, who put more emphasis on understanding than simply knowing, who put meaningful life as the values to strive for.

One of the main keys to achieving this dream is learning. Students, teachers, and teacher-trainer are obligated to learn. We can have big dreams by thinking globally but still acting locally. We can start with ourselves, starting from what we have around us, starting with making the most of what we can do. Everybody learns; test less, learn more.

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SHIFTING MULTIPLICATION PERSPECTIVES IN LOWER PRIMARY LEVEL

MENGUBAH PANDANGAN TENTANG PERKALIAN DI PENDIDIKAN SEKOLAH DASAR

ANISA NURFAIDAH

E/ Multiplication is a crucial concept for students, yet teaching it is a problematic situation for teachers. We may reflect on the teaching and learning process in lower educational stages as their essential foundation for further mathematics learning. Contents related to calculating multiples of 2, 5 and 10, and recalling doubles of numbers from 1 to 10 are taught in year 1; recalling multiplication facts for the 2, 5 and 10 times tables are given in year 2, and recalling multiplication facts for the 2 to 6 and the 10 times tables are delivered in year 3 (Thompson, 2010).

Early multiplication starts in year 2 through the process of repeated sum or addition. According to thematic textbook used in the classroom, teachers are supposed to teach basic multiplication by using the instrumental mathematics way (rote learning, memory, rules, and correct answer) which is considered easier to understand. For example, when teachers are going to teach multiplication of 2 (in this case, 3×2), teachers start with the formula shown in Figure 1.

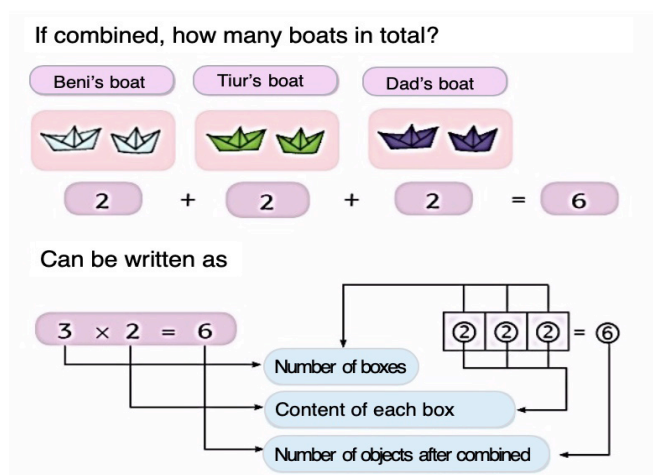


Figure 1. Typical way teachers introduce multiplication
Gambar 1. Cara umum guru mengenalkan perkalian

The explanation continues with typical exercises shown in figure 2.

In our perceptions, the concepts of 'addition' and 'multiplication' may have connection as we can prove that multiplication can be the same as 'repeated addition' (Barmby, et al, 2010). However, some students still find it hard to understand. As teachers, we may expand their mathematical concepts understanding by using the strategies as follow:

1. **Skip counting.** This mathematics technique which is also called counting by twos (threes, fours, etc.) taught as a kind of multiplication in reform mathematics. This session starts with skipping practice on a big mat where students have to hop on it or we can use snake and ladder board. Later on, we give students a table of numbers in which they should shade any colors upon numbers they wish to choose. For example, skip counting by twos (Figure 3).

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

Figure 3. Skip counting by twos
Gambar 3. Berhitung lompat 2

The numbers they shade indicate those which are already skipped by two numbers. They will find numbers such as: 2, 4, 6, 8, 10, etc. They will not realize that it is the answers to the multiplication 2 list, but this technique will ensure them to able to recall numbers and associate it later. Multiplication of 2 = skip counting by twos.

2. **Developing concepts from concrete to abstract operational situation by referring to Piaget's theory.**

Students of year 2 (8-9 years old) are still experiencing a concrete stage where they will understand it but not as an independent concept. Teachers may feature a few pictures in a box to show multiplication. For example, stars in a box (Figure 4).

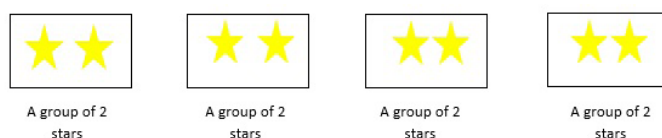


Figure 4. Stars in a box
Gambar 4. Bintang-bintang dalam kotak

How many groups are there? There are 4 groups. (We may say that there are 4 groups of 2 stars.). That means 4×2 , so there are 8 stars altogether.

3. **Multiplication array** (Figure 5). It specifically demonstrates the distributive properties of multiplication; however, the students hardly recognize it as another form of multiplication.

1

Two groups of children are playing jump rope. Each group consists of 5 children.

a. The mathematical sentence is: $..... \times$

b. Represent the mathematical sentence as repeated addition!

.....

2

Write the following multiplication in the form of repeated addition. Then, calculate the result!

1. $2 \times 5 = ... + ... = ...$

2. $4 \times 2 = ... + ... + ... + ... = ...$

3

Udin places pebbles in 6 holes of *congklak* game. Each hole is filled in with 5 pebbles.

a. Write the mathematical sentence!

.....

b. Determine the total number of pebbles!

.....

4

	32	
	$\times$	
...		8
...		...
...		4
...		...

Figure 2. Example of typical exercise for multiplication
Gambar 2. Contoh soal latihan untuk melatih perkalian

They will cultivate this technique as the new one to master. Therefore, we still have to emphasize on the use of array in the classroom. Since lower primary students are still undergoing concrete thinking, we may try to introduce it with considerably visible representations of multiplication such as finding areas (materials given in year 3).

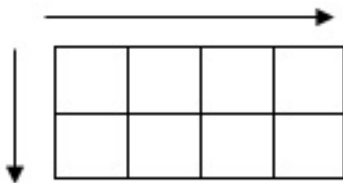


Figure 5. Multiplication array

As an example, in Figure 5, there are 4 horizontal boxes and 2 vertical boxes, as well as a total of 8 boxes. Means, 4 times 2 equals 8 or $4 \times 2 = 8$

Some may argue that the students can understand calculation more quickly through instrumental mathematics by using repeated addition or memorizing the multiplication table. But we must reflect again on how the knowledge can serve as the students' basic of understanding instead of merely solving mathematical problems.

// Perkalian adalah konsep yang sangat penting bagi siswa, akan tetapi mengajarkannya menjadi sebuah situasi yang problematik bagi guru. Padahal pembelajaran matematika di sekolah dasar bisa kita pandang sebagai pondasi awal pengetahuan siswa untuk jenjang yang lebih tinggi nantinya. Materi-materi terkait perkalian dari 2, 5, dan 10, dan menghitung kelipatan dua dari bilangan 1 sampai 10 dibelajarkan di kelas 1; menghafal tabel perkalian bilangan 2, 5, dan 10 dibelajarkan di kelas 2; sedangkan menghafal tabel perkaial 2 sampai 6 dan 10 dibelajarkan di kelas 3 (Thompson, 2010).

Materi awal dari perkalian mulai diajarkan pada siswa kelas 2 melalui proses penjumlahan berulang. Berdasarkan buku tematik yang digunakan di kelas,

kebanyakan guru masih mengajarkan perkalian secara instrumental (berfokus pada menghafal, rumus, dan jawaban yang benar), yang mana cara ini dianggap lebih mudah untuk dipahami oleh siswa. Contohnya, ketika akan mengajarkan perkalian 2 (dalam kasus ini 3×2), guru memulainya dengan menggunakan rumus seperti ditunjukkan di Gambar 1. Penjelasan dilanjutkan dengan latihan seperti ditunjukkan di gambar 2.

Dalam pandangan kita, konsep dari penjumlahan dan perkalian memiliki keterkaitan karena kita bisa membuktikan bahwa perkalian dapat disamakan dengan "penjumlahan berulang" (Barmby.et al, 2010). Akan tetapi, beberapa siswa masih mengalami kesulitan untuk memahaminya. Sebagai guru, kita bisa mengembangkan pemahaman konsep matematika siswa dengan menggunakan strategi-strategi sebagai berikut:

1. '**Berhitung Lompat**' atau skip counting, bisa berupa lompat dua, tiga, dst. Sesi ini diawali dengan aktivitas melompat pada karpet besar dimana siswa harus melompat di atasnya atau kita juga bisa menggunakan papan ular tangga. Setelahnya, kita memberikan tabel angka dimana nanti mereka harus mewarnai angka-angka yang mereka pilih. Contohnya, berhitung lompat dua (Gambar 3).

Angka-angka yang diwarnai menggambarkan angka-angka yang telah dilompati tiap dua angka. Mereka akan menemukan angka-angka seperti 2, 4, 6, 8, 10 dan seterusnya. Mereka tidak akan menyadari bahwa angka-angka tersebut adalah hasil dari perkalian dua, tapi teknik ini akan meyakinkan mereka untuk bisa mengingat kembali angka-angka tersebut dan mengaitkan bahwa perkalian 2 = berhitung lompat dua.

2. **Mengembangkan konsep dari bentuk konkrit ke operasi abstrak dengan berdasarkan kepada teori Piaget.** Siswa kelas 2 (usia 8-9 tahun) masih berada pada fase konkrit, dimana mereka akan memahaminya,

tapi tidak dalam konsep yang berdiri sendiri. Guru bisa menambahkan beberapa gambar di dalam kotak untuk memperlihatkan konsep perkaliannya. Contohnya, bintang-bintang dalam kotak (Gambar 4).

Ada berapa banyak kelompokkah pada gambar di atas? Ada 4 kelompok (kita bisa mengatakan ada empat kelompok dua bintang). Itu berarti $= 4 \times 2$ sehingga ada total semuanya ada 8 buah bintang.

3. **Multiplication array** (Gambar 5). Teknik ini secara khusus menunjukkan sifat distributif perkalian, akan tetapi banyak siswa yang tidak menyadarinya sebagai sebuah bentuk lain dari perkalian. Oleh karena itulah kita harus menekankan pada penggunaan array di dalam kelas. Karena siswa pada tingkat sekolah dasar masih dalam tahap berpikir konkrit, kita bisa mencoba memperkenalkannya dengan representasi perkalian yang mudah dilihat, seperti menemukan luas daerah (materi diberikan di kelas 3)

Sebagai contoh, di gambar 5, ada 4 kotak horizontal dan 2 kotak vertikal, dan total 8 kotak. Artinya: 4 dikalikan 2 sama dengan 8 atau $4 \times 2 = 8$.

Beberapa orang mungkin memperdebatkan bahwa siswa bisa memahami perkalian lebih cepat melalui cara instrumental dengan menggunakan penjumlahan berulang atau menghafal table perkalian. Akan tetapi kita juga harus merefleksikan kembali bagaimana ilmu pengetahuan tersebut bisa menjadi pemahaman dasar bagi siswa daripada hanya sekedar untuk menyelesaikan permasalahan matematika saja.

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Teknologi dalam Belajar Mengajar Matematika: Bermatematika Dahulu, Teknologi Kemudian

Technology in Teaching and Learning Mathematics: Mathematics First, Technology Later

YOSEP DWI KRISTANTO



I/Pernahkah anda menjumpai peserta didik yang begitu asiknya mendebatkan permasalahan matematika? Jika demikian, berarti anda berhasil mengajak mereka bermatematika. Sebelum berdebat, tentu mereka telah berjuang menyelesaikannya, mengorganisasikan pemikiran matematis mereka, kemudian mengemasnya ke dalam representasi yang mudah dipahami oleh teman-temannya. Proses ini juga mendorong peserta didik untuk memilih cara bernalar yang tepat untuk berargumen dan mengevaluasi argumen yang disampaikan temannya. Singkat kata, aktivitas seperti ini menunjukkan proses-proses pemecahan masalah, penalaran, komunikasi, koneksi, dan representasi yang diperlukan peserta didik untuk bermatematika (NCTM, 2000).

Tentu tidak mudah bagi pendidik menyediakan lingkungan belajar yang mengajak peserta didiknya bermatematika karena beragamnya keterbatasan. Untungnya, teknologi memberikan peluang yang menjanjikan. Teknologi bisa berupa teknologi yang spesifik terkait dengan matematika, misalnya Desmos dan GeoGebra, ataupun teknologi yang netral dengan matematika, seperti Google Dokumen dan Kahoot. Banyaknya pilihan teknologi yang menjanjikan ini tidak serta merta akan menyediakan lingkungan belajar yang efektif secara instan.

Teknologi hanyalah pelayan. Pendidiklah yang perlu mendesain dan mengelola pembelajaran agar

penggunaan teknologi tersebut benar-benar melayani peserta didik untuk bermatematika. Sebagai ilustrasi, akan diberikan dua skenario pembelajaran hipotetis dari dua orang pendidik, Pak Abimanyu dan Bu Utari, dalam topik pengumpulan, pengolahan, dan penyajian data.

Begitu mengenal Kahoot di sebuah lokakarya, Pak Abimanyu sangat antusias. Beliau meyakini bahwa Kahoot, yang membuatnya merasa antusias dan tertarik, juga akan memiliki dampak yang serupa kepada para peserta didiknya. Oleh karena itu, Pak Abimanyu menggunakan Kahoot di pembelajaran Statistiknya. Beliau menyulap soal-soal Statistika yang dimilikinya menjadi soal-soal digital yang dapat diakses melalui Kahoot.

Bu Utari ingin peserta didiknya dapat mengumpulkan, mengolah, dan menyajikan data melalui proses pemecahan masalah secara kolaboratif. Bu Utari mendampingi para peserta didiknya untuk bisa mengeksplorasi masalah dan mengomunikasikan hasil penyelidikannya secara efektif dengan menggunakan berbagai macam media dan teknologi. Mereka bebas berkreasi dengan Google Sheets, Instagram, YouTube, dan bentuk teknologi lainnya, selama teknologi tersebut dapat membantu pekerjaan mereka secara efektif. Untuk menjamin adanya diskusi yang produktif antar peserta didik, Bu Utari tak lupa untuk memberikan mekanisme kolaborasi yang jelas antar peserta didiknya.

Apa yang bisa kita pelajari dari dua skenario di atas?

Kedua kegiatan pembelajaran tersebut sama-sama menggunakan teknologi untuk topik matematika yang sama, tetapi menghasilkan fasilitasi yang sangat berbeda bagi peserta didiknya (lihat Tabel 1). Kegiatan pembelajaran Pak Abimanyu dikendalikan oleh teknologi yang dipilihnya. Dengan cara ini, konten-konten matematika harus disesuaikan dengan fitur-fitur Kahoot, yaitu sebagai kuis interaktif. Alhasil, penggunaan teknologi di sini lebih berperan sebagai pengganti kuis tradisional dengan sedikit penambahan fitur yang ditawarkan teknologi tersebut.

Sebaliknya, pembelajaran Bu Utari menekankan pencapaian tujuan pembelajaran. Dengan skenario ini, Bu Utari merancang pembelajaran terlebih dahulu untuk memfasilitasi peserta didiknya bermatematika. Baru kemudian, beberapa macam teknologi ditawarkan kepada peserta didiknya untuk memudahkan mereka bermatematika. Dengan cara ini, teknologi malahan dapat mendefinisikan ulang aktivitas-aktivitas pembelajaran yang dilakukan peserta didiknya. Artinya, teknologi memberi kesempatan siswa untuk melakukan hal-hal yang tidak mungkin bisa dilakukan jika tanpa menggunakan teknologi, seperti berkolaborasi secara langsung di Google Sheets dan berkreasi video di Youtube. Aktivitas-aktivitas seperti ini penting bagi peserta didik untuk mempersiapkan masa depan mereka (Brooks-Young, 2017).

Tabel 1 Perbandingan Skenario Pak Abimanyu dan Bu Utari

Aspek	Skenario Pak Abimanyu	Skenario Bu Utari
Proses Matematis	Teknologi kurang mendukung peserta didik untuk melakukan proses-proses matematis yang kompleks.	Teknologi mendukung peserta didik untuk melakukan proses-proses pemecahan masalah, penalaran, komunikasi, koneksi, dan representasi.
Penggunaan Teknologi (Puentedura, 2009)	Augmentasi. Teknologi hanya digunakan sebagai pengganti langsung kuis konvensional, tetapi dengan penambahan fungsi kompetisi.	Redefinisi. Teknologi digunakan untuk mendesain dan mengimplementasikan tugas yang sebelumnya tidak dimungkinkan.
Desain Pembelajaran	Menyesuaikan teknologi.	Berbasis tujuan dan konteks peserta didik.

Sebagai kesimpulan, tulisan ini memberikan wawasan dan gagasan tentang peran teknologi dalam pembelajaran matematika. Teknologi memberikan peluang nan lapang untuk menyelenggarakan pembelajaran matematika yang efektif. Sayang jika teknologi yang canggih dan terkini dimanfaatkan dengan menggunakan paradigma pengajaran gaya lama. Tidak seperti itu harapannya. Pendidik harus secara jeli memanfaatkan peluang tersebut untuk menyediakan lingkungan belajar yang bermakna

bagi peserta didiknya. Tidak mudah memang. Untuk bisa melakukannya, seorang pendidik perlu memiliki pengetahuan yang mendalam tentang teknologi, pedagogi, dan konten matematika secara simultan (Mishra & Koehler, 2006). Dengan demikian, pendidik dapat mendesain pembelajaran yang dapat memfasilitasi peserta didiknya bermatematika dan memilih teknologi sebagai pelayannya.



Technology is only a servant. It is the educator who needs to design and manage learning so that the use of the technology truly serves students' interest. As an illustration, two hypothetical learning scenarios will be given from two teachers, Mr. Abhimanyu and Mrs. Utari, in the topic of data collection, processing, and representation.

After encountering Kahoot at a workshop, Mr. Abhimanyu was very enthusiastic. He believes that Kahoot, which makes him feel enthusiastic and interested, will also have a similar impact on his students. Therefore, Mr. Abhimanyu uses Kahoot in his Statistics learning. He conjured his Statistics questions into digital questions that could be accessed through Kahoot.

Mrs. Utari wants her students to be able to collect, process and present data through a collaborative problem-solving process. Mrs. Utari accompanies her students to be able to explore problems and communicate the results of their investigations effectively using a variety of media and technology. They are free to be creative with Google Sheets, Instagram, YouTube, and other forms of technology, as long as the technology can help their work effectively. To ensure productive discussion between students, Mrs. Utari also provides a clear collaboration mechanism between her students.

What can we learn from the two scenarios above?

Both of these learning activities use technology for the same mathematical topic, but they facilitate their students differently (see Table 1). Pak Abhimanyu's learning activities are controlled by the technology he chooses. In this way, mathematical content must be adjusted to Kahoot's features, namely as an interactive quiz. As a result, the use of technology here is more a role as a substitute for traditional quizzes with little additional features offered by the technology.

Instead, Mrs. Utari's learning emphasizes the achievement of learning objectives. With this scenario, Mrs. Utari designs learning in advance to facilitate her students' mathematics. Only then, some kind of technology is offered to students to make it easier for them to do mathematics. In this way, technology can even redefine learning activities carried out by students. That is, technology gives students the opportunity to do things that might not be possible if conducted without technology, such as collaborating directly on Google Sheets and creating videos on Youtube. Activities like this are important for students to prepare for their future (Brooks-Young, 2017).

E/ Have you ever encountered students who are so engrossed in debating mathematical problems? If so, then you have succeeded in getting them to do mathematics. Before arguing, of course they have struggled to solve it, organize their mathematical thinking, then package it into representations that are easily understood by their friends. This process also encourages students to choose the right way of reasoning to argue and evaluate the arguments presented by their friends. In short, activities like this show the processes of problem solving, reasoning, communication, connections, and representations that are needed for students to do mathematics (NCTM, 2000).

Of course, it is not easy for educators to provide a learning environment that invites students to learn mathematics because of the various limitations. Fortunately, technology offers promising opportunities. Technology referred here can be specific technology related to mathematics, for example Desmos and GeoGebra, or technology that is neutral with mathematics, such as Google Documents and Kahoot. However, the availability of many promising technology choices does not necessarily provide an effective learning environment instantly.

Table 1 Comparison of Pak Abhimanyu and Mrs. Utari's Scenarios

Aspects	Pak Abhimanyu's scenario	Mrs. Utari scenario
Mathematical Process	Technology does not support students to carry out complex mathematical processes.	Technology supports students to carry out processes of problem solving, reasoning, communication, connection, and representation.
Use of Technology (Puentedura, 2009)	Augmentation. Technology is only used as a direct replacement for conventional quizzes, but with the addition of competition functions.	Redefinition. Technology is used to design and implement tasks that were not previously possible.
Learning Design	Adapting technology.	Based on students' goals and context.

In conclusion, this paper provides insights and ideas about the role of technology in mathematics learning. Technology provides ample opportunities to organize effective mathematics learning. It's a shame if the latest and sophisticated technology is utilized with the old teaching paradigm. That's not what we want. Educators must be passionate to maximize the advantage of these opportunities to provide a meaningful learning environment for their students. It is not an easy feat, indeed. To be able to do this, an educator needs to have a deep knowledge of technology, pedagogy, and mathematics content simultaneously (Mishra & Koehler, 2006). Thus, educators can design learning that can facilitate students with mathematics and choose technology to support them.

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SMARTPHONE DAN COVID-19

SMARTPHONE AND COVID-19

MERAWATI



I/ Dunia sedang dihinggap wabah virus yang mematikan. sejauh ini telah tercatat sekitar 6 juta kasus dan 400.000 kematian di seluruh dunia, jauh lebih tinggi dari pandemic lain di awal abad 21 seperti SARS dan H1N1. Krisis global tidak dapat terelakkan lagi baik dari segi ekonomi, sosiokultural, pendidikan, maupun berbagai aspek lainnya. Pengaruh wabah ini telah menyebar keseluruh penjuru dunia, tidak terkecuali Indonesia tercinta. Virus ini dikenal dengan nama Coronavirus diseases 2019 (COVID – 19), suatu varian virus Corona yang masih berkerabat dengan SARS.

Berita tentang COVID19 sudah meluas sejak Desember 2019, namun respon pemerintah dirasa lambat sehingga terasa kurang antisipatif, meskipun Indonesia dikelilingi negara terinfeksi seperti Singapura dan Malaysia. Kasus pertama baru muncul Maret 2020 di Jakarta, yang merembet ke berbagai daerah di Indonesia hingga tercatat sekitar 25.000 kasus dan 1500 kematian pada bulan Mei 2020. Berbagai pertimbangan terkait masalah sosial dan ekonomi membuat pemerintah enggan menerapkan strategi agresif yang banyak diterapkan di negara lain, seperti lockdown, quarantine, dan contact

tracing. Salah satu strategi yang dipandang sesuai dan diadopsi oleh pemerintah adalah social distancing atau pembatasan sosial, yang diterapkan di hampir semua wilayah Indonesia. Salah satu penerapan social distancing ini adalah himbauan untuk “stay at home” yang berujung pada kebijakan untuk bekerja dan belajar dari rumah.

Apa implikasinya bagi pendidikan? Sesuai Surat Edaran dan Instruksi Menteri Pendidikan Dan Kebudayaan (Mendikbud, 2020a), Surat Ketua BSNP (BSNP, 2020), hasil rapat terbatas Gubernur dengan aparat daerah setempat, serta Surat Edaran Kepala Dinas Pendidikan dan Kebudayaan tentang belajar dari rumah, siswa tidak diperbolehkan masuk sekolah dan semua bentuk kegiatan pembelajaran dialihkan ke pembelajaran daring. Guru diinstruksikan untuk tidak membebani proses belajar daring dengan tuntutan capaian kurikulum, materi harus difokuskan pada pendidikan kecakapan hidup tentang COVID-19, kemudian pemberian tugas dan aktifitas kepada siswa disesuaikan dengan kondisi siswa (Mendikbud, 2020b).

Kebijakan tersebut benar-benar mengubah wajah pendidikan Indonesia. Teknologi pembelajaran awalnya dianggap sebagai alternatif; jika ada dicoba, jika tidak ya sudah. Namun, COVID19 membuat teknologi pembelajaran satu-satunya pilihan. Pembelajaran dilakukan secara daring di rumah siswa masing-masing. Siswa dan guru hanya membutuhkan dan menggunakan fasilitas berupa *smartphone* dan kuota internet untuk dapat tetap melaksanakan pembelajaran. Keluhan dan kesulitan tidak dapat dihindari yang dampaknya dapat terlihat dari berbagai sisi. Dilihat dari sisi sekolah, sekolah mengalami kesulitan dalam melaksanakan berbagai program yang telah direncanakan. Dari sisi siswa, adanya kebijakan tersebut menimbulkan kebosanan siswa akibat jenuh dengan tugas-tugas; tekanan psikologis karena tidak dapat bertemu dengan rekan-rekannya; kesulitan sebagian besar siswa dalam menguasai materi pelajaran daring dan menyelesaikan sendiri tugas-tugas dari guru. Banyak siswa mengandalkan sumber belajar dari buku-buku di perpustakaan sekolah sehingga penguasaan materi bersumber dari *smartphone* tidak maksimal.

Dari sisi orang tua, banyak orang tua yang belum mampu mendidik anaknya sendiri khususnya materi-materi pelajaran karena keterbatasan waktu dan kompetensi, ditambah membengkaknya pengeluaran akibat pembelian kuota. Dari sisi guru, terdapat banyak kendala dalam memberikan pembelajaran daring. Guru tidak dapat memberikan penilaian secara obyektif terhadap siswa, sulit memantau progress siswa dalam belajar, dan guru harus menjelaskan materi pelajaran berulang-ulang.

COVID19 pun mengekspos lubang besar lain yang ternyata adalah peranan teknologi komunikasi dalam pembelajaran; *smartphone*. Penggunaan *smartphone* untuk anak-anak cenderung mengundang polemik karena adanya resiko penggunaan yang tidak tepat terhadap kesehatan fisik dan mental anak (Fischer-Grote, Kothgassner, & Felnhofer, 2019). Penggunaan telepon genggam dilarang selama ujian (BNSP, 2017) dan di jenjang pendidikan tertentu, siswa dilarang membawa *smartphone* ke sekolah apalagi menggunakannya selama pembelajaran. Kini, dalam masa pandemic COVID19, guru dan siswa bergantung pada *smartphone* agar pembelajaran tetap berlangsung.

Kendala terkait penggunaan *smartphone* pembelajaran daring sangat banyak, namun sebagian besar bisa digolongkan menjadi tiga, yaitu kendala dalam hal pedagogi, infrastruktur, dan psikologis. Sebelum COVID19, dunia pendidikan Indonesia menganggap teknologi dalam pembelajaran sebagai sebatas nilai plus. Ketimbang memanfaatkan *smartphone* sebagai medium yang paling dekat dengan kehidupan anak-anak dan susah dihindari, praktisi pendidikan lebih nyaman melarang dan



menghindari penggunaannya. Saat pandemi melanda dan platform online satu-satunya pilihan, siap tidak siap, mau tidak mau, guru harus menggunakan *smartphone*. Dari segi pedagogis, hal ini sangat mempengaruhi penyampaian materi karena guru tidak terbiasa memanfaatkan platform online untuk mengajar. Guru kesulitan dalam mengelola kelas online, menyajikan materi, dan memberi penilaian online. Dari segi infrastruktur, banyak siswa tidak memiliki *smartphone*; tempat tinggal jauh dari sinyal internet; letak rumah di zona merah; dan kondisi ekonomi keluarga siswa memprihatinkan. Dari segi psikologis, siswa merasa bosan dan jenuh dengan aktifitas di rumah saja; siswa tidak didukung lingkungan keluarga; tekanan psikologis karena tidak bisa bersosialisasi dengan teman; dan tertekan oleh tuntutan harus belajar mandiri untuk semua mata pelajaran.

Mata pelajaran matematika merupakan mata pelajaran yang kurang direspon siswa selama pembelajaran jarak jauh. Pada saat pembelajaran tatap muka seperti biasa saja, anak-anak sudah menunjukkan kejenuhan



instansi pemerintah terkait untuk memastikan tersedianya infrastruktur yang merata bagi siswa dan guru di seluruh Indonesia. Melalui sinergi yang baik antara pemangku kepentingan, niscaya dunia pendidikan Indonesia bisa berbenah demi kesiapan yang lebih baik dalam menghadapi masa pandemi.

E/ The world is currently struck by a deadly virus outbreak. So far there have been around 6 million cases and 400,000 deaths worldwide, far higher than other pandemics in the early 21st century such as SARS and H1N1. Global economic, sociocultural, and educational crises are inevitable. The influence of this plague has spread throughout the world, including our beloved Indonesia. This virus is known as coronavirus diseases 2019 (COVID-19), a variant of coronavirus that is still related to SARS.

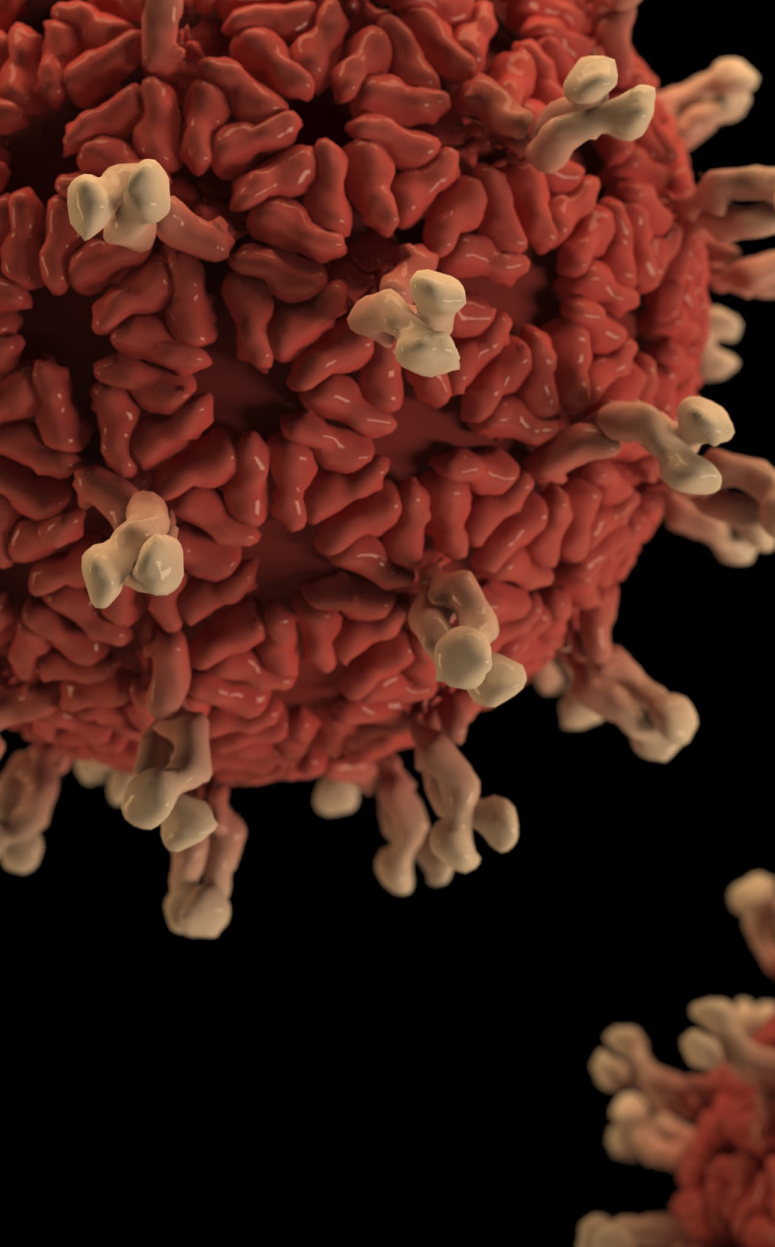
News about COVID-19 has been widespread since December 2019, but there has been no anticipatory action from the government, even though Indonesia is surrounded by infected countries such as Singapore and Malaysia. The first case only emerged in March 2020 in Jakarta, which spread to various regions in Indonesia until it reached around 25,000 cases and 1500 deaths in May 2020. Considerations pertinent to social and economic problems make the government reluctant to implement aggressive strategies that are commonly applied in other countries, such as lockdown, quarantine, and contact tracing. One strategy deemed appropriate and adopted by the government is social distancing, which are applied in almost all regions of Indonesia. One of the applications of social distancing is the "stay at home" policy which entails working and learning to be done from home.

What are the implications for education? In accordance with the Circular Letter and the Instruction of the Minister of Education and Culture (Mendikbud, 2020a), Letter of the Chairperson of BSNP (BSNP, 2020), the results of the Governor's limited meeting with local regional authorities, and Circular Letter of the Head of the Education and Culture Office about learning from home, students are not allowed to enter schools and all forms of learning activities are switched to online learning. Teachers are instructed not to burden the online learning process with demands for curriculum achievement, the material must be focused on life skills education about COVID-19, not to mention assigning tasks and activities to students according to students' conditions (Mendikbud, 2020b).

The policy has profoundly changed the face of Indonesian education. Learning technology was initially considered a mere alternative or enrichment. However, COVID-19 makes learning technology the only choice. Learning is done online at each student's home. The only facilities needed

dan membutuhkan waktu lama untuk bisa memahami penjelasan guru. Sekarang matematika menjadi semakin sulit dipahami sendiri oleh siswa tanpa bantuan langsung dari guru ataupun rekannya sendiri. Hal ini ditunjukkan capaian nilai Kriteria Ketuntasan Minimal (KKM) yang lebih rendah dari biasanya.

Bercermin dari keadaan ini, guru memang harus terus memperbaharui diri dengan ilmu pengetahuan dan teknologi, serta harus terbiasa membuat perencanaan atau desain pembelajaran matematika dengan teknologi sebagai fasilitasnya. Kolaborasi keduanya akan menciptakan pembelajaran yang menyenangkan bagi siswa, terlebih di musim pandemi ini. Webinar dan bimtek daring selama pandemi telah banyak membantu guru-guru untuk terus meningkatkan kualifikasi diri demi mampu menyajikan pembelajaran daring yang berkualitas bagi siswa-siswinya, namun webinar-webinar tersebut belum sepenuhnya juga menjamin optimalisasi peningkatan kemampuan guru dalam memberikan pembelajaran daring jika fasilitas yang dimiliki oleh siswa juga tidak seimbang. Untuk itu, diperlukan dukungan dari



their students, it is difficult to monitor student progress in learning, and the teacher must repeatedly explain the topic.

COVID-19 also exposed another big hole which turned out to be a weakness of the Indonesian education system: smartphone. The use of smartphones for children tends to induce polemic because of the risk of improper use on the children's physical and mental health (Fischer-Grote, Kothgassner, & Felnhofer, 2019). The use of mobile phones is prohibited during exams (BNSP, 2017) and at certain levels of education, students are prohibited from bringing smartphones to school let alone use them during lesson. Ironically, during COVID-19 pandemic, teachers and students depend on smartphones to keep on learning.

Obstacles pertaining to the use of smartphones during online learning are numerous, but mostly can be classified into three, namely obstacles in terms of pedagogy, infrastructure, and psychology. Before COVID-19, the culture of education in Indonesia considered technology in learning as a plus-not a must. Rather than taking advantage of smartphones since it is the technological appliance that is the closest to the lives of children and difficult to avoid, education practitioners are more comfortable banning and avoiding its use. When the pandemic struck and the online platform was the only choice, ready or not, willing or not, teachers have to make peace with using smartphones to support their online learning.

From pedagogical point of view, this greatly influences the delivery of material because teachers are not accustomed to utilizing online platforms in teaching. The teacher has difficulty managing online classes, presenting material, and giving online assessments. In terms of infrastructure, many students do not own a smartphone; they live in places inaccessible by internet or worse, COVID-19 red zones; and the economic conditions of their families are alarming. From a psychological perspective, students feel bored and fed up with activities at home; some are not supported by their family environment; psychological pressure for not being able to socialize with friends; and pressured by the demands of having to study independently for all subjects.

Furthermore, mathematics is a subject that students respond to less during distance learning. Even during normal face-to-face learning, the children were bored and needed a long time to understand the teacher's explanation. Now mathematics becomes increasingly difficult for students to understand on their own without direct assistance from the teacher or their more capable friends. This is reflected in the achievement of the Minimum Accomplishment Criteria (also known as *Kriteria Ketuntasan Minimal* or KKM) which is lower than usual.

and used by the teachers and students to carry out the learning process are in the form of smartphones and internet access.

Complaints and difficulties are unavoidable, whose multifaceted effects are apparent. The schools are unable to carry out their previously planned programs. From the student side, the implementation of these policies leads to the students' boredom due to the tediousness of working with the tasks; psychological pressure for not being able to meet with their friends; the difficulty of most students in mastering the topics being taught online and completing assignments by the teacher by themselves. Many students rely on learning resources from school library books, which means learning from smartphone and online resources is far from optimal.

From the parents' perspective, many of them are unable to help with their own children's lessons due to limited time and competence, plus the increasing family expenditure due to internet spending. From the teachers' perspective, there are many obstacles in providing online learning. The teachers cannot provide objective assessments of

Reflecting on this situation, teachers do have to keep updating themselves with the state of the art of education and technology. They also must be accustomed to making plans or designs of learning mathematics with technology as main facility. Collaboration between the two will create joyful learning for students especially during this pandemic season. Online webinars and technical guidance during the pandemic have helped many teachers to continue to improve their qualifications to be able to present quality online learning for their students. However, these webinars cannot be guaranteed to help teachers to provide quality online learning if the facilities owned by students are not sufficient. For this reason, support is needed from relevant government agencies to ensure the availability of equitable infrastructure for students and teachers throughout Indonesia. Through good synergy between stakeholders, the education of Indonesia will undoubtedly be able to improve themselves for the better preparedness in facing a pandemic.

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Development & Innovation

BELAJAR MATEMATIKA, BELAJAR PEDULI SAMPAH PLASTIK

GROWING AWARENESS ABOUT PLASTIC WASTE THROUGH MATHEMATICS LEARNING

SEPTIARINI DWI NURSHANTI

I/ Menurut Kepala Dinas PLH DKI Jakarta, Jakarta memproduksi sekitar 7.000 ton sampah per hari, dan dari jumlah itu 1.900-2.000 ton merupakan sampah plastik. Berawal dari ketertarikan dan kepedulian terhadap limbah botol plastik yang semakin banyak serta keinginan untuk menggunakan alat peraga yang tidak biasa, saya terpikir untuk memanfaatkannya sebagai kubus transparan. Kubus tersebut akan digunakan pada pembelajaran Luas Permukaan Kubus mata pelajaran Matematika.

Hal ini menjadi daya tarik tersendiri untuk peserta didik SMP Negeri 121 Jakarta tempat saya mengajar. Peserta didik sangat antusias dan memiliki rasa ingin tahu tinggi ketika saya menugaskan mereka membawa sebuah botol plastik minuman ringan untuk dibuat menjadi kubus. Mereka ingin tahu Apakah bisa membuat sebuah kubus yang permukaannya datar dari sebuah botol plastik minuman yang sisinya lengkung. Mereka juga tak sabar menanti hari dimana mereka mendapat jawaban dari keingintahuan mereka tersebut.

Tibalah saat peserta didik bersama-sama dalam kelompoknya membuat alat peraga kubus dari botol plastik. Alat yang digunakan untuk pembuatan kubus tersebut adalah: gunting, pisau cutter, dan penggaris (Gambar 1). Mereka juga menggunakan kertas origami sebagai pelapis kubus transparan yang digunakan sebagai model untuk penemuan jaring-jaring kubus serta luas permukaan kubus.



Gambar 1. Alat dan Bahan
Figure 1. Tools and materials

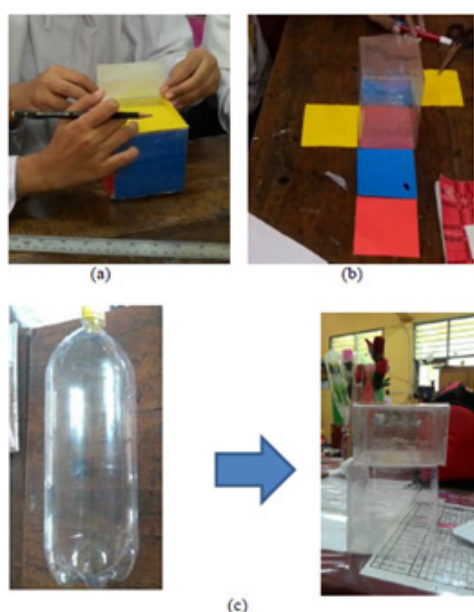
Proses pembuatannya sangatlah mudah, tidak membutuhkan lem dan alat perekat. Dimulai dengan memotong bagian atas bawah botol plastik, siswa mengambil bagian tengahnya. Bagian tengah botol tersebut kemudian dipipihkan sehingga didapat bentuk menyerupai balok yang bagian kanan dan kirinya terbuka. Selanjutnya, siswa menggunakan penggaris dan gunting/cutter untuk membagi balok tersebut menjadi tiga bagian sama secara horisontal. Tiga bagian yang sudah digunting, kemudian disusun dan dimasukkan satu persatu dengan aturan bahwa sisi yang sudah dua lapis, tidak ditimpa lagi.



Gambar 2 Proses pembuatan kubus
Figure 2 The cube-making process

Video proses pembuatan kubus bisa diakses dengan memindai QR code yang disediakan (Gambar 3). Selanjutnya, kertas origami dan lembar kerja digunakan sebagai model untuk menjembatani penemuan Jaring-jaring dan konsep Luas Permukaan Kubus.

Voila! Terbentuklah kubus sederhana dari botol plastik bekas minuman ringan. Murah, mudah, dan menyenangkan. Guru pun tidak perlu lagi membeli alat peraga dari plastik yang mahal dan menambah jumlah sampah plastik yang sudah ada.



Gambar 4. Penggunaan Alat Peraga
Figure 4 Using the manipulative

Penggunaan limbah botol plastik sebagai alat peraga pembelajaran akan sangat bermanfaat untuk mengurangi produksi sampah. Selain itu, botol plastik sangat mudah dibentuk, sehingga bisa dikreasikan menjadi alat peraga lain. Bagian atas dan bawah botol yang tidak digunakan untuk bahan kubus transparan, dapat digunakan sebagai pot untuk tanaman hydroponic yang digunakan sekolah.

Siswa pun terinspirasi untuk memanfaatkan sampah botol plastik, contohnya salah satu siswa saya yang ingin membuat kotak plastik kecil kemasan slime. Praktik ini merupakan semangat dari SMPN 121 Jakarta, yang juga merupakan sekolah adiwiyata.

Pembelajaran akan sangat berkesan dan menyenangkan, karena siswa mendapatkan pengalaman dan pengetahuan baru yang membuat mereka termotivasi untuk terus belajar dan ingin tau. Semoga pembaca juga bisa terinspirasi untuk membuat sesuatu yang bermanfaat dari barang yang tidak terpakai.



Gambar 3. QR code video
Pembuatan Kubus Transparan
Figure 3. QR code for cube-making video

E/ According to a government official, Jakarta produces around 7000 tonnes of waste per day, and from that amount, 1900 -2000 tonnes are plastic. Starting from my concern on the growing number of plastic bottle waste coupled with my desire to use out-of-the-box physical manipulative, it occurred to me to use the plastic bottle to make transparent cubes. The cubes will be used during a mathematics lesson on the topic of Surface Area of Cube.

Apparently, the plastic bottle has its own appeals for my students at SMP Negeri 121 Jakarta, where I teach. The students were very enthusiastic and incredibly curious when I tasked them to bring a soda plastic bottle to be made into a cube. They were curious whether it is possible to make a flat-surfaced cube from a plastic bottle, whose sides are curved. They were also excited for the day where they will finally be able to get the answer to their question.

Finally, the day came when the students worked in groups to create cubic physical manipulative from plastic bottles. The materials needed to make the cubes are scissors, knives, cutters, and rulers. They also used origami paper to layer the transparent cube's surface as a model to discover the nets and the formula for the surface area of cubes.

The process of making the cubes itself is pretty easy, no need for glue or any sticky substances. Starting by cutting the top and bottom of the plastic bottle, the students take the middle part. The middle part of the plastic bottles is flattened out to acquire cuboid-like shapes with open left and right side. Afterward, the students use rulers and scissors/cutter to split the cuboid horizontally into three equal parts.

Then, they arranged the three sections by inserting them into one another, with a rule that each side only has two layers of plastic.

The video of the cube-making process can be accessed by scanning the QR Code in Figure 3. Afterward, the origami paper and the worksheet can be used as a model to bridge the discovery of

Voila! Just like that, we have a minimalist cube made from soda plastic bottle waste. Cheap, easy, and admit it, the students get to have fun. Teachers no longer need to buy physical manipulatives made from expensive plastics, only to add to the pile of plastic waste out there.

Utilizing plastic bottle waste to create physical manipulative can help to reduce the amount of plastic waste out there. Furthermore, the plastic is pliable and easy to mold, opening the possibility for teachers to create many kinds of manipulatives. The unused top and bottom part of the plastic bottle can be used as hydroponic plant pots in school. Some students are even inspired to make use of plastic bottle waste, for example, making plastic packaging for slime products. This is exactly the spirit held by my school, which is also adiwiyata (environmentally friendly) school.

The lesson will be joyful as well as meaningful because the students obtained new experience and knowledge, which hopefully will make them strive to learn and stay curious. I hope the readers can also take inspiration in creating useful things from waste around us.

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SEPTIARINI DWI NURSHANTI

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Event	Level (Jenjang)	Registration Deadline (Penutupan Pendaftaran)	Dates
Southeast Asia Realistic Mathematics Education (RME)	SMP	8 Februari 2020	6 - 19 Maret 2020
Joyful Learning in Mathematics Education (JL)	SD	3 Maret 2020	3 - 16 April 2020
Developing Lesson Study in Mathematics Education (LS)	SMA/K	16 Juni 2020	16 - 29 Juli 2020
Integrating ICT in Mathematics Education (ICT)	SMP	28 Juli 2020	28 Agustus - 10 September 2020
STEM for Mathematics Learning	SD	9 September 2020	9 - 22 Oktober 2020

Untuk informasi lebih lanjut kunjungi www.qitepinmath.org

You May Not Know

A Quest for a New Settlement: Where is the new spring?

An island has been logged for a new settlement. Figure 1 shows the map of the island in a coordinate plane. There are three water springs on the island which have the same water quality. One of the government's considerations is the access to the nearest water spring. Therefore, the government will divide the area of the island to enable citizens to access the nearest spring. If we want to help the government to divide the island, what do we do?

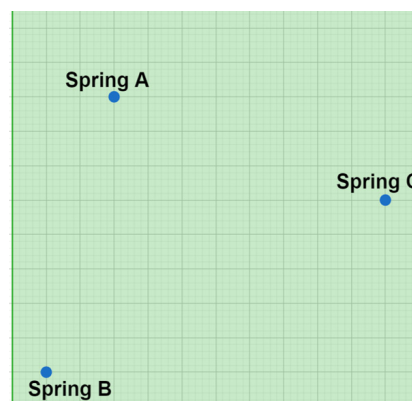


Figure 1 Map of the island

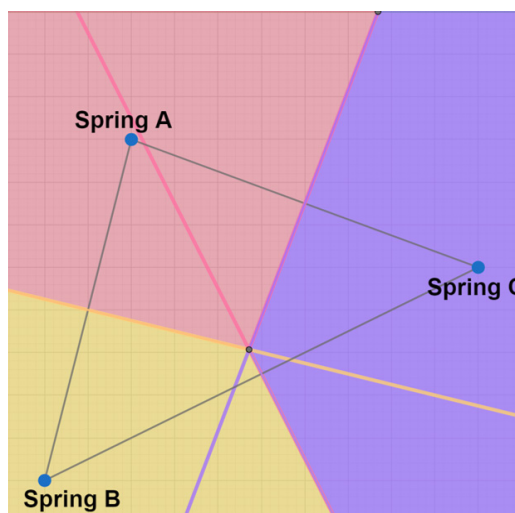


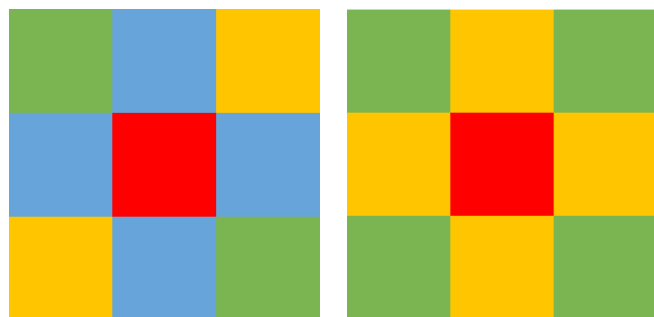
Figure 2 Solution with perpendicular bisector of triangle

You may not know that we can solve this problem with a simple mathematical concept! Can you guess it? We can use the concept of a perpendicular bisector line to solve the problem.

On the given map, make segments from spring A to spring B, from spring B to spring C, and from spring C to spring A (Figure 2). For each line segment, determine its perpendicular bisector line. Using the three perpendicular bisector lines, we can determine the boundary of each area such that the citizens are aware of their nearest water spring. (TW)

Challenges

Tableclothing Arts



Yesterday, I made two tableclothes from some pieces of colorful fabrics. And here are my tableclothes!

I find it really interesting that those tableclothes satisfy a different symmetry rules. Look at the colors! the first one has 4 lines of symmetry and rotational symmetry of order 4. The second one has 2 lines of symmetry and rotational symmetry of order 2.

I want to design another 5 x 5 tablecloth and satisfy different symmetry rules. I want my design has no line symmetry and rotational symmetry of order 2. You can use any color you want.

Send your beautiful design to us!

Contributor: Ummy Salmah

Get The

PRIZE

Send your answer to this challenge to seametrical@qitepinmath.org with subject MATH CHALLENGE. Two lucky winners, which will be announced in the next edition, will get a unique souvenir from SEAMEO QITEP in Mathematics.



Math Around Us

MENAKSIR TINGGI: MEMBAWA PRAMUKA KE KELAS MATEMATIKA

ESTIMATING HEIGHT: BRINGING SCOUTING INTO MATHEMATICS CLASSROOM

HENING WINDRIA

// Pramuka merupakan gerakan yang tidak asing bagi siswa di Indonesia. Dalam kegiatannya, pramuka mengharuskan anggotanya untuk mengikuti tes kecakapan sesuai dengan tingkatan kepramukaannya. Dalam Surat Keputusan Kwarnas Gerakan Pramuka no. 198 tahun 2011, salah satu syarat kecakapan umum penggalang ramu adalah memperagakan kecakapannya untuk menaksir tinggi dan lebar. Pembahasan kali ini akan fokus pada menaksir tinggi.

Menaksir, menurut KBBI, adalah menentukan dengan kira-kira. "Kira-kira" di sini tidak lantas diartikan sebagai sangkaan atau dugaan tanpa alasan atau pertimbangan. Khusus untuk menaksir tinggi dan lebar ini menggunakan alasan matematis untuk menentukan tinggi atau lebar sesuatu.

Menaksir tinggi suatu benda, misal tiang bendera, bisa dilakukan dengan memanfaatkan kesebangunan segitiga. Kegiatan ini biasanya dilakukan dengan menggunakan bantuan tongkat pramuka dan tinggi tubuh pengamat. Selain itu, penaksiran dilakukan pada tanah yang datar,

seperti lapangan. Perhatikan sketsa gambar di samping (Gambar 1). Perbandingan tinggi tiang bendera dan tinggi tongkat pramuka sama dengan perbandingan jarak pengamat dengan tiang dan jarak pengamat dengan tongkat pramuka, sehingga persamaan tersebut bisa diteruskan untuk menaksir tinggi tiang bendera. Pada gambar tersebut, mata pengamat dekat dengan tanah. Dalam kenyataan, pengamat berbaring di atas tanah saat mengamati. Jika pengamat berdiri, maka tinggi tiang hasil penaksiran harus ditambah dengan tinggi pengamat.

Meskipun pada kegiatan pramuka tidak disinggung tentang alasan penggunaan konsep kesebangunan dan perbandingan hingga mendapatkan rumus seperti tertulis di atas, permasalahan ini dapat didiskusikan pada kelas matematika. Penggunaan konteks sehari-hari membuat matematika lebih dekat dengan kehidupan siswa. Sehingga siswa terfasilitasi untuk berargumentasi secara matematis dan dapat menaksir tinggi dengan strategi yang berbeda.

Dapat dikatakan, keterampilan kepramukaan merupakan

contoh dunia nyata yang dapat dibawa guru dalam kelas matematika. Ditambah lagi, guru dapat mengembangkan permasalahan untuk diskusi dan belajar memecahkan masalah terkait dengan konsep kesebangunan segitiga.

Salah satu poin belajar lain yang bisa dibawa ke dalam kelas matematika adalah ketika bidangnya tidak datar, misalnya menaksir pohon di atas bukit. Apa yang harus dilakukan siswa, apakah proses yang sama ketika bidangnya datar tetap bisa dilakukan? Apakah hasil yang diperoleh benar secara konsep matematikanya? Pertanyaan semacam ini diharapkan dapat melatih siswa untuk bisa berargumentasi secara matematis.

E/ Scouting is a familiar movement for Indonesian students. In scouting, members are obliged to take the advancement test based on their sections. One of the requirements, as listed in the general skills for Penggalang Ramu number 24, is that Scouts must demonstrate their ability to estimate the height and the width of objects. In this article, we will focus on estimating the height.

Estimating is closely related to approximation. It can be defined as “a rough calculation of the value, number, quantity, or extent of something.” However, this should not be understood as random guessing. In estimating heights and widths, we use mathematical reasoning.

In estimating an object, for instance a flag pole, a scout can use the concept of the similarity of triangles by effectively utilizing a scout stave (pole) and the height of the observer. To estimate the height of an object, it should be done on a flatland. Take a look at the illustration below (Figure 1).

The ratio of the height of the flagpole to the height of the stave is equal to the ratio of the distance between the observer and the pole to the distance between the

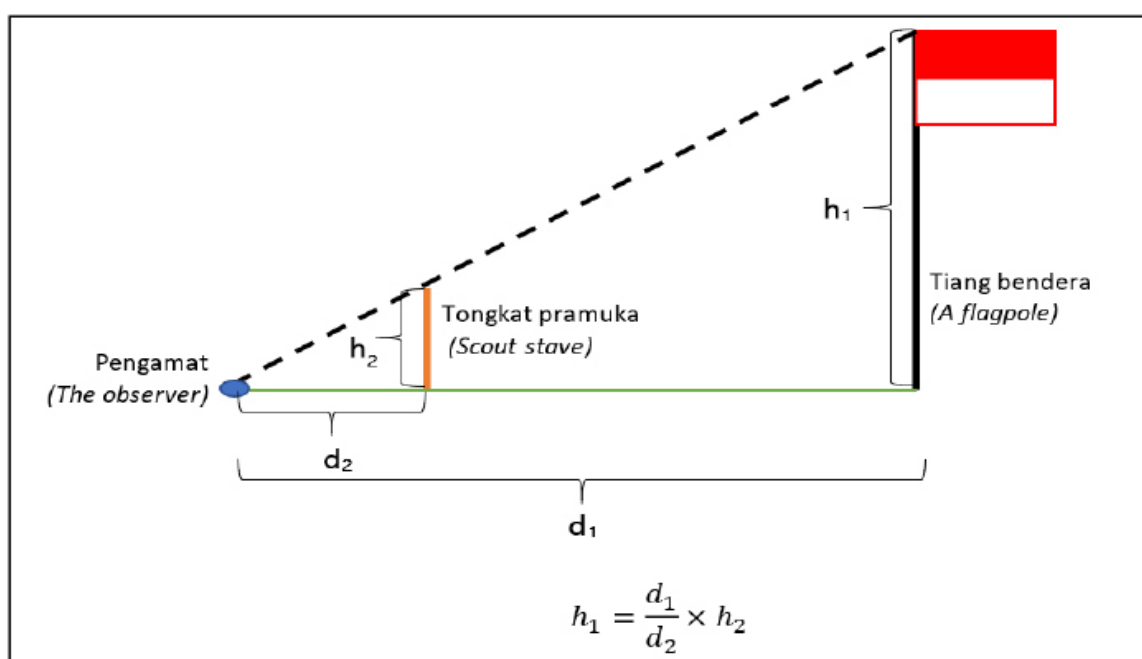
observer and the stave. The eye of the observer is close to the ground. Therefore, the observer should lay on the ground in observing the height of an object. If the observer is standing up, then the their height must be added up to the estimated height of the pole.

In mathematics classroom, the concept of similarity of triangles can be discussed further. The use of daily context brings mathematics closer to students’ life. By using a context, we can support students to argue mathematically and to estimate by using different strategies. In other words, scouting is an example of real life context that can be included in the mathematics classroom. Moreover, mathematics teachers may elaborate the problems for students to discuss and to solve problems related to the concept of similarity of triangles.

Using the activity, teachers may also provide more challenging problems by considering different situation whether the observation is done on a rugged terrain, for example hills or riverbanks. Will the observation will be the same as observing on a flatland? Is the estimation correct according to the mathematical concept? These questions are expected to emerge and to support students to argue mathematically.



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Gambar 1 Menaksir tinggi tiang bendera dengan tongkat pramuka
Figure 1 Estimating the height of flag pole with scout stave

Toán học và nghệ thuật ẩm thực truyền thống

Serving a Vietnamese Traditional Dish with a Mathematical Concept

NGUYEN THU HA

V/ Toán học và nghệ thuật ẩm thực truyền thống. Bạn đã bao giờ tự hỏi rằng toán học có thể được tìm thấy trong cách thưởng thức một món ăn? Ở Việt Nam, chúng tôi đón Tết Nguyên Đán với Bánh Chưng truyền thống - món ăn không thể thiếu trong mỗi dịp Tết đến xuân về. “Thịt mỡ, dưa hành câu đối đỏ/ Cây nêu tràng pháo bánh Chưng xanh” đó là tất cả những gì đặc trưng phong phú nhất của ngày tết Việt.



Hình 1. Nguyên liệu và cách gói bánh Chưng
Figure 1. Ingredients for making a Banh Chung

Bánh Chưng được làm từ gạo nếp, nhân bánh làm từ đậu xanh và thịt lợn. Những chiếc bánh Chưng được gói vuông vắn bằng lá dong (người Việt xưa quan niệm mặt đất hình vuông – bầu trời hình tròn) minh họa trong hình 1.

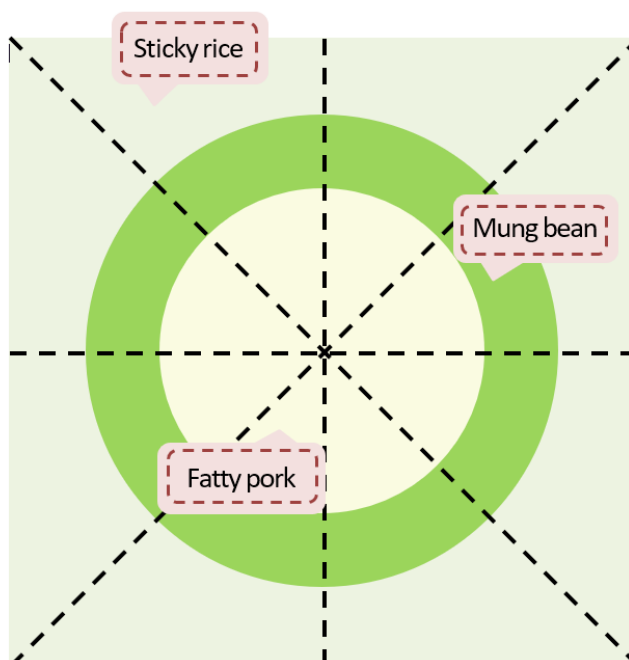
Gói bánh Chưng rất cầu kì, nhưng cách cắt bánh cũng rất đặc biệt, bằng cách sử dụng lạt (dây buộc bánh được làm từ tre). Trong hình 2, Những cái lạt được xếp theo bốn trục đối xứng của hình vuông, chiếc bánh

Chưng được cắt thành tám phần hình tam giác vuông cân bằng nhau, như vậy chúng ta có thể thưởng thức toàn bộ hương vị của bánh Chưng bao gồm vỏ bánh, nhân thịt và đậu xanh.

Rõ ràng, tính chất đối xứng trong toán học rất hữu ích, giúp chúng ta thưởng thức bánh Chưng một cách hoàn hảo nhất. Ngoài ra, tất cả mọi người đều nhận được cùng một lượng bánh! Không ai muốn nhận phần bánh nhỏ hơn người khác, phải không? Bạn có cách nào khác để cắt bánh Chưng thành 8 miếng bằng nhau và chúng ta có thể nếm tất cả hương vị của bánh không?

Toán học thật tuyệt vời. Tôi yêu môn Toán, yêu cả cách người Việt Nam dùng Toán học để thưởng thức Bánh Chưng cổ truyền. Bạn thấy đấy, Toán học luôn hiện hữu quanh chúng ta, nó gần gũi và thân thiện đến nỗi nó đã đi vào món ăn truyền thống của một dân tộc.

Còn ở đất nước của bạn thì sao? Có những món ăn truyền thống nào sử dụng trục đối xứng?



Hình 2. Cách cắt bánh chưng
Figure 2. How to cut a Banh Chung

E/ Have you ever wondered that mathematics can be found in serving food? In Vietnam, we welcome the Lunar New Year by featuring a traditional dish named Banh Chung (Chung cake).

Chung cake has been considered as an indispensable dish on such occasions. Vietnamese people celebrate it by following an old saying “**thịt mỡ dưa hành câu đối đỏ – cây nêu tràng pháo bánh chưng xanh**” (meaning: fat pork, pickled onion, and red couplets – Lunar New Year pole, strings of firecrackers, and Chung cake).

The Chung cake is made of sticky rice and filled with pork and mung bean, as illustrated in Figure 1. Moreover, the cake is wrapped up tightly and shaped into a square following the ancient concept. The shapes of round and square symbolize sky and ground, respectively.

Wrapping the cake requires great carefulness. Once the cake is ready, we cut it, particularly by using a lat (a kind of bamboo slicer). In Figure 2, the lat is arranged in accordance with four symmetrical axes of a square. As a result, the cake is cut into eight equal-sized right triangular pieces. The specific cutting technique enables us to savour entire flavours of Chung cake including rice, fat pork and mung bean.

Obviously, the symmetrical concept in mathematics is useful to help us to enjoy Chung cake in the best way possible. Also, to make sure everyone get the same amount of cake! You don't want to get smaller slice than other people, right?

Now think about it. Is there other way to cut the cake into eight pieces that is also fair and let us taste all flavour of the cake?

Mathematics is awesome. I love mathematics, especially how Vietnamese people applying mathematical concepts to enjoy traditional Chung cake. As you can see, mathematics is around us. It appears in the traditional dish of a nation.

What kind of traditional dish in your country that uses symmetry?



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Math Around Us

How I Teach My 7th-Grade Students the Expansion of Algebraic Expression by Connecting Mathematical Concepts to Local Cultural Context

Bagaimana Saya mengaitkan Konsep Matematika dengan Konteks Budaya Lokal dalam Ungkapan Algebra Tingkatan Dua

LIM YI WEI

E/ “When am I going to use algebra?” “Why is it necessary to learn algebra?” I pondered these questions in my head because I was taught with a traditional mathematics approach, where learning mathematics concepts was just rote memorization with many drills and practices. I did not realize mathematics is all around us until I became a mathematics teacher.

Many students perceived algebra as an abstract concept, which is difficult to understand and has zero relevance to real life. Students repeat the step-by-step algorithm taught by the teacher into direct questions but unable to apply in real-life word problems. Only 21% of students reported are frequently exposed to algebraic word problems during their mathematics lesson (OECD, 2018).

It is the responsibility of mathematics teachers to help students to connect the mathematics concepts into a real-life situation. Hence, I came out with an idea to teach my 7th-grade students the expansion of algebraic expression by connecting the mathematical concept to the local cultural context of buying ethnic food. The guiding question is “How can we apply the skills of ‘expanding algebraic expressions’ in purchasing a set combo?”

Students were divided into small groups to complete the given task at four pre-setup ethnic food stations. In every station, students need to solve the given “expanding algebraic expressions” task by referring to the Sabah ethnics Combo Menu (Figure 1). For instance, in the Malay station, students were asked ‘If I buy 2 Malay Combo Sets, in which each combo offers 3 nasi lemak and 7 chicken satays, what are the detailed food items that I would get?’

The expected algorithm is $2(3 \text{ nasi lemak} + 7 \text{ chicken satays})$, and the expected answer is 6 nasi lemak + 7 chicken satays. From here, we can derive an expression that works in every situation, such as $z(x + y) = zx + zy$, where z = number of sets, x = number of the first food item, and y = number of the second food item. This lesson can be easily adapted into other cultures as well, by using the local ethnic food menu.

By connecting mathematical concepts to real life, it helps students to develop interests in mathematics. During the

Students The Expansion Connecting Mathematics Context

gan Konteks Budaya

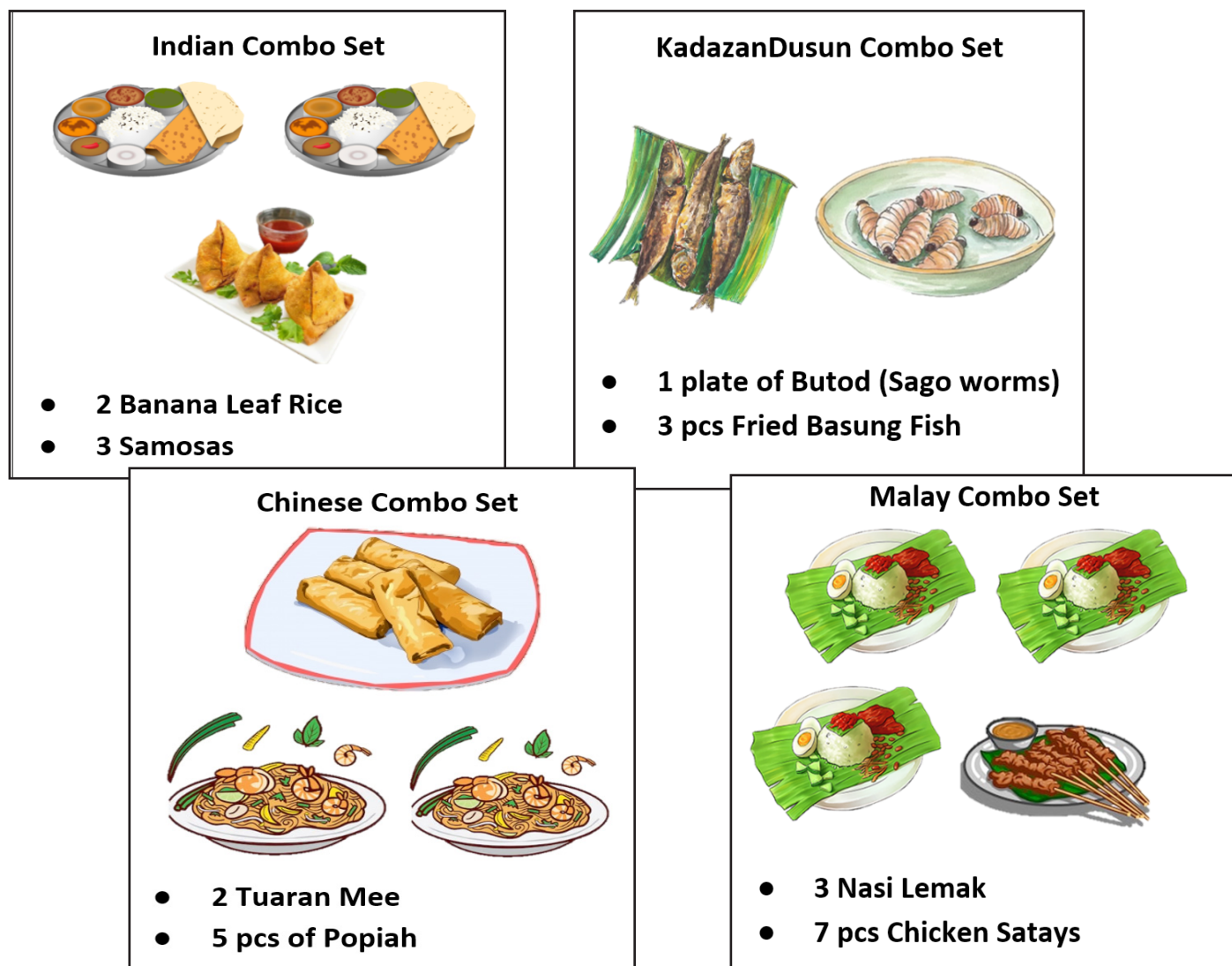


Figure 1 Sabah ethnics combo menu
Gambar 1 Menu set combo kaum Sabah

lesson, I found that students who usually have less interest in mathematics also immersed in the group discussion because it was relevant to their life. Such a lesson is also a wonderful day to introduce ethnic food of our country. It is worth spending time to design a lesson that is connected to a real-life situation to make the learning experience meaningful, engaging, and fun.

M/ "Bila baru saya boleh guna algebra?" "Kenapa kita perlu belajar algebra?" Soalan-soalan ini timbul di kepala saya semasa masih seorang murid sekolah. Pada ketika itu,

saya belajar konsep matematik dengan menghafal dan membuat latihan yang bertubi-tubi. Saya tidak menyedari matematik berkait rapat dengan sekeliling kita sehingga menjadi seorang guru.

Ramai murid beranggapan bahawa matematik merupakan satu konsep yang abstrak dan susah difahami. Sering kali, mereka hanya mampu membuat soalan yang terus kepada pencarian jawapan dengan langkah-langkah algoritma yang diajar tetapi tidak mampu mengaplikasikannya ke dalam masalah matematik berayat.

Hanya 21% murid dilaporkan sering terdedah dengan soalan-soalan berayat semasa dalam pembelajaran ungkapan algebra (OECD, 2018).

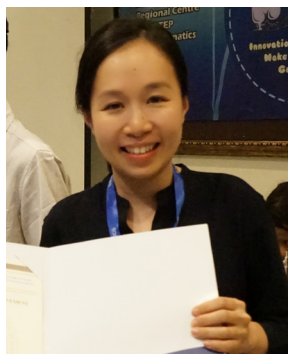
Ia merupakan tanggungjawab guru untuk mengaitkan konsep matematik dengan situasi kehidupan seharian murid. Oleh itu, saya pun tercetus idea untuk mengaitkan konteks budaya dalam pengajaran dan pembelajaran kembangan ungkapan algebra Tingkatan 2. Soalan panduan ialah “Bagaimanakah kita boleh mengaplikasikan kemahiran ‘kembangan ungkapan algebra’ semasa pembelian combo set?”

Murid-murid akan dibahagikan kepada kumpulan kecil untuk menyelesaikan tugas di setiap stesen kaum yang tersedia. Di setiap stesen, murid-murid dikehendaki untuk menyelesaikan tugas “Kembangan ungkapan algebra” dengan merujuk kepada menu set combo kaum Sabah (Gambar 1). Sebagai contoh, di stesen Melayu, soalnya ialah “Jika saya membeli 2 set combo Melayu (3 nasi lemak + 7 Satay ayam), apakah makanan terperinci yang saya dapat?” Algoritma yang dijangkakan ialah $2(3 \text{ nasi lemak} + 7 \text{ satay ayam})$, dan jawapan yang dijangkakan ialah 6 nasi lemak + 7 satay ayam. Dari sini, kita boleh menerbitkan satu ungkapan algebra yang boleh digunakan dalam setiap situasi, iaitu $z(x + y) = zx + zy$, di mana z = bilangan set combo, x = bilangan makanan pertama and y = bilangan makanan kedua. Pengajaran ini boleh digunakan dalam budaya yang lain dengan senang sekali.

Dengan mengaitkan konsep matematik dalam kehidupan seharian, ia menggalakan minat murid-murid terhadap matematik. Semasa pengajaran ini, saya mendapati murid yang biasanya tidak berminat terhadap matematik telah menumpukan perhatian dan terlibat dengan aktif dalam perbincangan kumpulan kerana kesinambungannya terhadap kehidupan seharian mereka. Oleh itu, tidak sia-sia seorang guru untuk merancang satu pengajaran yang berhubungkait dengan situasi kehidupan seharian dan dapat merangsangkan pembelajaran yang bermakna,

Reference:

OECD (2016), *Equations and Inequalities: Making Mathematics Accessible to All*, PISA, OECD Publishing, Paris, <https://doi.org/10.1787/9789264258495-en>.



LIM YI WEI has been teaching in SANZAC secondary school since 2008. She completed her master degree from University Malaysia Sabah in 2013. In 2019, she won second place in the South East Asia Mathematics Teaching and Learning Model (SEA-MTLM) competition. She lives in Kota Kinabalu, Sabah, Malaysia.

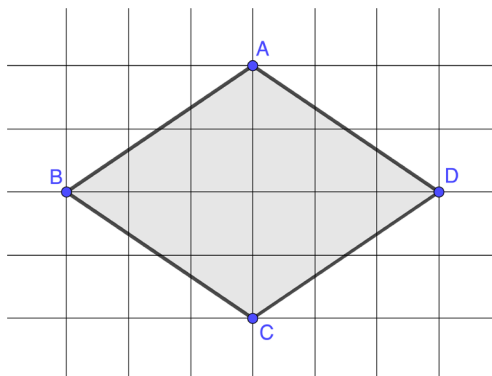


DESAIN DIDAKTIS LUAS DAERAH SEGI EMPAT

A DIDACTICAL DESIGN ON THE AREA OF QUADRILATERALS

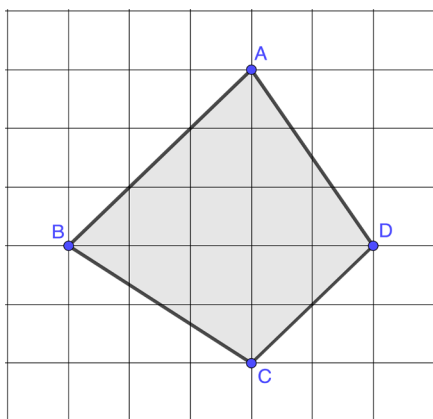
BAGUS ARDI SAPUTRO

// Banyak dari kita sudah mengenal rumus luas daerah layang-layang dan belah ketupat. Rumus layang-layang dan belah ketupat yang dimaksud yaitu $L = \frac{1}{2} \times d_1 \times d_2$, dimana L menyatakan luas daerah, sementara d_1 dan d_2 menyatakan panjang kedua diagonalnya. Walaupun kita telah mengenal lama rumus tersebut, kita hanya menggunakan rumus tersebut jika berhadapan dengan bangun layang-layang dan belah ketupat saja. Padahal, rumus ini dapat juga digunakan untuk mencari luas daerah bangun segi empat apapun yang diagonalnya saling berpotongan segak lurus. Sangat disayangkan jika pemahaman ini jarang disinggung dalam pembelajaran matematika di kelas.



Gambar 1 Belah ketupat dan layang-layang
Figure 1 A Rhombus and a kite

Lalu bagaimana cara agar siswa memahami ini? Pembelajaran yang saya lakukan diawali dengan memberikan dua buah gambar yaitu layang-layang dan belah ketupat pada kertas berpetak (Gambar 1). Siswa kemudian mencari luas kedua bangun tersebut. Mereka akan dengan mudah menghitung luas bangun dengan menghitung panjang diagonalnya.



Gambar 2 Trapezium
Figure 2 Trapezoid

Situasi kedua yaitu siswa menghitung luas trapesium yang diagonalnya berpotongan tegak lurus (Gambar 2). Beberapa siswa ternyata kesulitan menghitung luasnya, dan belum yakin bahwa gambar tersebut trapesium. Di sini kita perlu mengarahkan mereka agar menggunakan rumus lain (seperti rumus luas segitiga). Kita juga dapat menunjukkan bahwa dua pasang sisi pada segi empat tersebut sejajar.

Situasi ketiga adalah siswa menghitung luas dari gambar segi empat sebarang yang bukan trapesium, bukan layang-layang tetapi dengan diagonal yang berpotongan

tegak lurus (Gambar 3). Biasanya siswa akan dengan mudah menghitung luas dengan membagi segi empat menjadi empat segitiga. Setelah itu, siswa diminta menghitung dengan menggunakan rumus layang-layang dan belah ketupat, kemudian guru bisa bertanya, "Mengapa kedua prosedur tersebut memberi hasil yang sama?". Jika siswa belum dapat memberikan alasan yang tepat, ajak siswa memperhatikan diagonal-diagonalnya.

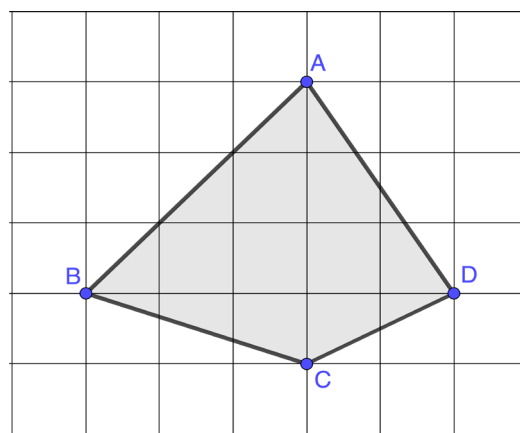
Kita dapat menggunakan GeoGebra untuk bereksplorasi dengan siswa (<https://www.geogebra.org/m/mfjqbvnd>). Siswa yang bereksplorasi dengan GeoGebra akan mendapatkan pencerahan bahwa diagonal-diagonal bangun-bangun yang dieksplorasi sebelumnya semua berpotongan tegak lurus. Gagasan siswa diharapkan akan berkembang, bahwa luas daerah segi empat sebarang bisa diperoleh dengan menghitung setengah dari hasil kali kedua diagonalnya, selama diagonal-diagonal tersebut berpotongan tegak lurus.

Evaluasi yang digunakan adalah meminta siswa menghitung luas persegi yang panjang diagonalnya 4 cm. Jika siswa



rhombus) and do not have certain regularity. Make sure the diagonals are perpendicular to each other (Figure 3).

Usually the students can easily calculate the area by splitting the quadrilateral into four triangles. After that, students were asked to calculate by using the kite and rhombus formula, followed by the teacher's question, "Why do the two procedures give similar results?". If students have not been able to give the right reasons, we can encourage students to focus their attention on the diagonals.



Gambar 3 Segi empat sebarang dengan diagonal yang berpotongan tegak lurus

Figure 3 Any quadrilateral with perpendicular diagonals

E/ Many of us are familiar with the formula for the area of kite and rhombus, which is $L = \frac{1}{2} \times d_1 \times d_2$ in which L symbolize the area, while d_1 and d_2 symbolizes the diagonals. Although we have known the formula for a long time, we have only used the formula when dealing with the shapes of kite and rhombus. However, this formula can also be used to find the area of other quadrilaterals on a condition that they have diagonals that are perpendicular to each other. It would be better if the understanding of this concept is also becoming the goal of mathematics learning in our classrooms.

Then, how do we make our students understand this concept? I started my lesson by giving them two drawings of kite and rhombus on grid paper (Figure 1). Students attempt to find the area of the two plane shapes. They can easily calculate the area of the plane shapes by calculating the length of the diagonals.

In the second situation, the students tried to calculate the area of the trapezoid in which the diagonals are perpendicular to each other (Figure 2). Some students apparently had difficulty when calculating the area and were not sure that the image is a trapezoid. Here, as teachers, we can direct students to use other formulas (such as the formula for the area of triangle). We can also show that the two sides of the quadrilateral are parallel.

In the third situation, students tried to calculate the area of any quadrilateral image (not a trapezoid, not a kite, not a

We can also use GeoGebra so students can explore more about this concept (<https://www.geogebra.org/m/mfjqbvnd>). Students who explore GeoGebra will get the idea that the diagonal pairings of the shapes explored earlier are all perpendicular to each other. We expect the students will get the "Aha!" moment, that the area of quadrilaterals can be found by calculating half of the product of its diagonals, as long as the two diagonals are perpendicular to each other.

An evaluation that can be used is by asking students to calculate the area of a rectangle that the length of the diagonals is 4 cm. If students use the area formula of kite and rhombus, it means students understand that the formula can be used on any quadrilateral with perpendicular diagonals.



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Math Conservation Project

ANINDHYTA PUTRI PRADIPTA



E/ This project is a collaboration between two things, namely 1) the evaluation of thematic lesson on human-nature interaction, and 2) mathematics lesson about cube. To foster their critical thinking, the students are asked to change waste into useful and valuable objects in the shape of cube. During this month long project, the students from class 5B have produced many objects namely: tissue boxes, piggy bank from cardboard boxes, mini drawers, tetris toy, and cubes of lesson summary. With this project, we hope the students can learn how to use the knowledge they learn in the school to innovate and creating products out of waste.

I/ Project ini merupakan hasil kolaborasi dari dua hal, yaitu 1) evaluasi pelajaran tematik tentang interaksi manusia dengan alam dan 2) pelajaran matematika tentang kubus. Untuk mengasah critical thinking mereka, siswa diminta untuk mengubah sampah tak berguna menjadi barang yang mempunyai nilai dan manfaat dalam bentuk kubus. Dari project selama sebulan ini, anak-anak kelas 5B mampu menghasilkan beberapa benda antara lain : kotak tissue, celengan dr kardus bekas, laci mini, mainan tetris, dan kubus rangkuman pelajaran. Dengan adanya project ini, siswa-siswi diharapkan belajar bagaimana menggunakan ilmu pengetahuan untuk berinovasi dan mengolah sampah menjadi sebuah produk.

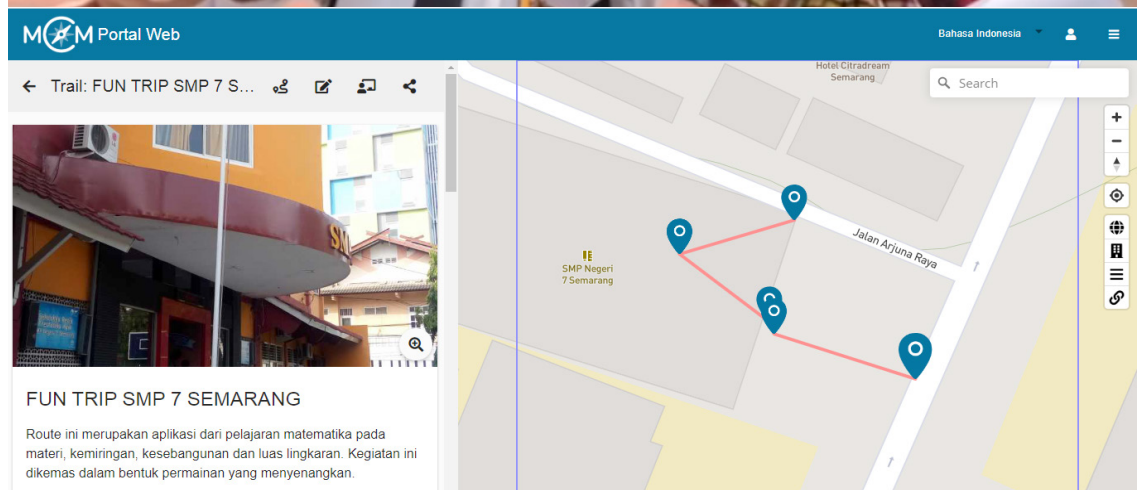
ANINDHYTA PUTRI PRADIPTA is a teacher at Labschool UNNES Semarang. She completed her education in Biology Education from Yogyakarta State University in 2013

LEARNING AND COMPETING BY EXPLORING MATHEMATICS AROUND THE SCHOOL

BAVO MANON NUGROHO

I/ Belajar, Bersaing Dan Bertanding dengan menelusuri matematika di sekitar sekolah merupakan kegiatan out door untuk siswa SMP. Dalam kegiatan ini, mereka bekerja sama untuk memecahkan masalah matematika dalam kehidupan nyata. Kegiatan ini didukung oleh aplikasi MathCityMap yang merupakan proyek math trail dengan memanfaatkan mobile technology. Math trail adalah jejak untuk mengeksplorasi matematika yang didukung oleh aplikasi berbasis peta/teknologi GPS.

E/ Learning and Competing by exploring mathematics around the school is an out door activity for middle school students. In this activity, they work together to solve real-life mathematics problem. This activity is supported by MathCityMap which is a math trail project utilizing mobile technology. Math trail is a trail to explore mathematic supported by map based application/GPS technology.



BAVO MANON NUGROHO

is a mathematics teacher at SMPN 7 Semarang. He is one of the alumni of 2017 Teacher-Made Teaching Aids course in SEAMEO QITEP in Mathematics



Hall of Fame

PARABOLIC BRIDGE CULMINATING ACTIVITY

LEONIDES BULALAYAO

E/ Mathematics is challenging but joyful. It is shown through the big smiles of my students during our culmination activity in quadratic function. Their task was to build a parabolic bridge with only popsicle sticks and glue. The bridge projects were assessed based on creativity, design, durability, and efficiency. In the Intel Bridge project (<https://vimeo.com/89580255>), the students used high tech materials and collaborated digitally. My students, on the other hand, used low cost materials and the internet as their resources. The students were having fun on top of developing collaboration during the project, especially during the durability testing. Two of the bridges collapsed in the durability test, but they are all happy with what they learned and achieved.

F/ Ang Matematika ay mahirap ngunit masaya. Ito ay ipinapakita sa pamamagitan ng malaking mga ngiti ng aking mga mag-aaral sa aming aktibidad sa pagtatapos sa quadratic function. Ang kanilang gawain ay ang pagbuo ng isang parabolic tulay na may lamang mga popsicle sticks at pandikit. Ang mga proyekto sa tulay ay nasuri batay sa pagkamalikhain, disenyo, tibay, at kahusayan. Sa proyekto ng Intel Bridge (<https://vimeo.com/89580255>), ang mga mag-aaral ay gumagamit ng mga high tech na materyales at nagtulungan nang digital. Ang aking mga mag-aaral, sa kabilang banda, ay gumagamit ng mga murang materyales at internet bilang kanilang mga mapagkukunan. Ang mga mag-aaral ay masaya sa tuktok ng pagbuo ng pakikipagtulungan sa panahon ng proyekto, lalo na sa pagsubok ng tibay. Dalawa sa mga tulay na gumuho sa pagsubok ng tibay, ngunit lahat sila ay nasisiyahan sa kanilang natutunan at nakamit.

LEONIDES BULALAYAO is a school master teacher in Nueva Ecija High School, Nueva Ecija, Philippines. She is passionate about ICT in education, shown by the many achievements she achieve in this area. She was an alumni of Workshop on STEM Using Low Cost materials in SEAMEO RECSAM, Malaysia.

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Abstract Acceptance Notification	: 31 August 2020
Deadline for Full Paper Submission	: 31 October 2020
Conference Date	: 18-19 November 2020



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