KEMENTERIAN PENDIDIKAN
INSTITUT PENDIDIKAN GURU MALAYSIA

MAJLIS BELIA MALAYSIA

TOOLKIT

MERENTAS KERJAYA

KEMENTERIAN PENDIDIKAN
INSTITUT PENDIDIKAN GURU MALAYSIA

Toolkit
STEM
Merentas Kerjaya

Pusat Pembangunan Latihan
Institut Pendidikan Guru Malaysia
&
Majlis Belia Malaysia

Toolkit STEM Merentas Kerjaya

Diterbitkan oleh:

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KANDUNGAN

KANDUNGAN

Kata Alu-aluan

Rektor
Institut Pendidikan Guru Malaysia

Assalamualaikum Warahmatullahhi Wabarakatuh.

Alhamdulillah, bersyukur kita ke hadrat Allah S.W.T kerana dengan limpah kurnia dan keizinan-Nya, saya diberi kesempatan dan kekuatan untuk menulis sepatah dua kata dalam kata alu-aluan buku *Toolkit* STEM Merentas Kerjaya ini.

Alhamdulillah buku ini berjaya dihasilkan bagi membantu golongan pendidik, pelajar dan komuniti dalam memenuhi hasrat Pelan Pembangunan Pendidikan Malaysia 2013-2025 yang menekankan pengukuhan kualiti pendidikan Sains, Teknologi, Kejuruteraan dan Matematik (STEM) dalam Pengajaran dan Pembelajaran. Di samping itu, buku *toolkit* ini turut menekankan di mana STEM tidak hanya tertumpu kepada bidang Sains, Matematik dan Kejuruteraan sahaja malah ia juga boleh merentas bidang yang lain.

Institut Pendidkan Guru Malaysia ingin merakamkan penghargaan dan ucapan syabas kepada semua pihak yang terlibat dalam menghasilkan buku *toolkit* ini. Oleh itu, saya berharap buku *toolkit* ini dapat digunakan oleh golongan pendidik, pelajar dan komuniti bagi menarik minat lebih ramai pelajar untuk menceburi bidang STEM.

Akhir kata, tahniah dan terima kasih kepada semua penulis yang menyumbang pengalaman mereka dalam penerbitan kali ini. Tahniah dan syabas diucapkan kepada warga Institut Pendidikan Guru Malaysia kerana sentiasa inovatif dalam penerbitan.

Sekian, terima kasih.

Dr. Rusmini binti Ku Ahmad

Kata Alu-aluan

Timbalan Rektor
Pusat Pembangunan Latihan
Institut Pendidikan Guru Malaysia

Bismillahirrahmanirrahim.

Assalamualaikum dan salam sejahtera.

Alhamdulillah, marilah kita sama-sama memanjatkan rasa kesyukuran kepada Allah SWT kerana dengan izin-Nya kita masih lagi diberi peluang dan kesempatan untuk memikul amanah sebagai pendidik, peneraju pendidikan dan sekaligus menyumbang tenaga dan idea untuk meneruskan kecemerlangan pendidikan.

Sesungguhnya, naskah ini penting sebagai garis panduan dan rujukan berterusan kepada golongan pendidik, pelajar dan komuniti dalam membentuk kendiri yang berilmu dan kreatif seterusnya menjadikan budaya Pendidikan STEM ini lebih menarik yang tidak hanya tertumpu kepada Sains, Matematik dan Kejuruteraan sahaja tetapi merentas bidang lain.

Tahniah dan terima kasih diucapkan kepada jawatan kuasa buku *Toolkit* STEM Merentas Kerjaya, Majlis Belia Malaysia, Universiti Putra Malaysia dan semua pelajar yang julung-julung kalinya menjadi panel kerana telah berjaya menyempurnakan buku ini dengan cemerlang.

Semoga naskah ini bermanfaat mengikut bidang pembacadan mudah-mudahan usaha ini diberkati Allah S.W.T dan menjadi amal soleh yang akan kita kecapi pada kemudian hari. In shaa Allah.

Sekian, salam hormat.

Dr. Yazid bin Abdul Manap

Kata Alu-aluan

Pengarah
Institut Pendidikan Guru
Kampus Sultan Mizan

Assalamualaikum Warahmatullahi Wabarakatuh

Sekalung tahniah dan syabas diucapkan kepada semua panel penggubal modul yang terlibat dalam menjayakan penerbitan Modul Kerjaya STEM (Sains, Teknologi, Kejuruteraan dan Matematik) yang telah dibangunkan ini. Minat kerjaya dalam bidang STEM dapat dikenal pasti di awal peringkat pengajian di Sekolah Rendah pada seawal tahun satu, di samping mengambil berat tentang Dasar Pendidikan Kebangsaan yang menitikberatkan agar sekolah menengah dapat mencapai nisbah 60:40 dalam aliran sains berbanding sastera.

Pendidikan STEM telah dinyatakan secara eksplisit di dalam dasar pendidikan negara. Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013–2025 telah meletakkan pendidikan STEM sebagai satu agenda yang penting dalam transformasi pendidikan dalam menyediakan generasi muda bagi menghadapi cabaran abad ke-21. Pendidikan STEM juga menekankan konsep berpandukan komponen 4C atau 4K iaitu komunikasi, kerjasama, kreativiti dan pemikiran kritikal seperti yang terkandung di dalam pembelajaran abad ke-21 (PAK-21) serta kemahiran berfikir aras tinggi (KBAT).

Modul Kerjaya STEM dihasilkan bersama IPG Kampus Sultan Mizan dan IPG Kampus Kent bertujuan menghasilkan pemahaman bahawa kemahiran dalam STEM boleh digunakan untuk menyampaikan pengetahuan dalam bidang lain. Harapan saya, ia dapat memperkasakan guru muda menggunakan amalan emansipatori untuk menghasilkan panduan dan/atau toolkit yang boleh diakses oleh pendidik dan pekerja belia.

Akhir kata, besarlah harapan saya dengan penerbitan modul ini dapat melahirkan murid-murid yang dapat menguasai mata pelajaran STEM dan seterusnya dapat melahirkan ramai tenaga kerja dalam bidang STEM.

Sekian, terima kasih.

Dr. Hj. Ahamad bin Rahim

Kata Alu-aluan

Timbalan Pengarah
Institut Pendidikan Guru
Kampus Kent

Assalamualaikum Warahmatullahi Wabarakatuh

Sekalung syabas diucapkan kepada semua panel penggubal modul yang terlibat dalam menjayakan penerbitan Modul Kerjaya STEM (Sains, Teknologi, Kejuruteraan dan Matematik) yang telah dibangunkan ini. Minat kerjaya dalam bidang STEM dapat dikenal pasti di awal peringkat pengajian di Sekolah Rendah pada seawal tahun satu. Justeru minat kerjaya dalam bidang STEM ini perlu dipupuk pada peringkat Sekolah Rendah lagi bagi menjamin negara Malaysia dapat mengharungi dunia tanpa sempadan serta memenuhi cabaran pasaran global pada masa kini.

Modul Kerjaya STEM ini hasil bersama IPG Kampus Kent dan IPG Kampus Sultan Mizan bertujuan menghasilkan pemahaman bahawa kemahiran dalam STEM boleh digunakan untuk menyampaikan pengetahuan dalam bidang lain. Penyertaan golongan muda dalam bidang STEM diharapkan akan dapat memperkasakan guru muda menggunakan amalan pedagogi terbaik untuk menghasilkan panduan dan/atau toolkit yang boleh diakses oleh pendidik dan pekerja belia.

Diharapkan juga modul ini boleh juga digunakan oleh semua komuniti masyarakat di Malaysia bagi memotivasikan murid-murid di peringkat Sekolah Rendah untuk meningkatkan minat terhadap mata pelajaran yang bersangkut paut dengan bidang STEM.

Akhir kata, besarlah harapan saya dengan penerbitan modul ini dapat melahirkan murid-murid yang dapat menguasai mata pelajaran STEM dan seterusnya dapat melahirkan ramai tenaga kerja dalam bidang STEM pada abad yang ke-21 ini.

Sekian, terima kasih.

Datin Dr. Rosinah binti Ednin

Bismillahirrahmanirrahim

Assalamualaikum Warahmatullahi Wabarakatuh dan Salam Sejahtera

Alhamdulillah syukur ke hadratNya kerana dengan limpah rahmatNya buku Toolkit STEM Merentas Kerjaya telah Berjaya diterbitkan dengan jayanya. Terima kasih dan tahniah diucapkan kepada semua yang terlibat didalam penghasilan buku ini.

Seperti yang semua maklum, keberhasilan pelajar adalah berdasarkan minat, dan minat seseorang pelajar itu boleh diinspirasikan. Setiap pelajar digalakkan memilih laluan kerjaya yang diminati tanpa perlu terikat dengan keputusan yang mereka perolehi dalam Sijil Peperiksaan Malaysia. Seiring dengan ledakan Revolusi Industri 4.0, bidang STEM perlu dilestarikan agar generasi baharu memahami keperluannya yang mendesak. Matlamat ini juga selaras dengan sasaran Kementerian Pendidikan dalam Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013- 2025 untuk mencapai nisbah 60:40 pelajar aliran Sains atau Teknikal berbanding sastera yang telah diberi penekanan sejak tahun 1967.

Berada dalam gelombang ketiga PPPM iaitu 2021-2025, menjayakan inovasi pada peringkat seterusnya adalah sasaran utama Institut Pendidikan Guru Malaysia. Program kolaboratif IPGM, Majlis Belia Malaysia dan Universiti Putra Malaysia telah menggilap guru-guru pra perkhidmatan (panel pelajar) di IPG Kampus Sultan Mizan dan IPG Kampus Kent dalam menghasilkan buku *Toolkit* STEM Merentas Kerjaya.

Bermula dengan karya panel pelajar dalam bidang STEM yang unik telah mencetus idea untuk menghasilkan satu *toolkit* sebagai panduan sekali gus menggalakkan minat pelajar memilih Sains dan Matematik sebagai laluan kerjaya. Penghasilan *toolkit* ini adalah sebagai pembakar semangat kepada mereka bagi membuktikan STEM bukan sahaja berfokuskan kepada kerjaya Sains dan Matematik, namun panel pelajar berjaya mencungkil bakat di luar kotak mereka. Antara bidang yang digali adalah bidang seni kreatif, seni lukis, kreativiti dan inovatif serta bidang teknologi dan digital sepanjang penghasilan *toolkit* ini.

Sepanjang bengkel penghasilan *toolkit*, panel pelajar mendapat bimbingan padu daripada pensyarah di IPG Kent dan Sultan Mizan, panel penasihat daripada Majlis Belia Malaysia dan pakar daripada Universiti Putra Malaysia. Dua sesi sindikasi telah dilaksanakan untuk memberi refleksi dan cadangan penambahbaikan. *Toolkit* ini bukan sahaja memberi manfaat kepada pelajar dan pembaca malah telah menjadi *platform* Komuniti Pembelajaran Profesional antara IPGM, IPG Kampus Kent, IPGK Sultan Mizan dan agensi luar.

Harapan IPGM adalah agar platform ini dapat dilestarikan dari semasa ke semasa bersama 27 IPG Kampus dan ELTC jua.

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Nazirah binti Kharudin
Muhammad Aiman bin Sharulnizam
Aina Afiqah binti Malek
Noor Anis Aqilah binti Mohamad Noor
Nur Syafiza Husna binti Ahmad
Puteri Nur Farhana binti Tarmizi
Muhd 'Izzduddin bin Zulkefli
Alia Qistina binti Mohd Bazli
Nor Athirah binti Mohd Zain
Nurul Athilah binti Azhar
Syazana Fahimah binti Sani

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Elzirrea Elmiricquea Anak Ricky
Evelyn Thian Hui Ni
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Muhammad Nazrey Bin Sabli
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Thian Wen Hui
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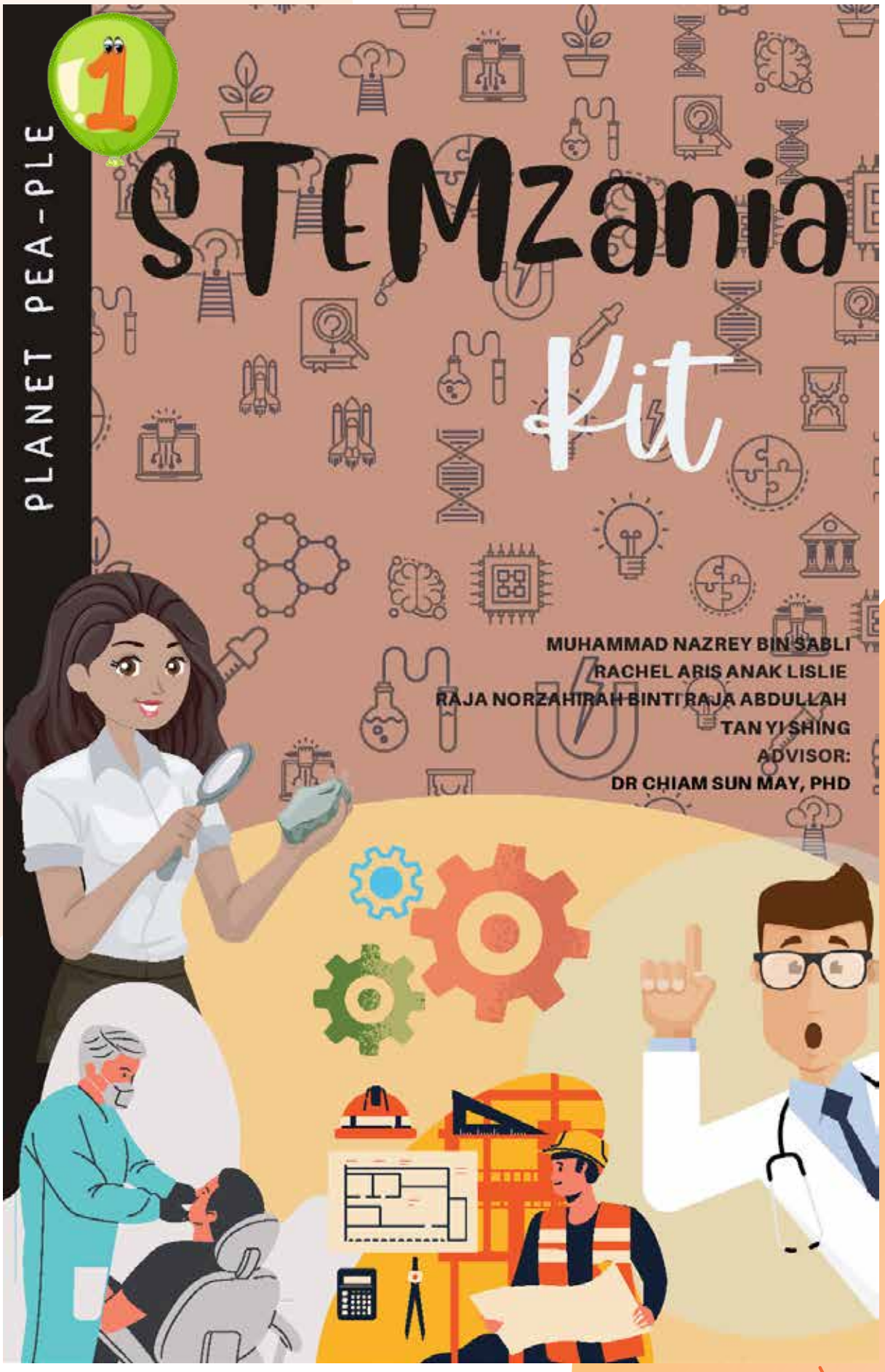

PLANET PEA-PLE
1
STEMzania
Kit
MUHAMMAD NAZREY BIN SABLI
RACHEL ARIS ANAK LISLIE
RAJA NORZAHIRAH BINTI RAJA ABDULLAH
TAN YI SHING
ADVISOR:
DR CHIAM SUN MAY, PHD

Lava Lamp Science Experiment


OBJECTIVES
to apply the knowledge on density by carrying out projects or activities.
to predict whether oil and water will mix in a glass.
to predict and carefully observe how a drop of food coloring and a Alka-Seltzer tablet reacts in oil and water.
to see how density and polarity, when they are powered by the release of a gas, cause a reaction between oil and water.
to explain the result of observation about objects or materials which are more or less dense.

Lava Lamp Science Experiment

Tools & Ingredients

- Drinking glass
- Food coloring
- Alka-Seltzer tablet
- Vegetable oil
- Water

Instructions

1. Fill the drinking glass about 2/3 full with vegetable oil.
2. Fill the rest of the drinking glass with water, but don't fill it to the brim.
3. Add two or three drops of food coloring to the drinking glass.
4. Add a half or quarter of an Alka-Seltzer tablet to the drinking glass.
5. Watch what happens!

Safety first :

DO NOT put the Alka-Seltzer tablet in your mouth.

THEORY

BEHIND THE LAVA LAMP SCIENCE EXPERIMENT

Why this happens?

Before the Alka-Seltzer tablet is dropped in the glass, the oil floats on the coloured water. Oil floats because it is less dense than water. Oil and water do not mix because water molecules are not attracted to oil molecules. When the Alka-Seltzer tablet is dropped in the oil and water, it sinks to the bottom because it is denser than oil and denser than the water. In the area of water, the tablet begins to dissolve and the chemicals in the tablet react with each other creating bubbles of carbon dioxide gas. When enough gas enters an area of water, the water-and-gas combination in this spot becomes less dense than the water around it, so it floats up through the water. If this water-and-gas mixture is less dense than the oil, it floats up through the oil too. Since the water is so attracted to itself and not to the oil, the water-and-gas mixture moves through the oil in a ball-shape. Once a ball of water-and-gas gets to the surface, some bubbles of carbon dioxide gas pop, releasing the gas into the air. When enough bubbles pop, the water-and-remaining gas becomes denser than the oil. So, the ball of water sinks down through the oil and joins the rest of the water. Changes in density as gas is added to or taken away from water cause it to float up and sink down through the oil. Thus, the lava lamp is created!

How can the study of Density be used in the real world?

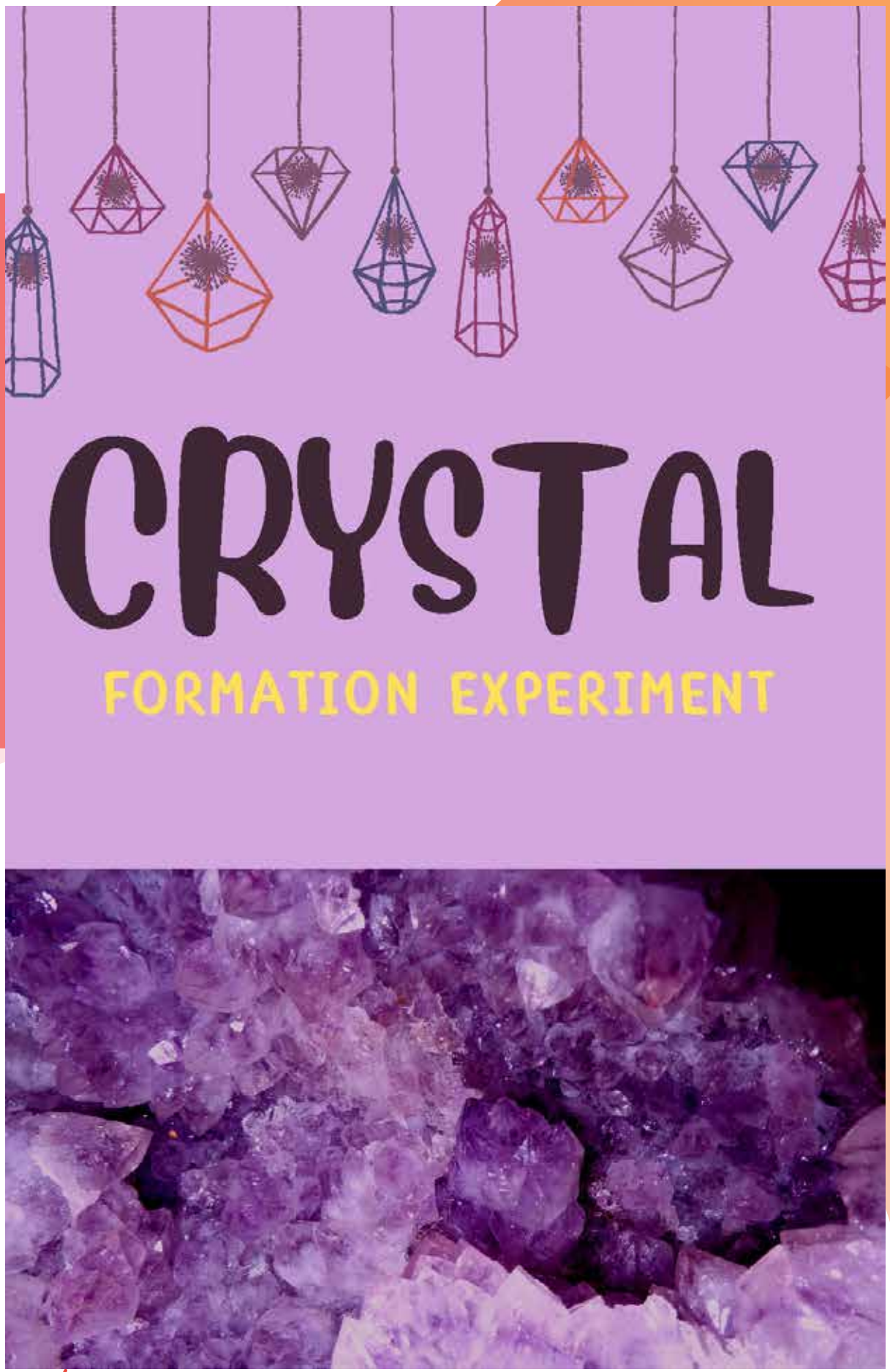
Plumbing Systems

Fluid flow through a pipe is an important real-world application of density governed by a relation known as Bernoulli's equation. Bernoulli's equation is an exclusive use of the concept of conservation of energy, and the result is that the density of the fluid affects the fluid's velocity, pressure, and even its height. A fluid of greater density will flow through a pipe with a lower pressure, velocity, or height, respectively. Engineers rely on Bernoulli's equation when they design dams and large-scale plumbing projects.

Yes!!!

Interesting!!!

You can solve daily life problem!!!


CRYSTAL
FORMATION EXPERIMENT

MATTER

WHAT YOU WILL LEARN

able to identify two types of matter which is solid (crystal formed) and liquid (epsom solution).

able to differentiate the physical properties between two different matter which is solid and liquid.

able to understand the arrangement of particles in two states of matter which is solid and liquid.

CRYSTAL FORMATION EXPERIMENT

Tools and Ingredients:

- 250ml of water
- Sugar
- Seed crystal of sugar
- Glass jars or clear containers
- String
- Stick
- Measuring cup
- Aluminium foil
- Pot
- Stove
- Ladle

INSTRUCTIONS:

1. Pour 250 ml of water into the pot.
2. Turn on the stove and let the water boil. (⚠ Get help from an adult)
3. After the water boils, add sugar into the water until a saturated solution is formed.
4. Stir the solution by using a ladle until the sugar is fully dissolved.
5. Let the saturated sugar solution cool down for 10 minutes.
6. Pour the solution into the glass jar once the solution already cooled down.
7. Tie one end of the string to the seed crystal of sugar while the other end of the string was tied to a stick.
8. Place the seed crystal of sugar into the glass jar containing the saturated sugar solution.
9. Cover the mouth of the glass jar with aluminium foil.
10. Left the glass jar until sugar crystals was formed.

THEORY BEHIND CRYSTAL FORMATION EXPERIMENT

When more sugar solid has dissolved until it reached the maximum possible amount of solute that can dissolve inside the solvent, the solution will become saturated. If excess solute is present inside the solution the rate of particle leaving the surface of solid and the rate the particle returned to the surface of solid is equal. A supersaturated is formed when the excess solute was filtered off and the temperature of the solution was lowered down. When seed crystal is added into the supersaturated solution, solute particles will leave the solution and attach to the seed crystal. Thus, a crystalline precipitate is formed. Crystalline solid is formed when seed crystal is added into the supersaturated solution. This is because supersaturated solution is unstable, the same a supercooled and superheated liquid. By adding a small particle of solute such as seed crystal, the excess solute will rapidly precipitate or crystallize.

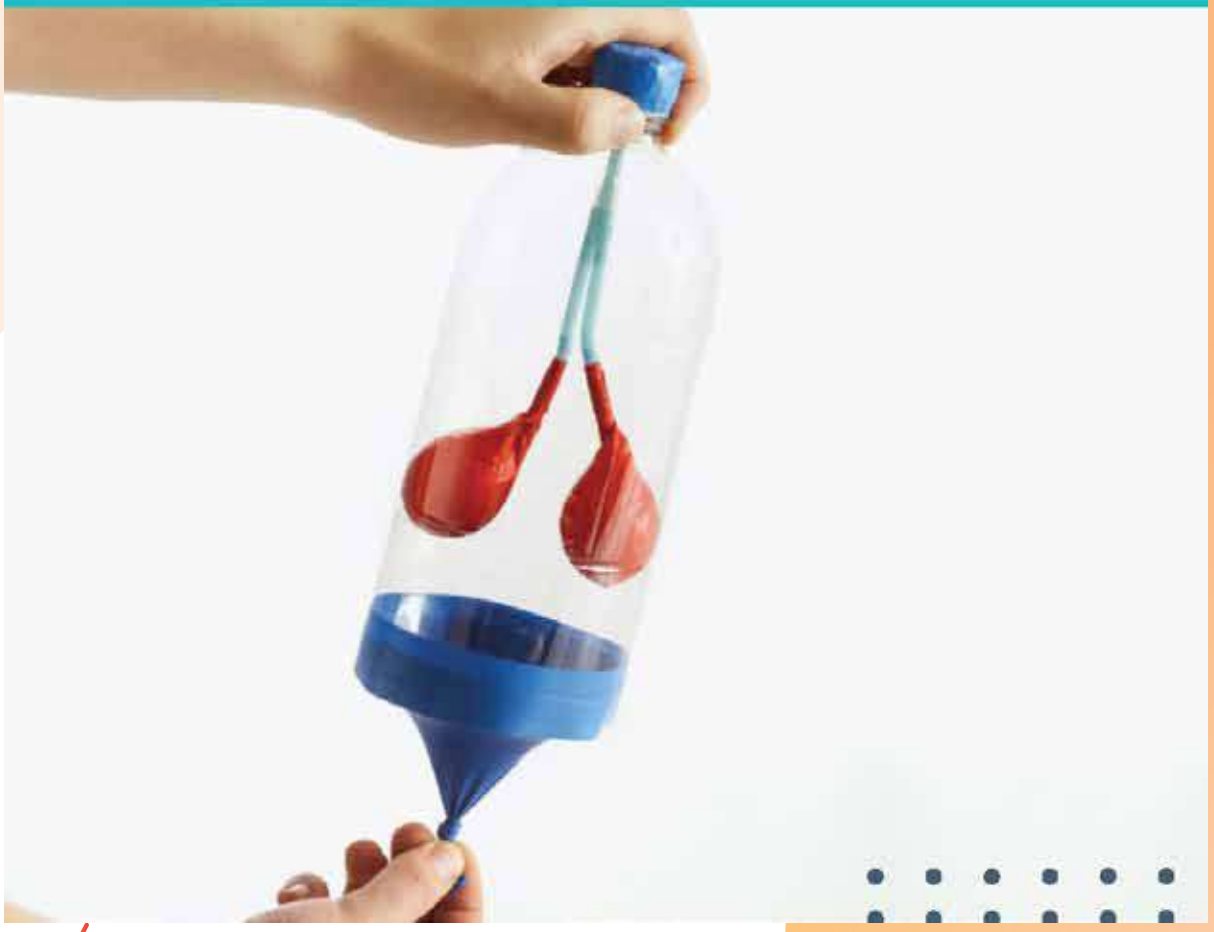
More About GEOLOGIST

A Geologist is a scientist skilled in the study of earth sciences and how they affect the environment. A career in geology is ideal for students who have an interest to explore the earth and seabed. A geologist is someone who studies the processes that influence how the earth changes over time and how certain land formations form.

There are various types of geologists, each of which specialises in a specific field. Petroleum geologists, mineralogists, geophysicists, and so forth. Geologists play a variety of roles, including predicting volcanic eruptions and earthquakes, locating gold, silver, and other precious minerals such as crystals, and advising engineers on whether a particular type of soil is suitable for laying building foundations. Geology graduates have a diverse job market. They can work in the oil and gas, construction, academic, mining, and a variety of other industries.

Enhance your creativity !

BUILDING 3D LUNG MODEL



BREATHING PROCESS

WHAT YOU WILL LEARN

1. Identify the organs involved in the breathing process
2. Describe the breathing process in terms of air passage and exchange of gases in the lungs
3. Describe the chest movement during inhalation and exhalation by carrying out activities
4. Differentiate the content of oxygen and carbon dioxide during inhalation and exhalation

WHAT DO YOU NEED ?

1. PLASTIC BOTTLES 
2. BALLOONS 
3. STRAWS 
4. SCISSORS 
5. TAPE 

LET'S TRY!

CHALLENGE YOURSELF!

1. Cut the bottles horizontally into two pieces (⚠ask an adult for help!)
2. Make a hole on the bottle cap to fit a straw through it (⚠ ask an adult for help)
3. Cut the straw in half and attach the balloon to each straw using tape
4. Place a new straw through the bottle cap
5. Connect the lungs by building an upside-down Y-shaped trachea using the straws
6. Place the lungs inside the bottle
7. Cut the neck off of the last balloon and stretch it over the bottom of the bottle to make the diaphragm.

Now, pull down the diaphragm and see what happen to the lungs!

HOW DOES 3D LUNG MODEL WORKS?

When we **pull** the diaphragm, the pressure within the container **drops** below atmospheric pressure, which causes the balloons to **expand**. When the diaphragm is **squeezed**, the balloons **contract** as the pressure inside the container **increases.**

THIS IS HOW REAL LUNGS WORK!

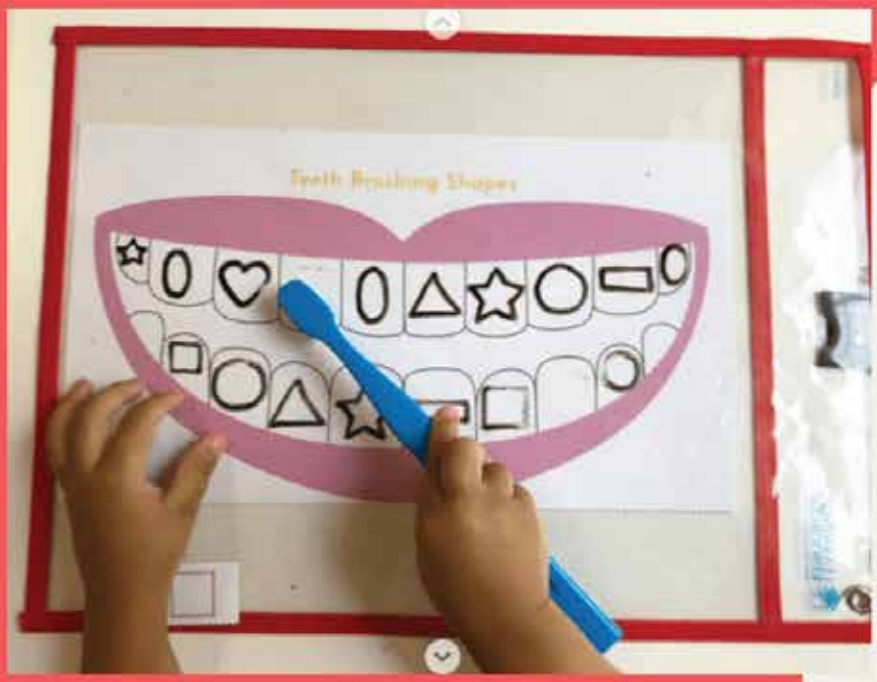
As air fills the lungs when inhaled, the diaphragm contracts, expanding the chest cavity.

This process is reversed as we breathe out!

A doctor who focuses on diseases of the lungs is called a pulmonologist. A pulmonologist treats and diagnoses respiratory illnesses. These medical professionals may be referred to as chest doctors, lung specialists, or lung doctors.

BE CREATIVE AND INOVATIVE

KILL THE BACTERIA !



WHAT YOU WILL LEARN

- State the units that are used to measure area and volume.
- Measure the volume of liquid using correct tools and techniques
- Solve problems to estimate the area of irregular surfaces
- Identified the the parts of teeth's and it functions
- Learn to brush the teeth properly


RULER
BEAKER
WHITEBOARD MARKER
PAPER SHAPES
TOOTHBRUSH
TOOLS
WHITEBOARD

INSTRUCTION

1. Choose and draw a few shapes on the teeth diagram.
2. Measure and record the length of the shapes being drawn by using a ruler and the correct unit.
3. Calculate the area of the shapes being drawn.
4. Pour 50 ml water into the beaker.
5. Clean and brush the shapes being drawn by using water and a toothbrush until it is totally clear.

MARI MENGENAL GIGI KITA

GIGI TARING

MENYIAT MAKANAN

GIGI KACIP

MEMOTONG MAKANAN

GIGI GERAHAM

MELUMATKAN MAKANAN

REFERENCES

ABC Science Online. (2008). DIY Lava Lamp Brief description. https://www.abc.net.au/science/surfingscientist/pdf/lesson_plan17.pdf

Afterschool.my. (2017). Afterschool.my. https://afterschool.my/career/geologist#:~:text=What%20are%20the%20requirements%20to,should%20be%20taken%20in%20SPM.

Chang Tun Kuet. (2018). Nota Sains tahun 3 unit 2: Manusia. UNIT 2 : MANUSIA. Retrieved August 8, 2022, from http://www.changtunkuet.com/unit-3-manusia/nota-sains-tahun-3-unit-2-manusia

Chi Epsilon Mu (XEM) Chemistry Club. (2011). Lava Lamp Main Science Idea for Kids. https://www.acs.org/content/dam/acsorg/education/outreach/kidschemistry/activities/lava-lamp.pdf

Dentistry course in Malaysia | eduadvisor. Your Guide to a Dentistry Course in Malaysia. (2019). Retrieved August 8, 2022, from https://eduadvisor.my/dentistry/

Geologist Career Information with Education Requirements. (2010, January 29). Best Accredited Colleges; Best Accredited Colleges. https://bestaccreditedcolleges.org/articles/geologist.html

Home Science Tools. (2009, May 3). How to Make a Lava Lamp: DIY Lava Lamp Science Experiment + Video. Www.homesciencetools.com. https://www.homesciencetools.com/article/how-to-make-a-homemade-lava-lamp-science-project/#:~:text=Add%20a%20few%20drops%20of

HST. (2019, February 22). Build a Lung Model | Anatomy Lesson | Home Science Tools. Home Science Tools. https://learning-center.homesciencetools.com/article/build-lung-model-science-project/

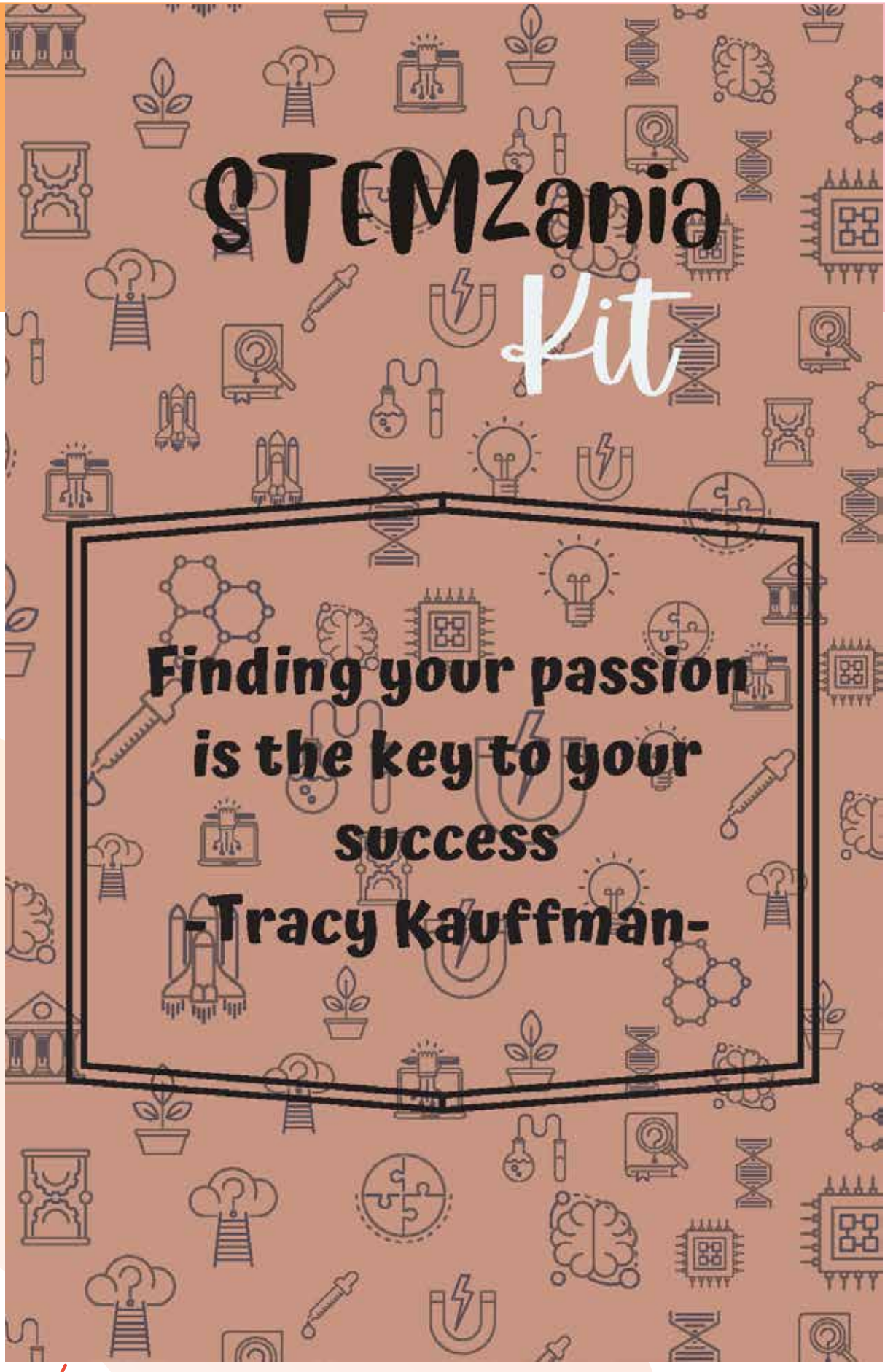
Kiah Price. (2003, February 23). HiMama Activities. Www.himama.com. https://www.himama.com/learning/child-activities/activity/water-lava-lamp-experiment

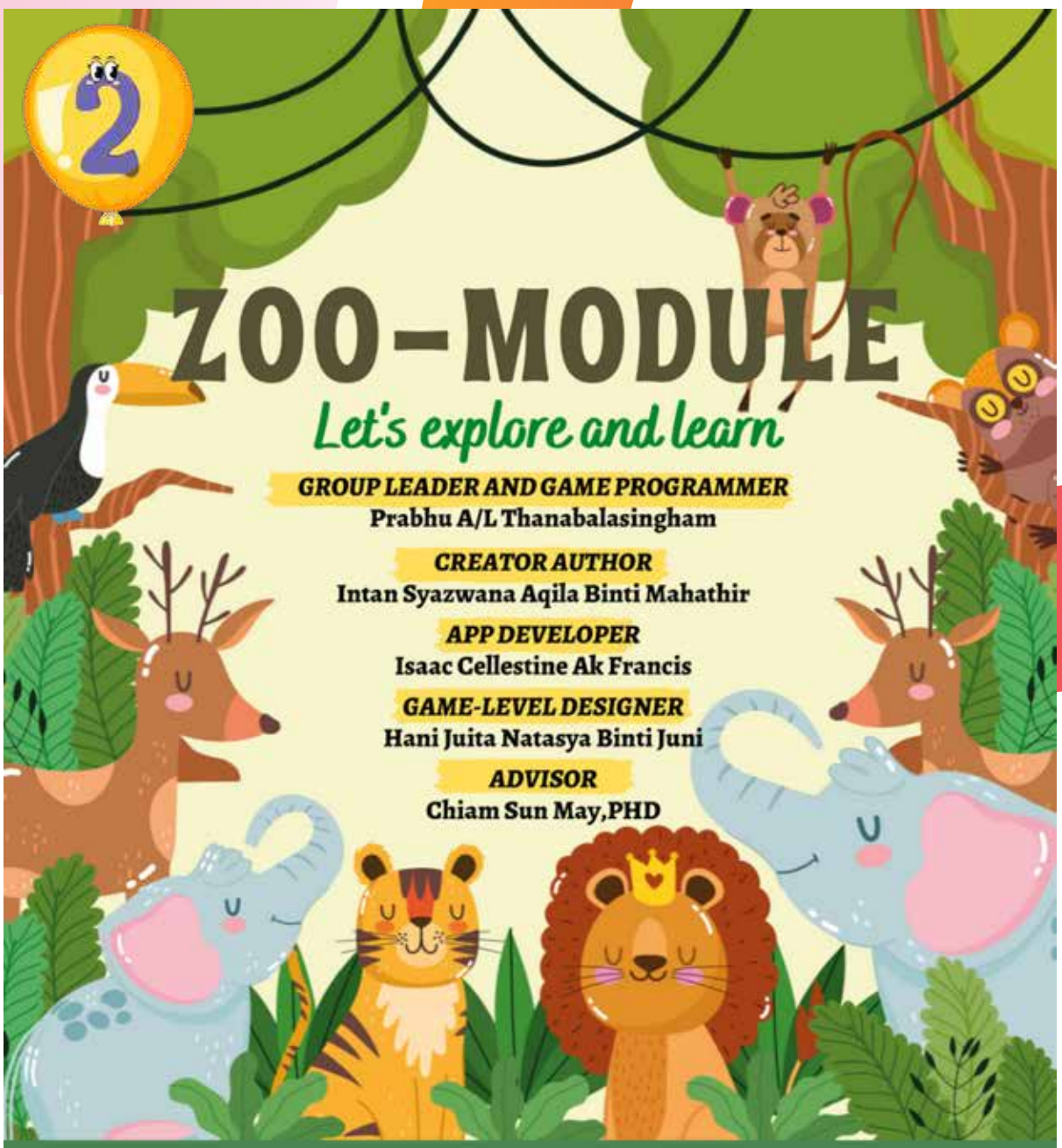
Mcclure, E. (2022, May 28). How to Build a Model Lung: 12 Steps (with Pictures). WikiHow. https://www.wikihow.com/Build-a-Model-Lung

Rakni, R. (2021a, March 31). How To Become A Surgeon in Malaysia. Excel Education | Study in Australia, Malaysia, the UK & Canada. https://www.e2studysolution.com/news/how-to-become-a-surgeon-in-malaysia/

Science Fun. (2020, January 23). Lava Lamp. Science Fun. https://www.sciencefun.org/kidszone/experiments/lava-lamp/

What Are Crystals? (2022, August 8). Geologyin.com. https://www.geologyin.com/2014/12/what-are-crystals.html#:~:text=Crystals%20are%20the%20outer%20form,or%20not%2C%20is%20crystallized%20inside.


STEMzania
Kit
Finding your passion is the key to your success
-Tracy Kauffman-



STEM CAREER Toolkit Module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Group Leader and Game programmer
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HANI JUITA NATASYA BINTI JUNI
Game-Level Designer
ISAAC CELLESTINE ANAK FRANCIS
App Developer
ORGANISATION

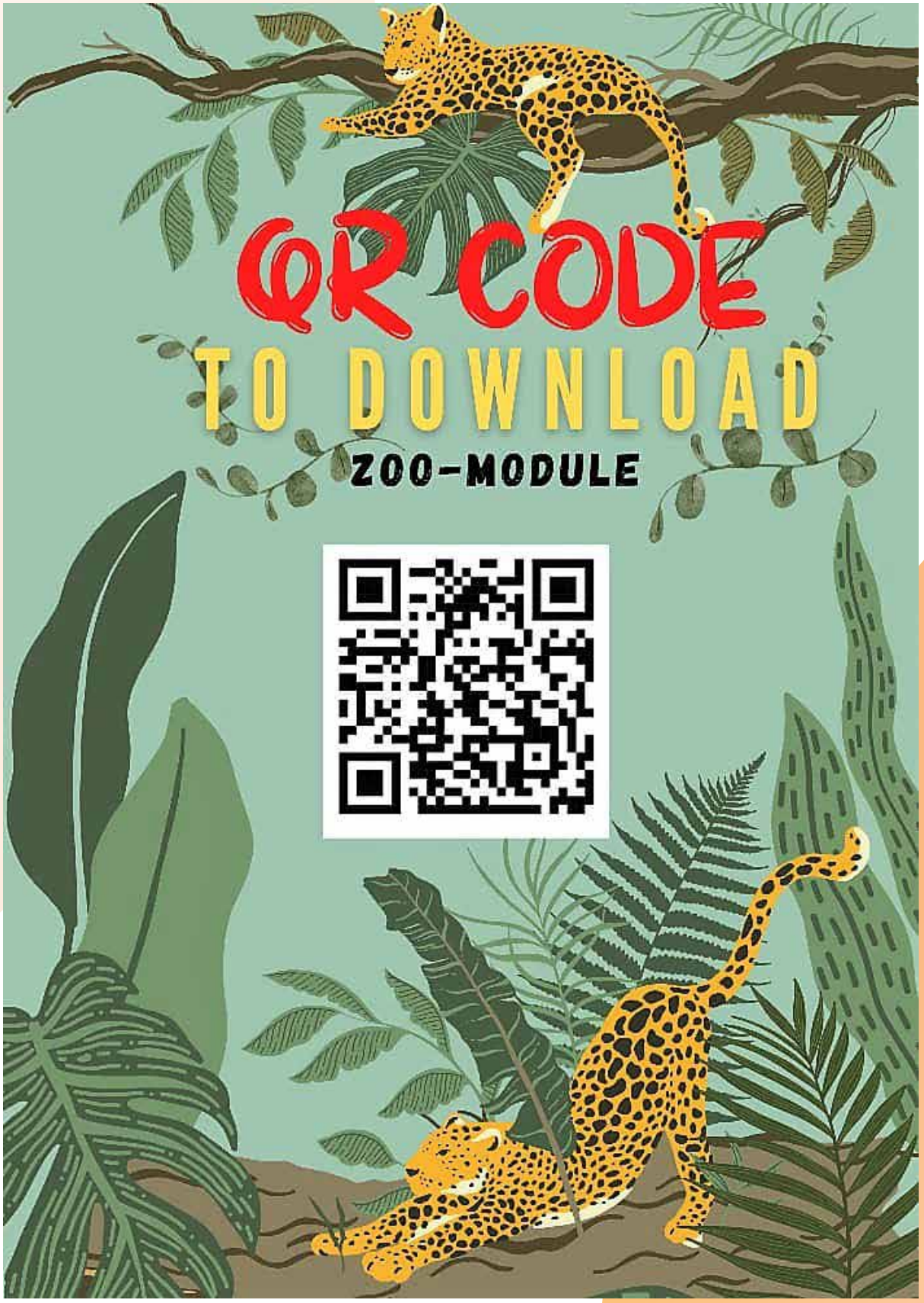
Acknowledgement

Four people made this module eminently more sentimental and beneficial than it otherwise might have been—Prabhu A/L Thanabalasingham, Hani Juita Natasya Binti Juni, Intan Syazwana Aqila Binti Mahathir and Isaac Cellestine Ak Francis. We took our early, much too long, far too redundant draft and blast our way through the quite substantial barrier between unwieldy early scribblings and something that resembled a kit or module for the youngsters to love STEM. We have taken a lot of effort into this project. The completion of this project could not have been possible without the participation and assistance of a lot of individuals contributing to this project. However, we would like to express our deep appreciation and indebtedness to our lecturers and supervisors for their endless support, kindness, and understanding during the project duration.

Our thanks and appreciation also go to *Majlis Belia Malaysia* in developing the project. We are very grateful to our lecturers and the professor who gave us a chance to work on this project. We would like to extend our sincere thanks to all of them. We would like to acknowledge the extraordinary debt we owe to our respectable lecturer, Dr. Chiam Sun May whose insightful leadership and knowledge benefited us to complete this project successfully. Thank you so much for your continuous support, for providing the necessary information as well as resources for this project and presence whenever needed.

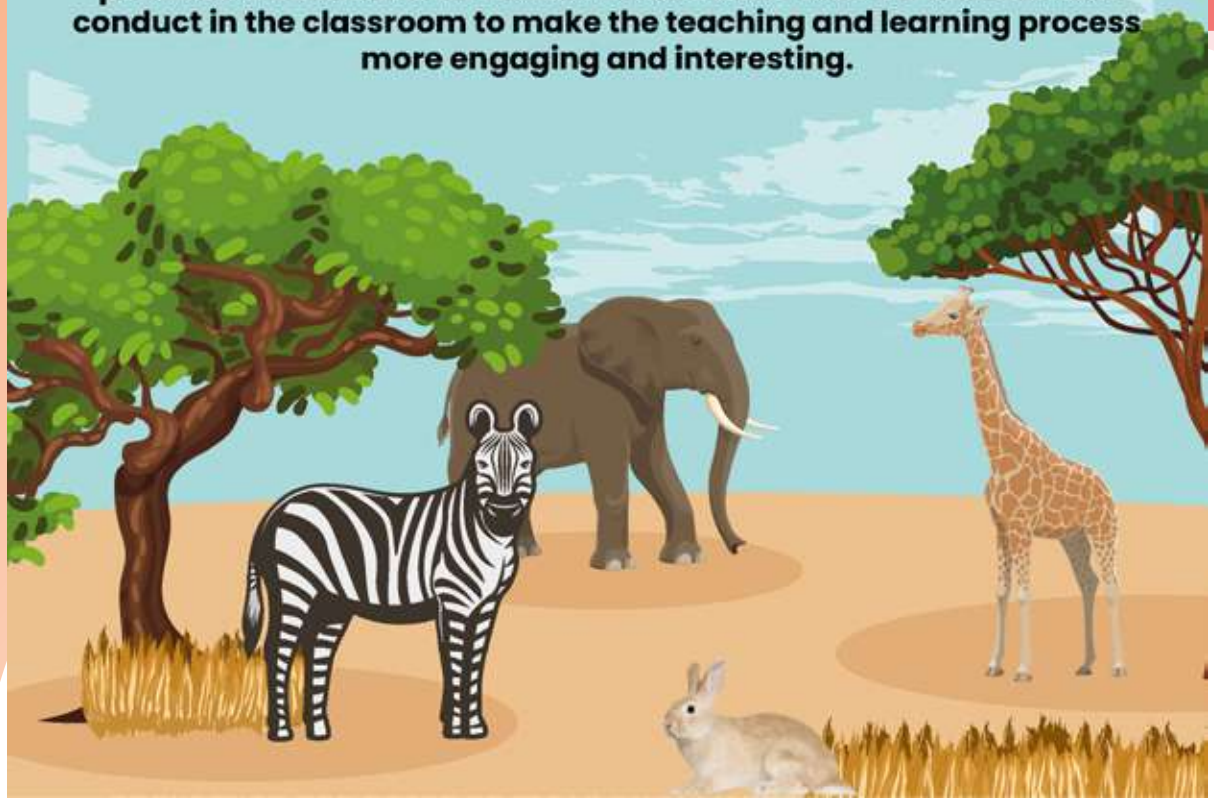
Our sincere gratitude to Prof. Abd. Lateef and Dr. Syafiqah for giving us valuable suggestions, ideas, advice for reinforcement, contribution to the project and the preparation of this kit as well as in tightening our written planning during the throes of final drafting. Also, we would like to thank all our family and friends who supported us in one way or another and for their kind cooperation and encouragement which helped us a lot in completing this project. We would like to thank everyone who is involved in the project directly or indirectly, willingly helping us out with their abilities to make this educational kit better.

Above all, we would like to thank the Great Almighty for always having his blessing on us.


QR CODE
TO DOWNLOAD
ZOO-MODULE

Product DESCRIPTION

Looking for an interactive and educational way to learn about animals' eating habits? Look no further than the Zoo-Module application! This application, which was built using MIT App Inventor, really gives numerous benefits, especially for science teachers and young children in primary school. This is because this application contains compact and concise design notes about animals' eating habits topics that can be easily understood by users. It also provides printable worksheets that are useful for the teachers. The notes were created using the Canva application and based on the DSKP KSSR Primary School Science syllabus. Relevant and informative data were also included. We decided to use DSKP KSSR as our references because we want this product to be friendly to young children, particularly young children in Malaysia. There are also online games in the apps that were created with the Scratch application to make the learning process more enjoyable while also evaluating the user's understanding of the topic. Lastly, this application provides instructions for hands-on activities that the teacher can conduct in the classroom to make the teaching and learning process more engaging and interesting.




THE PROCESS TO CREATE
ZOO-MODULE APP
For this module, we created the Zoo-Module application, which is an application about animals. We are using MIT App Inventor, which requires us to write some code in order for the application to run. The purpose of using this application is to attract users to use it on their phones because, as we all know, everyone nowadays has a phone, so they can visit the application right away.
Students can access notes in this application by clicking the buttons for notes 1 and notes 2 on screen 6. Furthermore, the student has a hands-on activity by visiting screen 7, which they can explore and do after going over all of the notes given to them. The purpose of the hands-on activity is to ensure that the students truly understand the topic they have learned.
We began by exploring how to create the application using MIT App Inventor via YouTube because there we can learn many things about how to create the application, particularly about coding techniques, which is the most important part that we should comprehend before creating any applications. Then, using the Canva application, we begin our task of creating the application by adding a cover page for the module.

THE PROCESS TO CREATE

ZOO-MODULE APP

In general, for each screen, background images are inserted to make the application more visually appealing and attractive, as well as buttons that allow us to easily navigate to other pages.

After we finish creating 7 screens for the Zoo Module Application, we focus on doing the coding for each screen. For coding, we only focus on coding for buttons so that it will be easier to navigate to another page when we press one of the buttons on the screen. We learn how to code each button by watching a tutorial on YouTube which helps us with our task.

After that, we export the application by publishing its QR Code so that we can install the application by scanning the code.

DATE	PROGRESS
19 MAY 2022	Bengkel Kerja Penyelarasan Modul Sains, Teknologi, Kejuruteraan dan Matematik (STEM) IPGM Merentas Kerjaya through online platform • Draft idea on project (module) • Team regroups to review the project deliverables
23 JUNE 2022	Mesyuarat Sumbang Saran Aktiviti Modul Sains, Teknologi, Kejuruteraan dan Matematik (STEM) IPGM Merentas Kerjaya through online platform together with Dr. Chiam
26 JUNE 2022	Meeting with Dr. Chiam for consultations and inspections
4 JULY 2022	Meeting with group members • Clarify objectivesWork on the goals & KPIs of the module • Decide the position for each member • List of deliverables • Work distribution • Decide the main platform for the module (apps) • First version draft of module • Decide to develop an application specifically for Topic Animal's Eating Habits Year 3
6 JULY 2022	Intan Syazwana (6 July -12 July) • Does research and gather information regarding the syllabus under the topic "animals' eating habits" (year 3) through the textbook and internet. • Do research and gather the information for the "Do you know?" section (knowledge beyond the syllabus). Hani Juita Natasya (6 July - 9 July) • Gathering materials and map out module • Study the proper design for the assessment of the proposed project. • Find-and-match facts with the game design and DSKP level.

To Create The App

Zoo-module

DATE	PROGRESS
7 JULY 2022	Isaac Cellestine • Explore the MIT Apps by watching YouTube to learn about coding. • Brainstorm idea on how to arrange the content in the apps Prabhu (7 July to 13 July) • Explore the MIT by various resources • Going through the internet to get an idea about the structure and aim of the game
8 JULY 2022	Meeting with Dr. Chiam • Discussion on report format
13 JULY 2022	Meeting with group members • Share each group member's progress • Discuss and solve some problems regarding module's issues • Team "inspections" • Date setting for the next team's meeting • Pitching the structure of the online game
14 JULY 2022	Isaac Cellestine • Make the cover page for the apps before inserting all the contents into it. • Make one organization to be inserted into the apps. Prabhu (14 July to 25 July) • Develop the game furthermore after getting an thumbs up from the group members
15 JULY 2022	Hani Juita Natasya (15 July - 18 July) • Elect "Treasure Hunt" as the main theme of Hands-On activity. • Selection of facts and create list on important references to be allocated in the activity • Breakdown on game design into key components
17 JULY 2022	• Do the draft for product description part • Consultation from Dr. Chiam

To Create The App

Zoo-module

DATE	PROGRESS
18 JULY 2022	Intan Syazwana (18 July - 20 July) • Start designing the notes using the Canva application. Hani Juita Natasya (18 July - 23 July) • Organizing and developing the game plan for Hands-On activity based on conducted research and DSKP Science Year 3 textbook (DLP ver.) • Reassess game plan • Working on task using Canva before group meetings on agreed-upon date
20 JULY 2022	STEM talk
22 JULY 2022	Hani Juita Natasya (22 July - 25 July) • Activity detailing • Adjust the final version of hands-on activity
6 AUGUST 2022	Isaac Cellestine • Import the design notes and the exercise into the apps • Import hands-on activity section into the apps
9 AUGUST 2022	Presentation from groups and feedback
30 AUGUST 2022	• Final check for the Zoo-module application • Finalizing report • Meeting Dr. Chiam for consultation
2 SEPT 2022	Meeting Dr. Chiam for consultation Submission • Project handing • Project analysis

Science concept involve

: Biology - Animal diet

The science

: The Science in your life

Theme

: Life science

Topic

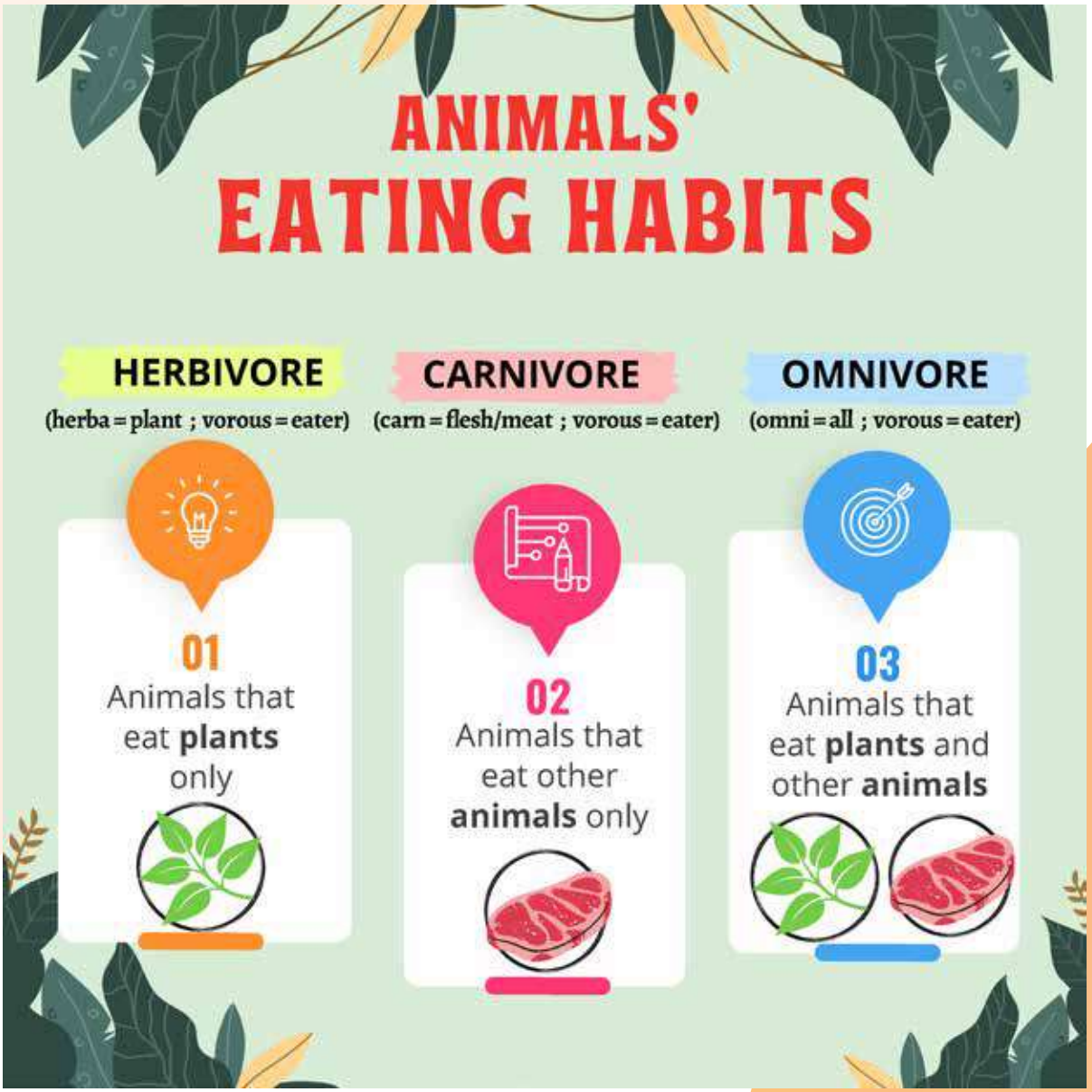
: Unit 4 : Animals

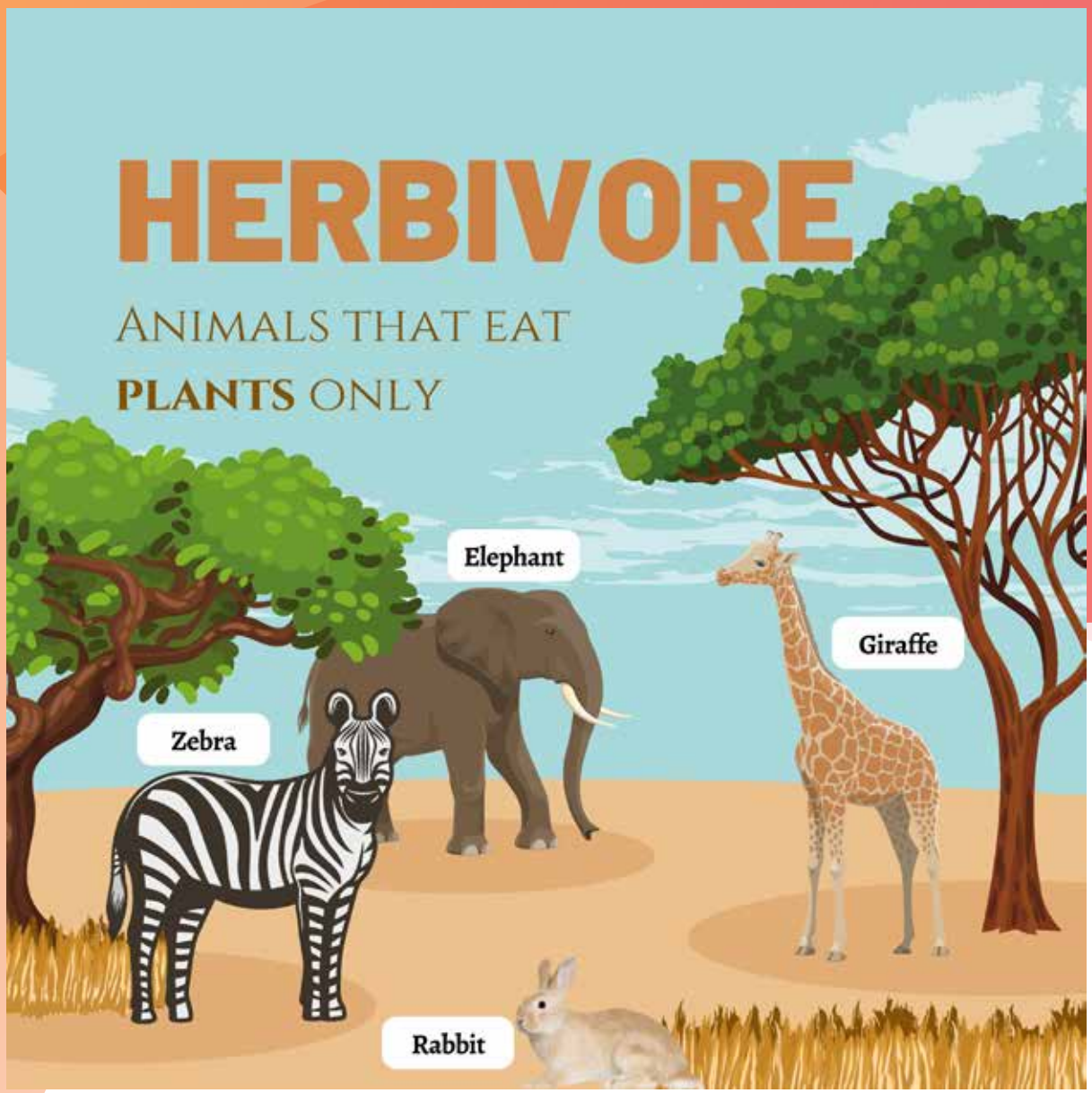
Content Standard

: 4.1 Eating Habits

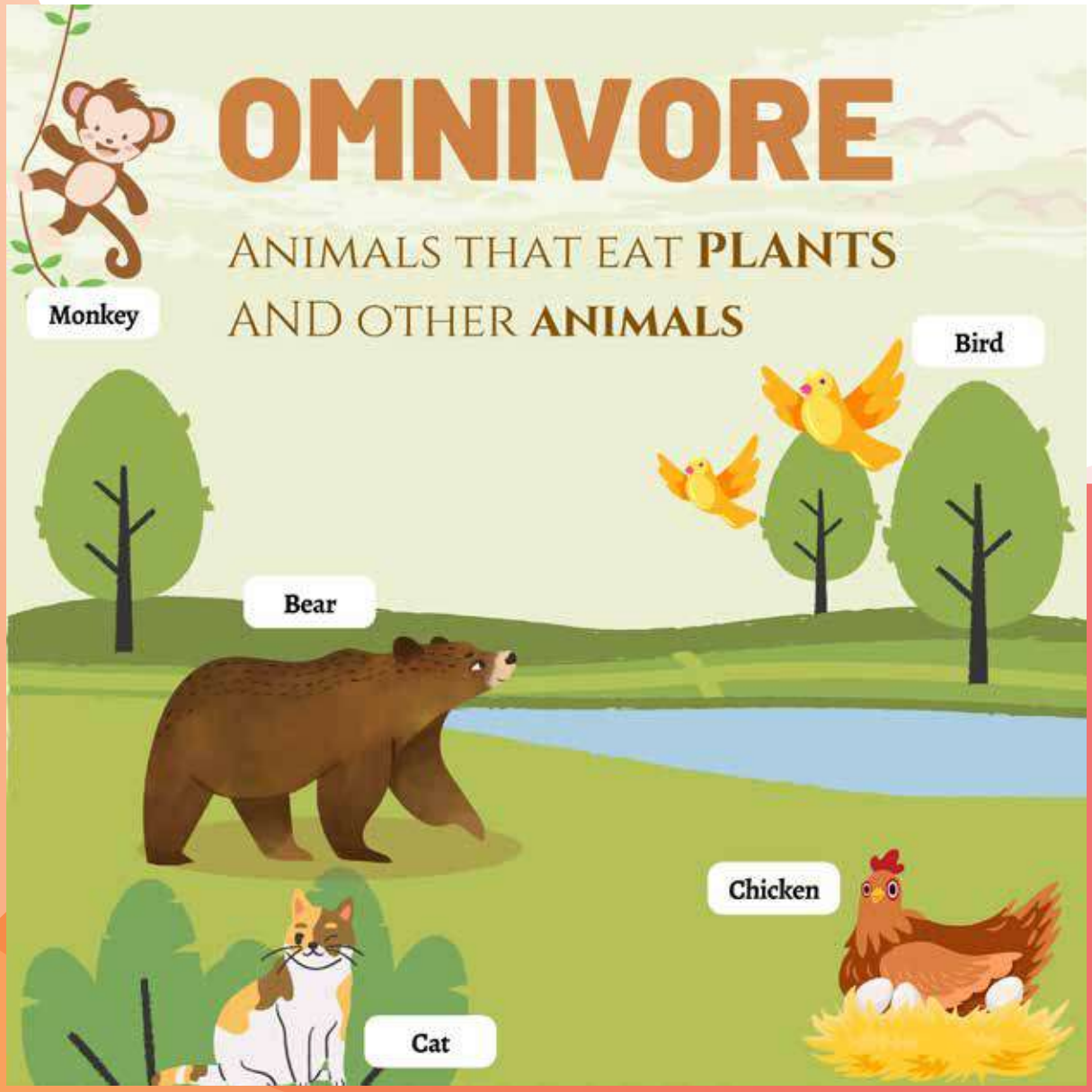
What You Will Learn

1. Classify animals according to their eating habits.
2. Explain with examples the eating habits of herbivore, carnivore and omnivore.
3. Make inference about the animal groupings based on their eating habits.
4. Compare and contrast the dentition of herbivore, carnivore and omnivore.
5. Explain the result of observations about animals' eating habits through written or verbal forms, sketches or ICT in a creative way

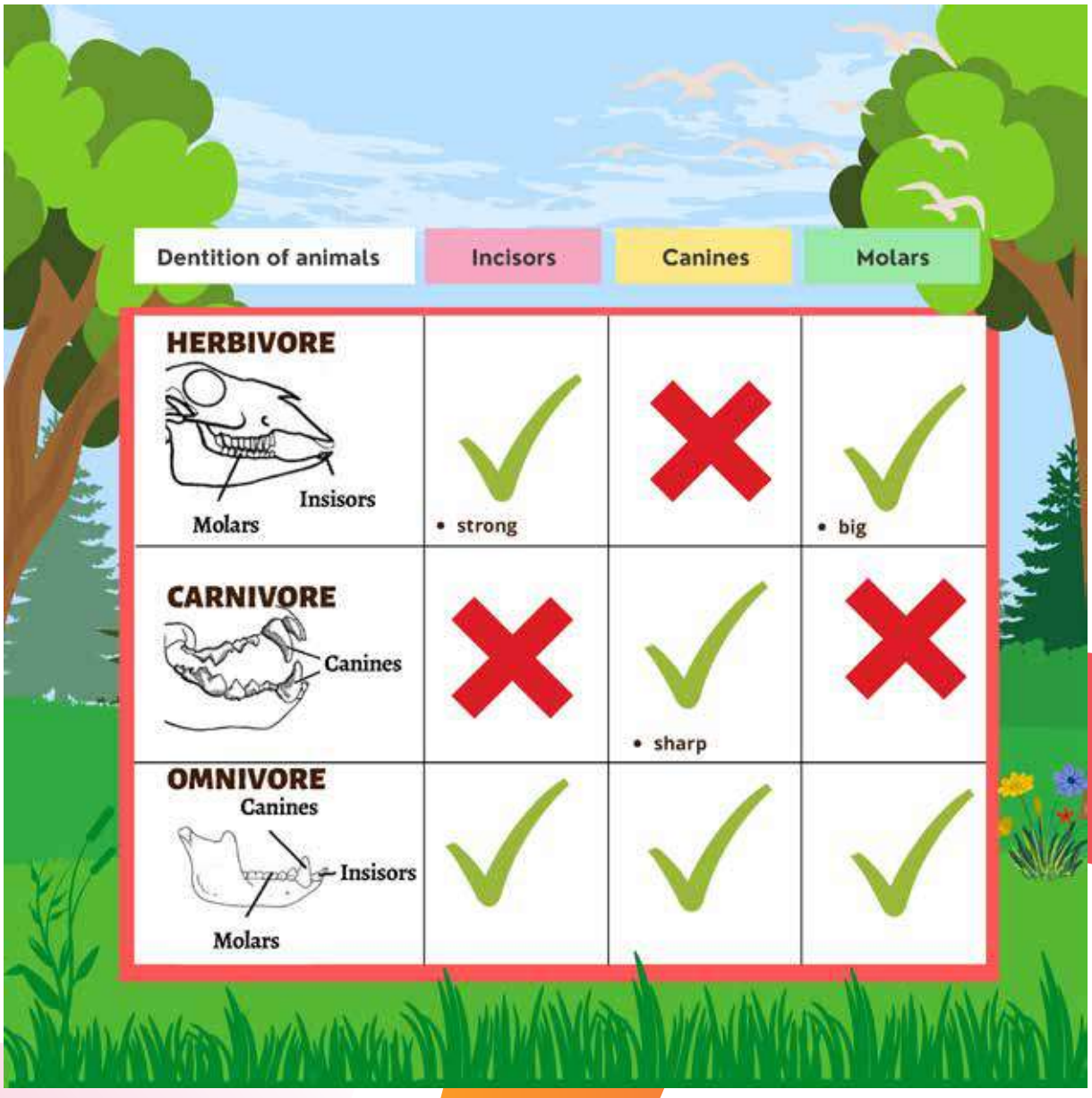

ANIMALS'
EATING HABITS
HERBIVORE
(herba = plant ; vorous = eater)
01
Animals that eat plants only
CARNIVORE
(carn = flesh/meat ; vorous = eater)
02
Animals that eat other animals only
OMNIVORE
(omni = all ; vorous = eater)
03
Animals that eat plants and other animals


HERBIVORE
ANIMALS THAT EAT
PLANTS ONLY
Elephant
Giraffe
Zebra
Rabbit


CARNIVORE
ANIMALS THAT EAT
OTHER ANIMALS ONLY
Eagle
Snake
Lion
Tiger
Frog


OMNIVORE
ANIMALS THAT EAT PLANTS
AND OTHER ANIMALS
Monkey
Bird
Bear
Chicken
Cat

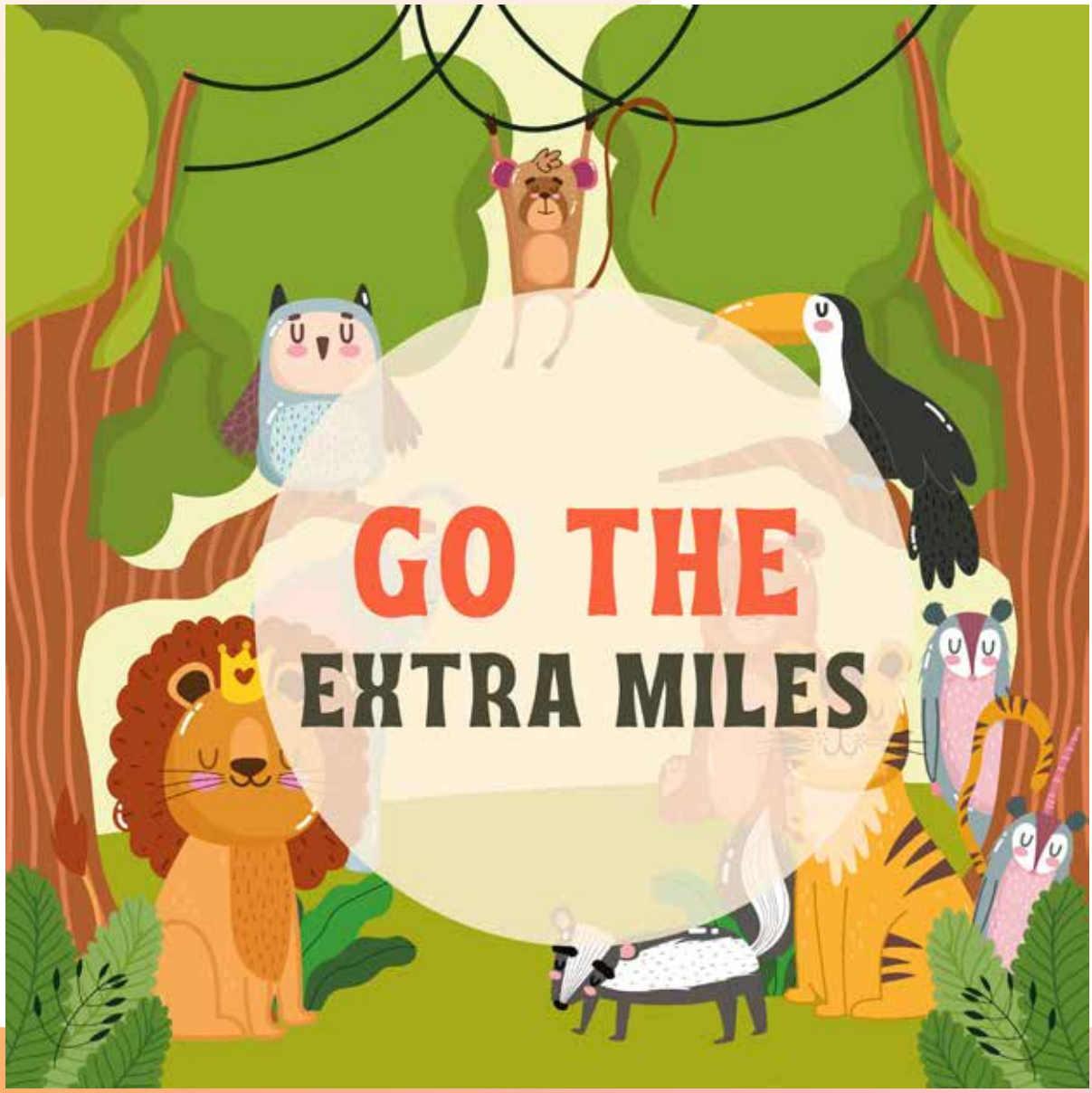

DENTITION
OF ANIMALS
HERBIVORE
• Have strong incisors to cut plants
• Have big molars to grind plants for easier swallowing
OMNIVORE
• Have incisors to cut food
• Have canines to tear meat
• Have molars to grind food
CARNIVORE
• Have sharp canines to tear meat
• Have sharper canines than other animals


Dentition of animals
Incisors
Canines
Molars
HERBIVORE
Insisors
Molars
• strong
• big
CARNIVORE
Canines
• sharp
OMNIVORE
Canines
Insisors
Molars

SUM UP

	Herbivore	Carnivore	Omnivore
Eating habits	Animals that eat **plants** only	Animals that eat other **animals** only	Animals that eat **plants** and other **animals**
Dentition	• Have **strong incisors** to cut plants • Have **big molars** to grind plants for easier swallowing	• Have **sharp canines** to tear meat • Have sharper canines than other animals	• Have **incisors** to cut food • Have **canines** to tear meat • Have **molars** to grind food
Example	• Goat • Cow • Elephant	• Tiger • Snake • Lion	• Monkey • Chicken • Bird


CHANGES
IN THE ANIMALS' EATING HABITS
1 Animals may change their natural eating habits if there are environmental changes around them.
2 The changes in animals natural eating habits are due to adaptation.
3 Our environment changes through the years and animals needed to adapt to suit the environmental changes
POLAR BEAR
Omnivore
change to
Carnivore
WHY?
Bears are naturally omnivores that eat plants and other animals. However, polar bears live in the polar regions, which are always cold and covered in ice. They cannot find plants because they cannot grow in the polar regions. Therefore, polar bears are classified as carnivores, which eat other animals only.
ZOO


GO THE
EXTRA MILES

Do You KNOW?

Rabbits Eat Their Own Faeces ?

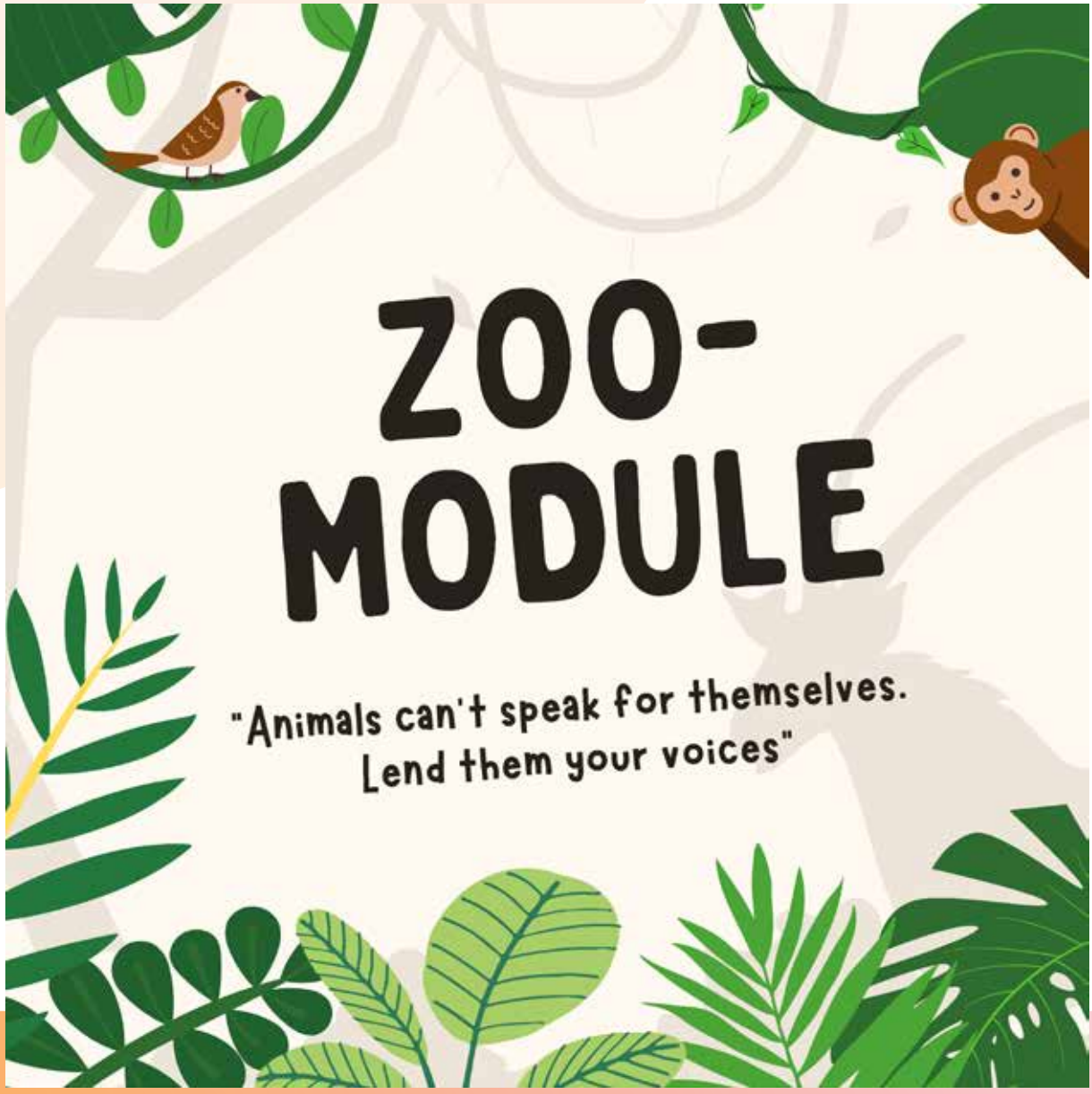
Rabbits undergo the process of breakdown products passing through the alimentary canal twice. The faeces in the first batch are usually produced at night, and are soft and watery. These are eaten again to enable the animals to absorb the products of bacterial breakdown as they pass through the alimentary canal for the second time. The second batch of faeces becomes drier and harder. This adaptation allows rabbits to recover the nutrients initially lost with the faeces.

Do birds not chew their food ?

Birds do not have teeth. They swallow their food whole. Birds also swallow some small stones along with their food. These stones help in crushing the grains they eat.

Cats cannot create suction to drink ?

Cats cannot create suction to drink. Animals like cats lap liquids like water and milk with their tongues. Cats have rough tongues. Their tongues have a sharp-edged surface which helps them to lap liquids and groom their fur.


ZOO-
MODULE
"Animals can't speak for themselves.
Lend them your voices"


PRINTABLE
WORKSHEET
ZOO-MODULE
GROUP LEADER AND GAME PROGRAMMER
Prabhu A/L Thanabalasingham
CREATOR AUTHOR
Intan Syazwana Aqila Binti Mahathir
APP DEVELOPER
Isaac Cellestine Ak Francis
GAME-LEVEL DESIGNER
Hani Juita Natasya Binti Juni
ADVISOR
Chiam Sun May,PHD

Name: Class:

Classifies the animals according to their eating habits.

HERBIVORE CARNIVORE OMNIVORE

zoo-module

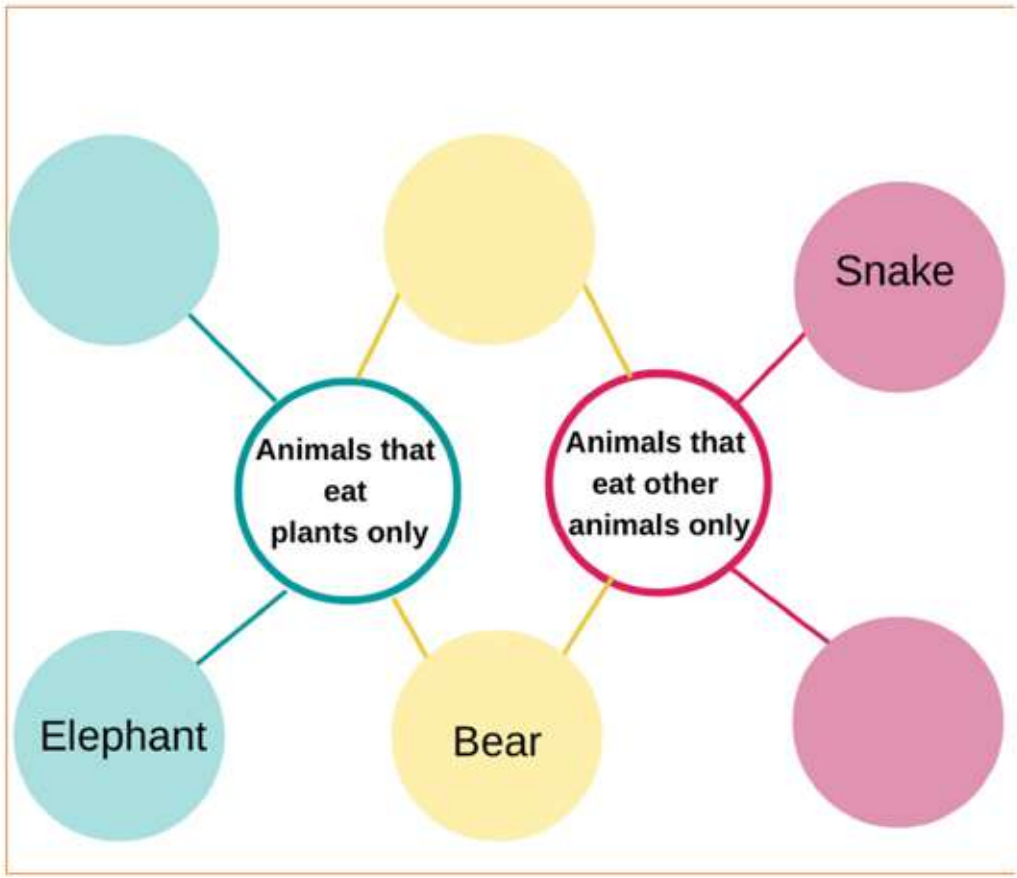
Name: Class:

Complete the table below.

Group 1	Group 2	Group 3
 	 	 
What do these animals eat?	What do these animals eat?	What do these animals eat?
What are these animals' eating habits?	What are these animals' eating habits?	What are these animals' eating habits?

Name: Class:

Complete the i-THINK map below.



zoo-module

Name: Class:

Complete the table below.

Who am I?	What do I eat?	What are my eating habits?	State two other examples of animals with the same eating habits.
 _____			
 _____			
 _____			

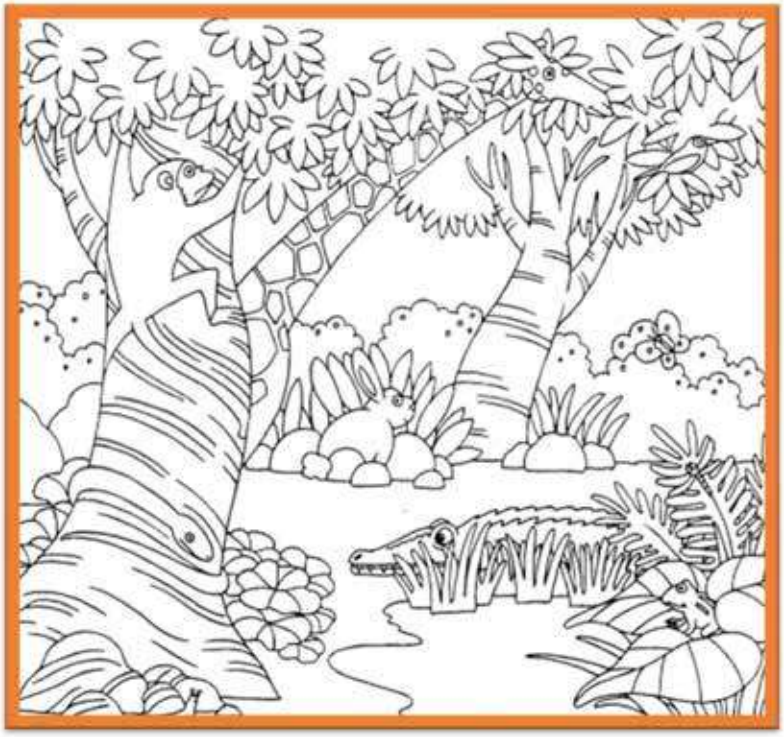
Name: Class:

What do animals eat?

Circle with green the herbivorous animals. Use red to circle the carnivores.

Name: Class:

Look at the picture below. Find the hidden animals and answer the questions below.



1. State the animals which are herbivores.

_____

2. Give the reasons based on the answer above.

_____

3. Name two animals that eat plants and other animals.

_____

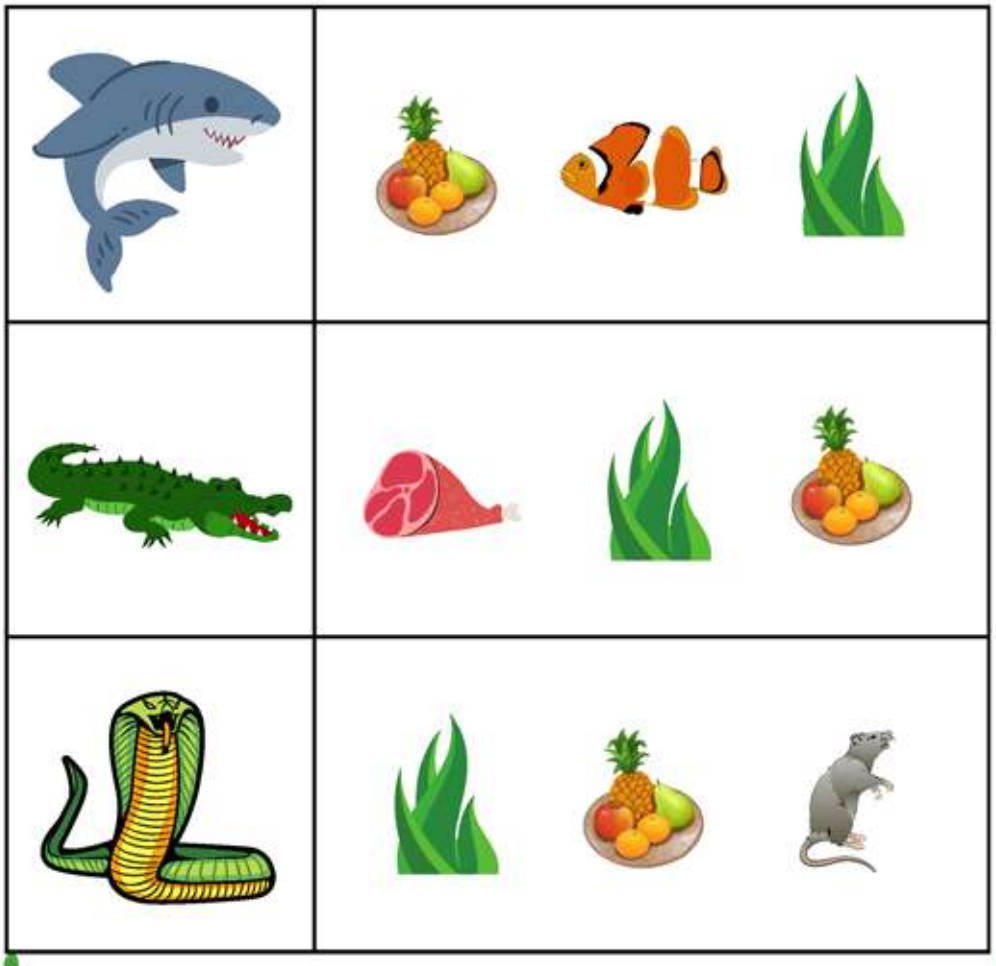
4. State the animals which are carnivores.

Name: Class:

Carnivores

Look at the animals on the left.

Draw a circle around the food they eat.



zoo-module

Name: Class:

Answer the following questions about the changes in eating habits of these animals.

Polar bear

Sun bear

Omnivore	Polar bear	Carnivore
Plants and other animals	Other animals	

1. What does the polar bear eat?

_____

2. What does the sun bear eat?

_____

3. What is the natural eating habit of the bears?

_____

4. Sun bear are still hunting for other animals and feed on fruits in the jungle while polar bears feed on fishes only as their source of food. Which animals have changed their eating habits?

_____.

5. They classified as _____ because they eat other animals only.

zoo-module

Name: Class:

Match the statement of dentition of animals with the animals' eating habits.

1. Have strong incisors to cut plants
2. Have big molars to grind plants for easier swallowing

1.Have incisors to cut food
2.Have canines to tear meat
3.Have molars to grind food

1.Have sharp canines

Carnivore

Herbivore

Omnivore

zoo-module

Name: Class:

The picture below shows the teeth of carnivore animals. Answer all the questions below based on the picture.

1. State the names of two animals that have the teeth as shown in the picture.

_____

2. What types of teeth do these animals have?

_____

3. What is the function of the teeth based on the answer given above?

_____


ZOO-
MODULE
PRINTABLE
WORKSHEETS
SCAN ME

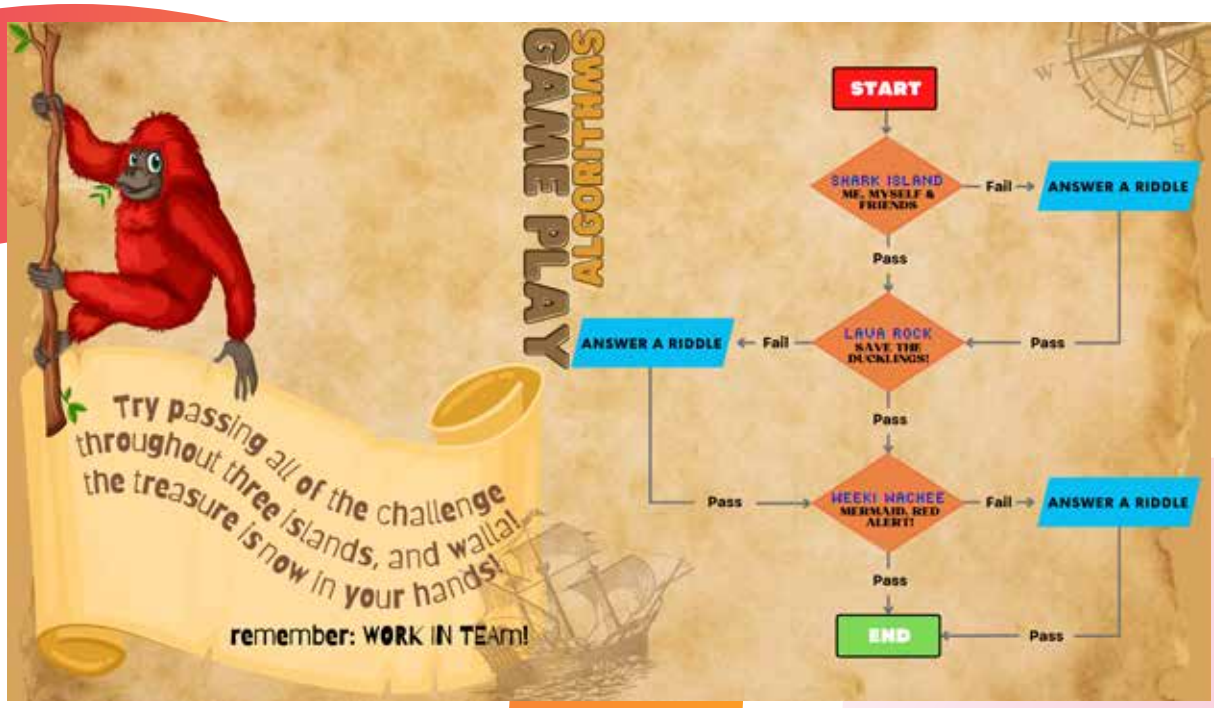
TREASURE HUNT

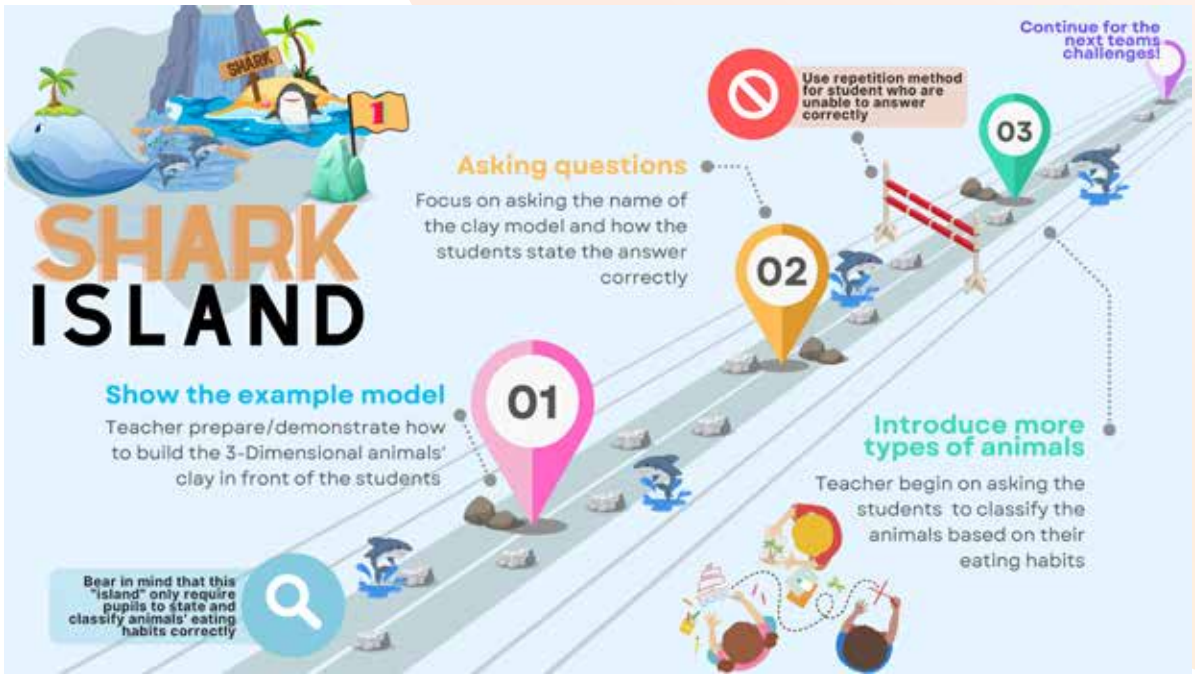
LEARNING OUTCOMES

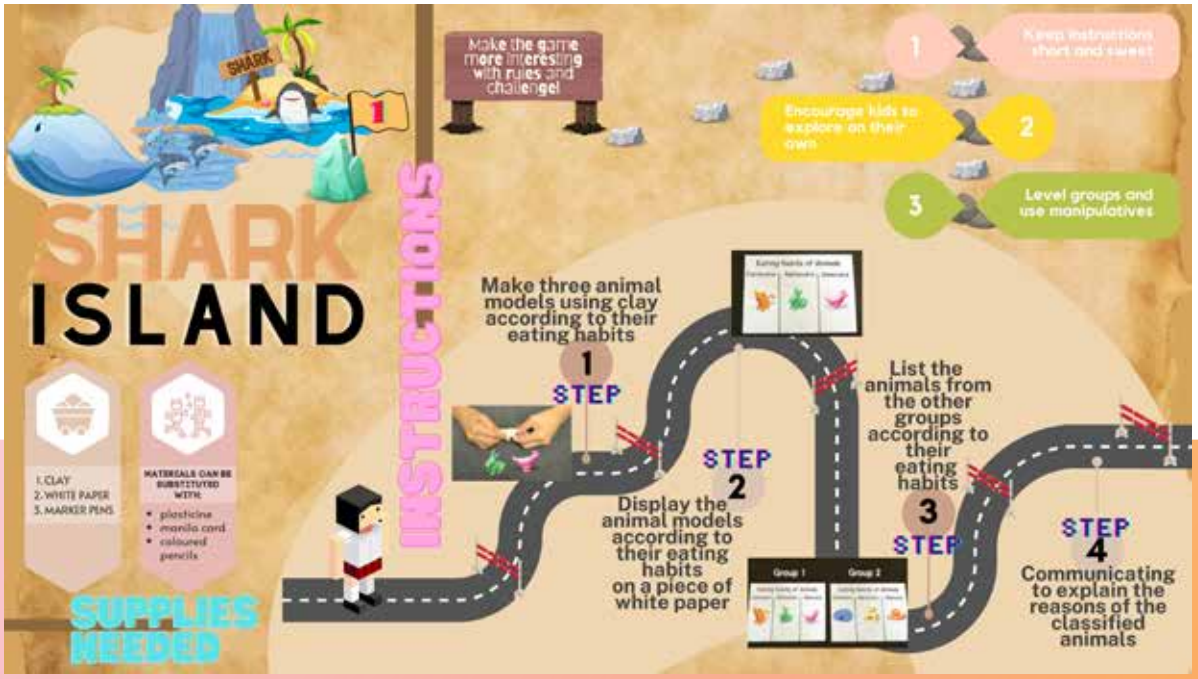
Performance Standard & Level

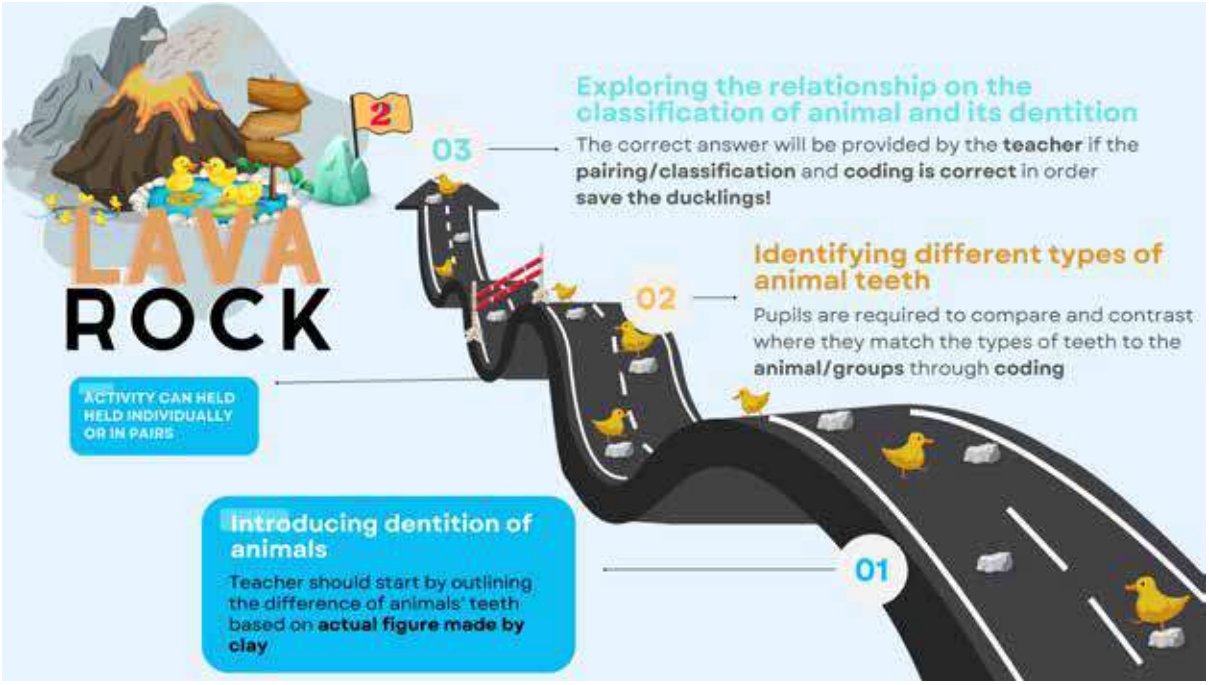
LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6
State the animals' eating habits	Classify animals based on their eating habits	Make generalisation about the eating habits of herbivore, carnivore and omnivore	Give reasons on the dentition of herbivore, carnivore and omnivore based on their eating habits	Explain the change of animals natural eating habits through examples	Communicate and justify the change of animals' natural habits

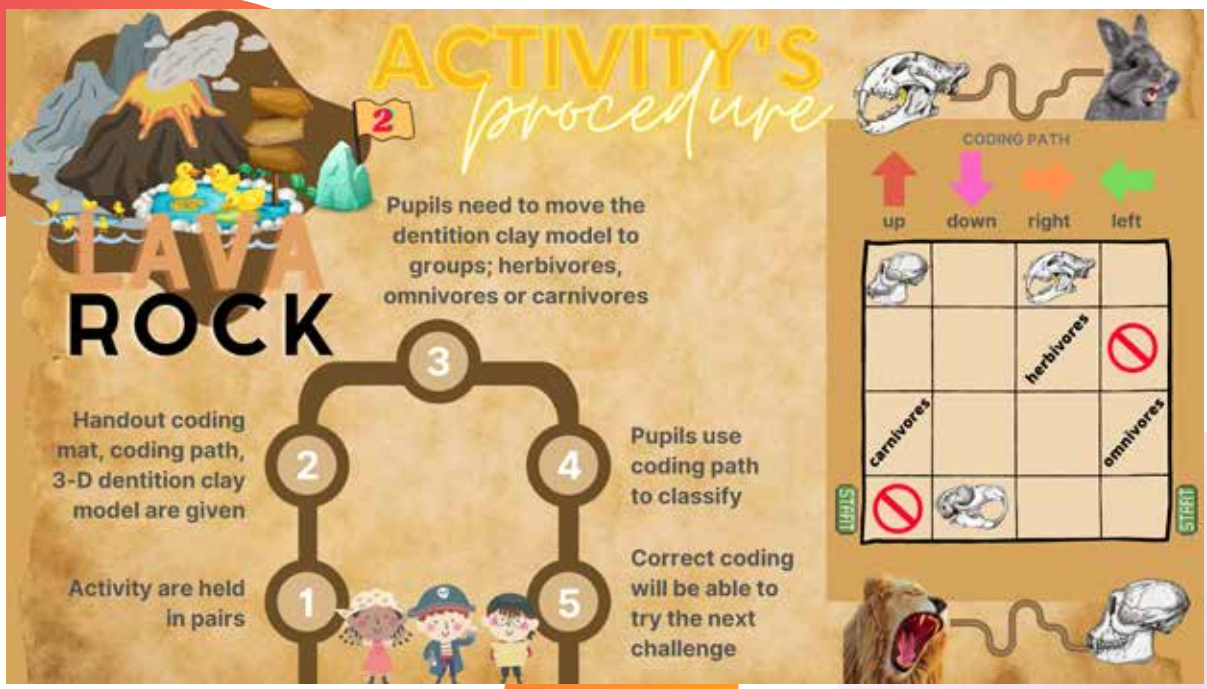

TREASURE HUNT
MAP
SHARK
SHARK ISLAND
1
LAVA ROCK
2
3
WEEKI WACHEE

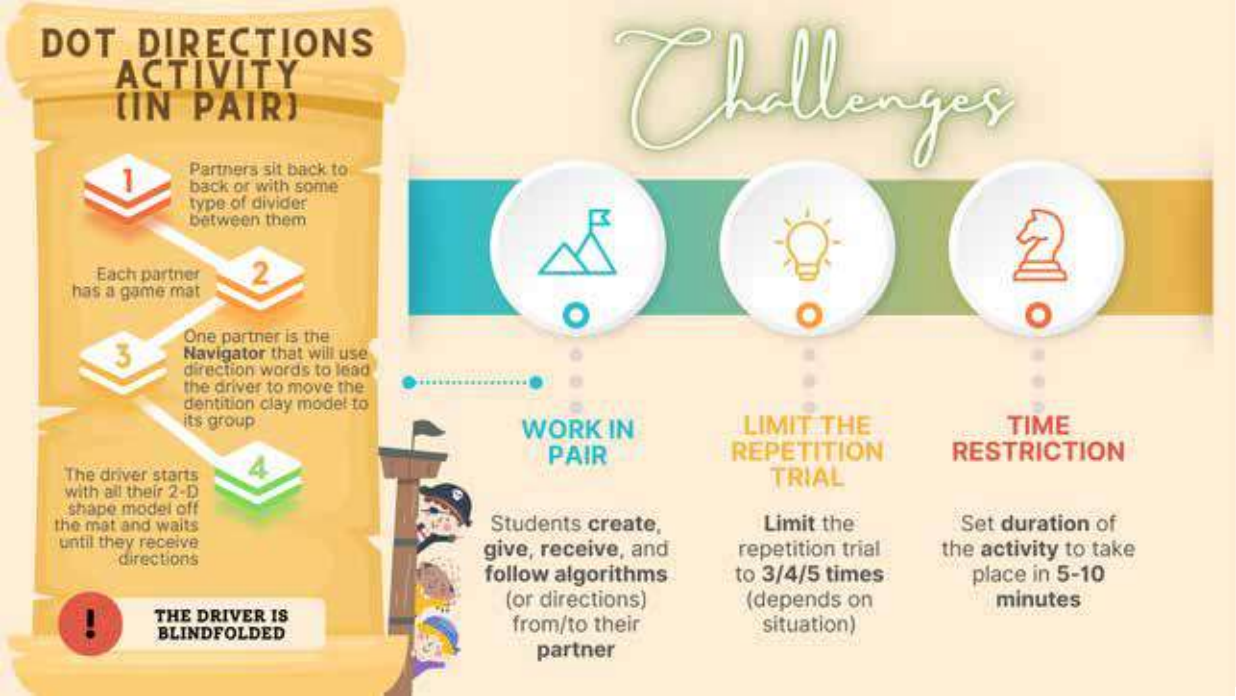

GAME PLAY
ALGORITHMS
Try passing all of the challenge throughout three islands, and walla! the treasure is now in your hands!
remember: WORK IN TEAm!
START
SHARK ISLAND
ME, MYSELF & FRIENDS
Fail
ANSWER A RIDDLE
Pass
LAVA ROCK
SAVE THE DUCKLINGS!
Fail
ANSWER A RIDDLE
Pass
Pass
WEEKI WACHEE
MERMAID, RED ALERT!
Pass
Fail
ANSWER A RIDDLE
Pass
END
Pass


SHARK
ISLAND
Continue for the next teams challenges!
Use repetition method for student who are unable to answer correctly
Asking questions
Focus on asking the name of the clay model and how the students state the answer correctly
03
02
01
Show the example model
Teacher prepare/demonstrate how to build the 3-Dimensional animals' clay in front of the students
Introduce more types of animals
Teacher begin on asking the students to classify the animals based on their eating habits
Bear in mind that this "island" only require pupils to state and classify animals' eating habits correctly

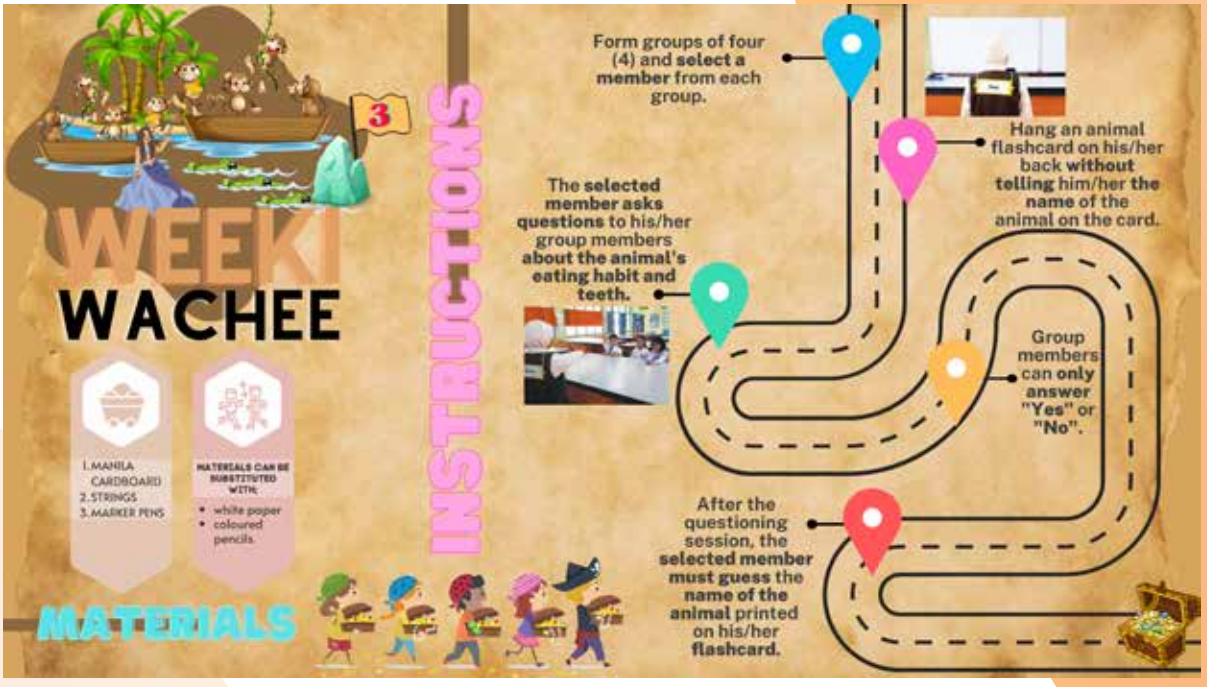

SHARK
ISLAND
Make the game more interesting with rules and challenge!
1
Keep instructions short and sweet
Encourage kids to explore on their own
2
3
Level groups and use manipulatives
INSTRUCTIONS
Make three animal models using clay according to their eating habits
STEP 1
STEP 2
Display the animal models according to their eating habits on a piece of white paper
List the animals from the other groups according to their eating habits
STEP 3
STEP 4
Communicating to explain the reasons of the classified animals
SUPPLIES NEEDED
1. CLAY
2. WHITE PAPER
3. MARKER PENS
MATERIALS CAN BE SUBSTITUTED WITH:
• plasticine
• manila card
• coloured pencils

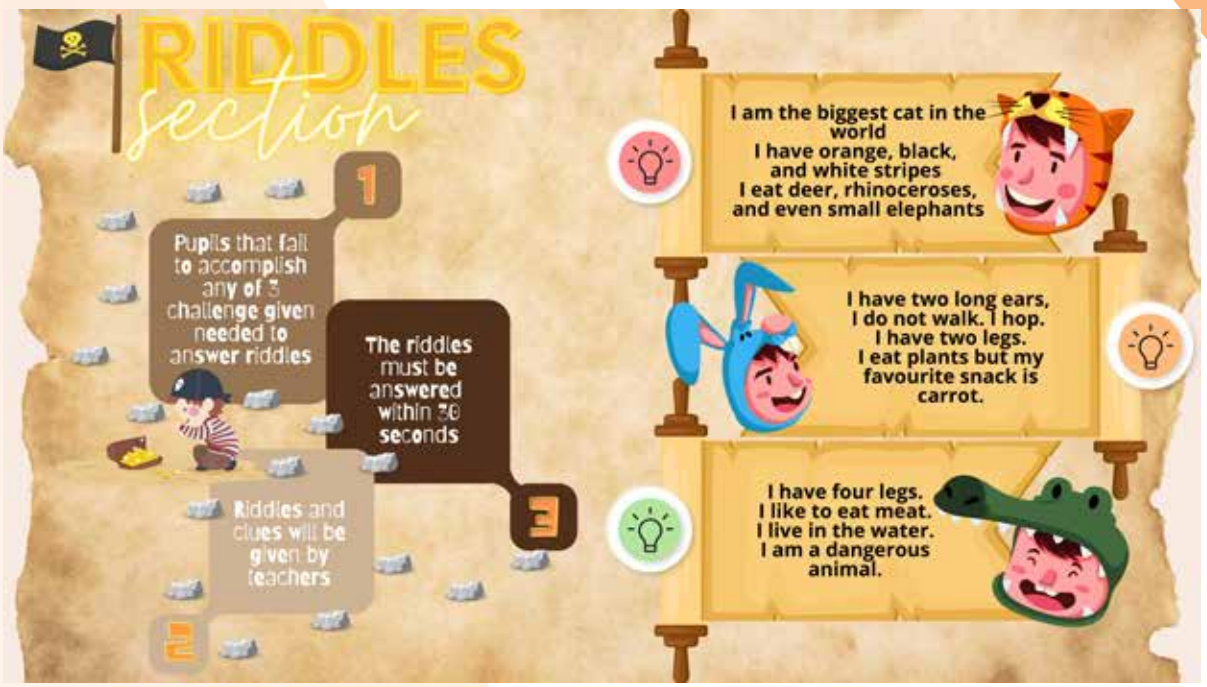

LAVA ROCK
2
03
Exploring the relationship on the classification of animal and its dentition
The correct answer will be provided by the teacher if the pairing/classification and coding is correct in order save the ducklings!
02
Identifying different types of animal teeth
Pupils are required to compare and contrast where they match the types of teeth to the animal/groups through coding
ACTIVITY CAN HELD HELD INDIVIDUALLY OR IN PAIRS
Introducing dentition of animals
Teacher should start by outlining the difference of animals' teeth based on actual figure made by clay
01


LAVA ROCK
2
ACTIVITY'S procedure
Pupils need to move the dentition clay model to groups; herbivores, omnivores or carnivores
Handout coding mat, coding path, 3-D dentition clay model are given
Activity are held in pairs
1
2
3
4
5
Pupils use coding path to classify
Correct coding will be able to try the next challenge
CODING PATH
up
down
right
left
herbivores
carnivores
omnivores
START
START


DOT DIRECTIONS ACTIVITY (IN PAIR)
1
Partners sit back to back or with some type of divider between them
2
Each partner has a game mat
3
One partner is the Navigator that will use direction words to lead the driver to move the dentition clay model to its group
4
The driver starts with all their 2-D shape model off the mat and waits until they receive directions
THE DRIVER IS BLINDFOLDED
Challenges
WORK IN PAIR
Students create, give, receive, and follow algorithms (or directions) from/to their partner
LIMIT THE REPETITION TRIAL
Limit the repetition trial to 3/4/5 times (depends on situation)
TIME RESTRICTION
Set duration of the activity to take place in 5-10 minutes


WEEKI WACHEE
Evaluating clues
Sharpen the skills to evaluate the stimulus given by their members and justify the animal
Communicating skills
Providing easy clues to the selected member to guess the animal correctly
Team up to accomplish mission
Pupils are divided into groups of four (4)
01
02
03


WEEK 3
WACHEE
INSTRUCTIONS
1.MANILA CARDBOARD
2.STRINGS
3.MARKER PENS
MATERIALS CAN BE SUBSTITUTED WITH:
white paper
coloured pencils
MATERIALS
Form groups of four (4) and select a member from each group.
Hang an animal flashcard on his/her back without telling him/her the name of the animal on the card.
The selected member asks questions to his/her group members about the animal's eating habit and teeth.
Group members can only answer "Yes" or "No".
After the questioning session, the selected member must guess the name of the animal printed on his/her flashcard.


RIDDLES section
1
Pupils that fail to accomplish any of 3 challenge given needed to answer riddles
2
Riddles and clues will be given by teachers
3
The riddles must be answered within 30 seconds
I am the biggest cat in the world
I have orange, black, and white stripes
I eat deer, rhinoceroses, and even small elephants
I have two long ears,
I do not walk. I hop.
I have two legs.
I eat plants but my favourite snack is carrot.
I have four legs.
I like to eat meat.
I live in the water.
I am a dangerous animal.

Careers

INVOLVED THROUGHOUT COMPLETING THIS KIT

The skill and knowledge needed within this project comprises a variety of skills across multiple of field of occupation, as we imagined such as the following:

GRAPHIC DESIGNER

1 A graphic designer is a professional in the graphic design and graphic arts sectors who incorporates images, typography, or motion graphics to create a design. Art directors primarily create graphics for authored, printed, or electronic media such as brochures and advertising. They are also occasionally in charge of typesetting, illustration, or user interfaces. The designer's key focus is to present information in a way that is both obvious and memorable.
The skill required during the notes development materials as well the making of the instructions to the hands-on project was learned independently by everyone in the group via the Canva app to produce an interactive and engaging material that is both eye-catching and informative for the students and the educators that are going to use it throughout the teaching process. The skills of sorting out colors and space within a space is essential in the material making process and applies to any field of creative design as this would be among the easiest ways to attract the public to pay attention towards a certain material. This skill of editing, theme setting, color selection, space usage and font setting are required in the occupation of graphic designer.

ZOOLOGISTS AND WILDLIFE BIOLOGISTS

2 Zoologist and wildlife biologists' career involve throughout developing and completing this module. This is because the app that we built is about animals, specifically animals' eating habits. Both careers study animals and other wildlife and how they interact with their ecosystems.

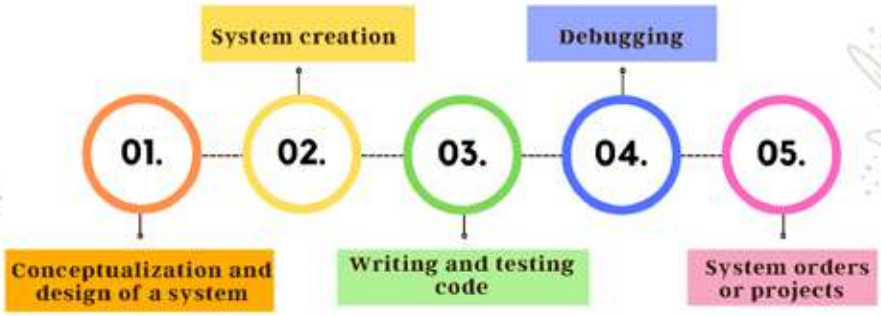
Careers

INVOLVED THROUGHOUT COMPLETING THIS KIT

The skill and knowledge needed within this project comprises a variety of skills across multiple of field of occupation, as we imagined such as the following:

GAME PROGRAMMER

3 Aprogrammer is an individual who writes/creates computer applications or software by providing detailed programming instructions to the computer. Most programmers have exhaustive computing and coding experience in a wide range of programming languages and platforms, including Structured Query Language (SQL), Perl, Extensible Markup Language (XML), PHP, HTML, C, C++, and Java. A programmer may work in a variety of settings, from small to large IT firms, and may be involved in any of the system programming components, like:

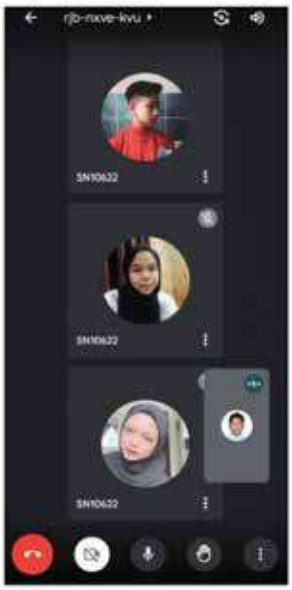


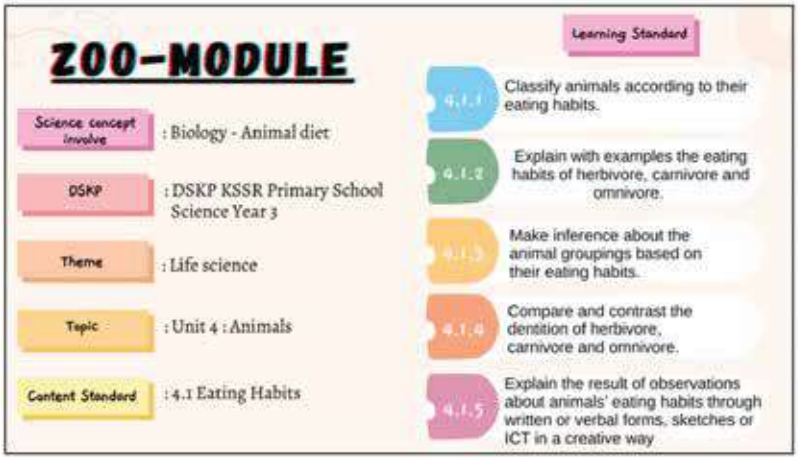
The usage of the scratch app and the MIT apps as within this project have made the materials of the projects accessible with a click on anyone's smartphone and laptop as all the materials are compiled within the MIT apps and the games found within the project was developed from ground zero with basic understanding of programming thus undergoing the following process to produce a functional apps display and game interaction.

A programmer pursues being associated with them by a systems analyst or senior programmer. A programmer converts a programme into a series of codes or instructions that a computer can run and execute, using a specific programming language and required platforms. A programmer runs the code after converting the design to code to look for bugs and errors. If a programmer discovers a bug in the code, the appropriate adjustments are made, and the programme is re-run. The programmer appears to be trying to perfect the code through trial and error until it extends an acceptable error level, and this procedure is repeated throughout the life of a programme because software and programmes are never truly perfect or finished.

19 MAY 2022

First meeting at IPG Kampus Kent with expertise from Majlis Belia Malaysia, Dr. Syafiqah, Prof. Abd. Lateef Krauss from UPM, Dr. Azman bin Omar, Special Gred C Excellent Lecturer, together with Dr. Chiam Sun May, Special Gred C Excellent Lecturer, our beloved advisor.



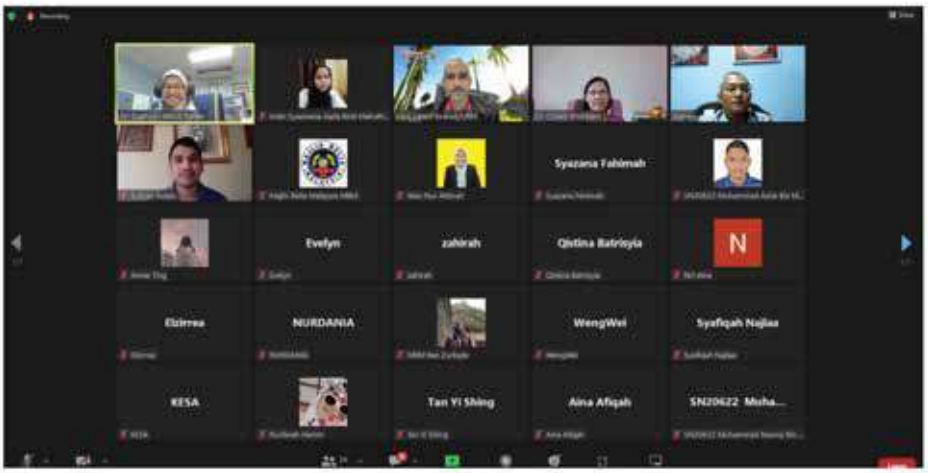


4 JULY 2022

Meeting with group members where we decide to develop seatwork on an application specifically for Topic Animal's Eating Habits

13 JULY 2022

Share each group member's progress and discussing some problems regarding module's issues



20 JULY 2022

STEM Talk

ZOO - MODULE

CAREER : ZOOLOGIST – Biologist who study a variety of animal species.

CHAPTER SASARAN : TOPIC berkaitan haiwan
Year 1 - Year 6 Primary School students.

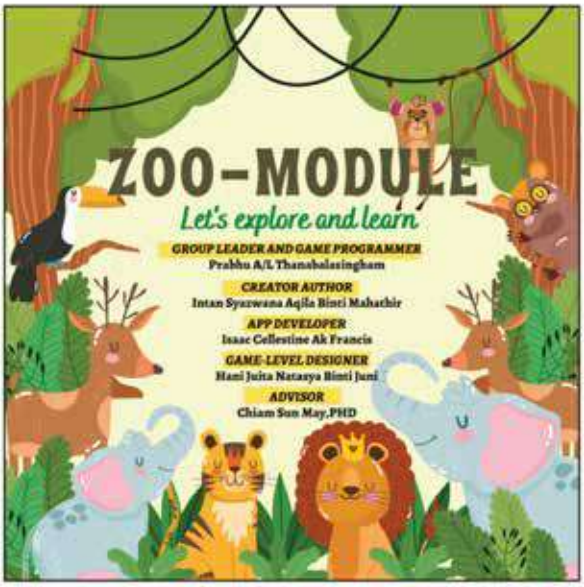
Animal Eating Habits (Year 3)	Reproduction of animal (Year 2)
HANDS-ON ACTIVITY : TREASURE HUNT TECHNOLOGY : SCRATCH GAME	HANDS-ON ACTIVITY : Animal LIFE CYCLE (FROG) TECHNOLOGY : WEBSITE
Parts of Animals (Year 1)	Animal organs (Year 4)
HANS-ON ACTIVITY : FREEZE & UNFREEZE TECHNOLOGY : WORDWALL	HANDS-ON ACTIVITY : EXPERIMENT DISSECTION TECHNOLOGY : VIDEO

19 MAY 2022
The Initial draft ideas on module

Zoo module

1. medium : apps
2. sasaran : science teacher's, science students
3. topic : chapter 'Animal's eating Habits' Year 3
4. work distribution
   - Explore / develop apps
   - Design all notes
   - Creating games — online; hands on (can be printed by the teacher)
   - quiz / latihan
5. position
   1. Isaac - apps developer
   2. Iman Syazwana - Researcher / Data analyst's (design notes)
   3. Prabu - Leader & Game programmer 1
   4. Rani Juita - Game programmer 2

4 JULY 2022
Final draft for the module after GM meeting together with our advisor Dr. Chiam



18 JULY 2022

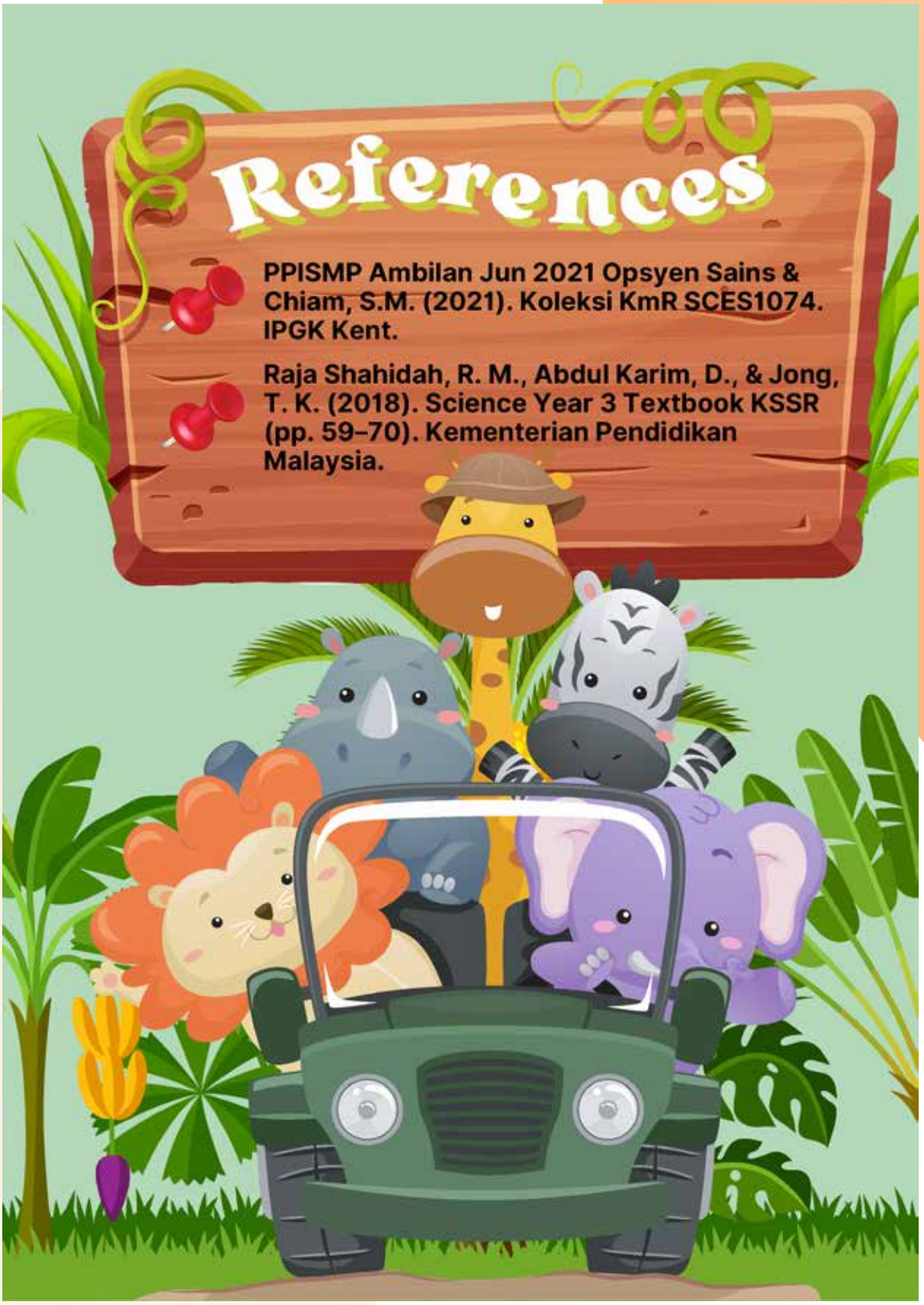
Final design front page for 'Zoo-Module' notes after comments and suggestions from our advisor Dr. Chiam

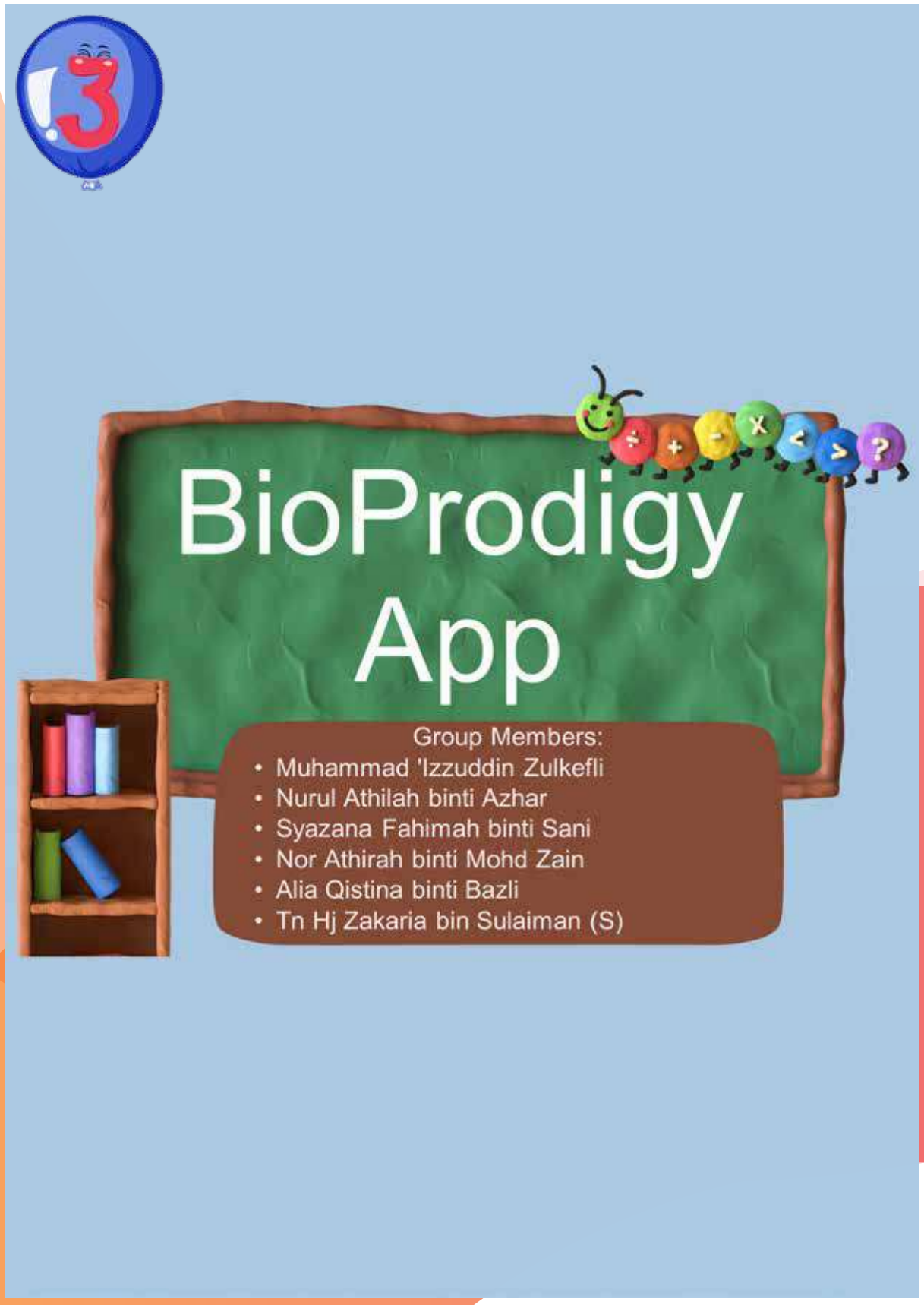
25 JULY 2022

Final design front page for 'Zoo-Module' hands-on activity after comments and suggestions from our advisor, Dr. Chiam

27 JULY 2022

Final design front page for 'Zoo-Module' printable worksheet after comments and suggestions from our advisor Dr. Chiam


References
PPISMP Ambilan Jun 2021 Opsyen Sains & Chiam, S.M. (2021). Koleksi KmR SCES1074. IPGK Kent.
Raja Shahidah, R. M., Abdul Karim, D., & Jong, T. K. (2018). Science Year 3 Textbook KSSR (pp. 59–70). Kementerian Pendidikan Malaysia.


BioProdigy App
Group Members:
• Muhammad 'Izzuddin Zulkefli
• Nurul Athilah binti Azhar
• Syazana Fahimah binti Sani
• Nor Athirah binti Mohd Zain
• Alia Qistina binti Bazli
• Tn Hj Zakaria bin Sulaiman (S)

Latar Belakang

Menyedari penurunan bilangan murid aliran STEM saban tahun, inovasi STEM dalam PdPc perlu dilakukan. Kandungan **mata pelajaran** Sains seperti Biologi yang banyak tertumpu kepada perkara abstrak **merupakan satu daripada** punca hilangnya minat murid dalam bidang ini. Malah, pembelajaran yang hanya menggunakan buku teks menjadikan PdPc membosankan. Maka, tercetusnya idea BioProdigy adalah untuk menarik semula minat **murid** dalam bidang STEM. BioProdigy **merupakan** aplikasi Pembelajaran Abad ke-21 (PAK-21) yang tertumpu kepada subjek Biologi. Penggunaannya oleh guru dan murid adalah ***compatible*** kerana berkonsepkan ***one-stop centre*** yang menggabungkan komik sains digital, proses sains dalam tiga dimensi (3D) dan juga latihan untuk mengukuhkan pemahaman murid.

Masalah dan Penyelesaian

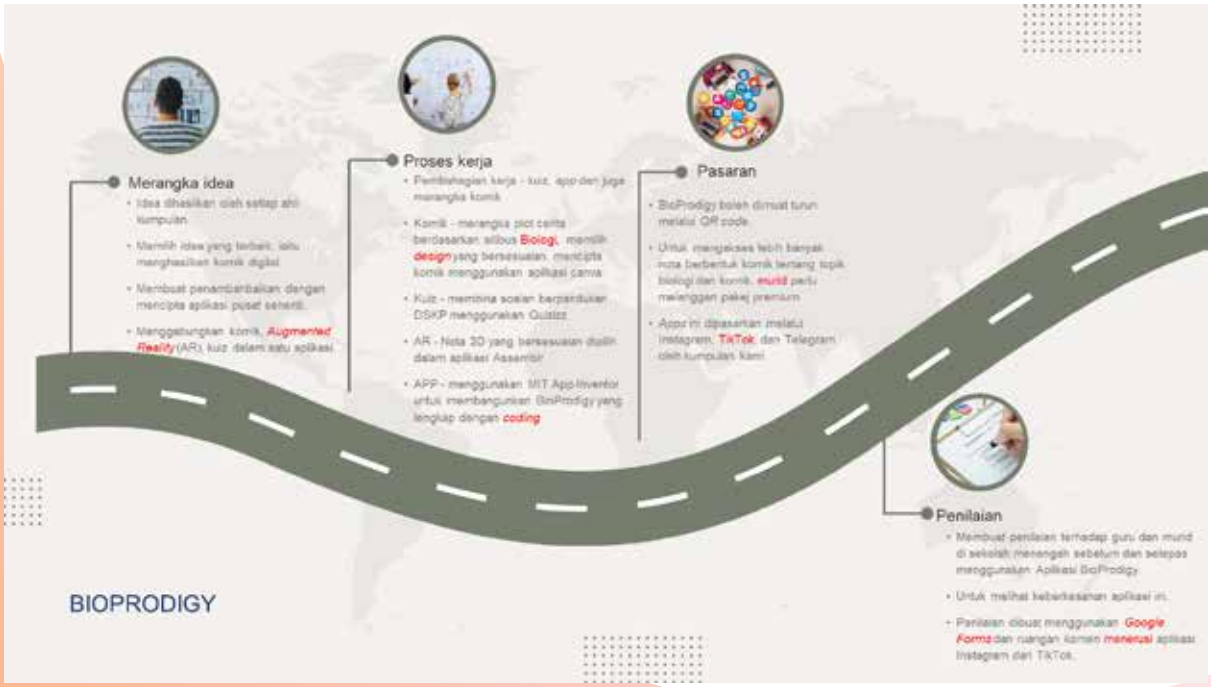
MASALAH	PENYELESAIAN
• **Murid aliran** Sains Tulen sukar menguasai subjek Biologi • Murid sukar memahami pembelajaran secara teori dan abstrak sahaja	• Menggunakan konsep 3D dalam model proses sains sebagai bahan bantu mengajar • PdPc menjadi lebih menarik dengan memanfaatkan pelbagai teknologi yang ada
• Bilangan murid aliran STEM semakin menurun	• Menggunakan komik sebagai bahan bacaan yang diselitkan dengan nota dan ilustrasi yang menarik
• Tanggapan negatif masyarakat terhadap bahan bacaan komik • PdPc yang dijalankan kurang menarik	


GRAPHIC DESIGNER
Mereka grafik dalam bentuk ilustrasi komik yang menarik. Menentukan design untuk membangunkan sebuah aplikasi
APP DEVELOPER
Membangunkan sebuah aplikasi pembelajaran BioProdigy dan memastikan pengaturcaraan aplikasi berfungsi dengan baik
PELUANG KERJAYA
EDITOR
Membina jalan cerita yang menarik dan sesuai untuk murid sekolah
TEACHERS
Menyumbang tenaga dalam membina soalan dan latihan untuk mengukuhkan pemahaman murid


Paparan Muka Depan
WELCOME TO BIOPRODIGY
TAP TO START
SCIENCE DIGITAL COMIC
Comic Reading
Real Science Process
Challenge Yourself!
About

Contoh komik

Proses Pembinaan Inovasi

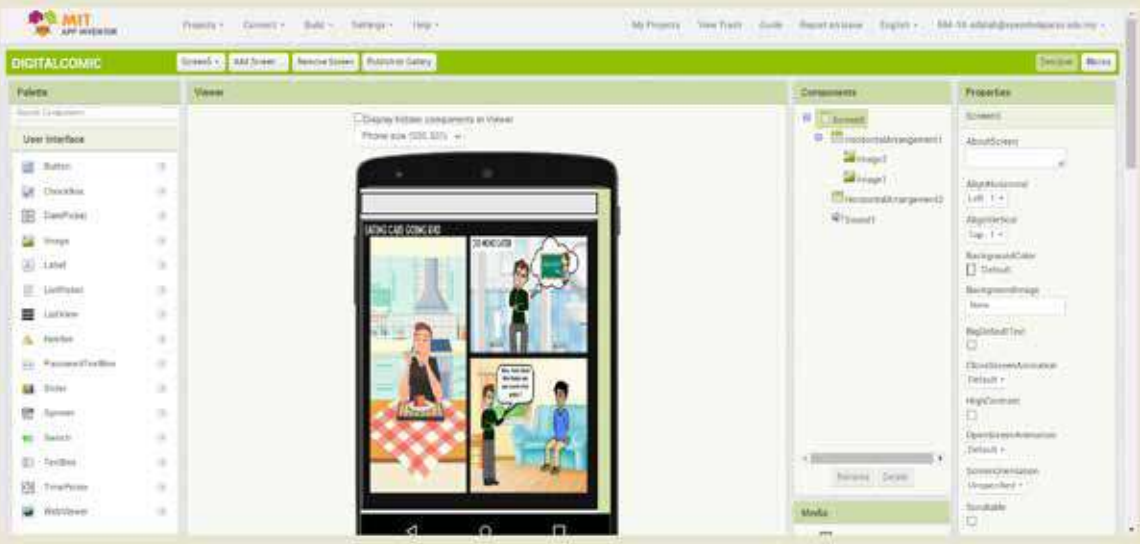

Merangka idea
• Idea dihasilkan oleh setiap ahli kumpulan
• Memilih idea yang terbaik, iaitu menghasilkan komik digital
• Membuat penambahbaikan dengan mencipta aplikasi pusat sehenti.
• Menggabungkan komik, Augmented Reality(AR), kuiz dalam satu aplikasi
Proses kerja
• Pembahagian kerja - kuiz, apps dan juga merangka komik
• Komik - merangka plot cerita berdasarkan silibus Biologi, memilih design yang bersesuaian, mencipta komik menggunakan aplikasi canva
• Kuiz - membina soalan berpandukan DSKP menggunakan Quizizz
• AR - Nota 2D yang bersesuaian dialih dalam aplikasi Assemblr
• APP - menggunakan MIT App Inventor untuk membangunkan BioProdigy yang lengkap dengan coding
Pasaran
• BioProdigy boleh dimuat turun melalui QR code.
• Untuk mengakses lebih banyak nota berbentuk komik tentang topik biologi dan komik, murid perlu melanggan pakej premium
• Apps ini dipasarkan melalui Instagram, TikTok dan Telegram oleh kumpulan kami.
Penilaian
• Membuat penilaian terhadap guru dan murid di sekolah menengah sebelum dan selepas menggunakan Aplikasi BioProdigy
• Untuk melihat keberkesanan aplikasi ini.
• Penilaian dibuat menggunakan Google Forms dan ruangan komen menerusi aplikasi Instagram dan TikTok.
BIOPRODIGY


Draft komik

Proses Membangunkan Aplikasi (MIT App Inventor)

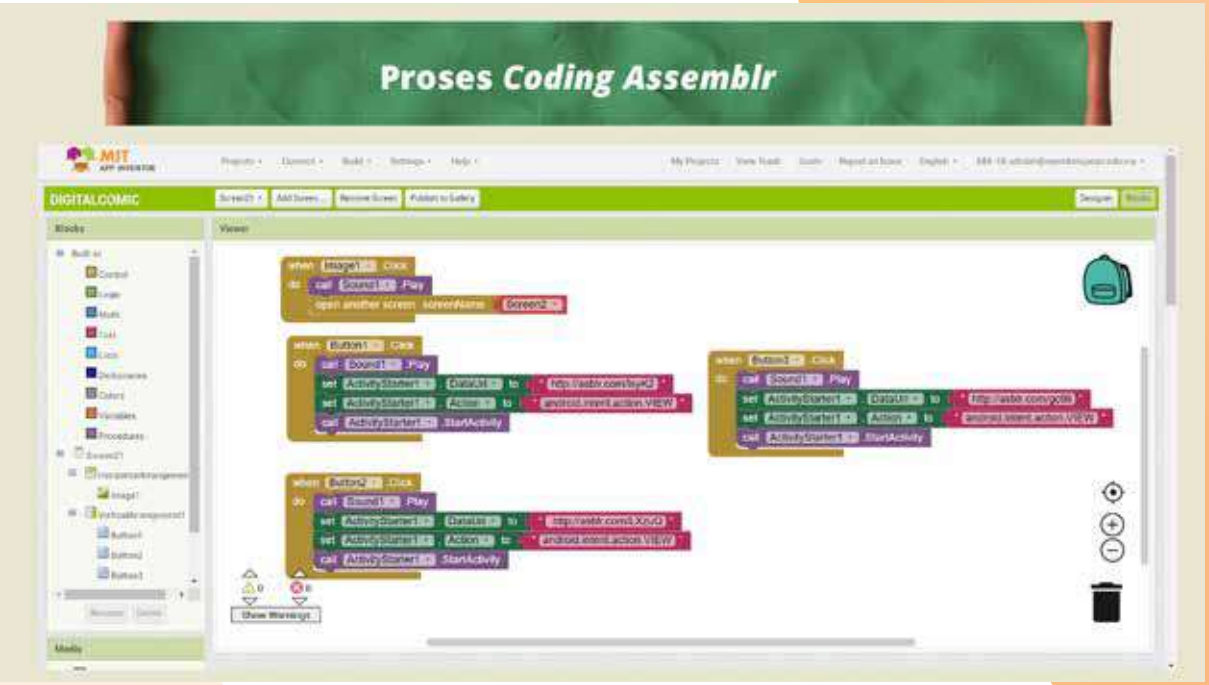
Tetapan Paparan Muka Depan (*background, button, sound effect*)

Proses Memasukkan Komik ke dalam Aplikasi

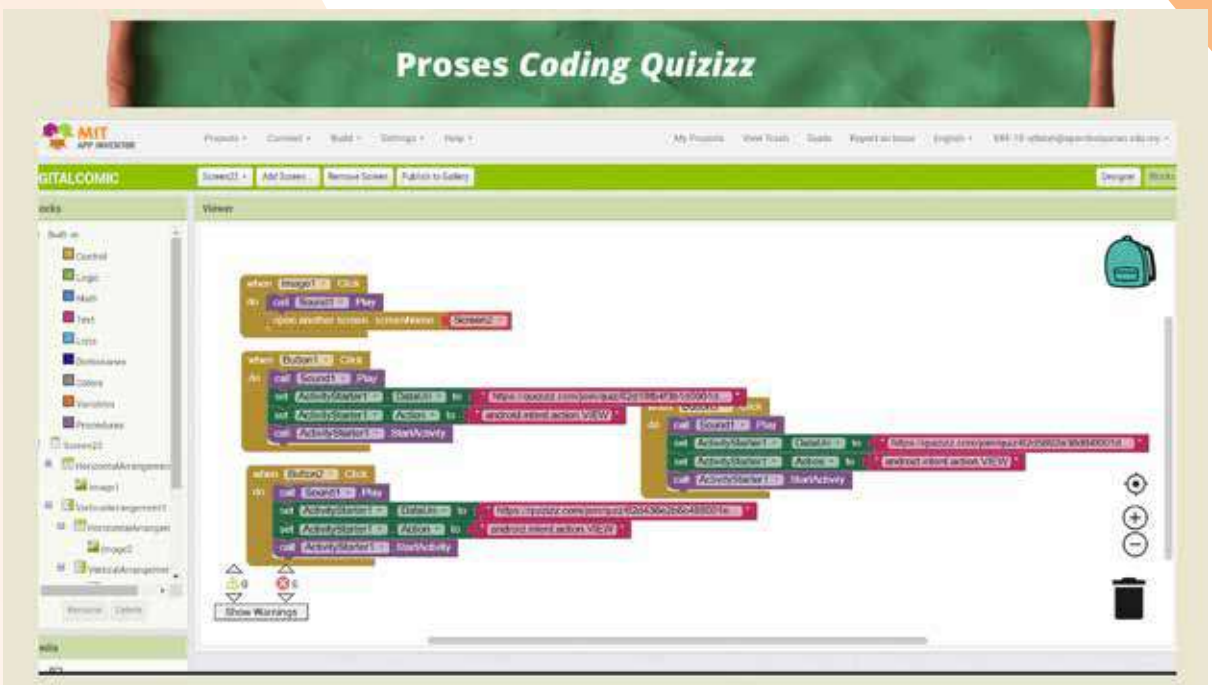


Proses Memasukkan Komik ke dalam Aplikasi

Proses Coding Assemblr



Proses Coding Quizizz



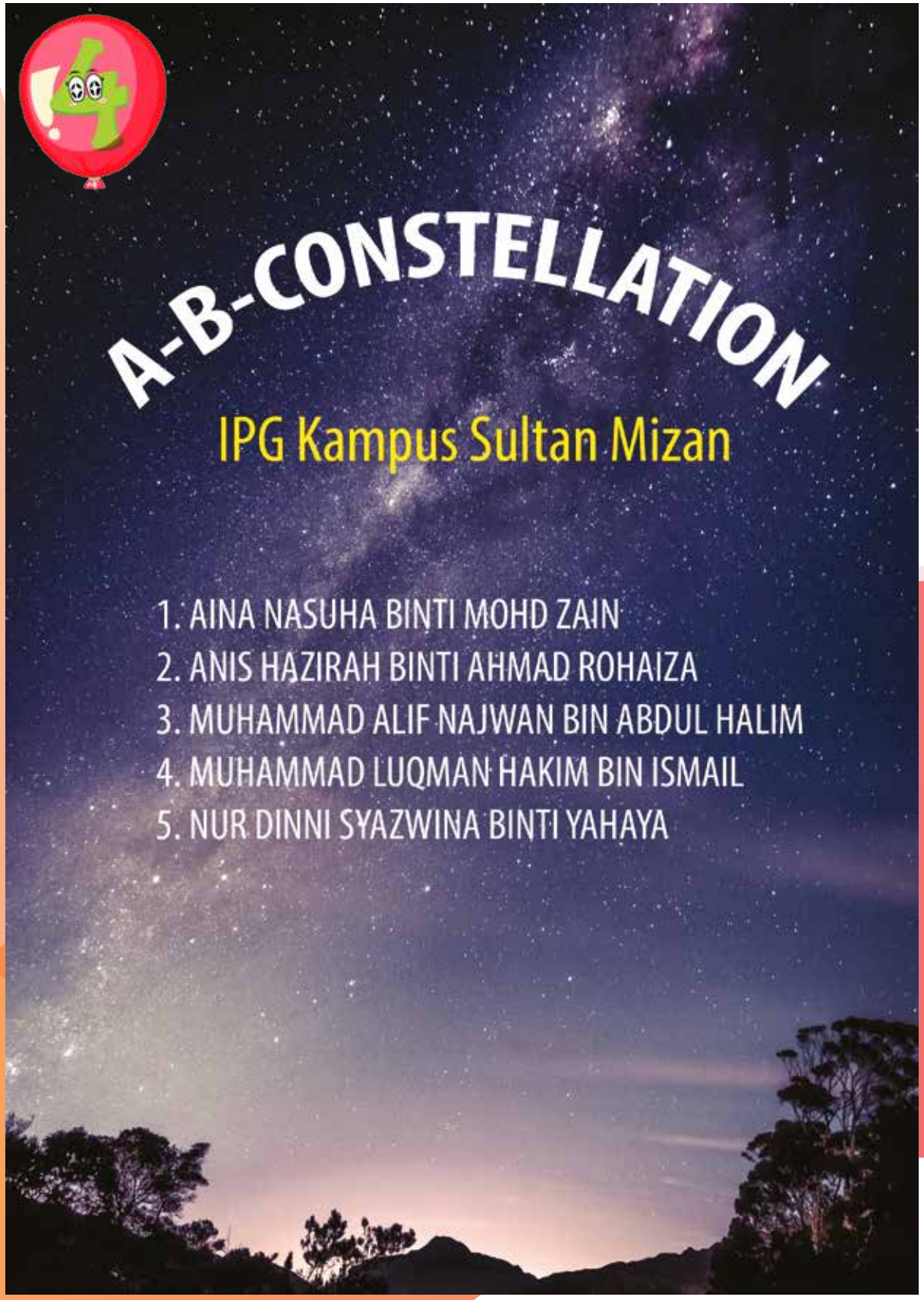

Aplikasi yang Siap Dibangunkan
Terdapat 23 Screens yang Berbeza Coding


Aplikasi Diuji dengan Mengimbas Kod QR
Kod QR Hanya Valid Pada Tempoh Tertentu
Your code is
piwevt
Cancel

Paparan Video Penggunaan Aplikasi

Penghargaan

Ribuan terima kasih diucapkan kepada pihak IPGM dengan kerjasama Majlis Belia Malaysia kerana memberi peluang kepada kumpulan untuk mengetengahkan idea inovasi kami. Tidak lupa juga kepada pihak IPGK Kent yang turut sama-sama menyumbang idea dalam pembinaan modul ini. Diharapkan dengan adanya modul ini dapat membantu menarik minat murid sekolah menengah dalam bidang STEM. Banyak kerjaya STEM yang dapat dilibatkan dalam pembinaan inovasi ini.


A-B-CONSTELLATION
IPG Kampus Sultan Mizan
1. AINA NASUHA BINTI MOHD ZAIN
2. ANIS HAZIRAH BINTI AHMAD ROHAIZA
3. MUHAMMAD ALIF NAJWAN BIN ABDUL HALIM
4. MUHAMMAD LUQMAN HAKIM BIN ISMAIL
5. NUR DINNI SYAZWINA BINTI YAHAYA

INTRODUCTION

What to Expect From Us

A-B-Constellation has been produced and innovated to be a teaching aid that can help students in understanding the constellations better. These teaching aids are built so to create a more interactive learning lesson as well as providing hands-on activity for students. It can also create a two-way communication between students and teachers.

OBJECTIVES

- Create a product for two-way interaction between teachers and students that promotes student-centred learning.
- Help students to identify types and patterns of the constellations better
- Correct students' misconceptions about constellations and their use in daily life

INNOVATION PROCESS

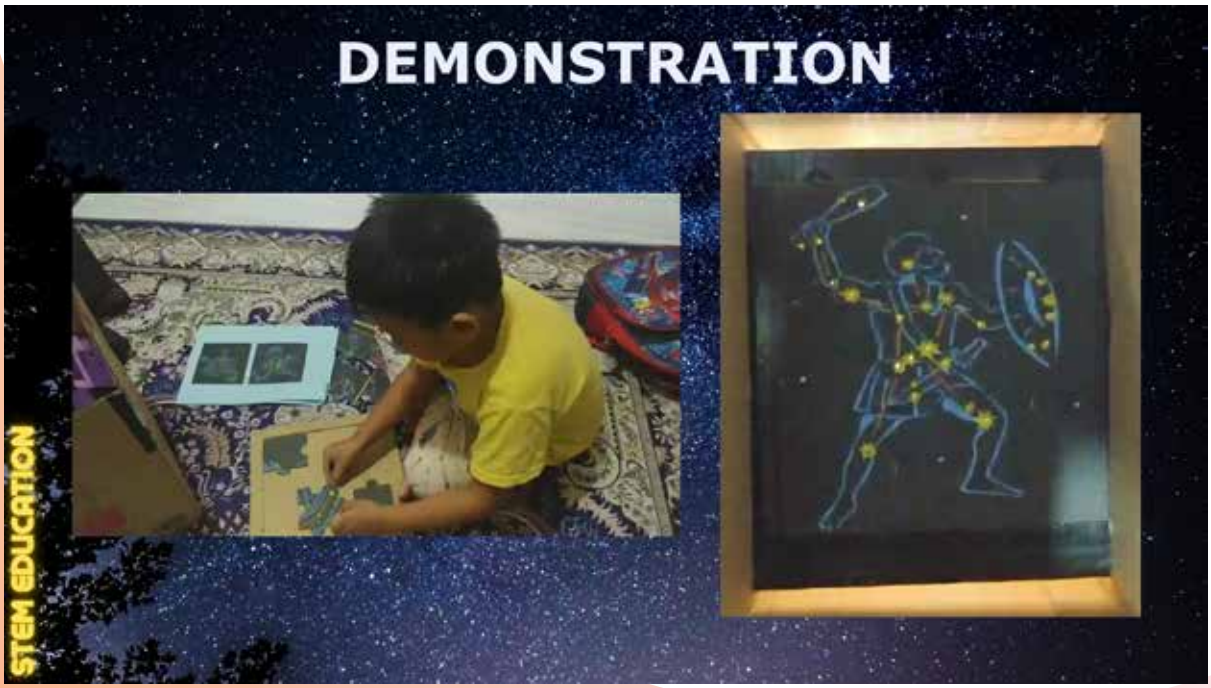
1. Discuss and brainstorm ideas with the group members and find the information about the project
2. Draft and sketch the project
3. Start creating the project
   - paint the box with dark colour
   - attach the picture of the constellation to the puzzle
4. Test the project on the students
5. Improvise the project based on the survey

INNOVATION PROCESS

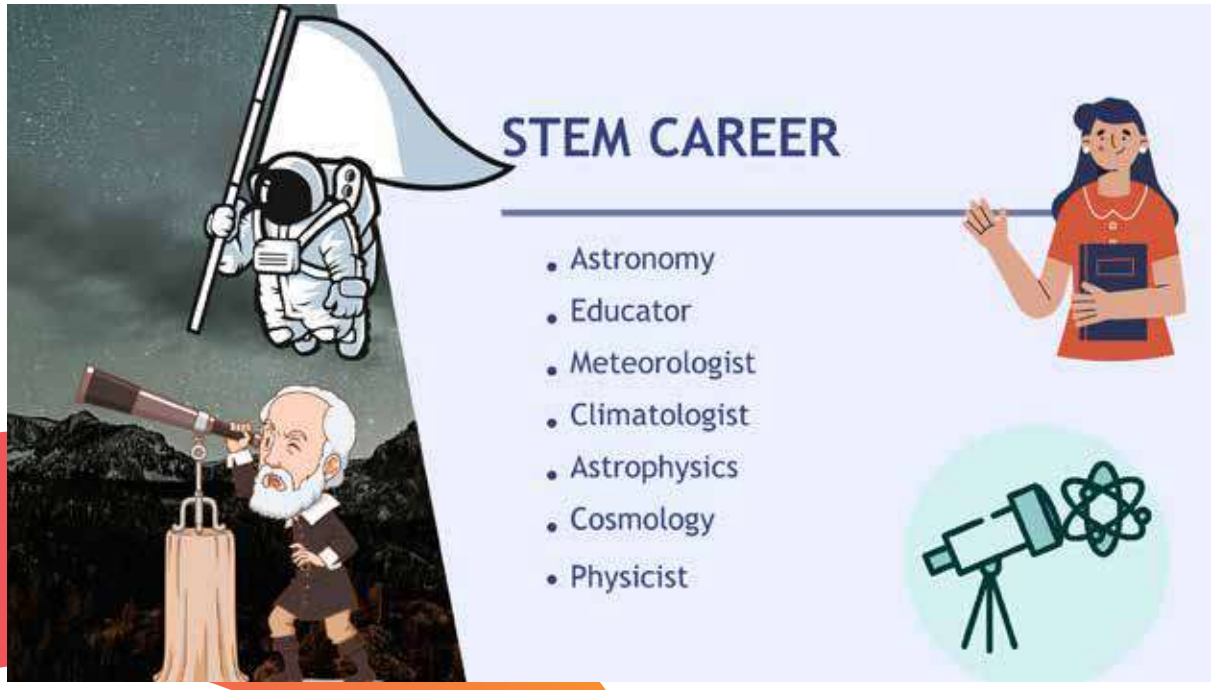
22nd May- First face-to-face meeting and discussion on the module
29th May- Forming groups and task division
9th June- Meeting and discussion on the selection of product
5th July- Distribution of the task and drafting of the product
7th July- Discussion on the content of our product
8th July- Improvising the draft on the product's effectiveness in the learning process.
10th July- Collecting material from recycled things to make the product
12-20th July- The process of making the product started
20th July- Second session of the module with Mr. Sufyan
21st July- Discussion with mentor and taking advice to improve our product
22-24th July- We improvised the structure and the content so that it is in line with DSKP
31st July - Making corrections to the puzzle
25th July- The product (A-B-Constellation) was completed
9 August- Third session of the module
11 August - A little bit of touch up for the end product


APPARATUS
SCISSORS
CUTTER
LED
SPRAY
TAPE
BO
X
A4
PAPER


THE PUZZLE


DEMONSTRATION
STEM EDUCATION


IMPACT ON TEACHING AND LEARNING
• Increase intrinsic and extrinsic motivation among students during their learning process.
• Encourage students to embrace their inquiry to explore the science world.
• enhance understanding of the topic among the students through the hands-on activity.
• consume low cost as it is made from easily available as well as recycled materials


STEM CAREER
Astronomy
Educator
Meteorologist
Climatologist
Astrophysics
Cosmology
Physicist


STEM KERJAYA
DUNIA GIGI
Digital Comic

Ahli Kumpulan

Nurdania Maisarah	Nur Shafiqah Najlaa	Najiyan Aimi	Wan Nur Athirah	Kesavartni
Ilustrasi & Grafik	Dokumentasi	Ketua Kumpulan	Perekacipta digital	Bahasa & Isyarat

STEM Kerjaya

KANDUNGAN

STEM Kerjaya

Apakah itu *Living Lab?*

Living Lab ialah konsep pembelajaran yang menggunakan dunia nyata berdasarkan model. Pembelajaran menggunakan bahan atau alatan yang sebenar, kadang kala sukar untuk diperoleh oleh guru di dalam kelas sewaktu sesi PdP, justeru *Living Lab* diwujudkan sebagai ganti kepada alatan sebenar yang sukar diperoleh. Oleh itu, dengan wujudnya Living Lab berkenaan topik gigi maka pelajar dapat belajar melalui komik animasi yang dicipta yang bukan sahaja berinformasi malahan menarik.

STEM Kerjaya

Pengenalan Inovasi

- Inovasi ini merupakan transformasi komik maujud kepada e-komik
- Komik DUNIA GIGI merupakan komik interaktif mempelajari tentang gigi yang terkandung dalam buku teks murid tahun 3
- Lengkap dengan jalan cerita yang menarik dan juga soalan-soalan kuiz sebagai pengukuhan
- Sesuai dijadikan sebagai alat bantu mengajar dan bahan ulang kaji untuk murid mempelajari tajuk ini

STEM Kerjaya

DSKP SAINS TAHUN 3

- **Tajuk 3.0 : Manusia**
- **Topik : 3.1 Gigi**

3.0 MANUSIA

STANDARD KANDUNGAN	STANDARD PEMBELAJARAN	STANDARD PRESTASI	
		TAHAP PENGUASAAN	TAFSIRAN
3.1 Gigi	Murid boleh:		
	3.1.1 Memerihalkan jenis gigi dan fungsinya.	1	Menyatakan jenis gigi.
	3.1.2 Melabelkan struktur gigi.	2	Memerihalkan fungsi setiap jenis gigi.
	3.1.3 Membanding dan membezakan set gigi susu dan set gigi kekal.	3	Melabelkan keratan rentas struktur gigi.
	3.1.4 Menghubung kait penjagaan kesihatan gigi dengan struktur gigi.	4	Membanding dan membezakan set gigi susu dan set gigi kekal.
	3.1.5 Menjelaskan pemerhatian tentang gigi melalui lakaran, TMK, penulisan atau lisan secara kreatif.	5	Menasakul kepentingan amalan harian penjagaan kesihatan gigi.
		6	Berkomunikasi secara kreatif dan inovatif tentang penggunaan teknologi dalam rawatan gigi.

STEM Kerjaya

Proses Penghasilan Komik "DUNIA GIGI"

Brainstorming

Memilih tajuk dalam buku teks sains, mengenal pasti masalah yang dihadapi murid dan memikirkan konsep yang sesuai untuk menyampaikan isi pelajaran (penceritaan menggunakan medium komik)

Pengagihan tugas kepada ahli kumpulan

Setiap ahli kumpulan berperanan menyiapkan tugas masing-masing. Setiap ahli mempunyai peranan masing-masing dalam proses mengilustrasi komik, menentukan bahasa dan isyarat komik, menyediakan komik digital, kuiz digital dan mendokumentasikan proses sepanjang pembuatan komik

Proses sebelum melukis

Storyboard dan dialog disediakan terlebih dahulu sebelum mula melukis supaya dapat menggunakan gaya lukisan yang sesuai dan dapat menentukan karakter komik yang mempunyai ekspresi wajah sesuai dengan jalan cerita dan mencapai objektif dalam DSKP

Proses semasa melukis

Karakter komik dan latar belakang komik yang berkaitan dunia gigi dilukis menggunakan aplikasi *ibis paint* yang boleh didapati sa ada dalam peranti android at ios. Komik yang siap diluki juga diwarnakan menggunakan aplikasi *ibis paint*

STEM Kerjaya


Proses Penghasilan Komik "DUNIA GIGI"
Proses selepas melukis
Memasukkan dialog ke dalam komik yang telah siap dilukis mengikut storyboard yang telah dibuat. Ekspresi wajah karakter dalam komik juga ditambah baik supaya komik menjadi lebih menarik dan menyeronokkan
Memasukkan latihan pengukuhan dalam komik
Komik berkaitan pelajaran tidak lengkap tanpa penilaian terhadap murid. Oleh itu, kuiz berkaitan topik yang dimasukkan ke dalam komik dihasilkan menggunakan aplikasi Wordwall. Qrcode kuiz dihasilkan menggunakan perisian free qr code generator dan diletakkan dalam komik supaya mudah diakses oleh murid
Penghasilan flipbook
Setiap helaian komik yang telah siap dilukis dalam aplikasi ibis paint disimpan dalam format PDF. PDF yang telah disimpan kemudian dicantum menggunakan perisian merge PDF dalam Google supaya helain-helaian komik tersebut berada dalam sebuah fail PDF. Fail PDF ditukarkan kepada flipbook menggunakan free flipbook generator.
Aplikasi dan perisian yang digunakan
Ibis paint
anyflip
(flipbook generator)
Wordwall
wordwall
Qr code generator
I PDF
Merge PDF online
STEM Kerjaya


Lakaran awal
Muka Hadapan
Kandungan
Latihan
STEM Kerjaya


Sebelum diwarnakan
Selepas diwarnakan dan ditambah dialog
STEM Kerjaya


Kerjaya Berkaitan Inovasi
CLICK HERE
DOKTOR GIGI
PELUKIS
EDITOR
GURU SAINS
STEM Kerjaya

KOMIK "DUNIA GIGI"


Wacy-Box
Prepared by:
Nurfarah Hanim Rafini
Nurul Aina Kasman
Maryam Daleela Mohd Nazeli
Nur Aqilah Mursyidah Rokman
Ummi Salima Hassan


INTRODUCTION
• Natural resources like water are vital to maintaining life.
WACY - BOX
• Students now have access to new teaching and learning methods because to sustainable development.
• An initiative for teachers to attract students in the topic of the water cycle

METHODS OF GENERATING INNOVATION

MATERIALS

- BOX
-COTTON
-COLOUR PAPERS
-SCISSORS
-CLOTH TAPE
-HOT GLUE GUN
-WATER COLOUR
-FLOWER FOAM

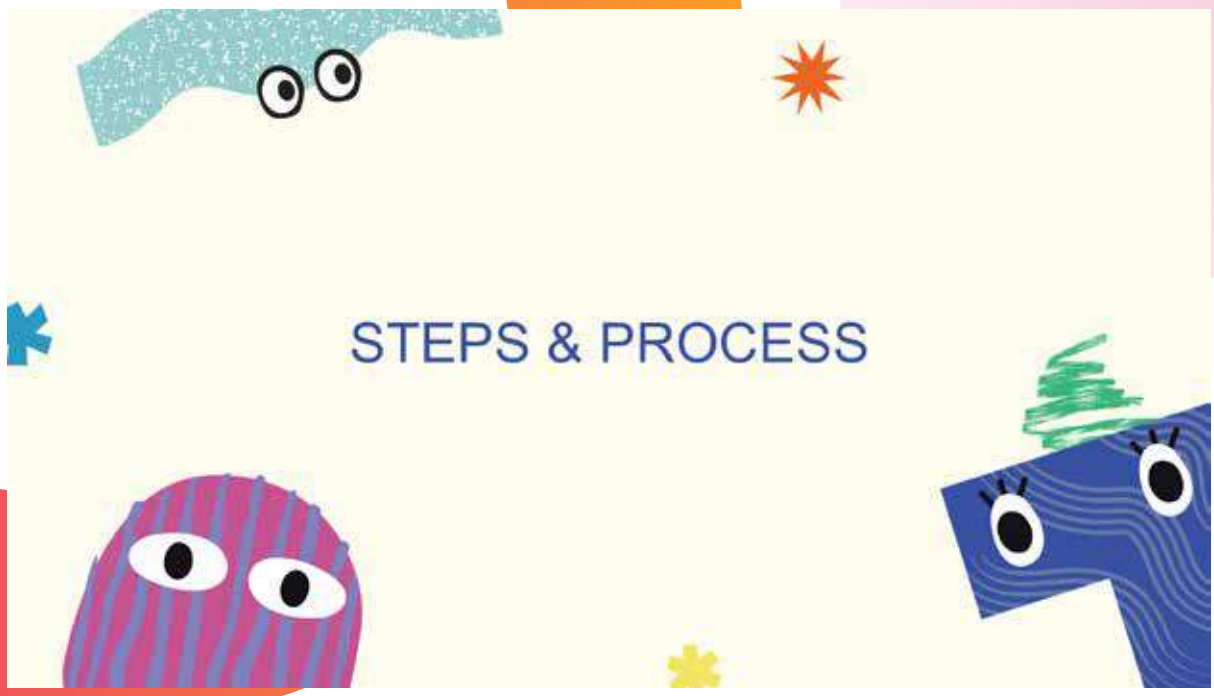
MYSTERY BOX

DESIGN

SURPRISE BOX

COLOUR CHOICE

Bright colours are chosen to attract pupils to try.



Process of Producing Wacy Box

- 30th June- We had a meeting with mentor to discuss about the problem statement and the effectiveness of the product in learning process.
- 5th July- We distributed the task and made a draft about Wacy-box (Wacy-box was draw using notability.).
- 7th July- Another draft of the arrangement of the boxes was made
- 8th July- We discussed about the content of the boxes
- 10th July- We bought the materials to build the Wacy-box
- 12-20th July- We started making the Wacy-box
- 21th July- Feedback from our mentor about the Wacy-box
- 22-24th July- We improvised the structure and the content of the Wacy-box
- 25th July- Completion of the Wacy-box

Steps of Producing Wacy Box

INNOVATION PRODUCTION METHODS

. "Wacy-Box" is a new innovation that can help students understand the topic of the water cycle through the stimulation of several layers of exploding boxes that focus on the concept of natural water resources, natural water flow and the natural water cycle.

Steps of Producing Wacy Box

Steps

1. Prepare three boxes of different sizes.
2. Roll out the largest box and cut each side to measure 30cm x 30cm. (Five square pieces measuring 30cm x 30cm are required.)
3. Then, the five pieces of the box are joined to form a cube without a top surface using cloth tape.
4. Lay out a medium-sized box. Then, repeat steps 2 and 3 with a size of 20cm x 20cm to create a box on the second layer.

3rd layer (deepest box)

5. Cut a box measuring 48cm x 48 cm. Next, fold the box into 9 equal squares measuring 16cm x 16cm. After that, the four corners are folded inward to make it a small box.
6. Cut the box to produce two circles, circles A and B that are 8 cm in diameter to make the base of the water cycle model. Then, the circle B is cut wavy at the end of one side of the circle.
7. Cut blue colored paper that follows the shape of circle A and stick it using a hot glue gun on top of circle A.
8. Repeat step 7 on circle B using green paper.
9. Randomly cut flower sponges to make them stones in a model of the water cycle placed in a small box.
10. Then, the surface of the sponge is coated with tissue using glue. Once dry, color the surface of the sponge, using water color and attach it to the base.
11. Use a hot glue gun to make a waterfall and place it on the rock. You can refer to this link to get a clearer picture.
    https://www.youtube.com/watch?v=PxiYxJtBdW8
12. Then, touch-up the model again using water-colour and plants cut from fake flowers.
13. Use blue paper measuring 16cm x 16cm to make the background of the water cycle model.
14. Cotton is clumped together to produce two clouds. One cloud is colored black to show dark clouds with rain.
15. Cut red paper to make 5 arrows to show the water cycle process.

Steps of Producing Wacy Box

3rd layer cover

16. Cut a box measuring 18cm x 18cm. Next, score the lid on all four sides with 1.5cm. Then, two score lines on each side of your lid will appear, one on the left and one on the right. Make a small cut on the right score line until you reach the next score line. Rotate your piece of paper clockwise and repeat this process until you've made four small cuts. Add a small piece of double sided adhesive inside the top right corner. Rotate clockwise and repeat until you have double sided adhesive in all four corners. Remove the backing on the adhesive and fold the tab inside to form a corner, adhering to the piece next to it. Repeat this process on all four corners until you have your lid.

First and second layer

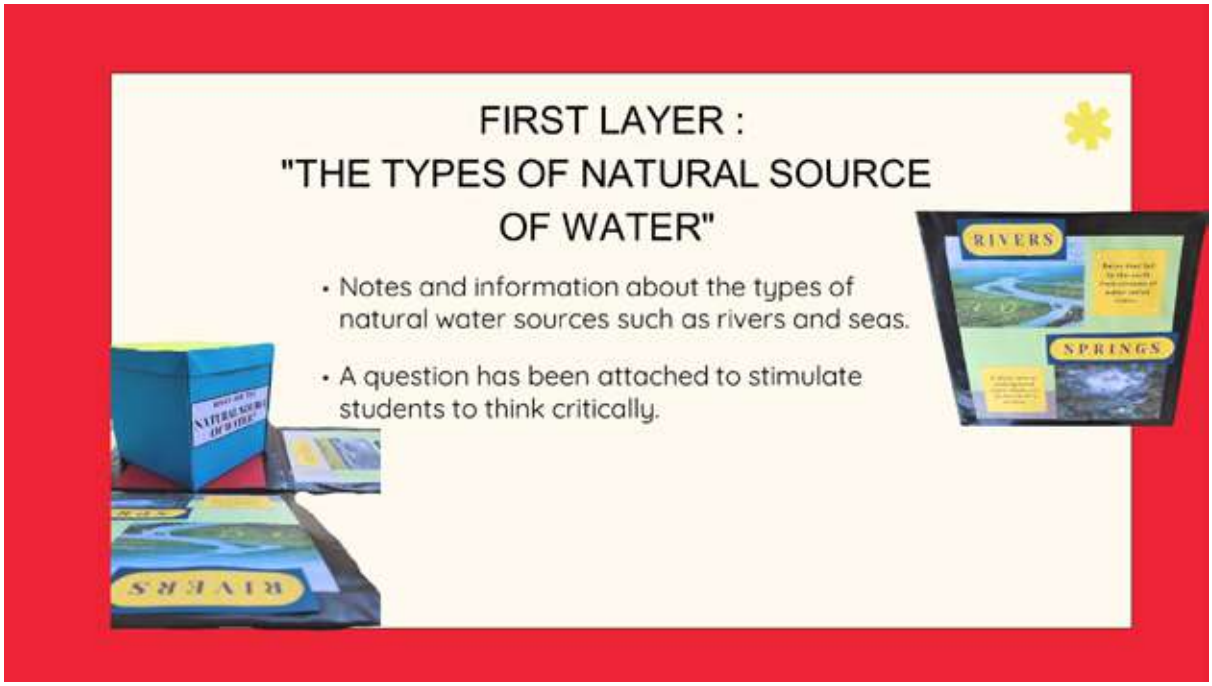
17. To make this surprise box more interesting, decorate the first and second layers with interesting quick notes and quizzes according to your own creativity.

First and second layer cover

18. Repeat step 16 for using different measurements which are 22cm x 22cm and also 32cm x 32cm.

Components of Wacy Box


the Wacy - Box has THREE LEVELS OF BOX WITH VARIED SIZES.
MYSTERY BOX
SMALL BOX
MEDIUM BOX
BIG BOX
COMBINE THEM ALL TO BECOME ONE BOX.
MYSTERY BOX


FIRST LAYER :
"THE TYPES OF NATURAL SOURCE OF WATER"
• Notes and information about the types of natural water sources such as rivers and seas.
• A question has been attached to stimulate students to think critically.
RIVERS
SPRINGS

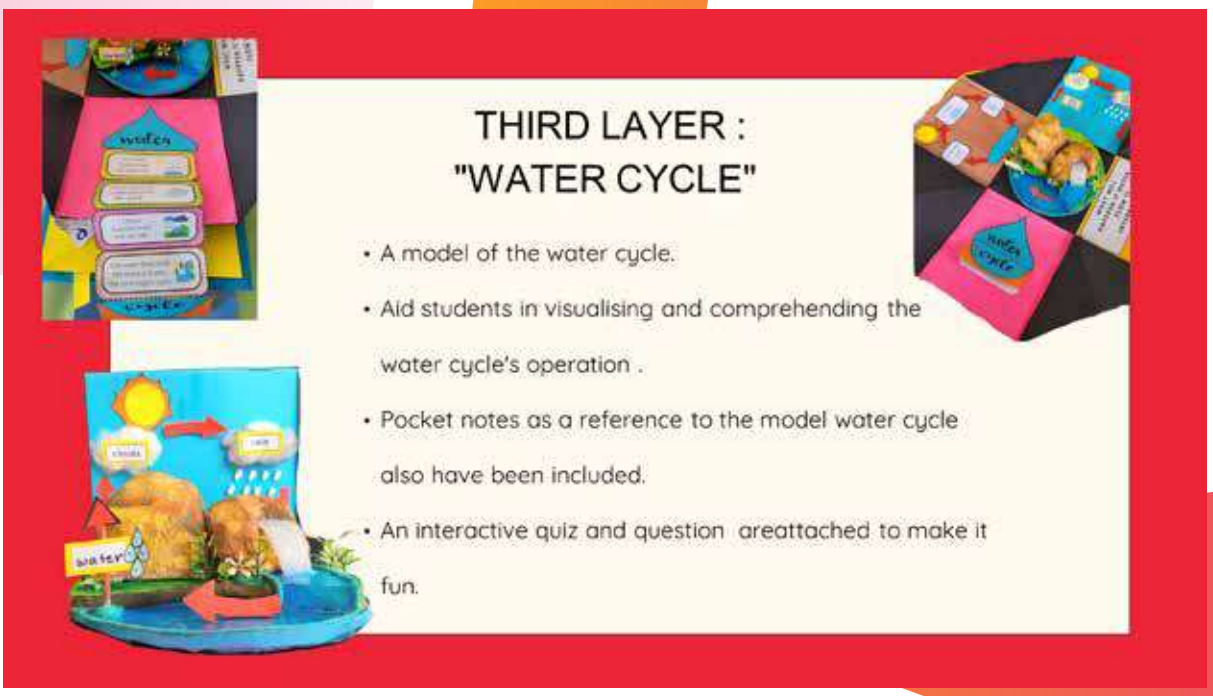
WACY-BOX

- A surprise box concept.
- Focus on the understanding of the topic of water in levels.
- Big enough for student to see it clearly.

- Save cost
- Environmental friendly by using recycle things
- Save time

SECOND LAYER : "WATER FLOWS"

- Students are introduced to "water flows" which means water flows from a high place to a low place.
- Notes and diagram about the water flows.
- An interactive quiz has been attached to attract the students to use it.


THIRD LAYER :
"WATER CYCLE"
• A model of the water cycle.
• Aid students in visualising and comprehending the water cycle's operation .
• Pocket notes as a reference to the model water cycle also have been included.
• An interactive quiz and question areattached to make it fun.


CAREERS
• Designer
• Hydrology Scientist
• Artist

PENGHARGAAN

Sidang Editorial Buku Toolkit STEM Merentas Kerjaya merakamkan ucapan terima kasih dan penghargaan kepada Rektor IPGM, Timbalan-timbalan Rektor IPGM, Pengarah-pengarah IPG, Ketua-ketua Penolong Pengarah PPL, Pensyarah-pensyarah IPG, Majlis Belia Malaysia, Universiti Putra Malaysia dan semua pihak yang terlibat dalam menjayakan penerbitan buku Toolkit STEM Merentas Kerjaya.

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