



CATEGORY 4 RESOURCE DEVELOPMENT

4-072

OPERATIONS SCIENCE MADE EASY (O.S.M.E)

Group Members:

Rayden Lim 1O3 (15)

Goh Mu Xun 1O3 (8)

Sai Cheng Yi 1O2 (20)

Ye Tian Cheng 1P2 (29)

ABSTRACT

Project O.S.M.E is an online resource platform that aims to provide upper primary students an avenue to gather science resources for their self-directed learning. The website contains animated videos and interactive quizzes to promote learning Science in a fun and engaging way.

1. INTRODUCTION

1.1 Rationale

In Singapore, the Primary School Leaving Exam (PSLE) is a high-stakes examination for primary school students as the results will determine their academic programme & secondary school posting. Many parents caveat for the IP programme which allows students to skip the O levels and go straight to the A levels or International Baccalaureate. Many students find that their marks dipped in Upper Primary as they adjust to more subjects being taught and the increasing complexity of the content. As Science is a heavy content subject with many topics being tested during PSLE, it is thus important to have a platform where students can gather the science resources easily, revise and test themselves before sitting for the examination. We also hope that this platform can help disadvantaged students who cannot afford tuition to access quality resources that will aid them in their preparation for the PSLE.

1.2 Objective

The resource aims to create an online platform for upper primary students to gather Science resources for their self-directed learning and promote learning Science in a fun and engaging way.

1.3 Target Audience

Our target audience is Primary 6 students who will be sitting for the Science Examination during the PSLE.

1.4 Our resource

We created an online website <https://scienceops2021.wixsite.com/learning> that is divided into 3 main Science themes, Energy, Interactions and Systems that are taught at Primary 6 level.



For every topic under the theme, we created an overview and highlighted the main science concepts that students need to understand using Powtoon Videos. The use of animations in the Powtoon videos helps to present the science concepts in a fun and engaging way for them.

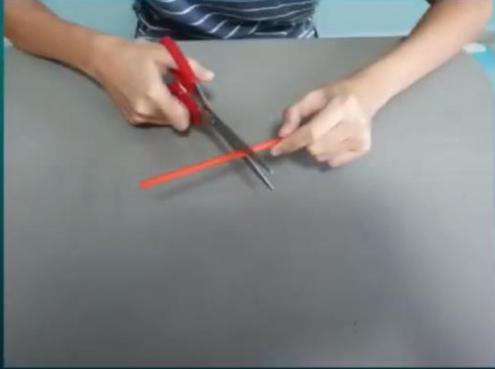


Experiments are also used to illustrate the science concepts being taught. We have included a step-by-step guide on how the experiments can be carried out. Observations and explanations of the science concepts are also included in the videos.

0 Chemical reaction

Step 1

Cut the straw into half.



MORE VIDEOS

0:54 / 2:35

CC YouTube

This video frame shows the first step of an experiment. The background is a dark teal color with a faint grid pattern. In the top left corner, there is a circular icon with the number '0' and the text 'Chemical reaction'. The main heading 'Step 1' is written in a large, green, monospace-style font. Below it, the instruction 'Cut the straw into half.' is also in the same green font. The central part of the frame contains a video inset showing a person's hands using red-handled scissors to cut a red straw in half on a grey surface. At the bottom left, there is a black button with the text 'MORE VIDEOS'. At the bottom, there is a video player interface with a play button, a volume icon, and the text '0:54 / 2:35'. On the right side of the player, there are icons for closed captions (CC) and settings (gear), followed by the YouTube logo.

0 Chemical reaction

Observations

Air bubbles could be seen escaping through the straw when the baking soda and vinegar reacted with each other.

The bottle was able to propel through the water.

MORE VIDEOS

2:10 / 2:35

CC YouTube

This video frame shows the observations from the experiment. The background is a dark teal color with a faint grid pattern. In the top left corner, there is a circular icon with the number '0' and the text 'Chemical reaction'. The main heading 'Observations' is written in a large, green, monospace-style font. Below it, the text 'Air bubbles could be seen escaping through the straw when the baking soda and vinegar reacted with each other.' is in the same green font. Further down, the text 'The bottle was able to propel through the water.' is also in the same green font. At the bottom left, there is a black button with the text 'MORE VIDEOS'. At the bottom, there is a video player interface with a play button, a volume icon, and the text '2:10 / 2:35'. On the right side of the player, there are icons for closed captions (CC) and settings (gear), followed by the YouTube logo.

For every topic, we created a Kahoot Quiz to test their understanding of the science concepts learned. As Primary 6 students may be unfamiliar with the Kahoot Quiz, we also created a video to guide them on how to access the quiz.

 <p>Forces</p> <p>Quiz on Forces.</p> <p>Click Here to access Quiz</p>	 <p>Adaptations</p> <p>Quiz on Adaptations</p> <p>Click here to access Quiz</p>	 <p>Man's impact on Environment</p> <p>Quiz on Man's impact on the Environment</p> <p>Click here to access Quiz</p>
--	--	---

Watch this video on how to access Kahoot Quiz.



Please refer to Annex A for more information on the science topics covered & features on the website.

2. REVIEW

2.1 Literature Review

Research was conducted to find out parents' perceptions of PSLE. Most parents think that PSLE is too stressful for both students and parents but is still needed to gauge their child's learning progress. Many students find that their marks dipped in Upper Primary as they adjust to more subjects being taught and the increasing complexity of content. PSLE Science has also become "trickier" with application-based testing.

Due to the COVID pandemic in 2020, the students have made good progress in online learning during home-based learning (HBL). In 2021, MOE will be introducing blended learning, which is a mix of home-based and in-school activities that taps both online and offline approaches to learning. Blended learning aims to provide students with opportunities to learn at their own pace and take charge of their own learning.

Research also shows that an interactive website helps to improve the learning experience, as the student can access the learning materials readily. Experiments can be used to introduce new ideas which will help students to prepare for application-based testing. Entertaining and fun-based teaching methods such as educational games can be used to engage learners and foster a deeper understanding of science concepts.

2.2 Existing resources

Research was conducted to identify the current science resources available for the students.

The most commonly used resource by students is the Singapore Learning Space (SLS). Although SLS is free for all students to use and aligned with the Ministry of Education (MOE)'s curriculum, it is difficult for the student to navigate the MOE Library to search for the resources, especially for the upper primary science topics.

The second resource is the science videos posted on YouTube. Most of the videos shown are just mainly the speaker reading off the notes from the presentation slides. There are no real-life experiments conducted to capture the audience's attention. A short question and answer are also presented by the speaker to the audience at the end of the video. However, there are no interactive quizzes for the audience to attempt on their own.

The third resource is the Science revision cards. The science revision cards serve more as a quick reference guide for students before they sit for their examinations. The revision cards are not engaging as it contains only words and pictures on it. In addition, the cards are not free as students will need to purchase them from various sources.

Based on the research conducted, there was a need to create an online resource platform for students to gather Science resources for their self-directed learning. Besides being easy for students to navigate, it should also be fun and entertaining so that it engages the learners and fosters a deeper understanding of science concepts.

3. METHODOLOGY

3.1 Needs Analysis

We surveyed about 126 students from Primary 5 to Secondary one to find out how much they like science and some of the topics that they face difficulties in. We also wanted to gather information on their preferred learning methodology when learning science.

3.2 Survey Results

The majority of our respondents (65.1%) strongly like or like science in Primary School (Figure 1). Most students find the Primary 6 topics (e.g., Forces & Adaptation) more difficult as compared to Primary 3 topics like diversity (Figure 2). About 89% of respondents like to learn through experiments (Figure 3), 80% of respondents like to learn through videos (Figure 4) and 84% of respondents like to learn through games (Figure 5), suggesting that we need to think of ways to engage the students in their learnings.

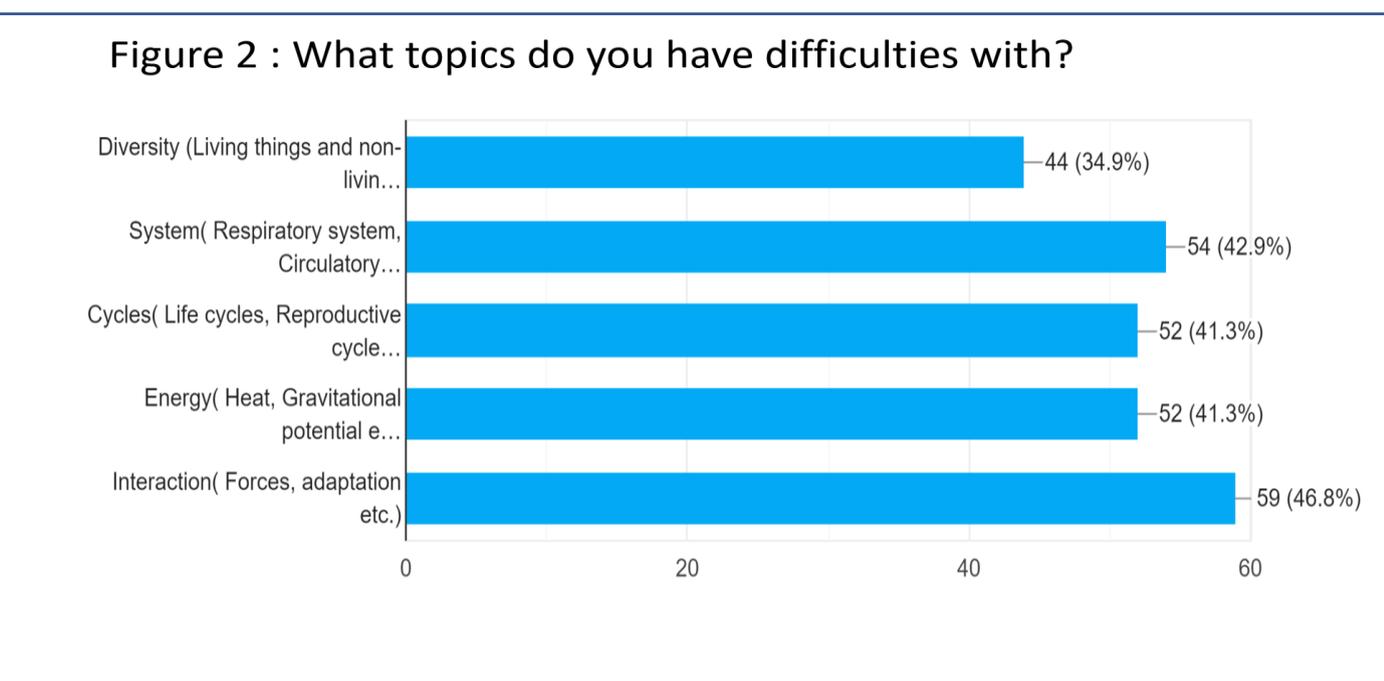
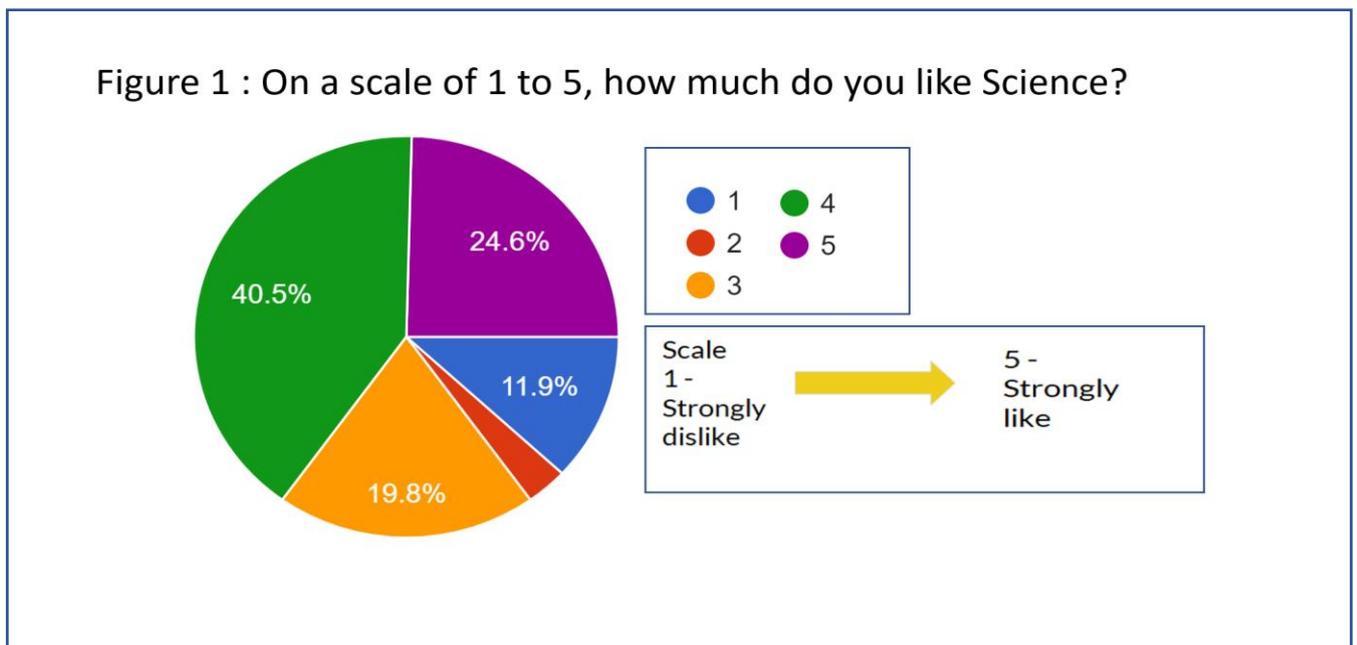


Figure 3: Do you like experiments?

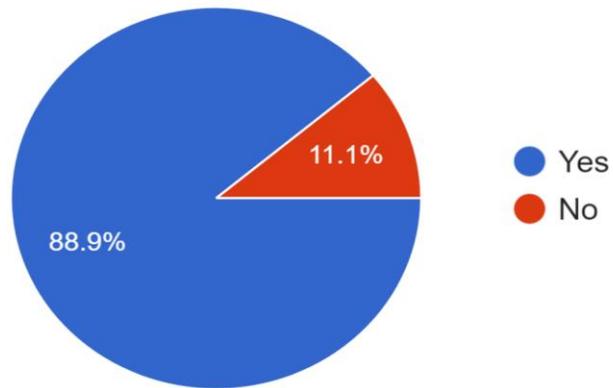


Figure 4: Do you like to watch videos to learn anything that you like?

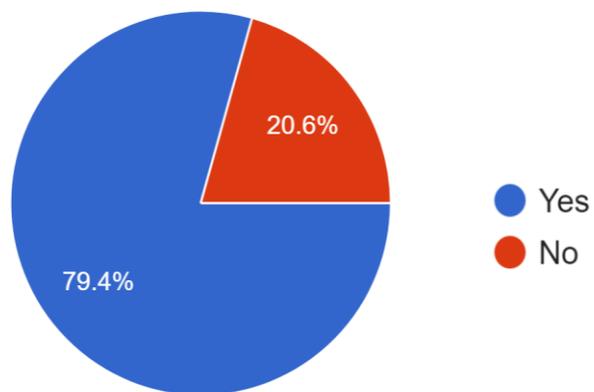
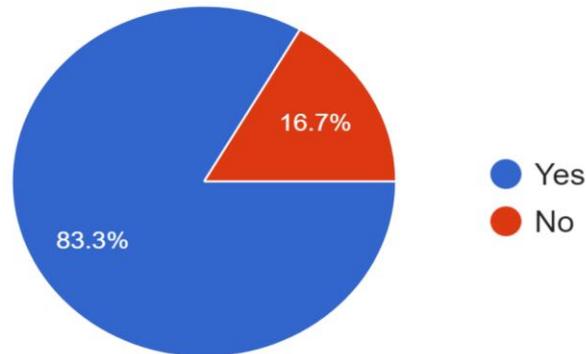


Figure 5: Do you like to game?



3.3 Development of resources

Based on our research, most students feel that science concepts taught at Primary 6 are more difficult to comprehend as compared to other levels. We have thus narrowed our focus on 3 main themes; Energy, Interactions and Systems that will be taught at Primary 6. We reviewed the science notes in the Science PSLE Revision Guidebook by Marshall Cavendish as well as the handouts given by our teachers to produce the materials for our videos. We decided to use Powtoon videos to create the videos as the animation in the videos is captivating and engaging to grab students' attention. Our group also feels that the videos should not be too long as students usually have a short attention span.

From our research, we also learnt that students like to learn science by doing experiments. Our group decided to show the viewers how to do these experiments using a step-by-step guide to encourage them to conduct the experiments themselves, as we believe that hands-on activities will benefit students when learning new or challenging topics of science.

Lastly, we also developed quizzes on science topics using Kahoot. These quizzes are designed to assess students' understanding of their scientific concepts. If the students

get any questions wrong, it shows that they may have some conceptual errors or do not understand the topic well enough. The student then reviews the topics with the help of Powtoon videos which we also created. As most P6 students may be new to the Kahoot quiz, our group also decided to make step-by-step videos to teach them how to access Kahoot.

3.4 Pilot Testing

A total of 30 respondents from primary 6 students stated that they are willing to participate in the beta testing when we reached out to them via the Kiasu Parents forum. However, we only got 13 survey responses after we sent the survey link to the target respondents. As they may be busy with their DSA interviews & PSLE Oral preparation, they may not have time to participate in the survey.

Based on the survey results, 84.6% of the respondents find that the website is easy to navigate (Figure 6). 69.3% of the respondents think that videos are effective in helping them to have a better understanding of the science topics. 84.6% of the respondents think that Kahoot quizzes helped to reinforce their understanding of the science topics (Figure 8). Respondents also hoped to see past PSLE questions in Kahoot quizzes so that they can attempt these questions online.

Figure 6: Is the website easy to navigate?

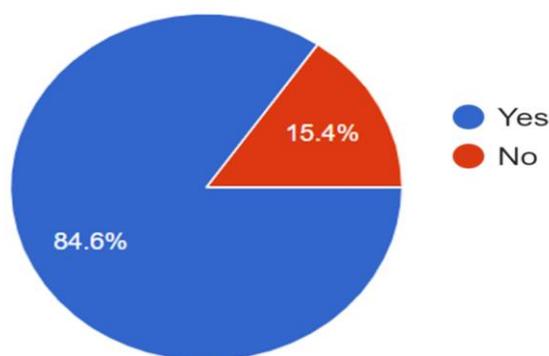


Figure 7: Do you think that videos are effective in helping you to have a better understanding of the science topics?

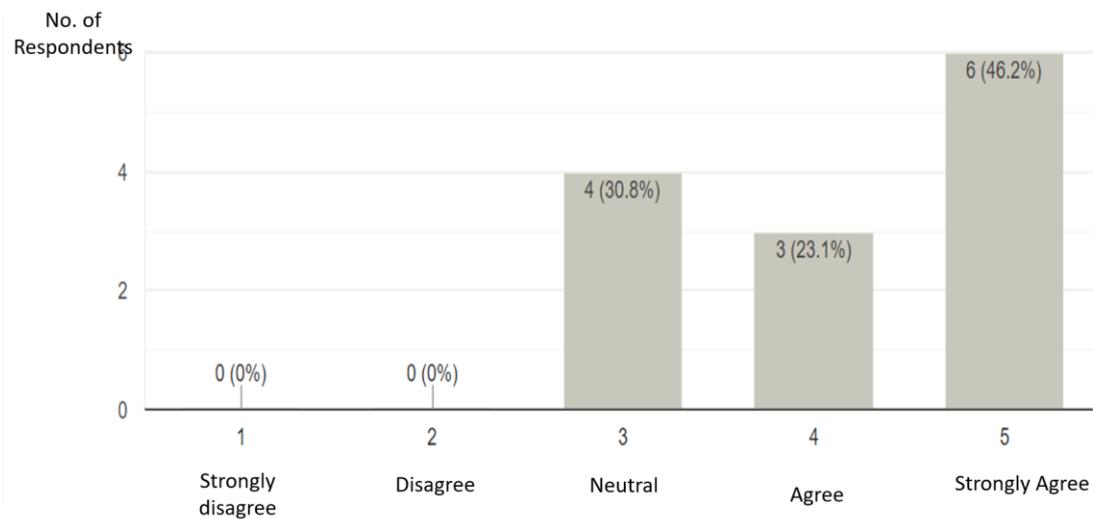
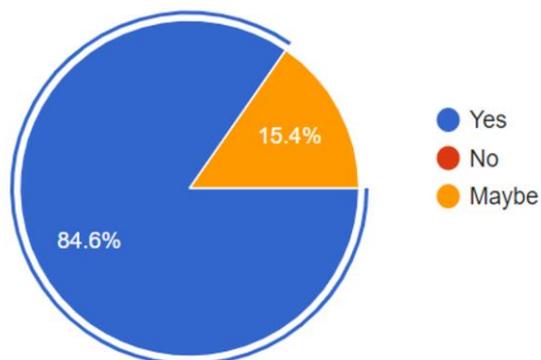


Figure 8: Do you think that Kahoot quizzes helped to reinforce your understanding on the science topics?



We managed to invite a science tutor, Ms Serene Goh teaching Primary 6 students to review the resources on our website. Ms Serene Goh commended that the science

videos are captivating & engaging for students to learn the science topics. She suggested that for each video, we can include a brief word summary of what are the learning outcomes covered so that students know what they are expected to learn from each video. As students become more technology-savvy, she feels the Kahoot Quiz is an interactive and interesting game for students to test their understanding of the topics.

4. OUTCOME AND DISCUSSION

Based on the positive feedback that we gathered from the respondents, the objective of creating an online platform for Primary 6 Students to gather Science resources for their self-directed learning has been achieved. Students also found that it was fun learning science through animated videos and Kahoot quizzes as they were engaged with them while they were learning.

During beta testing, the respondents provided feedback on the inclusion of past PSLE exam questions in our Kahoot quiz. We have taken note of this and included a separate tab in the Kahoot Quiz for past PSLE questions.

Some respondents also suggested expanding the content to Primary 3, 4, and 5 topics. We have taken note and will consider expanding the topics when we have the time to do an enhancement of the websites.

To promote the awareness of our websites, we decided to create an O.S.M.E Facebook page and join the PSLE discussion groups in Facebook. In addition, we can also post a link to our science resources websites through parenting forums e.g. Kiasu parents forum. (Please refer to Annex A for more details on our Facebook page)

5. CONCLUSION

Through this project, we learned that creating a resource website was not an easy feat. All of us had no prior knowledge of using Powtoon to create animated videos & creating websites using WIX tools. We had to learn how to use these tools by watching YouTube videos.

Due to the Covid 19 Phase 2 Heightened Alert announced in May, we were not able to use the school lab facilities to conduct experiments. As we were uncertain when the Phase 2 Heightened Alert would end, we decided to modify some of the experiments and conduct them at home so as not to impact our beta testing timeline.

In the process of creating Kahoot Quizzes, we also realized that we could not load the quizzes onto our website as we did not register the account that was used to create the quiz. All of us had to re-do the Kahoot quiz in a short period of time using a different registered account. From this experience, we learned that we should have tried to load the first quiz and troubleshoot to check whether there were any problems before creating other quizzes.

We also learnt that time management is very important in this project as all of us have lessons and CCA commitments. Right at the start of the project, we tried to schedule at least one day per week to discuss the project and check in with each other on the difficulties that we faced while completing our tasks.

6. ACKNOWLEDGEMENT

We would like to acknowledge and extend our deepest gratitude to the following; without whose help this project would never have come to be:

- a) Our mentor for guiding and mentoring us throughout the process of our project.
- b) Ms Oh Ee Ling, Senior Laboratory Technician for allowing us to use the lab facilities for our experiments.

c) Ms Serene Goh, a science tutor for reviewing the resources on our websites.

d) Students who took part in the beta testing for our websites.

REFERENCES

1. End of streaming: Worries over mixing with Normal students may drive parents to chase IP schools (March, 2019) Retrieved on 17 March 2021 from the Strait Times.

<https://www.straitstimes.com/singapore/education/end-of-streaming-how-will-changes-affect-ip-schools>

2. Marks do fall as lessons get harder but a big drop may indicate other issues (2016, 30 Oct) Retrieved 24 Feb 2021 from the Straits Time

<https://www.straitstimes.com/singapore/education/marks-do-fall-as-lessons-get-harder-but-a-big-drop-may-indicate-other-issues>

3. PSLE is still a necessary checkpoint for students: Study (2017, July 17) Today Newspaper. Retrieved on 17 March 2021

<https://www.todayonline.com/singapore/psle-still-necessary-checkpoint-students-s>

4. 'Interesting, tricky' PSLE science paper scores well with parents (2013, October 12) Retrieved on 17 March 2021 from Straits Times

<https://www.straitstimes.com/singapore/interesting-tricky-psle-science-paper-scores-well-with-parents>

5. Ministry Of Education, (29 December 2020) Blended Learning to Enhance Schooling Experience and Further Develop Students into Self-Directed Learners. Retrieved on 24 February 2021

<https://www.moe.gov.sg/news/press-releases/20201229-blended-learning-to-enhance-schooling-experience-and-further-develop-students-into-self-directed-learners>

6. CSI Media, The benefits-of-an-interactive-schools-website. Retrieved on 24 February 2021

<https://www.csimedia.net/benefits-of-an-interactive-schools-website>

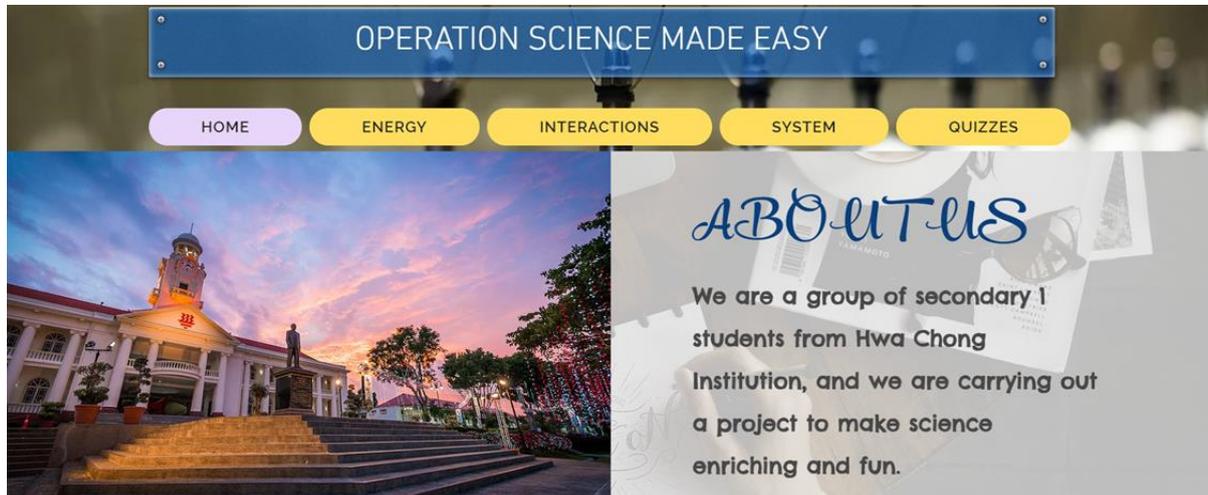
7. Mohammad Hasan Al-Tarawneh,(m.h.a.t) 2009
The Effectiveness of Educational Games on Scientific Concepts Acquisition in First Grade Students in Science Published by Journal of Education and Practice

8. Pedagogy in Action the SERC portal for Educators (2009) Why teach with classroom experiments. Retrieved on 24 February 2021

<https://serc.carleton.edu/sp/library/experiments/why.html>

Website: <https://scienceops2021.wixsite.com/learning>

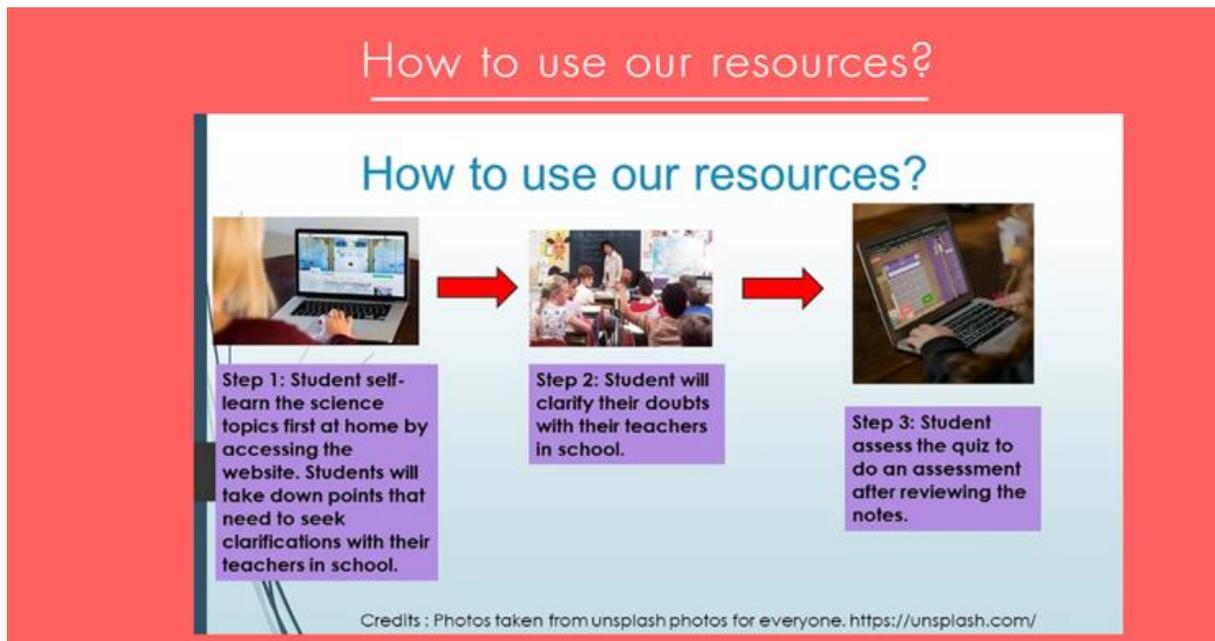
Our website Main homepage consists of a brief introduction of our project group Operations Science Made Easy (O.S.M.E).



An introduction video on how this project was conceptualized.



A guide on how the students can use our resources.



A get in touch page for students to email us if they have any questions.



Our Science website is divided into 3 main Science themes, Energy, Interactions and Systems. To help the students to navigate the website easily, headings are placed at the top of the page.



1) Energy Theme

Introduction Page to Energy



OPERATION SCIENCE MADE EASY

HOME ENERGY INTERACTIONS SYSTEM QUIZZES

WHAT IS ENERGY?

Energy is "the ability or capacity to do work." Energy is how things change and move.

Energy cannot be created or destroyed, but it can be stored, used or converted from one form to another

The page features a navigation bar with five yellow buttons: HOME, ENERGY, INTERACTIONS, SYSTEM, and QUIZZES. Below the navigation is a large image of wind turbines and solar panels in a field. To the right of the image is a green box containing the text.

Videos on Energy



Check out our science videos on Energy.

0 Energy

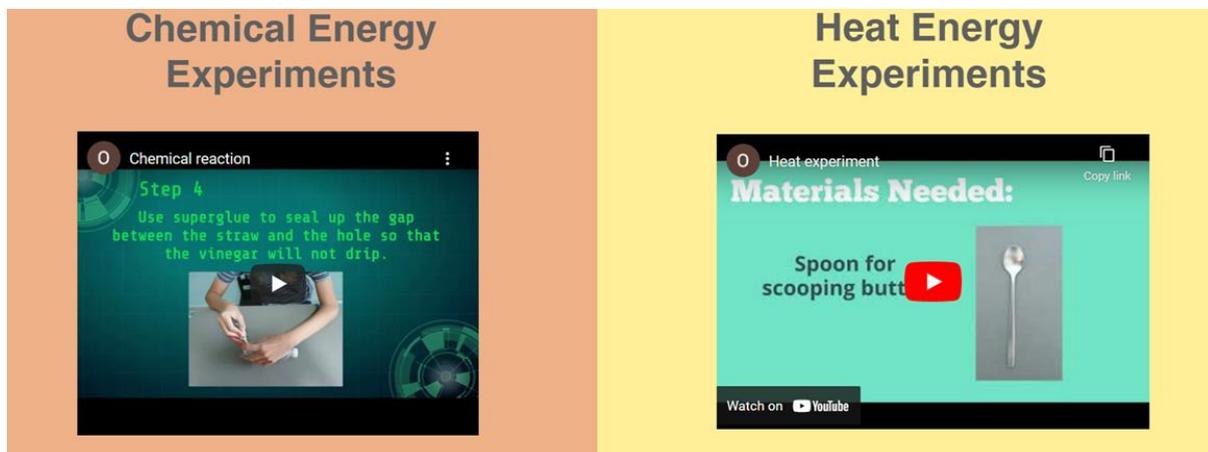
CHEMICAL POTENTIAL ENERGY

Stored energy that can be released by chemical reactions.

Watch on  YouTube

The video thumbnail shows a beaker with blue liquid and bubbles, with a play button icon. The text is in green and black. There is a 'Copy link' icon in the top right corner.

Experiments



Chemical Energy Experiments

0 Chemical reaction

Step 4

Use superglue to seal up the gap between the straw and the hole so that the vinegar will not drip.

Watch on  YouTube

Heat Energy Experiments

0 Heat experiment

Materials Needed:

Spoon for scooping butts 

Watch on  YouTube

The left experiment shows a person's hands working with a straw and a hole. The right experiment shows a spoon. Both thumbnails have a play button icon and a 'Copy link' icon in the top right corner.

2) Interaction Theme

Introduction Page to Forces



Videos on forces



Experiments



Introduction Page to Adaptations



WHAT IS ADAPTATIONS?

An adaptation is any heritable trait that helps an organism, such as a plant or animal, survive and reproduce in its environment.

Videos on Structural Adaptations

Check out our science video on Structural Adaptations.

Adaptations
Let's talk about how animals use their physical characteristics defend themselves against predators.
Aha! Camouflage!
Watch on YouTube

A video thumbnail with a green background. It features a cartoon character pointing to the text. The text discusses physical characteristics and camouflage.

Videos on Behavioural Adaptations

Check out our science video on Behavioural Adaptations.

Behavioural Adaptations
Hiding in Burrows or Holes
Rabbit
To avoid getting noticed by predators.
Shhhh... No one can know I'm Here
Watch on YouTube

A video thumbnail with a green background. It shows a rabbit in a burrow. A speech bubble says "Shhhh... No one can know I'm Here". The text discusses hiding in burrows to avoid predators.

Introduction Page to Man's impact on the environment



Videos on positive impact of man on its environment



Videos on negative impact of man on its environment



Our O.S.M.E Facebook Page

 **Ops Sci**
23 mins · 

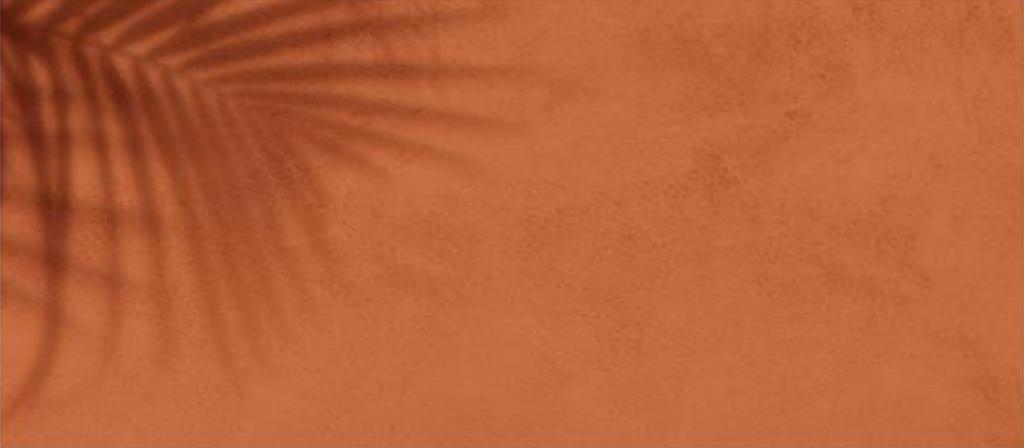
Welcome to Operation Science Made Easy (O.S.M.E) facebook page.
We are a group of secondary 1 students from Hwa Chong Institution, and we are carrying out a project to make science enriching and fun.



0:31 / 1:02

 **Ops Sci**
27 mins · 

Here is the link to our science resources website. We hope you have fun learning.



[SCIENCEOPS2021.WIXSITE.COM](https://scienceops2021.wixsite.com/home) 

HOME | Learning
We are a group of secondary 1 students from Hwa Chong Institutio...

PSLE Discussion Group on Facebook



PSLE Science >

Private group · 16k members



PSLE Science Parent Support >

Private group · 2.8k members



Kiasu Parents forum

The Kiasu Parents forum interface. At the top is a blue navigation bar with the 'Kiasu Parents' logo on the left and several menu items: 'LEARNCONCERGE', 'BLUR_MUM', '0 NEW MESSAGES', 'LOGOUT', 'ASKQ', 'FORUM', and 'PORTAL'. Below this is a secondary blue bar with icons and labels for 'PRE-SCHOOL', 'PRIMARY', 'SECONDARY', 'TERTIARY', 'GENERAL', 'DIRECTORIES', 'FORUM', and 'NEWS/EVENTS'. The main content area shows two forum threads. The first thread is titled '2021 PSLE Discussions and Strategies (Children born in 2009)' by 'laughingcat', posted on 28 Sep 2018 at 16:21. It has 415 replies, 116234 views, and was last updated by 'Gemini11' on 14 Aug 2021 at 11:41. The second thread is titled '2022 PSLE Discussions & Strategies (born in 2010)' by 'zac's mum', posted on 29 Sep 2018 at 21:42. It has 102 replies, 24523 views, and was last updated by 'zac's mum' on 05 Aug 2021 at 16:38.