

**CONTENT ANALYSIS OF MALAYSIAN FORM TWO SCIENCE TEXTBOOK****Lim Yi Xing****\*Hidayah Binti Mohd Fadzil**

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This research is driven due to significant role of textbooks possess in a country. The purpose of this study is to analyse the Malaysian Form Two Science textbook as this learning tool may acts as one of the reason that affects national Science education. The textbook was analysed based on content element adapted from Florida University Department of Education [FLDOE] (2015). Only four chapters from the theme 'Energy and Sustainability of Life' were analysed due to its physics related concepts which consider notoriously difficult for students (Oon & Subramaniam, 2011). This qualitative content analysis study found that all the requirements set by national syllabus were aligned with textbook. Other criteria were developed which were values and STEM careers. The values emerged were caring and patriotic aside from Science core values. Nevertheless, limited example of STEM careers and portrayal of caring and patriotism values found in the textbook which may result in lower efficiency of the objectives to be achieved in real life. Following the analysis, the treatment level or the complexity in the introduction chapter is generally consistent except for Chapter 8 (*Force and Motion*) as it demonstrates questions with lower order thinking skills (LOTS). There were also certain examples in the textbook were not further explained which shows insufficiency in its content. Meanwhile, the textbook does not consist of any error in scientific disciplines, however few inaccuracies were found in technical websites and language manner. These technical difficulties may affect classroom lessons while the grammatical errors may distort students' language coherency.

**Keywords:** Content Analysis, Science Textbook, Science Education, Learning Strategies

**INTRODUCTION**

Textbooks are dictated as the ultimate source of learning materials to obtain comprehensive information in science curriculum (Vahdany, 2015). Nevertheless, the competences of textbooks are concerned in terms of inability to provide students with problem solving skills in real life applications (Balliet et al., 2015). Additionally, textbooks were often misunderstood as a source of textual memorisation and hinder learning efficiency, but many technologies tools can be integrated in order to motivate students besides than aiding the teachers to focus on real duty of teaching than to prepare materials (Tomlinson, 2012). Even technology savvy countries such as Finland and Singapore encourage the use of textbooks as one of the reason that affect students proficiency is incompetent textbooks (Loewen, 2018; Yeasmin & Uusiautti, 2018). Hence, the noble old textbooks should not be shunned as it provides the totality of education system.

In Malaysia, science education system is highly related with Science textbooks as it acts as major source of information to the students. Hence, there is a necessity to analyse the textbook to identify its appropriateness. However, very few researches had been conducted in Science textbooks such as by Cheok (1994) and Ho (1997) which were done for past two decades ago. There were also numerous errors occurred in other textbooks such as Year Six History textbooks and Form 6 textbooks which were approved by the Ministry of Education (Ooi, 2017). Besides, it was stated in the Bahasa Malaysia, English, Science and Mathematics textbooks that they're unable to cultivate concern towards environment as the content focused only on the language aspects (Savita et al., 2017). Despite of all the meticulous vetting done, there are still issues that need to be looked into in order to enhance the learning of Science.

This research is interested in analysing the textbook in terms of its' content with few sub-elements adapted from FLDOE framework. This framework is chosen due to its broad yet distinguishable definitions among each other besides it was studied comprehensively since 1999. Content is generally referred to as the entirety of the message that it wants to be delivered from the textbook (Neuendorf, 2016). Nevertheless, only physics related theme ('Energy and Sustainability of Life') was analysed due to its notoriously difficult concepts and greatly causes misconceptions among students (Oon & Subramaniam, 2011). Therefore, this research aims to discover ways to improve the gap of Science textbooks. As a result, this research able to bridge the gaps and consequently benefits future curriculum developer, publishers and writers to tackle effectively on the components to amplify the impacts on students. Thus, this study answer the following research question: how is the content of the Form 2 Science textbook on theme 'Energy and Sustainability of Life'?

## METHODOLOGY

### *Research Design*

Content analysis refers to the act of interpreting and producing inferences during the analytical process (Drisko & Maschi, 2015). The textbook analysed was Science Form 2 textbook which was first published in 2017. The textbook comprise of four themes with 13 chapters however only 1 theme was analysed that known as 'Energy and Sustainability of Life' which consists of four chapters (Table 1). This due to its physics related theme which consider difficult for students (Oon & Subramaniam, 2011). It was analysed from the beginning of the chapter and ends before the practices at the end of the chapter.

The analysis of content was according to the qualitative approach which was adapted from Florida University Department of Education's (FLDOE, 2015) framework. The adapted framework was then validated by two reviewers and acts as a guideline during the analysis as researcher was open to any emerging elements such as values and careers. Trustworthiness strategies of peer debriefing were used in this research (Creswell, 2014). Peer debriefing refers to the researcher's peer whom completed her doctoral studies which experienced in this research to continuously ask challenging questions about interpretations and provide opinions to enhance credibility to this research.

Table 1

#### *Chapters in Theme 'Energy and Sustainability of Life'*

Chapters	Description
7	Electricity and Magnetism
8	Force and Motion
9	Heat
10	Sound Waves

### *Elements of FLDOE*

The Florida University Department of Education (FLDOE) framework which was used in this research consists of three sub-elements in term of content which were alignment with curriculum requirements,

level of treatment and accuracy of content. This framework was studied and field-tested since 1999 and revamped in 2015 by a group of curriculum specialist. To carry out a deeper assessment of categories, articles about each sub-element was used parallel to the FLDOE criteria:

*i) Alignment with curriculum requirements*

The content should fulfil the required curriculum standards such as the subjects, grade level, objectives and skills. It is required that the content should be parallel with national obligation in order to achieve its objectives. It is also important that the content should also be adequate enough to stand on its own without the help of other sources.

*ii) Level of treatment*

According to the framework, the content should be simple yet complex to aim learners and adequate to meet objectives. It should also be mentally challenging in terms of thoughts.

*iii) Accuracy of content*

A good quality of content should be error-free and absence of biases in context. It has to be precise in terms of context and up-to-date facts and theories besides than the graphic or other elements of instruction.

## **FINDINGS AND DISCUSSION**

The findings presented are based on the content and sub-elements emerge during the analysis that was guided by the proposed framework. The sub-elements are (i) Alignments with curriculum requirements, (ii) Level of treatment, and (iii) Accuracy of content.

*i) Alignment with curriculum requirements*

Textbooks that had been approved by Ministry of Education must be align with national's Science Curriculum Standard (KSSM) requirements to achieve its' objectives (Ministry of Education, 2016). It is analysed based on the Table 2 which depicts the checklist of fulfilling the Learning Standard, consists of carry out or designing experiments, daily life applications and applications of 21<sup>st</sup> century skills which were communication, critical thinking, collaboration and informative. Following the analysis, two other criteria were developed which were values and STEM careers. The values emerged from this research were caring and patriotic. It is recorded according to the chapters in the theme 'Energy and Sustainability of Life'.

Table 2  
*Checklist of Criteria of Science Curriculum Standard According to Chapters*

Features		Theme 3 – Energy and Sustainability of Life			
		Ch 7: Electricity and Magnetism	Ch 8: Force and Motion	Ch 9: Heat	Ch 10: Sound Waves
Fulfil learning standard criteria		✓	✓	✓	✓
Experiments	Carry out	2	2	2	-
	Design	-	-	1	-
Daily life application		4	17	6	8
21 <sup>st</sup> century skills	Communication				
	i) Using technology	1	1	-	2
	ii) Using other than technology	1	1	2	-
	Critical thinking	2	-	1	-
	Collaboration	2	2	2	3
Values	Informative	8	1	-	2
	Caring	-	-	1	-
	Patriotic	-	1	-	-
STEM career		-	1	-	-

**1. Fulfil Learning Standard Criteria**

A national approved textbook must fulfil all the requirements of Learning Standard criteria which was measurable that had been conceptualized according to the learning areas stated in National’s curriculum (Ministry of Education, 2016). Based on analysis, all of the four chapters in the theme ‘Energy and Sustainability of Life’ in Form Two Science textbook fulfil all the learning standard criteria (Table 2). It comprise of thinking and scientific skills which acts as list of objectives that were transcribed in measurable manners to ensure it will be achieved in a textbook (Figure 1 and Figure 2).

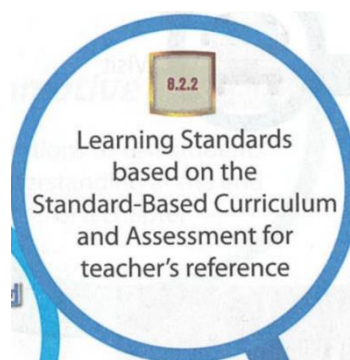


Figure 1. Explanation on Learning Standards

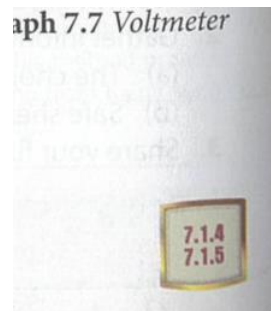


Figure 2. The portrayal of the Learning Standard on bottom of the related page

**2. Experiment**

Based on the analysis for the experiment in the textbook, it was precisely stated as the name "Experiment" in the textbook. There are two types of experiment which are carrying out or designing experiments. For carry out experiments known as experiments where students need to follow exactly the procedure as stated like inside a 'cookbook' (Figure 3) (Durmaz, 2016). It was found in three of the analysed chapters that consist of two experiments each except Chapter 10 (Sound waves) which has none (Table 2). It is usually stimulating for the students as they able to prove and work together to solve something intriguing by testing the hypothesis and observing it. However, based on a research by Dong (2017), it is stated that there is a necessity to produce a better experimental textbook, as teachers who have not enough scientific inquiry skills would just follow the inadequate textbook.

**Experiment 8.2**

**Aim:** To study the relationship between surface area and pressure.

**Problem statement:** What is the effect of surface area on pressure produced by the same force?

**Hypothesis:** The larger the surface area, the lower the pressure exerted.

**Variables:**  
 (a) Constant variable: Metal blocks of the same mass  
 (b) Manipulated variable: Surface area  
 (c) Responding variable: Depth of dent

**Materials:** Metal block and plasticine

**Apparatus:** Retort stand with clamp, metre rule and thread

**Procedure:**

1. Prepare two metal blocks of the same mass.
2. Hang the two blocks as shown in Figure 8.31.
3. Place a piece of plasticine under the two metal blocks.
4. Release metal block P and measure the depth of the dent produced using a metre rule.
5. Repeat step 4 using metal block Q.

**Result:**

Metal block	P	Q
Depth of dent produced (cm)		

**Conclusion:**  
 Is the hypothesis accepted? Give your reasons.

**Questions**

1. What is the change in depth of the dent produced when the surface area upon which the force is applied increases?
2. What is the relationship between surface area and pressure?
3. State an inference based on the observation.
4. State the operational definition of pressure.

Figure 1. Example of carry out experiment

On the other hand, designing experiments known as experiments which constructed using own ideas. It only consists of one which was on Chapter 9 (Heat) (Figure 4). Designing experiment activity is considered as a more challenging work than carry out experiment as it requires more scientific inquiry and critical thinking skills. By providing such opportunity to design their own experiment able to show their understanding of the steps in order to achieve the objective required (Suardana et al., 2018). Simultaneously, designing experiment enhances problem solving skills which consider as an important scientific skill (Ministry of Education, 2016). Nevertheless, students may require scaffolding in designing experiment as it may considered too challenging for some (Durmaz, 2016).

#### Questions

1. Which can radiates heat better?
2. What inference can you make from this activity?
3. What method of heat flow causes the cans to lose heat?
4. Design an experiment to study whether a dull or shiny object absorbs and radiates heat better.

Figure 2. Designing experiment in Experiment 9.2 (pg. 218)

### 3. Daily life application

Another important criterion in the curriculum is the knowledge of application on our daily life in order to solve problems and making decisions that related to life. By making a connection with daily life examples able to arouse students' curiosity besides than enhancing understanding and students' learning (Ormanci & Cepni, 2019). All of the four chapters consist of daily life examples and applications such as in Figure 5.



Figure 3. Daily life examples

There is also a section known as 'My Science World' specifically for situation where students encounter with science related problem on daily life (Figure 6).

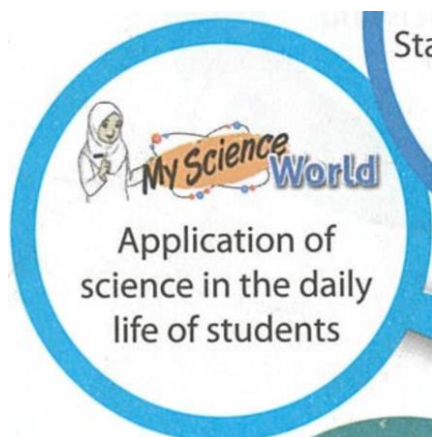


Figure 4. Explanation on 'My Science World'

However, only one example was found which was labelled as 'My Science World' in Chapter 8 (Force and Motion) (Figure 7).

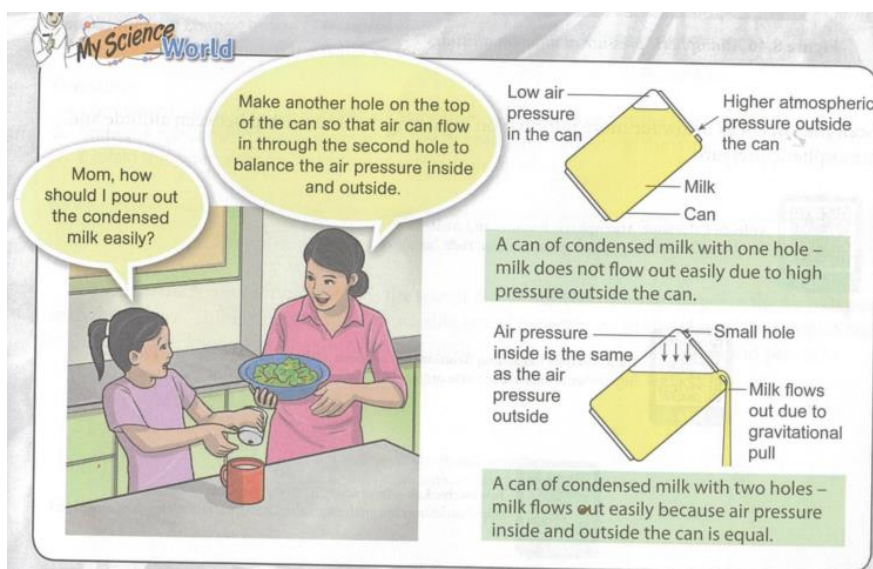


Figure 5. Example of 'My Science World' section

Chapter 8 (Force and Motion) has the highest number of examples in daily life applications which consists of 17 examples in comparison with Chapter 7 (Electricity and Magnetism) which has the lowest number of examples in daily life with only four examples of daily life. It is advisable for Chapter 7 (Electricity and Magnetism) to add more daily life examples to increase the connection between the context besides than using their thinking skills to link the concepts with daily life examples.

#### 4. 21<sup>st</sup> Century skills

In addition to the curriculum objectives, it is intended to produce 21<sup>st</sup> century skills pupils that consist of adequate thinking, literate and life skills to be applied in life in their future professions. The 21<sup>st</sup> century skills selected in this research were communication, critical thinking, collaboration and informative (Ministry of Education, 2016).

#### Communication

Communication refers to students' platform that able to communicate their thoughts and ideas positively while working with a group of pupil using various methods either in verbal, written or technology ways.

All the four chapters consists of two activities each which requires verbal presentation skills. Meanwhile, in terms of using technology as a way to present the ideas was found in all of the chapters except in Chapter 9 (Heat) which has no verbal activities using ICT (Information and Communication Technology). Figure 8 depicts an example of verbal activity which requires application of ICT. According to Malaysia Education Blueprint (2012), technology is regard as an essential aspect to enhance students' learning as it makes learning fun, effective and beneficial for their ICT skills. Effective persuasive communication is also an important skill in 21<sup>st</sup> century as it helps to convey the intended message proficiently (Turiman et al., 2012).

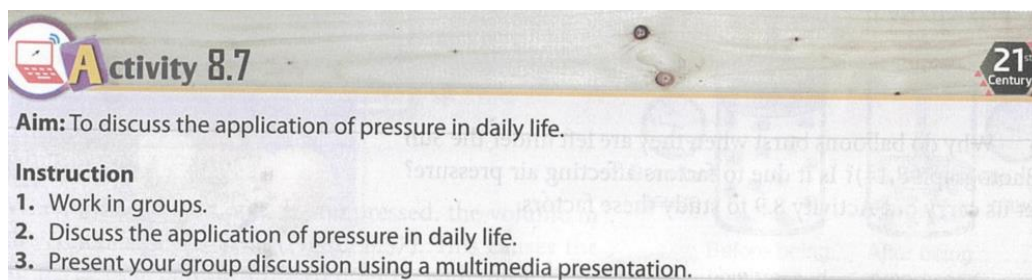


Figure 8. Example of communication activity with application of ICT

### Critical thinking

Critical thinking pupil is generally referred to a pupil who able to think creatively, critically and innovatively to solve a multifaceted problems with confidence in real world applications (Dwyer et al., 2015; Turiman et al., 2012). In the textbook, a section known as 'Brain Teaser' was allocated which consists of questions that challenge pupil to think critically (Figure 9 and Figure 10).

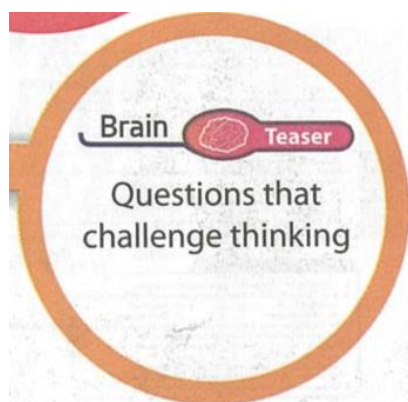


Figure 6. Explanation on 'Brain Teaser'

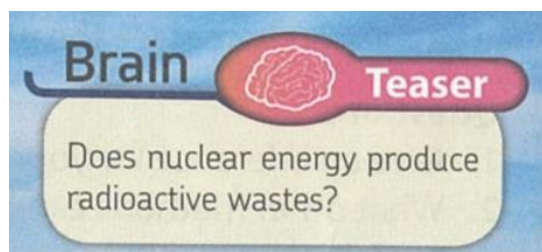


Figure 7. Example of 'Brain Teaser' section

Nevertheless, only two chapters consist of 'Brain Teaser' sections which were on Chapter 7 (Electricity and Magnetism) and Chapter 9 (Heat) which made a total of three examples. Therefore, it is recommended that each of the chapter to include at least one critical thinking question to courageously challenge the students' to think as it was stated as a very important skill. However, it was also found to



be inadequate in few researches (Arum & Roksa, 2011; Momsen et al., 2010). It may due to the difficulty and time consuming to synthesis such questions (Stanger-Hall, 2012).

**Collaboration**

Collaboration or teamwork activities was found in all of the four chapters where the pupil is given chance to work harmoniously with other teammates. Such collaborative activities able to enhance their interpersonal skills to create sense of respecting and appreciating towards each other either as a leader or team member. These interpersonal skills were gained through the collaboration as they able to cope with their own emotions from the social discussion which then be applied practically in their future workplaces (Turiman, 2012).

Most of the activities comprise of collaboration opportunity through presentation activities in grouping manner. Collaboration activities is almost the same as communication activities as discussed earlier as it involves discussion among team members. However, only Chapter 10 (Sound Waves) consists one extra activity which involves collaboration skills without much communication skills where it requires another partner to run past while sound an air horn to carry out the experiment (Figure 11).

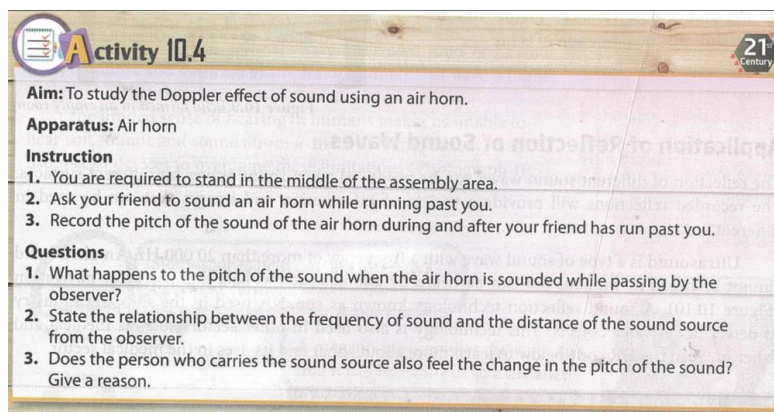


Figure 8. Example of collaboration activity

**Informative**

Informative known as content that is rich in information and knowledge in terms of local or global relating life issues which may motivate and enhance the students' interest (Laughridge, 2011). It is well balanced with various types of disciplines, ethical issues or laws related to the information. Therefore, this able to produce students who are not only well in academic but also rich with instructive knowledge from all around the world. Figure 12 shows an example of informative knowledge pertaining on cargo ships used across the globe in Chapter 8 (Force).

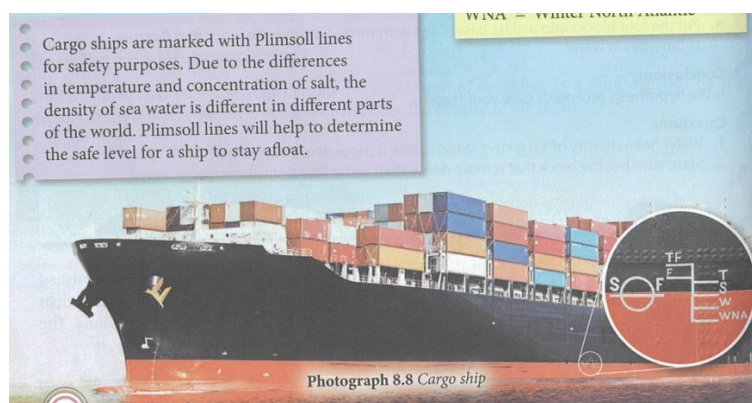


Figure 9. Informative knowledge on Cargo ships in Chapter 8

In the textbook, there is a section that related to informative knowledge which known as 'Science Info'. It refers to additional information that added to the topics (Figure 13 and Figure 14).



Figure 10. Explanation on 'Science Info'

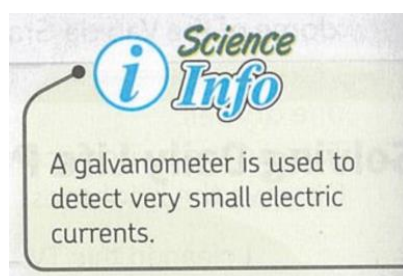


Figure 11. Example of 'Science Info'

A total of 11 'Science Info' examples were found in three chapters where Chapter 7 (Electricity and Magnetism) recorded the highest with eight examples, followed by Chapter 10 (Sound Waves) with two examples and lastly Chapter 8 (Force and Motion) with only one example. The inconsistency of the number of examples where Chapter 9 (Heat) recorded none should include more informative issues to utilise such section to increase students' knowledge and interest (Laughridge, 2011).

## 5. Values

A good Science textbook should not only teach and consists of science core knowledge and skills but also able to nurture good values on the pupils. Through my research on analysis of textbook, I established two values that are important in Science curriculum which are caring and patriotic.

### Caring

Aside from science core values, a textbook includes humanities values such as caring which is stated in KSSM are important to show empathy, concern and respect towards others. These caring portrayals able to impart on the students' morality through such curriculum textbook (Bim & Egorova, 2016). It is also to ensure sustainability of environment and responsibility to serve the society.

Nevertheless, it only consists of only one example found in Chapter 9 (Heat) that shows caring value which uses the application of green technology (Figure 15). With limited example of portrayal towards environment may cause difficulty to raise awareness of importance of environment and consequently unable to achieve its' objective. According to a research, it was stated that some Science textbooks unable to demonstrate a sense of caring towards the environment as the students were taught to focus more on other aspects (Savita et al., 2017). It was also mentioned that the extend of discussion on environment in a textbook is depending on the degree of a country connected to the global environmental issue rather on a specific set of interest (Bromley et al., 2010).

**Heat Concept in Daily Life**

The **Green Building Concept** is an idea developed to reduce the effects of rapid development on the environment and our health. The features of green buildings are listed below:

- ☑ has high energy efficiency through the usage of solar energy or renewable energy.
- ☑ has good water flow system, air circulation and lighting.
- ☑ uses recycled materials.

Figure 12. Example of caring value in application of Green technology

**Patriotic**

Patriotism which defines by the love and support towards own country is important as stated in KSSM. According to Bim and Egorova (2016), education is able to instil intrinsic values such as patriotism and humanity among students. Through cultivating patriotism in textbook, students would be able to elevate their love spirit for Malaysia and inspire them to be proud of Malaysia. It is labelled as 'My Malaysia!' which depicts patriotism of latest success of Science in Malaysia (Figure 16).



Figure 13. Explanation on 'My Malaysia!'

However, it only consists of one example in this Theme 3 (Energy and Sustainability of Life) which is on Chapter 8 (Force and Motion) (Figure 17). Increasing the example of patriots succeed may increase the awareness and knowledge of the country's achievement. However, it might not be effective as it needs to cultivated at a very young age; wherein children should narrate and involve themselves to think why and how the patriots struggled in order to instil higher patriotism value (Nussbaum, 2012).



Figure 14. Example of 'My Malaysia!'

## 6. *STEM careers*

Meanwhile, to benefit pupils and country in the long run, Science, Technology, Engineering and Mathematics (STEM) practice is emphasized in KSSM. Hence, STEM related careers information is beneficial to both the students and national development as able to attract students' interest and raise their awareness on the STEM careers as they can set as their future careers. Nevertheless, it was stated that the careers should be written in a various representation manner as it may lead to gender inequality that may influence their interest on science (Good et al., 2010; Pienta & Smith, 2012). In the textbook, it is shown as 'Career in STEM'. By providing such examples on the textbook able to help students to recognise that there is numerous successful science careers. Nevertheless, only one example was depicted in Theme 3 (Energy and Sustainability of Life) which is on Chapter 8 (Force and Motion), as presented in Figure 18.

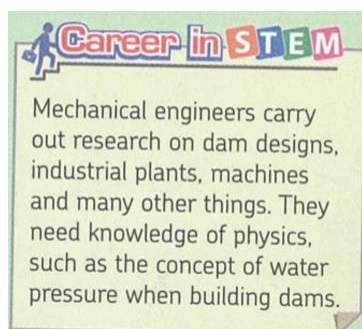


Figure 18. Example of Career in STEM Section

### ii) **Level of treatment**

The level of treatment in this study refers to the density and complexity of content to ensure it is simple and complex based on students' abilities and level to motivate students for continuous learning. It is analysed based on three sub-criteria which are (1) starting with real life example and thinking questions, (2) sufficient details to understand without the aid of other sources and (3) verbal discussions activities.

#### 1. *Starting with real life example and thinking question*

Incorporating real life example and thinking question on the beginning of a chapter may be able to make students understand better and boost their interest as they able to relate with their daily life experiences and think critically. Generally, all chapters start with thinking questions indicated on one whole page (Figure 19). Table 3 shows the list of thinking questions according to its chapter.

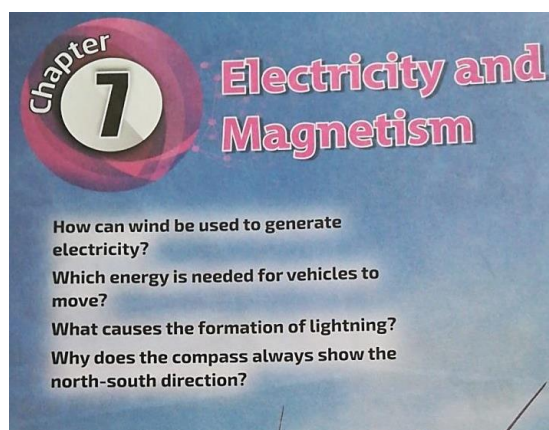


Figure 15. Example of thinking questions on chapter introduction

Table 3  
*List of Thinking Questions on Chapter Introduction*

Chapter 7: Electricity and Magnetism	Chapter 8: Force and Motion	Chapter 9: Heat	Chapter 10: Sound Waves
<ul style="list-style-type: none"> <li>• How can wind be used to generate electricity?</li> <li>• Which energy is needed for vehicles to move?</li> <li>• What causes the formation of lightning?</li> <li>• Why does the compass always show the north-south direction?</li> </ul>	<ul style="list-style-type: none"> <li>• All daily activities involve force. We need force to produce motion. What is the meaning of force?</li> <li>• What is the effect of force on daily activities?</li> </ul>	<ul style="list-style-type: none"> <li>• Why are tall buildings fixed with shiny glass panels?</li> <li>• Why does a thick glass break when it is filled with hot water?</li> <li>• How do thermometers work?</li> <li>• Why is a bonfire lit on a cold night?</li> <li>• How does heat affect gas?</li> </ul>	<ul style="list-style-type: none"> <li>• Can sound waves propagate to the bottom of the sea?</li> <li>• How do our ears respond to sound?</li> <li>• What is echo?</li> <li>• What is the limitation of a human's hearing?</li> </ul>

Based on Table 3, all of the questions from each of the chapters were related to real life examples and thinking questions used. This may enhance students' motivation and understanding throughout the learning process. However, Chapter 8 shows the least amount of questions which has two questions compare to other chapters. In addition, both of the questions used were also on lower order thinking skills (LOTS) which was on remembering level which uses only recalling information. These questions may dampen students' interest as it may not effectively stimulate critical thinking skills (Eshun & Mensah, 2013; Tofade et al., 2013).

Meanwhile, for further analysis of the beginning of the chapters' paragraph was shown on Table 4. It depicts the checklist of starting the chapters with real life example or thinking question in the beginning of the paragraph.

Table 4  
*Checklist of Starting with Real Life Example and Thinking Question Based on Chapters*

Chapter	Start with real life example	Start with thinking question
7 : Electricity and Magnetism	✓	✓
8 : Force and Motion	✓	✓
9 : Heat	✓	✗
10 : Sound Waves	✓	✓

Based on Table 4, it portrays the significant use of starting the textbook chapters with real life connections examples and thinking questions for all of the chapters (Figure 20).

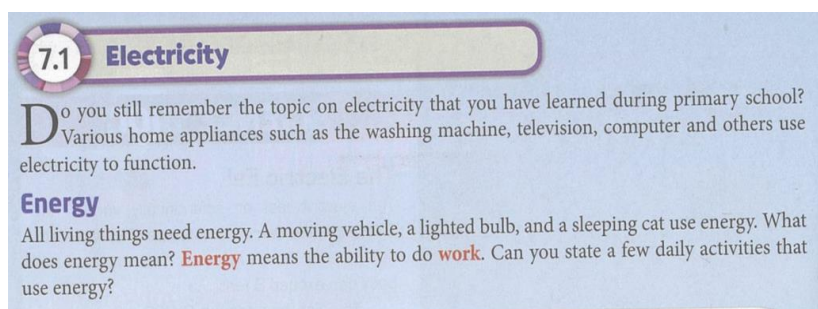


Figure 16. Example on real life examples and thinking questions on beginning of chapter

Nevertheless, Chapter 9 (Heat) lack on starting with thinking question on the beginning of the chapter may be unable to provoke students to think critically and maintain their interest (Figure 21) (Eshun & Mensah, 2013; Tofade et al., 2013).

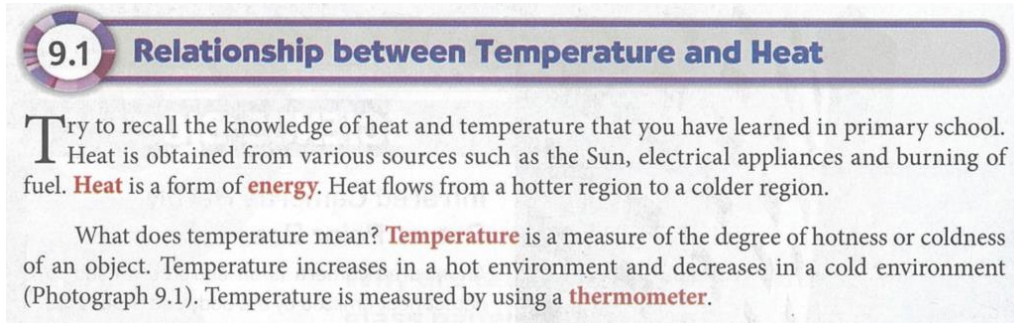


Figure 17. Example on lack of thinking question on beginning of chapter

1. Sufficient details without aid from other sources

The complexity present in the textbook should encompass sufficient details from the textbook itself for students to understand easily without the aid from other sources. Few shortages were found in Chapter 7 (Electricity and Magnetism). For instance, Figure 22 only briefly shows how the electroscope works. It does not explain how the charges travel in the device which may cause students unable to fully understand.

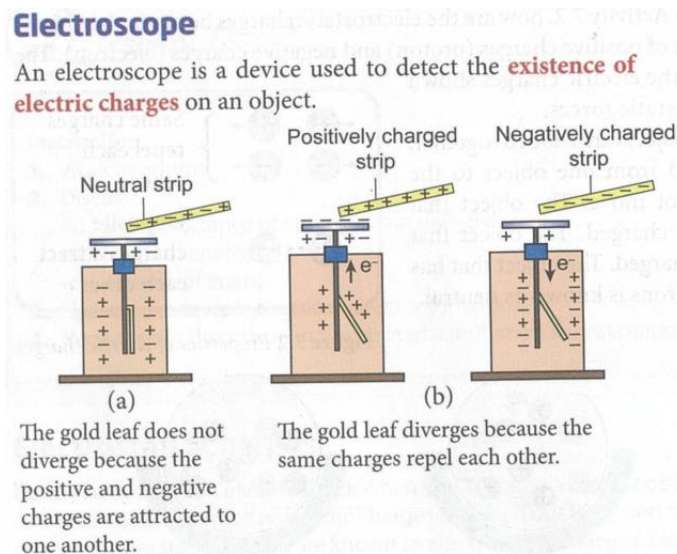


Figure 7.5 How the electroscope works

Figure 18. Example on lack of explanation on how the charges travel

Meanwhile, Figure 23 shows the lack of explanation on how microfibre cloth works. It stated that the cloth able to cause the TV screen not to become dusty quickly but with less information on how it works may deter students from fully understanding.

It mentioned that microfibre membrane is a positively charged ion which is able to attract the negative charges of the dust (Chen et al., 2017).

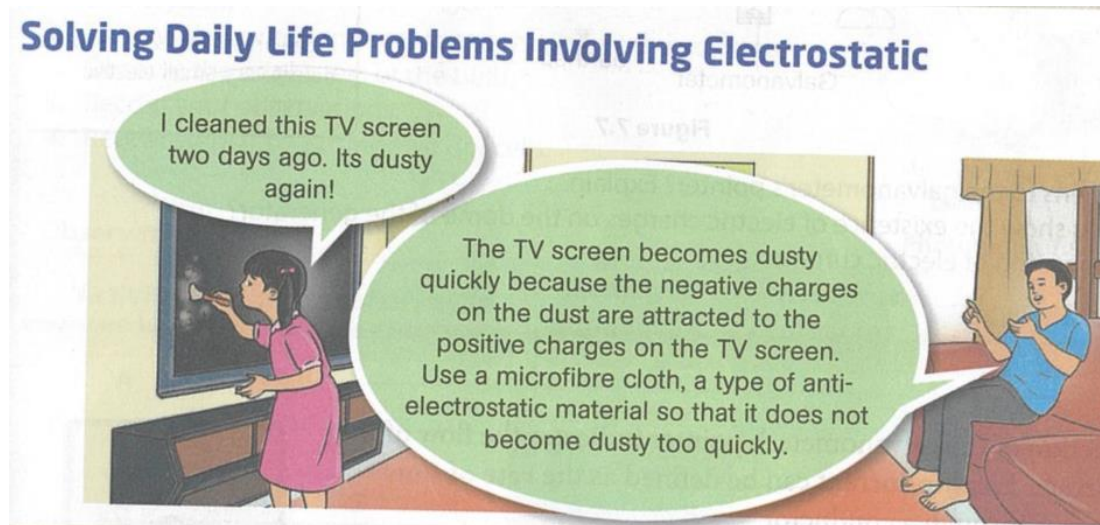


Figure 19. Example on lack of explanation on how microfibre cloth works

On the other hand, Figure 24 also depicts the lack of explanation on how the devices work. Lacking understanding of how these devices work may cause students unable to fully comprehend or gaining new knowledge in terms of application. It only provides examples of devices but lack of explanation on how these devices work may cause students unable to fully comprehend in terms of application. It was said that a lower performance obtained if the information assigned abruptly without complete understanding (Kager, 2015).



Figure 20. Example on lack of explanation on how the devices work

2. Verbal discussion activities

As this section focuses on the treatment level on complexity of the textbook, verbal discussion is considered important to be analysed. Discussion helps students to understand better through practical class discussions and promotes them to communicate their ideas (Pombo & Talaia, 2012). This is almost the same as mentioned above on the section of alignment with national curriculum, where its' objective is to produce 21<sup>st</sup> century skills pupils with communication skills.

Table 5  
Number of Discussion Activities Based on Chapters

Chapter	Number of discussion activities
7: Electricity and Magnetism	2
8: Force and Motion	2
9: Heat	2
10: Sound Waves	2

According to the Table 5, a total of two activities involving collaboration and presentation skills were found on each of the chapters. On-field verbal discussion during classroom learning may be beneficial

as the teachers able to provide corrections and comments such as in Figure 25. It is more engaging as it involves students' participation which then able to produce communicative competence students (Dourado & Leite, 2013; Pombo & Talaia, 2012). However, it was stated that discussion activities consume a lot of time in a classroom (Dourado & Leite, 2013).

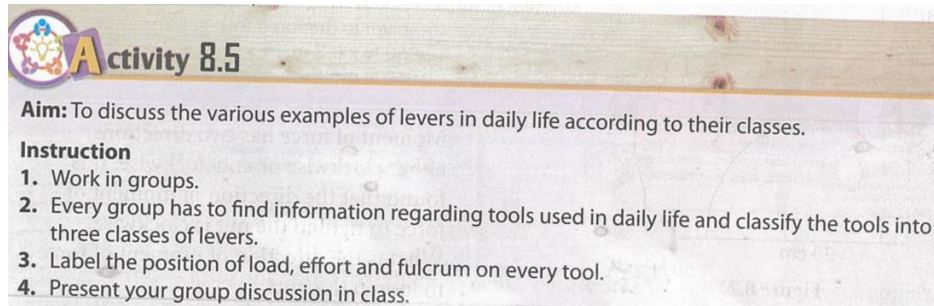


Figure 21. Example on verbal discussion activity

### iii) Accuracy

The accuracy of the textbook content is known to be important as it affects the learning process towards students. Such accuracy is signified in terms of language, visuals, labels, videos, website link and others. There were errors spotted in the QR readers application in the textbook. A total of 15 QR readers were found from Chapter 7 to Chapter 10 which consists of either video, interactive quiz or additional information for students to explore through the scanning of QR codes. However, two errors were found from the 15 QR codes analysed. The first error was found in Chapter 9 (Heat) (Figure 26).



Figure 22. Error of QR code in Chapter 9

It was stated as "No post found" through scanning of the QR code or the website stated (Figure 27).

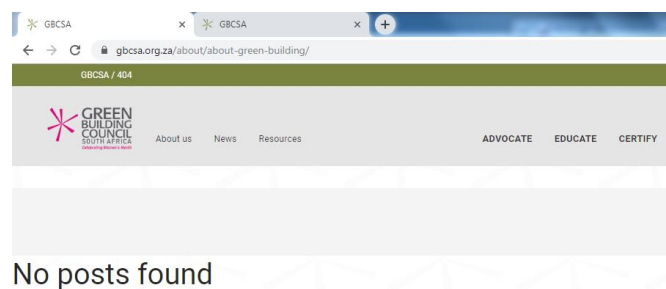


Figure 23. Result shown an error in Chapter 9

The next QR code error was found in Chapter 10 (Figure 28).





Figure 24. Error of QR code in Chapter 10

It was indicated as "This page could not be found" through scanning of the QR code or the website link given (Figure 29).

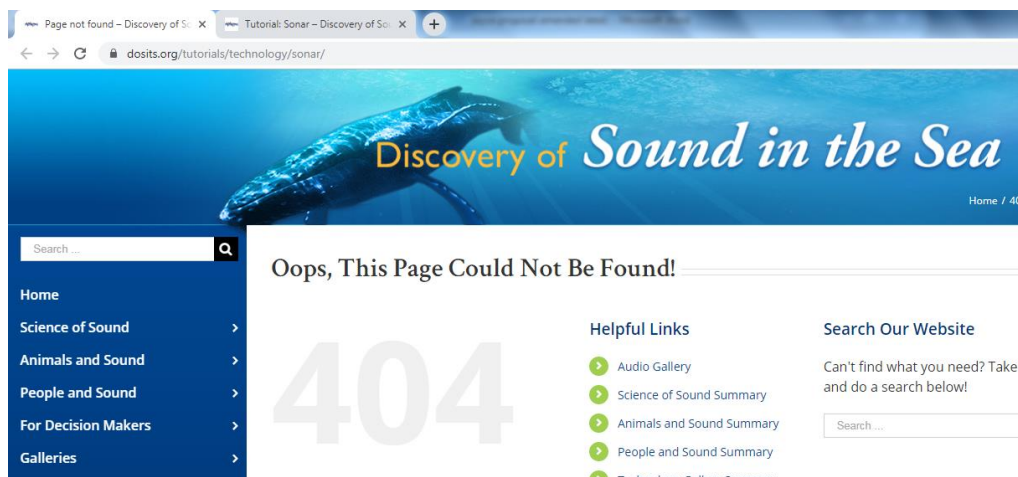


Figure 25. Result shown an error in Chapter 10

On the other hand, speech and grammatical errors were found in the self-reflection section in Chapter 10 (Sound Waves) where extra care for proofreading is advisable. In Figure 30, there is an error in terms of speech used as the sentence was just 'Doppler effect'. It lacks a verb as the sentence before it was 'After learning this chapter, you are able to'. Therefore, it is recommended the sentence to be reconstructed to 'Explain the Doppler effect'.

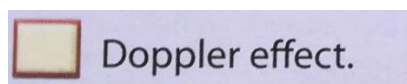


Figure 26. Speech error in Chapter 10 (Page 235)

A grammatical error was found in the same checklist (Figure 31). As a lot of phenomena and applications were studied in reflections of sound waves, it is suggested the word 'application' to be modified to 'applications'.

**10.3 Phenomena and Application of Reflection of Sound Waves**

Figure 27. Grammatical error in Chapter 10 (Page 235)

Generally, there is no error in terms of scientific disciplines, however few inaccuracies were found in technical and language manner. The corrupted QR codes may affect the teachers to conduct the intended website lesson while the grammatical errors may distort students' language coherency which is why it is important to have more type of proof-readers to ensure utmost accuracy (Harwood, 2019).

## CONCLUSION

Given the importance and major use of textbooks, it is substantial to analyse textbooks to obtain valuable insights as it plays an important role in national's curriculum. Findings showed there were several drawbacks of the textbook wherein it should include more examples on critical thinking questions and hinder LOTS questions on chapter introduction in order to stimulate the students. Hence, the results which highlight important elements of the content able to be use as rubric for future production of textbooks. The results of the analysis is also considered valuable as the information obtained able to be integrated for better production of textbooks when ample profound characteristics have been recognised and weaknesses able to be rectified. Consequently, this benefits the nations' education as well as teachers will be able to obtain a competitive teaching material to improve students learning. Therefore, rigorous research of textbooks is a perennial practise to ensure growth and continuous improvisation of textbooks.

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