



WWJMRD 2021; 7(11): 40-46

www.wwjmr.com

International Journal

Peer Reviewed Journal

Refereed Journal

Indexed Journal

Impact Factor SJIF 2017:

5.182 2018: 5.51, (ISI) 2020-

2021: 1.361

E-ISSN: 2454-6615

DOI: 10.17605/OSF.IO/ZJA9Q

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## Challenging Topics in the Senior High School Core Curriculum Subject (Earth and Life Science) as Perceived by First Year College Students

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### Abstract

The study primarily aims to map the challenging topics in the Senior High School (SHS) core curriculum subject Earth and Life Science. It is based on the perception of two hundred forty-two (242) first-year college students in Quezon City University during the second semester of Academic Year 2020-2021. The study employed the descriptive research approach to explore the challenging topics in Earth and Life Science subject and its reasons using a researcher-made survey questionnaire. Results revealed that most of the respondents agreed that the most perceived challenging topic under Earth and Life Science is Bioenergetics. Results also showed that the primary reason why the students considered these topics to be the most challenging is that because it included terms that they are not familiar with. Results of this study serve as baseline data in developing instructional materials for the subject that will improve the teaching and learning process.

**Keywords:** Earth and Life Science topics, Learning difficulty, Challenging topics, Student Perception, Senior High School Core Curriculum

### 1. Introduction

The results of the Trends in International Mathematics and Science Study (TIMSS) conducted in 2019 and the Program for International Student Assessment (PISA) in 2018 put the Philippine mathematics and science education in perils, where Filipino students are lag behind students among its Southeast Asian counterparts and in the world in general.

Various efforts are made to address the issue and close the gaps among educational literature on improving students' performances and the teaching and learning process, especially in science and mathematics. One of these efforts is developing instructional learning materials that will help to improve the teaching and learning process. There are numerous studies conducted to develop, design, and validate instructional learning materials in the Philippines. In educational institutions, developing teaching-learning materials is viewed as a critical component of promoting student learning and assisting students in achieving academic goals and objectives. It should be appropriate for the student's age, emotional and social development, and ability level. Instructional materials should be diverse in terms of difficulty, reader appeal, and point of view.

Studies show that in developing instructional learning materials in science, whether in the form of books, learning modules, interactive online learning resources, or localized learning materials, students' least mastered skills and academic performances are usually served as the basis (Cornejo, 2020; Ranille, 2020; Ringor, 2020; Telan, 2020; Avila, 2019; Tabunda, 2017; Estacio, 2015). However, aside from students' least mastered skills and academic performances, the perception of students on which topic is seemed to be the most difficult or challenging to them is also an important basis in developing and validating instructional learning materials.

Students' perceptions refer to their thoughts, beliefs, and feelings about individuals, situations, and events. In education, the perceived difficulty is the perception of the ease or difficulty of performing a particular activity or task. Recognizing and meeting the unique needs of each learner, like addressing their perceived difficult topics, boosts their morale and

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encourages them to learn more and achieve higher learning goals. Thus, understanding students' perspectives enables the teacher to select appropriate and beneficial resources and makes the teaching and learning process more effective and valuable.

The way students perceive difficult topics or subjects influences their academic performances, attitudes, and behaviors. Besides, this perception is based on their viewpoints and experiences (Gibson, 1979). Gibson (1979) asserts that sufficient contextual information exists to make perceptual judgments in the real world. He argued that one does not need to invoke higher-level intelligent processes to account for perception. He believed that a person makes direct use of this contextual information. In essence, that individual is biologically predisposed to react to it. Students' perspective on the topics, concepts, and situations reflects their overall standpoint on the teaching and learning process and influences their future conclusions and decisions.

In the desire to create and develop instructional learning material for science students primarily based on students' perceived difficult topics, the researchers look for available studies that focus on exploring the perceived difficult topics of the students in any science subject (Fauzi & Mitalistiani, 2018; Etobro & Fabinu, 2017; Ozcan, Ozgur, Kat, & Elgun, 2014; Ogunkola & Samuel, 2011; Tekkaya, Ozkan, & Sungur, 2001).

However, the researchers find it difficult to look for available published research focusing on students perceived difficult topics in science in the Philippines. The study of Rogayan Jr. and Albino in 2019 is deemed to be related to the present study. They explored the common misconceptions of Filipino students in biology that will serve as input for remedial teaching. Also, the recent research conducted by Sadera, Torres, and Rogayan, Jr. (2020), which focused on the challenges encountered by junior high school students in learning science that will serve as a basis for action plans, seemed relevant. However, there are no existing studies in the Philippines to map the challenging topics in science, especially in the Senior High School (SHS) core curriculum subject, particularly Earth and Life Science.

Thus, the researchers conducted a study that identifies the most challenging topics encountered by the students in Earth and Life Science subject that serve as baseline data in developing various instructional learning materials to improve science teaching and learning in the country.

Specifically, this study aims to answer the following research questions:

1. Which topics in Earth and Life Science are considered the most challenging by Quezon City University first-year college students?
2. What makes these topics seem to be challenging for the students?
3. Is there any difference in the respondents' perception towards the challenging topics in Earth and Life Science when grouped according to their gender, academic strand, and type of school? and
4. What interventions may be adopted to improve Science teaching and learning?

The study hypothesized that there is no significant difference in the respondents' perception towards the challenging topics in Earth and Life Science when grouped

according to their gender, academic strand, and type of school.

## 2. Materials and methods

The study employed the descriptive research approach (Fraenkel, Wallen, & Hyun 2013). Since the primary objective of the study is to explore the most difficult topic in the subject Earth and Life Science through the description of firsthand data, descriptive research approach is more applicable. Additionally, the researchers considered this type of research design because it is quick and cost-effective, as well as advantageous due to its flexibility, as it can utilize either qualitative or quantitative data, or a combination of the two, giving the researchers greater flexibility in selecting the instrument for data collection (Fraenkel, Wallen, & Hyun 2013).

### Research Instrument

Student surveys are critical tools for a teacher to elicit information about student perceptions. By conducting surveys to ascertain student perceptions, the teacher can make informed decisions about areas for improvement and monitor students' progress over time. Thus, this study used a survey questionnaire to map the most challenging Earth and Life Science topics.

The researchers developed the survey questionnaire. To ensure its validity, five (5) Senior High School science teachers were asked to evaluate the content of the survey questionnaire. As a result, the developed survey questionnaire was valid in terms of its content.

The survey questionnaire is divided into two parts. Part 1 includes questions that explore the profile of the respondents, such as gender, academic strand, and type of school. Part 2 of the survey consists of items that explore the respondents' perception of the most challenging topics in Earth and Life Science and why they thought these topics were considered the most challenging for them.

### Locale and Respondents

The survey was conducted during the last week of May 2021 in Quezon City University (QCU) in Quezon City, Philippines. The study surveyed two hundred forty-two (242) first-year college students. The researchers sent a letter of invitation to the respondents to voluntarily participate in the study, and then they were asked to accomplish the Informed Consent Form via Google Forms. Once the respondent agreed with the invitation to participate and completely responded to the Informed Consent Form, the researchers sent the link of the survey questionnaire to them.

Out of the 242 respondents, ninety-seven (97) or 40.08% are males, while one hundred forty-five (145) or 59.92% are females. Furthermore, ninety-three (93) or 38.43% of them took the Business, Accountancy, Management (BAM) strand, while seventy-two (72) or 29.75% took Technical-Vocational-Livelihood (TVL) strand. Also, there are forty-seven (47) or 19.42% respondents who took Science, Technology, Engineering, Mathematics (STEM) strand, while twenty-eight (28) or 11.57% took the Humanities, Education, Social Science (HESS) strand. Lastly, two (2) or 0.83% of respondents took the General Academic Strand (GAS) when they were in their Senior High School program. Most of the respondents came from private Senior High School, which is equivalent to one hundred sixty-one (161) or 66.53%, while eighty-one (81) or 33.47% came

from public Senior High schools.

In the survey, the respondent can select more than one topic they feel to be the most challenging among the listed topics in the subject Earth and Life Science. They are not required to identify which is the most and the least challenging topics. Furthermore, the respondents were asked to identify the possible reasons why they thought that their chosen topic was the most challenging for them. Respondents may select one or more reasons from the given options. Aside from the listed options, an open-ended question asking the respondent why they considered their chosen topic the most challenging was given in the survey.

### Statistical Methods

The researchers used descriptive statistics to describe the survey results and answer research questions number one presented in this study. In determining the differences in the respondents' perception towards the challenging topics in Earth and Life Science according to their profile (gender,

academic strand, and type of school), the researchers employed a Chi-square test using IBM SPSS Statistics Version 22. Results were analyzed and interpreted by the researchers.

### 3. Results & Discussion

#### Topics in Earth and Life Science that are considered to be the most challenging by Quezon City University first-year college students

Table 1 presents the online survey conducted to first-year college students at Quezon City University. Data shows that majority of the respondents perceived that Bioenergetics, Interaction and Interdependence, Natural Hazards, Mitigation and Adaptation, Earth's Material and Resources, and Origin and Structure of the Earth are the most challenging topics in the subject Earth and Life Science. On the other hand, the least topics considered to be the most challenging are How Animals Survive, How Plants Survive, and Introduction to Life Science.

**Table 1:** Most challenging or difficult topics under the subject Earth and Life Science as perceived by the students.

Topics	Frequency*	Percentage (%)
Bioenergetics	142	58.68
Earth's Material and Resources	82	33.88
How Animals Survive	32	13.22
How Plants Survive	38	15.70
Interaction and Interdependence	105	43.39
Introduction to Life Science	60	24.79
Natural Hazards, Mitigation, and Adaptation	84	34.71
Origin and Structure of the Earth	82	33.88
Perpetuation of Life	72	29.75
The Process of Evolution	66	27.27

\*N=242

Furthermore, since Earth and Life Science subject is divided into two major components, Earth Science and Life Science, the study also explored the most challenging topics specific to both components. Table 2 shows the survey result on the most challenging topics under the Earth Science component.

Data shows that most respondents (50.83%) agreed that

Hydrometeorological Phenomenon and Hazards is the most challenging one. It is followed by Marine and Coastal Processes and their Effects (43.80%) and Geologic Process and Hazards (32.64%). In comparison, the least challenging topics under the Earth Science component include The Earth Systems (11.16%), The Universe and the Solar System (18.18%), and History of the Earth (19.01%).

**Table 2:** Most challenging or difficult topics under Earth Science component as perceived by the students.

Topics	Frequency*	Percentage (%)
Deformation of the Crust (Continental Drift Theory, Ocean Basins, and the Plate Tectonic Theory)	62	25.62
External Processes (Weathering, Sedimentation, Soil Erosion, and Mass Wasting)	54	22.31
Geologic Processes and Hazards	79	32.64
History of the Earth	46	19.01
Hydrometeorological Phenomenon and Hazards	123	50.83
Internal Processes (Volcano and Igneous Activity, Metamorphism, Folding and Faulting of Rocks, and Mountain Building)	68	28.10
Marine and Coastal Processes and their Effects	106	43.80
Minerals and Rocks	64	26.45
The Earth Systems	27	11.16
The Universe and the Solar System	44	18.18

\*N=242

Meanwhile, topics under the Life Science component that are perceived to be the most challenging for students are presented in Table 3. Results of the survey revealed that the most challenging topics under the Life Science component as perceived by the students are The Central Dogma of Molecular Biology (82.23%), Systematics which includes the identification, classification, naming and describing of living things (79.34%), Unifying Themes in Biology

(76.45%), and the Environment or Ecosystem (74.38%). On the other hand, the least challenging topics for the respondents under the Life Science component include Animal Reproduction (11.16%), Plant Reproduction (14.46%), What living things need to survive? (14.46%), Plant Responses and Growth (28.51%), and Vegetative Parts of Plants (Root, Stem, and Leaves) and their Functions (29.34%).

**Table 3:** Most challenging or difficult topics under Life Science component as perceived by the students.

Topics	Frequency *	Percentage (%)
<b>Introduction to Life Science</b>		
Characteristics of Living Things	42	17.36
Homeostasis	152	62.81
Unifying Themes in Biology	185	76.45
What do living things need to survive?	35	14.46
Where do living things come from?	30	12.40
<b>Bioenergetics</b>		
Cellular Respiration	143	59.09
Photosynthesis	66	27.27
The Cell (Parts and Functions)	124	51.24
<b>Perpetuation of Life</b>		
Animal Reproduction	27	11.16
Biotechnology	139	57.44
Plant Reproduction	35	14.46
The Central Dogma of Molecular Biology	199	82.23
<b>How Animals Survive</b>		
Animal's Organ System	103	42.56
Animal's Tissues and Organs	160	66.12
Common Diseases in the Philippines	83	34.30
<b>How Plants Survive</b>		
Plant Responses and Growth	69	28.51
Plant's Tissues and Organs	164	67.77
Vegetative Parts (Root, Stem, and Leaves) and Functions	71	29.34
<b>The Process of Evolution</b>		
Evolution	74	30.58
Systematics (Identification, Classification, Naming, Describing of Living Things; Plant and Animal Kingdoms)	192	79.34
<b>Interaction and Interdependence</b>		
Environmental Pollution	90	37.19
The Environment (Ecosystems)	180	74.38

\*N=242

The survey results on the most challenging topics under the Life Science component as perceived by the students are almost similar to Fauzi and Mitaliztiani in 2018. Fauzi and Mitaliztiani (2018) found that Genetics, Immune System, and Metabolism were considered the most difficult topics. Moreover, the overall results on the topics that are considered to be the most challenging by the students are consistent with the results of previous studies conducted by Johnstone and Mahmoud (1980), Finley, Stewart, and Yaroch (1982), Anderson, Sheldon, and Dubay (1990), Seymour and Longdon (1991), Jennison & Reiss, (1991), Lazarowitz and Penso (1992), and Bahar, Johnstone and Hansell (1999), Tekkaya, Ozka, and Sungur (2001), Ogunkola and Samuel (2011), and Etobro and Fabinu (2017).

#### Possible reasons why the identified topics seem to be challenging for the students

**Table 4:** Possible reasons why the identified topics under the subject Earth and Life Science seems to be challenging or difficult for the students.

Reason	Frequency *	Percentage (%)
The teacher could have not explained the topic or lesson properly.	71	29.34
The teacher has missed something important about the topic or lesson that I should know, to properly understand it.	54	22.31
The topic includes terms or words that I am not familiar with.	122	50.41
The topic or lesson is difficult to understand.	120	49.59
The topic or lesson is too abstract for me.	60	24.79
The topic or lesson is too different from what I have learned before (different from Junior High School Science).	88	36.36

The topic or lesson that we are learning are too advance for us.	25	10.33
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\*N=242

Furthermore, the results of the open-ended question, asking the students for other reasons that they considered why the identified topics are the most challenging ones, is presented below. Strikingly, some of the students' responses may be classified into various factors such as student-related factors, teacher-related factors, and curriculum-related factors.

In terms of the student-related factors, most of the respondents said that the primary reason they find the topic challenging is that they have a hard time retaining the concepts in their minds, and they are busy with other things like online gaming. They also said that they did not listen to their teachers, and their personal preference in learning affects their decisions in identifying the most challenging topics. Some of the answers of the respondents about student-related factors are the following:

**Actual Response 1:** Another factor was I didn't listen to my prof while he was teaching the topic back then.

**Actual Response 2:** Because it is not what I wanted to learn at that time.

**Actual Response 3:** Because of Gaming Addiction.

**Actual Response 4:** I am not interested in the topic, so I find it difficult to focus on the lesson, especially the one I chose.

**Actual Response 5:** My teacher is good at teaching. To be honest, the reason is, I was not focusing on class; therefore, I didn't understand the topic.

Regarding teacher-related factors, most of the respondents said that they find the topics in Earth and Life Science challenging because their teacher primarily comes to class unprepared, or their teacher assigns topics to them to present in class. And since the fact that teacher is one of the key drivers of student learning and interest towards the subject, the responses of students pertaining to the way how teachers teach in the actual classroom setting, their attitudes towards the class, and their mastery and preparedness cannot be neglected and should be considered to improve the teaching and learning process as well as students' learning and interest towards the subject. Some of the actual responses of the students in the open-ended question under teacher-related factors are the following:

**Response 6:** Actually, when I was a Senior High School my teacher in that subject was not that good at teaching. Whenever our teacher enters our room, she has an angry face and reads her lesson using PowerPoint and projector. When we have a question, she always says "ayan di Kasi kayo nakikinig sa kin" and doesn't even explain it and leaves. Every student in our school knows that teacher as terror because she gave a lot of students a line of 7 grade.

**Response 7:** Because the teacher only explains it in words, she should have included diagrams and pictures.

**Response 8:** I think those topics became challenging for me because my teacher back then was too strict, and most of us were terrified whenever she entered the classroom.

And also, we are afraid to recite because our answer should always be correct. Otherwise, she will embarrass the one who is reciting. In conclusion, maybe those topics became challenging because of the pressure I experienced and the fact that I'm not a fan of science.

And lastly, when it comes to curriculum-related factors, most of the respondents said that they have a lot of subjects to take, and the time allot per subject is very limited; that is why they find it challenging to comprehend and understand the lessons given to them. Some of the actual students' responses include the following:

**Actual Response 9:** Due to various topics in other subjects, there is a brain overload. Considering the fact that other topics in other subjects are also overly difficult.

**Actual Response 10:** Lack of time for learning. I felt like the discussion was very limited.

The findings on the possible reasons why the identified topics appear to be challenging for students support the claim of Tekkaya, Ozkan, and Sungur (2001). They assert that the possible sources of students' difficulties in learning science topics are the curriculum, teaching-learning strategies, textbooks, and poor laboratory conditions and equipment. Students' motivation and interest must be considered (Tekkaya, Ozkan, & Sungur, 2001; Etobro & Fabinu, 2017).

The results indicate that students had difficulty learning science topics and were disinterested in the lesson because it contained difficult-to-understand words or terms and omitted subject matter relevant to daily life. This finding is consistent with Ogunkola and Samuel's 2011 study, which concluded that educators and curriculum development officials must poorly so many students in lower secondary school find science a difficult subject and quickly lose interest in it.

Additionally, the results indicate that the identified topics are uninteresting to students and that learning is difficult without a precise sequence of the subjects to be learned in the curriculum. There is a need to make the subject matter more relevant, meaningful, and interesting for students by reflecting on recent developments in the field and connecting lessons to real-world issues (Cimer, 2012, Ogunkola & Samuel, 2011; Tekkaya, Ozkan, & Sugur, 2001).

Finally, the results indicated that science subjects should be supported in the Senior High School Curriculum by a dedicated teacher, appropriate textbooks and instructional materials, laboratory sessions, and observation and experiments that actively engage students in the learning process. Thus, science subjects such as Earth and Life Science must be taught dynamically rather than as a static subject in textbooks, emphasizing inquiry-based instruction that allows students to pursue areas of personal interest (Cimer, 2012; Tekkaya, Ozkan, & Sugur, 2001).

**The difference in the perception of the respondents towards the challenging topics in Earth and Life Science in terms of gender, previous academic strand, and type of school**

Table 5 shows that the differences between the respondents' perception of the challenging topics in Earth and Life

Science in terms of gender, academic strand, and school type are statistically insignificant. It means that both male and female respondents agreed that the identified

challenging topics in the subject Earth and Life Science are the same ( $\chi^2 = 6.344$ ;  $p = .705$ ).

**Table 5:** Chi-square test result on the difference between the perception of the respondents towards the difficult topics in Earth and Life Science in terms of gender, academic strand, and type of school.

Variable	X <sup>2</sup>	df	Asymp. Sig. (2-sided)	Interpretation	Decision
Gender	6.344	9	.705	Statistically Not Significant	Accept H <sub>0</sub>
Academic Strand	27.108	36	.857	Statistically Not Significant	Accept H <sub>0</sub>
Type of School	13.191	9	.154	Statistically Not Significant	Accept H <sub>0</sub>

Also, when it comes to the academic strand (whether the student took BAM strand, TVL strand, STEM strand, HESS strand, or GAS), their responses to the most challenging topics in the subject Earth and Life Science is almost the same ( $\chi^2 = 27.108$ ;  $p = .875$ ). And lastly, Table 5 revealed that whether the respondent is a graduate of a public or private Senior High School, their responses are equally the same ( $\chi^2 = 13.191$ ;  $p = .154$ ). It means that the identified challenging topics in Earth and Life Science are similar in the public and private school settings.

However, the above findings contradicted Tekkaya, Ozkan, and Sungur (2001) and Sadera et al. (2020), who asserted a significant difference in respondents' perceptions of challenging biology topics by gender.

#### Interventions to improve Science teaching and learning

After identifying the challenging topics for the students and their primary reasons, the researchers, in consultation with other research studies, suggest that instructional learning material in the subject Earth and Life Science must be crafted and developed based on students' perceived challenging topics. The instructional materials should be student-centered and tailored to the students' personalities and learning environments.

Specifically, instructional materials for Earth and Life Science should focus on the most challenging topics identified in this study, such as bioenergetics, interaction and interdependence, natural hazards, mitigation, adaptation, and earth's material and resources and origin and structure of the earth.

The instructional learning material should address issues such as those affecting students, teachers, and the curriculum. Whether in Earth and Life Science or other Science subjects, instructional designers and developers should consider activities that encourage and support student motivation, maximize teacher mastery, and include the topics that can be completed within the allotted time.

The survey results indicate that students struggle to comprehend Earth and Life Science topics because they contain unfamiliar terms or words. Thus, it is strongly recommended to develop instructional learning materials in Life and Science in particular that include the development of students' scientific vocabulary to comprehend and understand the subject thoroughly.

#### 4. Conclusions

The study primarily explores the most challenging topics in Earth and Life Science as perceived by first-year college students in Quezon City University. The researchers conclude that majority of the respondents perceived that Bioenergetics, Interaction and Interdependence, Natural Hazards, Mitigation and Adaptation, Earth's Material and Resources, and Origin and Structure of the Earth are the

most challenging topics in the subject Earth and Life Science. On the other hand, the least topics considered to be the most challenging are How Animals Survive, How Plants Survive, and Introduction to Life Science. In terms of the Earth Science component, most of the respondents agreed that the topic on Hydrometeorological Phenomenon and Hazards is the most challenging one, followed Marine and Coastal Processes and their Effects, and Geologic Process and Hazards. The least challenging topics under the Earth Science component include The Earth Systems, The Universe and the Solar System, and History of the Earth. While in terms of Life Science component, the most challenging topics under the Life Science component as perceived by the students are The Central Dogma of Molecular Biology, Systematics which includes the identification, classification, naming, and describing of living things, Unifying Themes in Biology, and the Environment or Ecosystem. On the other hand, the least challenging topics for the respondents under the Life Science component include animal reproduction, Plant reproduction, and what living things need to survive? Plant Responses and Growth, and Vegetative Parts of Plants and their Functions.

Researchers also conclude that the primary reasons why the students find the topics in Earth and Life Science to be challenging is because the topics include terms or words that they are not familiar with and it is difficult to understand. Other factors such as student-related, teacher-related, and curriculum-related factors are considered the reasons why the identified topics are the most challenging for them.

And lastly, the researchers conclude that there is no significant difference in the respondents' perception towards the challenging topics in Earth and Life Science when grouped according to their gender, academic strand, and type of school.

The perspectives expressed by students in this study appear to contain valuable information for those involved in the science education process, such as teachers, schools, policymakers, and researchers. They should consider these perspectives when developing curricula, textbooks, teaching and learning activities and materials, and educator professional development processes.

#### 5. Acknowledgments

The authors would like to acknowledge all first-year college students at Quezon City University during the Second Semester of Academic Year 2020-2021 who participated in the survey. The authors would also like to thank their Department Head, Mr. Nelson M. Lazare, the OIC Dean of the College of Education Prof. Araceli Suyat, Vice-President for Research and Extension Dr. Racidon Bernarte, and the QCU President Dr. Theresita V. Atienza

for their encouragement and support in the conduct of this study. The authors would also like to acknowledge the support of their family and close friends.

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