International Journal of Humanities and Social Sciences
p-ISSN: 1694-2620
e-ISSN: 1694-2639
Vol. 10, No. 3 (2018), pp. 31-44, ©IJHSS

A Benchmarking of the Status of Science Instruction between Two Selected Secondary Schools in Philippines and Malaysia: A Case Study

Nafisah M. Abdulrachman
Graduate Student, Mindanao State University Marawi
Teacher, Marawi City Division
DepEd ARMM, Philippines

Abstract
This paper investigated and described the status and quality of secondary science instruction and learning between two selected schools of Philippines and Malaysia. Quantitative and qualitative methods were utilized for gathering data in the year 2012 for a period of 6 months. Quantitative data was acquired from the survey of ten (10) secondary science teachers for each school and a complete list of one class in each level. Qualitative data, on the other hand, was acquired from the analysis of curriculum documents, interviews, written responses, field notes, and classroom observations. The science curriculum of selected school in Philippines, as mandated by Department of Education Philippines, comprised of one science subject in each level. Meanwhile, the science curriculum of selected of school of Malaysia comprised of three essential science subjects at lower levels and four elective science subjects in the upper secondary levels. In terms of academic qualification, teachers at the Philippines were eligible and registered with lengthy years of teaching experience and various seminars attended compared with teachers at the Malaysia.

Keywords: benchmarking**,** science instruction, status of secondary school.

Introduction

Science pedagogy has long been recognized as a significant factor in the development of a nation. How student learns, how to measure student understanding in these areas and how students apply the learned knowledge in their society. Thus, Batomalaque (2003) stated that science education is a precedence concern of science educators. Science is frequently perceived to be of great meaning because of it's undeniably contribution to the development of technology and industry. Consequently, science subjects are included as core subject in secondary levels of basic education despite abstract difficulty. Another justification for the inclusion of science in school curricula is that all citizen need to achieve a degree of "scientific literacy" to enable them to participate effectively as citizen in modern society.

The researcher cannot deny that Malaysia is currently ahead the Philippines in terms of socioeconomic progress despite the fact that the Philippines was more economically progressive compared to Malaysia in the 1970's.

Moreover, a study of Ogena that measures performance of students in science and mathematics which is generating increasing attention is the Trends in Mathematics and Science Study (TIMSS) which is being done every four years since 1995 (Ogena, Laña, & Sasota, 2010). A draft of orientation paper of Physics Research Group (2009) noted that Filipino scientists are seemingly unanimous in their observation that the state of the country's Science and Technology is deplorable. It further emphasizes that during the 1996 TIMSS 13 year old Filipino students placed 40th of 41 countries that participated in science. This position did not improve during the 1999 TIMSS-Repeat where Philippines ranked 36th place out of 38 countries that participated in the said international examination. On the contrary, Malaysia placed 16th in mathematics and 22nd in science (Siang, 2002). Additionally, during the 2008 TIMSS where only the science high school who participated in the Advanced Mathematics category, the Philippines still performed lowest among the 10 countries (Manila Times, 2014).

By this extent, there is reason for critical alarm in the science education in the Republic of the Philippines considering the humble quality of science and mathematics education in the country. According to the University of the Philippines Institute of Science and Mathematics Education "many teachers do not have the content background required to teach the subjects they are teaching". Furthermore, aside from unqualified teachers, the status of science education is made inferior by lack of funding, classroom, laboratory room and equipment (Anonymous, 2009). Thus, the Philippines have lagged behind other Asian countries in footing number of scientist, volume of scientific study, performance of students, and the quality of its universities (Bernido & Carpio-Bernido, 2010).

However, the resolution of the study, "Performance of Philippine High Schools With Special Science Curriculum In The 2008 TIMSS-Advanced have shown that Philippine Science High School (PSHS) lived up to its repute as the leading secondary school in the country. In view of this, there is a need to reconsider the implementation of curriculum in other science school, which generally performed far behind the PSHS. Periodic evaluation of the effectiveness of the special curriculum being followed in the other SHS may be done in order to determine the improvement that would have to be done in SHS that have gone "nominal" (Science High School in name only, but not in essence). The study further recommended looking into the curriculum and practices in other countries to improve the performance.

The association between Science and Technology and economic development cannot be denied, thus, efforts for improving the Filipino students' competence in science and mathematics, which makes the backbone of research and innovation, need to be accelerated if the country wants to be competitive (Ogena, Laña, &Sasota, 2010). Over the past few decades, there have been calls for reform and the improvement of school practice (NRC, 1996). That is to say, members of the teaching profession are interested in seeing that schools are 'doing better'.

Out of this call to action one needs to compare the current scenario of science teaching and learning of Philippine school in its Southeast Asian neighbor towards development. Hence, the researcher's goal is to have a benchmarking between the current situation of secondary science instruction situation in the selected secondary schools in Philippines and Malaysia.

The purpose of this paper is to compare and contrast the status and quality of science background learning in the selected national high school in the Philippines and Malaysia. More specifically the study will address the following research questions: 1) what is the difference between the existing teaching and learning situation of science education in selected secondary schools in Philippines and Malaysia? 2) How do Filipino science teachers differ from their Malaysian counterparts in terms of academic qualification, eligibility,

training/conference/seminar attended, and years of teaching experience? 3) What factors do Filipino and Malaysian science teachers perceive to affect the quality of teaching and learning in selected secondary schools in Philippines and Malaysia?

In an effort to develop the instruction of science in Philippine national high school and make the learning more participative to students, this research hopes to make the following contributions to science education. Firstly, learning the existing status of secondary science teaching and learning in other countries should be informative, and also help turn faster the wheel of the Philippine government in improving the administration, and visual science classroom set-up in secondary schools in the country and, consequently, better learning for the students. Secondly, the results of the study will bring science educators and curriculum planners, and the government the concrete image of science teaching and learning and practices in rural area. This in turn can help in planning and formulating further policies for science teaching and learning in rural areas. Finally, results of the study could serve as basis in the development of science education in the country.

Method

Participants

The population of the study was secondary science teachers and secondary students of selected secondary schools in the Philippines and Malaysia. The subject participants are ten (10) science teachers in the Philippines who were surveyed and 5were interviewed ten (10) science teachers in Malaysia was surveyed and ten (10) were interviewed. A complete list of one class in each level was used in this study which resulted to 84 students were surveyed and 40 students were interviewed in Philippines, and 99 students and 39 students in Malaysia.

Design

A mixed method of qualitative and quantitative information from different sources was used. Quantitative data was acquired from the survey of teachers and students. Qualitative data on the other hand was acquired from the analysis of curriculum documents, interviews, written responses, field notes and classroom observations.

Materials

There were two types of data gathering instruments. One is the secondary data guide. The other one is self-administered questionnaire. Secondary data guide was used in collecting information pertaining to curriculum. Secondary data such as curriculum and syllabus were collected and assembled in variety of ways. Self-administered survey questionnaire for teachers and students used in gathering information pertaining to the teaching- learning situation.

Interview for teachers and students using tape recorder and classroom observation were conducted to further validate the secondary data and self-administered questionnaires. Classroom observation checklist comprises four sections namely class structure, methods, teacher-student interaction, and lesson planning.

Procedure

The data gathering of this study was in five stages. The first stage is having a contact to seek approval to access schools. Second, the teacher and student survey questionnaires were pilot-tested with science teachers and students at RPMD National Science High School for the content and construct validity. Then, the survey questionnaires were disseminated to science teachers at selected secondary schools as well as the s survey questionnaires for students. Instantaneously curriculum documents such as science curriculum and science syllabi were

acquired. The final stage of this data collection involved interviews with students and teachers, and classroom observation at selected secondary schools.

Results

The representation of authentic science instruction in the selected schools was based on the information gathered from the subject respondents, site observations, and significant documents needed. The evidences gathered in this study have been used to generate a representation of concrete status of science instruction of the said schools. Table 1 show the major findings and highlights the salient point of the similarities and differences of science education between the selected schools.

Table 1: Similarities and Differences of General Findings between selected schools in Philippines (A) and Malaysia (B)

Category	**Secondary School A**	**Secondary School B**
Goal of science education	To develop scientific literacy among students that will prepare them to be informed and participative citizens who are able to make judgments and decisions regarding applications of scientific knowledge that may have social, health or environmental aspect.	Science education in Malaysia nurtures a science and technology culture by focusing on the development of individuals who are competitive, dynamic, robust, and resilient and be able to master scientific knowledge and technological competency
Science curriculum	The science curriculum comprises one science subject each level namely Integrated Science, Biology, Chemistry, and Physics for grade seven (first year), second year, third year and fourth year respectively. The science curriculum is didactic and teacher-centered except for science in grade seven. The science curriculum is content knowledge-focused for preparation for further education and careers. The science curriculum focuses on memorization of factual science concepts.	The science curriculum comprises three core science subjects and four elective science subjects. The core science subjects are Science at primary school level, Science at lower secondary level and Science at upper secondary level. Elective science subjects are offered at the upper secondary level and consist of Biology, Chemistry, Physics, and Additional Science. The science curriculum is didactic and student-centered. The science curriculum is content knowledge-focused for preparation for further education and careers. The science curriculum focuses on memorization of factual science concepts. The science curriculum includes valuing nature and working towards the preservation and

		conservation of the environment.
Syllabus	Teachers rely on reference from Department of Education and other textbooks to follow the scope of the curriculum.	Syllabus follows exactly the scope and sequence of curriculum.
Time spent in science courses	1200 minute per week Half of the time is allotted to teacher explanation and demonstrations and notes copying by students.	1665 minute per week Half of the time is allotted to teacher explanation and notes copying by the students.
Assessment practices in learning science	Assessment based on appreciative of science content, skills and processes. Assessment methods are usually in written tests and quizzes. Summative evaluation is for grading and reporting.	Assessment based on appreciative of science content, skills and processes. Assessment methods are usually in written tests and quizzes. Summative evaluation is for grading and reporting. Assessment is also for helping students to pass in tertiary entrance examination
Teaching Methodology	Talk and chalk. Carry out science experiment some of the time. Lots of notes copying. Work in groups with other students regularly. Teacher-centered and teacher-dominated. Students are active listeners to teacher's instruction.	Explaining with physical set-up of the concepts. Carry out science experiments most of the time. Lots of notes copying. Work in groups with other students regularly. Semi-student-centered. Students are active listeners to teacher's instruction.
Resources and facilities in learning science	Students have science textbooks. One of the science teachers is also the laboratory assistant. Incomplete science laboratory and equipment	Students have science textbooks. Have full time laboratory assistants. Complete science laboratory and equipment are regularly maintained.
Physical set-up and	Class sizes are very large (31-50).	Class sizes are manageable (31-

class size	Some of the classrooms are not conducive for effective learning.	40). Classrooms are conducive for effective learning.
Presentation of lesson	Teacher delivers well-planned lecture. Lecture content appears knowledgeable and well organized. Talk and chalk. Provide improvised materials to assess learning in science.	Teacher delivers well-planned lecture. Lecture content appears knowledgeable and well organized. Provide well-designed materials and employ instructional tools (i.e. computer, overheads)
Medium of instruction	English and *Tagalog*	*Bahasa Melayu* and English
Teacher academic qualifications	Teachers are mostly Bachelor of Science graduate Teachers are certified and registered to teach. Teachers are qualified and competent. More than half of science teachers have more than 10 years of teaching experience Some teachers have chances for ongoing professional growth. Most of the teachers are major in biology.	Teachers are mostly Bachelor of Science in Education graduate Teachers are not required to be certified and registered to teach. 60% of science teachers have less than 6 years of teaching experience Most teachers have chances for ongoing professional growth. Teachers are major in chemistry (40%), biology (30%) and physics and general science (20%).

Figure 1: Inhibiting effective science instruction in school A

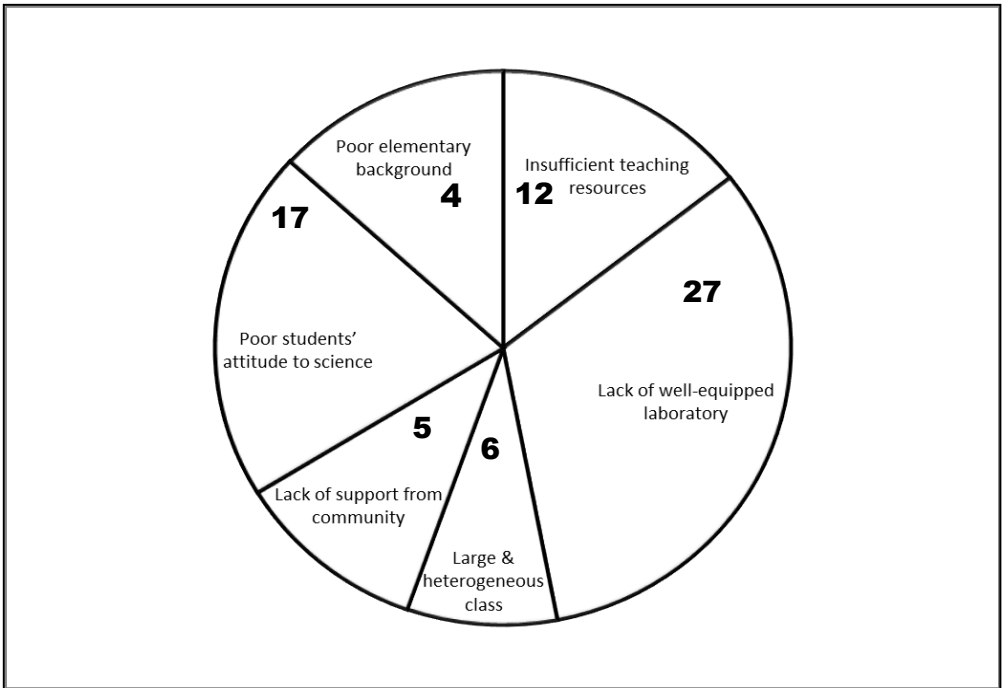


Figure 1. Factors inhibiting effective science teaching as mentioned by science teachers in school A in the Philippines and the total weighted rank for each factor

Furthermore, the questionnaire asked science teachers to give any four factors that inhibit the teaching and learning of science in their schools in order of importance with the most important factor listed as first and the least important factor listed as fourth. The summary of the rank of importance and the total weighted rank for each factor is presented in Figure 1 for selected school in Philippines and in Figure 2 for selected school in Malaysia.

Figure 2: Inhibiting effective science instruction in school B

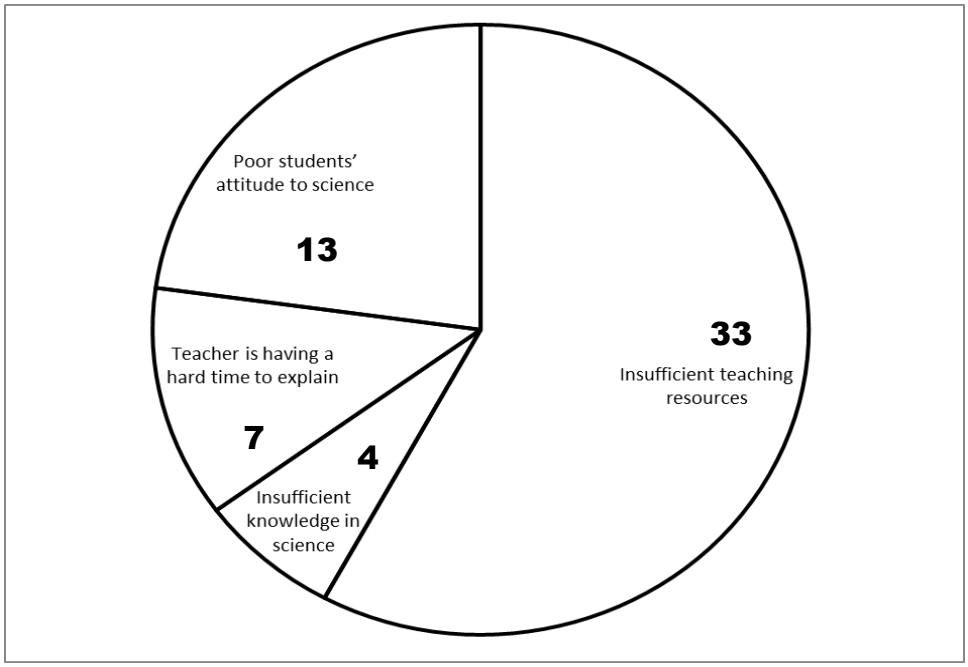


Figure 2. Factors inhibiting effective science teaching as mentioned by science teachers in school B in Malaysia and the total weighted rank for each factor

Discussion

This section answers briefly the research questions of this study as follows.

Research Question 1: What is the difference between the teaching and learning situation of science education in the selected secondary schools in the Philippines (A) and Malaysia (B)? The difference between the existing teaching and learning situation of science education in the selected secondary schools revealed with the documents and evidences acquired from the teachers and students of the said schools. The first difference encountered in this study is the goal of science education in which in Philippines it is focused on the development of scientific literacy among the students who are able to make judgments and decisions regarding the applications of scientific knowledge whereas in Malaysia it is focusing on the development of individuals to be competitive and resilient with mastery of scientific knowledge.

Second difference is the content of science curriculum and syllabus. School A curriculum composes of one science subject each level) while students in School B encounter science courses eleven times in the entire secondary school years.

The third difference is the time allotment in science subject in which 1200 minutes per week is allotted in School A and 1665 minutes in School B.

Availability and condition of lecture room, science laboratory rooms, facilities and equipment and instructional materials differ in the two schools. School B has adequate lecture

rooms, manageable class size, adequate laboratory rooms, facilities and equipment with laboratory assistant and storage room for chemical reagents and facilities, computers, projectors and well-designed materials to assist the learning. While School A has very large class size, only one laboratory room with inadequate facilities and equipment and there is no full time laboratory assistant to help maintain the good condition of available facilities

One of difference in presentation of lesson is the kind of materials used to assess the learning science. School a teachers use improvised materials and well-designed materials for School B science teachers. When School A teachers use talk and chalk method, School B is now practicing constructivism method with the help of power point presentation and well-designed materials in discussing.

Furthermore, science teachers in the two selected schools commonly used written test and quizzes to assess the students based on understanding of science content, skills and process. Assessment in both schools is for summative purposes of grading and reporting but Schoool B assess also the students to help them pass the tertiary entrance examination.

Research Question 2: How do Filipino science teachers differ in their Malaysian counterparts in terms of academic qualification, eligibility, training/conference/seminar attended, and years of teaching conference? In terms of academic qualification, science teachers are all Bachelor of Science in science or Bachelor of Science in education holders. Science teachers in both schools do not have Master degree except for one Doctor of philosophy in School A.

Science teachers in School A are certified and registered to teach by attending a national licensure examination for teachers or by acquiring enough requirements to be eligible. Moreover, half of them are biology major. In contrast, science teachers in School B are able to teach in secondary schools after receiving a diploma of Bachelor of Science and they are chemistry, physics and biology major.

Science teachers in School a have a lot of training/conference/seminar attended unlike the teachers in School B do have limited trainings attended.

Research Question 3: What factors do Filipino and Malaysian science teachers perceive to affect the quality of science instruction in the selected schools? Important factors that science teachers in School A stated that limit the effectiveness of science instruction include inadequate of well-equipped laboratory, poor students' attitude towards science, absence of enough sufficient teaching resources including modern textbooks, poor elementary background and lack of support from school administrations, parents and community, and heterogeneous and large class size. In addition, lack of full-time laboratory assistants and chemical reagents, poor maintenance of laboratory facilities and equipment, and non-conducive physical classroom environment further limit the quality of teaching and learning of science in School A.

The significant factors that science teachers in School B stated that disturb the quality of science teaching and learning include insufficient teaching resources, poor students' attitude towards science, and insufficient knowledge about science that leads to have a hard time explaining science concepts.

Conclusion

The revelation of this work agreed with the article written in the featured column section of Manila Times on May 28, 2014 entitled "Science education realities". The article described the Philippine classroom and science laboratory are inadequate for the learners as reported by the

Department of Education. It also mentioned that behind the poor quality of basic knowledge in science and mathematics education is the lack of science education facility.

The general findings of this work suggested that even though Philippine science teachers are eligibly qualified with numerous experiences and have chances for professional growth, physical set-up of classrooms, laboratory rooms and apparatus still need to be improved for the development of science instruction in the country. Furthermore, classroom activities that involve critical thinking skills to the part of the students need to be developed as well as the time allotment for experiments or non-lecture activities should be extended.

Hence this benchmarking study between Philippines and Malaysia will be one of the instruments to improve the science education not only in respondent-schools but to all secondary schools across the country. As Watson (1993) says, benchmarking is learning how to improve by sharing ideas.

References

Batomalaque, A. E. (2003). *Basic Science Development Program of the Philippines for International Cooperation*. Retrieved from http://www.criced.tsukuba.ac.jp/pdf/09_Philippines_Antonio.pdf.

Bernido, C., & Bernido M. V. (2010).*Ramon Magsaysay Award Presentation Ceremonies*. Retrieved from http://rmaward.asia/rmtli/a-passion-for-physics-christopher-bernido-and-ma-victoria-carpio-bernido/.

National Research Council. (1996). *National science education standards*. Washington, DC: National Academic Press.

Ogena, E. B., Laña, R. D., & Sasota, R. S. (2010). Proceedings from 11th National Convention on Statistics (NCS): *Performance of Philippine High Schools with Special Curriculum in the 2008 Trends in International Mathematics and Science Study (TIMSS-Advanced)*.

Siang, L.K. (2002). *Revisit my comments on TIMSS 1999 in 2002*. Retrieved from http://blog.limkitsiang.com/2009/01/11/revisit-my-comments-on-timss-1999-in-2002/.

Watson, G.H. (1993). *Strategic benchmarking: How to rate your company's performance against the world's best*. New York, NY: Willey.

Science education realities. (2014). *Featured Column, Manila Times newspaper*. Retrieved from www.manilatimes.net/science-education-realities/100096/#.

Appendix 1

A. Classroom set-up of school A

B. Classroom set-up of school B

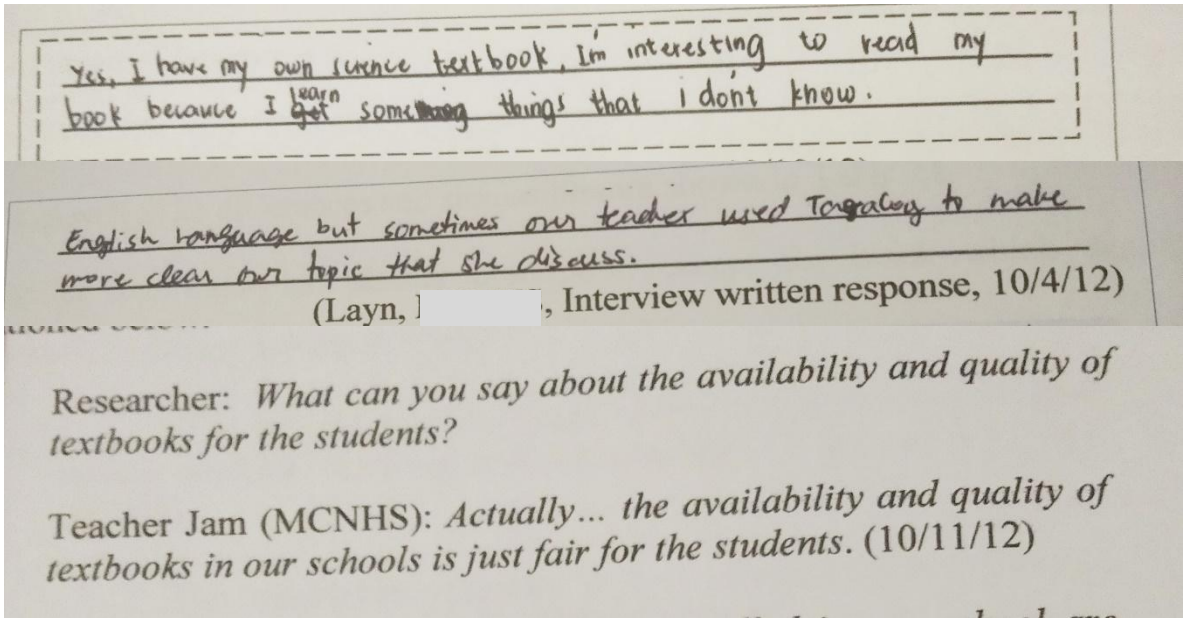
Appendix 2

A. Science laboratory room of school A

B. Science laboratory room of school B

Appendix 3

A. Some of the written responses and part of transcribed interview of subject respondents in school A



Yes, I have my own science textbook, Im interesting to read my book because I learn some things that I dont know.

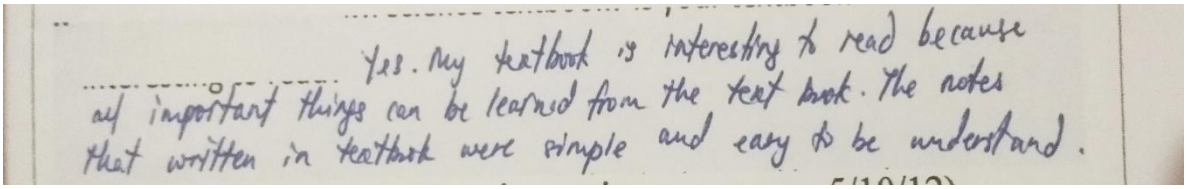
English language but sometimes our teacher used Tagalog to make more clear our topic that she discuss.

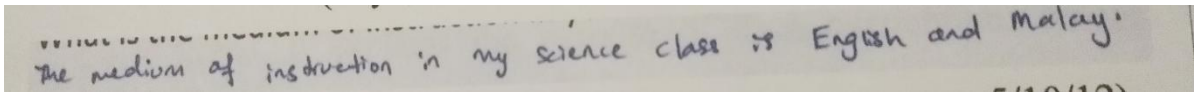
(Layn, [redacted], Interview written response, 10/4/12)

Researcher: *What can you say about the availability and quality of textbooks for the students?*

Teacher Jam (MCNHS): *Actually... the availability and quality of textbooks in our schools is just fair for the students.* (10/11/12)

B. Some of the written responses and part of transcribed interview of subject respondents in school B


Yes. My textbook is interesting to read because all important things can be learned from the text book. The notes that written in textbook were simple and easy to be understand.


The medium of instruction in my science class is English and Malay.

Researcher: *What can you say about the availability and quality of textbooks for the students?*

Teacher Atom (SMK Mahsuri): *Textbook provides a lot of information on.... students' syllabus and gives them cognitive questions for further learning. Ahmmm.. All students are provided with textbooks at the start of year.* (7/23/12)

Teacher Ryan (SMK Mahsuri): *All Malaysian students who enroll in government or government-assisted schools are eligible for free textbooks. Alhamdulillah...the quality of textbooks have also improved over the years with many...colored pictures... diagrams...notes and website address in order to find more relevant information* (7/23/12).