

TEACHING SCIENCE AND MATHEMATICS IN RURAL AREA: A CASE STUDY OF SK SABUR, SABAH, MALAYSIA

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Abstract: Teaching in rural elementary school is itself a challenge for teachers. Since rural schools generally have inferior equipment and infrastructure as opposed to urban schools, teaching technical subjects such as Science and Mathematics can be even more challenging than non-technical ones. This study attempted to understand the challenges and initiatives of teachers for teaching Science and mathematics in SK Sabur, Banggi island (*Pulau Banggi*), Kudat, Sabah, Malaysia. As a qualitative study, it collected data from a descriptive case study, a semi-structured interview, and observation. Through triangulation of the data and thematic analysis of the transcriptions, the study found the following themes: (I) Governmental role of education in the rural area, (II) personal sacrifices, and (III) local-based innovation and passion for teaching. All in all, it is pertinent for the government to continue improving ways to mitigate the challenges that teachers face in teaching Science and Mathematics in rural schools to ensure the delivery of quality education across all areas of the country. Future studies should include challenges of teaching in the rural area during Covid-19-lockdown and restricted movement phases.

Keywords: Education, policy, rural, Sabah, STEM

1. Introduction

The Government of Malaysia is committed in implementing and promoting scientific knowledge throughout the country, as can be seen in the policies that have been introduced over the years (Ling Chia & Maat, 2018; Sumintono, 2017). Ideally, such a commitment entails that even the rural areas will not be left behind in education, especially in Science and Mathematics. However, the reality on the ground indicates otherwise, creating a significant gap in quality education delivery between rural and urban schools.

School's locality, whether urban or rural, does affect the achievement of students (Fatin Aliah, Mohd Salleh, Mohammad Bilal, & Salmiza, 2014; Ministry of Education, 2012). In general, students from rural areas have lower marks in Science and Mathematics as compared to their urban counterparts (Ramos, Duque & Nieto, 2016; Young, 1998). It is unfortunate that locality also affects critical thinking in Science achievement (Domike & Odey, 2011) and Mathematics (Zhou, Da. Jinqing & Liu, 2020). Yet, the challenges of teaching in the rural area are not unique in Malaysia as it is also prevalent in many other countries (Domike & Odey, 2011; Ramos Lobo et al., 2016; Zhou, Da, Jinqing & Liu, 2020). In Malaysia, as of 2019, around 3 million people live in remote areas (Adnan, 2019). In particular, Sabah and Sarawak are the two states with the most inferior infrastructure developments of all states in Malaysia, thus with the most number of rural schools (Ministry of Education, 2012). At the time of the writing of this article, since March 2020, Malaysia has gone through phases of Restricted Movement Control Order (RMCOs) due to the Covid-19 pandemic. During these phases, as schools are closed, classes have to be conducted online. However, it proves to be troublesome for many, especially in the two states. In Sabah alone, 52% of the students have neither internet access nor gadgets for online learning (Nasrah, 2020). Furthermore, studies regarding rural schools in Malaysia are limited (Ardi, Bambang, & Nora, 2012).

Being in one of the remotest places in Sabah, which is Pulau Banggi, sits SK Sabur, the case study for this research. SK Sabur or its full official designation *Sekolah Kebangsaan Sabur* or in English verbatim, National School Sabur, is a public elementary school. To reach SK Sabur, one will need to drive about three hours from the capital city of Kota Kinabalu to the town of Kudat, then takes an hour trip by ferry to the Island and later drives for another one and a half hour. On top of poor road access and limited phone and internet coverage, SK Sabur too relies on solar energy for electricity and uses rain for water supply. Currently, it has 14 teachers with only one female teacher. Four of them teach Science and Mathematics. Opened in 1984, SK Sabur has 120 students ranging from the age of seven

(Standard 1) to 12 years old (standard 6). Since some of the students live in nearby smaller islands, which makes coming to school difficult and dangerous, the school provides a dormitory for the students. However, it has a limited capacity. Therefore, parents whose children did not get to stay in the dormitory build makeshift houses that serve as a transit for the children during the school days. Most of these makeshift houses, unfortunately, do not have an electric connection or water supply. The school host a variety of local ethnicities as students, amongst one of them is the Dusun Bongi ethnic, a unique indigenous ethnic on the island.

This study attempts to understand the challenges and initiatives of teachers for teaching Science and Mathematics in such conditions and the initiatives they had taken up to mitigate or overcome the challenges. The research questions of this study are as follow:

- (i) What are the challenges faced by teachers teaching Science and Mathematics in SK Sabur, Kudat?
- (ii) How did teachers teaching Science and Mathematics in SK Sabur, Kudat overcome these challenges?

2. Literature Review

2.1 *Impact of locality on education performance*

Studies regarding rural academic achievement and comparison with urban areas are numerous. Locality whether urban or rural has been shown as a factor in different educational achievement, where students in rural areas seem to be doing lesser than their urban counterparts (Fatin Aliah et al., 2014; Ministry of Education, 2012; Young, 1998). This can be attributed to many factors such as environment (Zainudin Abu Bakar & Haridas, 2011), parents' role and support (Nayak, Mohanty, Beriha, & Mohapatra, 2017; Zalika, Kassim, & Salleh, 2009), poverty (Miller, Votruba-Drzal, & Coley, 2019), attitude (Davadas & Lay, 2020), lack of teaching material (Soe, 2018), health (Nayak et al., 2017), lack of infrastructure (Mansor, Hamid, Medina, Vikaraman, Abdul Wahab, Mohd Nor, & Alias., 2020; Zalika et al., 2009) and income (Miller et al., 2019; Zalika et al., 2009). However, this is not conclusive, for there are also shreds of evidence showing that there are no significant differences in rural and urban achievement. In some cases, rural students outperformed their urban counterparts (Tayyaba, 2012), and this can be seen in a case in Sabah as well (DailyExpress, 2019).

2.2 *Challenges in teaching in the rural area*

Challenges in the rural areas in education may involve internet and communication access (Sern, Kamarudin, Lip & Hasnan., 2017; Soe, 2018), which involve accessing the internet for class and information, and this can be seen recently during RMCO in Malaysia (Nasrah, 2020) where rural students in Sabah made news headline for the dangerous way attempted to get internet coverage for their online classes (Lee, 2020; Chan, 2020). A study made in Malaysia shows that the usage of ICT is effective in helping teachers to teach Science in rural areas (Shanmugam & Balakrishnan, 2020). However, the lack of infrastructure in rural schools might have hampered this (Mansor et al., 2020). Other challenges in teaching in the rural area involve language barrier (Condy & Blease, 2014; Febriana, Nurkamto, Rochsantiningsih & Muhtia, 2018), parents of the students (Condy & Blease, 2014), teacher's inadequacy (Mandina, 2012), safety (Moidunny, Lee, Kaman, Kuslan, Husien, Khalid & Rahman, 2019), teacher's lack of training/competence (Mansor et al., 2020; Sern et al., 2017), student's competency (Condy & Blease, 2014) and student's mindset (Fatin Aliah et al., 2014; Febriana et al., 2018).

2.3 *Mathematics achievement in the rural area*

In a study made on rural kindergartens, their Mathematics achievement is lower than their urban counterparts (Graham & Provost, 2012). This can also be seen in China, where elementary students have lower Mathematics outcomes than their urban counterparts (Zhou, Da, Jinqing & Liu, 2020). One study in Malaysia found that one of the factors that make the student (both urban and rural) uninterested in STEM subjects is students' negative perception towards Mathematics (Fatin Aliah et al., 2014).

Furthermore, another study found that the motivation to learn Mathematics is moderate (Wan Naliza & Siti Mistima, 2020) and the percentage of getting an 'A' for Mathematics is halved as compared to the achievement in the urban area (Fatin Aliah et al., 2014). Another research in Malaysia showed that rural students perform poorly when Mathematics was taught in English in 2003 (Sumintono, 2017).

2.4 Science achievement in the rural area

Science subjects are considered to be difficult by students in Malaysia (Fatin Aliah et al., 2014). In one study in Africa, it is found that rural students are affected in terms of their critical thinking in Science accomplishments (Domike & Odey, 2011). One study in rural Malaysia found that female students perform better than males and that the teacher and student's attitude plays a role in student's achievement in Science (Velloo, Perumal, & Vikneswary, 2013). In Malaysia, urban students scoring an 'A' for Science subjects almost double their rural counterparts, who also view Science in a negative perception (Fatin Aliah et al., 2014). When Science was taught in English in Malaysia, starting in 2003, one research also showed that rural students also perform poorly (Sumintono, 2017). Based on the literature search, there appears to be a lack of study regarding teaching Science and Mathematics in the rural part of Sabah.

3. Methodology

This study is a qualitative and descriptive case study. A descriptive case study is a study where its purpose is to describe a phenomenon in its real-world setting (Yin, 2018). It obtained its primary data through in-depth interviews and observations. Secondary data were derived from articles concerning the topic. The interviewees were teachers teaching Science and Mathematics in the school (n=4). This also acts as the triangulation initiative for the validation of the data. The sample for this interview was purposive. The in-depth interviews were transcribed and interpreted using Thematic Analysis. Thematic analysis is a research method for the subjective analysis interpretation of the content of text data using the process of coding and detecting as well as identifying patterns or themes (Clarke & Braun, 2017). There are a few steps to conduct thematic analysis. The first one is familiarisation with data, next is generating initial codes, then searching for themes, reviewing themes, defining and naming themes, and lastly producing the report (Braun & Clarke, 2006). The in-depth interviews were conducted using semi-structured questions that were opinion based and related to respondents' own experience and knowledge. An interview protocol was created and validated by an expert. The interviews were conducted face-to-face during the researcher's visit to the school on a 3-day field trip. In an ethical concern, this study had obtained approval from the school management and the Education District Department before the start of the study.

4. Findings

Four themes were developed in this study as discussed in the following section. Table 1 shows the respondents as well as their details during the interview. For academic qualifications, the respondents had at least a Bachelors' Degree in education (P1, P2, and P4) while P3 has a Bachelor's Degree in Engineering (Oil and Gas). The respondents had a mean age of 31.25. Teacher's names are coded and represented in the following table.

Table 1: List of interviews with details

| No | Teacher's Code | Gender | Age | Teaching experience at SK Sabur (Approximate: years/months) | Subject |
|----|----------------|--------|-----|--|-------------|
| 1. | P1 | Male | 27 | 3 years | Science |
| 2. | P2 | Male | 25 | 10 Months | Science |
| 3. | P3 | Male | 29 | 3 Months | Mathematics |
| 4. | P4 | Male | 44 | 3 years | Mathematics |

4.1 Governmental role of education in the rural area

The first theme that was developed using thematic analysis is the governmental role of education in the rural area. It is deemed by the study as the main theme due to its presence in all of the respondent's responses. As a public elementary school, SK Sabur relies on funding and operation by the government i.e., the Ministry of Education and Sabah's Education Department (Federal and state level). However, due to the insufficient funds allocated to the school, it had impacted the way things were done in the school, which will be discussed in this theme. The main concern and challenges of all the respondents in teaching Science was the lack of proper infrastructure in the school. One good example was the absence of a science lab, lack of materials, apparatus, and place to carry out hands-on science experiments. This rendered the teachers to be unable to make experiments and practice for the students.

When teaching Mathematics, teacher P3 felt that the lack of materials to present a mathematical concept such as a sphere or circular object made learning to be less interesting for the students. Initiative taken to overcome this came in the form of teachers replacing experiments that they could not do by watching pre-downloaded videos from the teacher's laptop or phone. Some students were so poor that they could not afford to buy a reference book and other learning materials. Teachers sometimes had to provide reference books and extra materials to the students on their initiative.

Next is the challenge of getting the internet and communication access. The school has a Wi-Fi connection, however, the coverage is limited as the school and its surrounding had very poor phone signals, preventing teachers from getting information and communication for either education-related or personal usage. Since all of the teachers lived nearby the schools, they also had limited internet even when they returned home after work. Nowadays, most textbooks have a QR code that is generated for teachers and students alike to use to access extra information that is relevant to their study. However, this was seen to be not effective due to poor internet coverage in school. As a result, teachers even had to go out of the school during their free time, weekends, or even climb up a hill just to get a good connection to get the information to teach or for personal usage.

The challenge of getting the internet also impacted the student's ability to see the world from their locality. The teachers believed that the students lacked exposure to the outside world and technological advancements. This affected their understanding on the concepts in learning Science. As a case in point, one teacher (P2) recalled trying to draw something related to science but worried that students could not imagine something that they had never seen.

As much as the infrastructure issue impacted the school's ability to teaching and getting good internet and communication, it also provided a form of a challenge as well for the surrounding area. The school provided a dormitory for students from far away locations to stay and to study in the school. However, it could only accommodate a certain number of students. Thus, parents whose children did not get to stay in the dormitory built makeshift houses mostly without proper electricity or running water. These makeshift houses acted as a transit place for them to cater the needs of their children at the school. They would usually return to their home at the weekend. According to the teachers, with no running water and electricity, students were not able to study comfortably at night. To counter this, teachers often communicated and advised parents to emphasize helping out their children as best as they could, especially in ensuring that the students completed their homework.

For some time, Mathematics option teachers were absent in the school. It was only in the current year (2020) that a Mathematics teacher was sent to the school. As for 2020, there is only one Mathematics option teacher in the school. This proves to be a challenge as well because the new Mathematics teacher did not have a pedagogical background. The teacher is still up to this time of writing will be taking pedagogical and education training to complement his degree.

The teachers also highlighted the fact that the syllabus was harder for rural students to understand, especially for Mathematics. The syllabus of Mathematics in all Malaysian schools is standardized, however, the teachers felt that in some cases the level of learning was a bit too high for the students in the rural school. This was what had led to lower understanding and achievements, among other things.

The aforementioned challenges have an underlying theme, whereby the governmental role of providing education in the rural area can be hampered by its policy and administration that do not cater to the uniqueness of the location of the schools. This then affects the condition of the rural school and the surrounding area.

4.2 Personal sacrifices

The second theme developed was the theme of personal sacrifices. Personal sacrifices were observed in all of the interviews. This can be considered as prioritization of their work compared to their comfort. The weekend is where most teachers left the island to go back to their homes. However, this weekend time was also dedicated to getting information from the internet either by reading or downloading videos and information that was relevant for their classes. Therefore, the teachers had to sacrifice some of their time during weekends to do work that they could have done during weekdays at the school. So, before they left the school for the weekend, they had to plan what they needed to download during the weekends.

Another reason for the establishment of this theme can be seen in terms of how certain teachers who had to teach optional subjects due to the unavailability of teachers with specific skills to teach those subjects. This can be seen in the case of P4, where being a non-option in Mathematics but still had to teach it. Recent graduates from the teaching institute and university alike with a specialization in a particular subject or field is called an option teacher, such as a science-option teacher, or mathematics-option teacher. Being an option teacher in a particular subject means that they have the training and the know-how to teach the subject. Therefore, non-option teachers who have to take the role of other teachers have to relearn things that they were not trained on their own. This, according to the teachers, demotivated them to teach.

There were certain times when the surrounding areas were flooded; thus, it blocked the route in and out of the school. P1 recalled the time he was stranded when they were supposed to go back for holidays. During the MCO phase when the school had to be shut down, P4 was stuck on the island for weeks, unable to leave because of the shutdown of transportations in and out of the island. Personal sacrifice also comes in the form of a personal relationship. Working at SK Sabur means that they were far away from their home with limited access to communicate or seeing loved ones. P1 who was recently married only got the chance to meet his wife when he got off the island.

4.3 Local based innovation and passion for teaching

Amongst the various challenges that the teachers faced in teaching students in the rural area came in the form of language. Even though the national language was understandable by all students, several Standard 1 students needed translators. This was largely due to their mother tongue which was different from the national language. For instance, P2 relied on in-class students who could act as translators for help. For students who are left behind in studies, the school would send them to extra classes that would help them to grasp the subjects better.

P1 is a teacher that is a music-option with a minor in science. When he was teaching non-science subjects, he would sometimes include science teaching in the class just to help ensure that the students had some exposure. When he was assigned to teach science, but challenged with the lack of infrastructure to teach one, he came up with an idea of a water rocket competition amongst the school children. It went so well that his team in SK Sabur, won some prizes at an inter-school-water rocket competition. P1 said that he was passionate about Science, where he used to apply for a Science-option during his study days but ended up with music. Therefore, he enjoyed teaching Science. This can also be seen by P2 who noticed that students liked practical Science, where they could play around rather than just learning about theory. This can be attributed to some of the student's inability to read properly. As compared to Mathematics, the students appeared to be more interested in and excited by Science better.

For Mathematics, many students saw it as a 'killer subject'. P3 and P4 would use local context the students were familiar with within their daily lives rather than relying on examples given in the textbook that the students could not relate to such as using a formula to count fish or planting plants or even designing and measuring crop field.

All SK Sabur teachers lived close to the school with some living in the school's accommodation for teachers. This allowed students who stayed around the school to meet up with the teachers after school to study or play around with them. Some teachers had left the school because they could not stand the environment in the rural area. Some others were looking forward to staying even longer regardless of the challenges that they had.

5. Discussions and Limitations

The analysed themes using the nuances in the data for challenges that were presented in this study indicate that teaching Science and Mathematics has its unique attributes in the rural area, especially Science as compared to other subjects that do not need the use of a laboratory. The factorization of student's exposure is as well present in the teacher's teaching and learning sessions in the school for both subjects. The challenges that were seen in this study also mirror previous studies regarding rural schools. Although the condition of the school had improved drastically with Solar energy and with the existence of some form of Wi-Fi as compared to its early days, however, infrastructure wise it was still not up to a 21st-century standard. The main theme created in this study reflected as a common dimension that is observed by many previous studies such as infrastructure (Mansor et al., 2020; Zalika et al., 2009) and environment (Zainudin Abu Bakar & Haridas, 2011), lack of materials (Soe, 2018), safety (Moidunny et al., 2019) internet and communication (Sern et al., 2017), teachers inadequacy (Mandina, 2012), student's competency (Condy & Blease, 2014) and student's mindset (Febriana et al., 2018).

Despite the differences in the locality, certain challenges are present both in the rural and urban context such as student's mentality on Science and Mathematics (Fatin Aliah et al., 2014). Teacher-student rapport was observed within this case study, where previous studies see the significant impact of a positive student-teacher rapport (Veloo et al., 2013; Zhou, Da, Jinqing & Liu, 2020). In the case of SK Sabur, since both students and teachers were technically 'stuck' there until the weekend, it had allowed for frequent interaction amongst them. Student's interest in Science in the school was higher as compared to Mathematics, and this can be demonstrated in the poor achievements of Mathematics in the school. This can be seen in a previous study where Mathematics was considered as the most difficult for students in school while Science being most liked (Şahin, Meltem, Oya & Erdal, 2014).

This study assessed the challenges and initiatives of teachers teaching Science and Mathematics in a rural school such as SK Sabur. It groups the challenges and initiatives into a few themes, providing an interconnected theme that has an underlying element within the data. Therefore, some implications that can be said through the development of these themes would help to highlight the roles of the government, the teachers, and their surroundings. Several implications of this study would be in the ability to voice out teachers and community concerns regarding education in the rural area. Whereby the governmental role in providing apt infrastructure for the school would allow for a better teaching environment for the teachers and students, sprouting from this, infrastructure for the surrounding area should also be developed to ensure a spillover effect to the community in the long run. Moreover, the results of the study could be a guideline for policy and governmental work to take place that would include for teachers in the rural area to be appreciated and celebrated more. This is to ensure that their unsung work will be noticed and awarded, and this will then encourage the development of the rural area to reduce such personal sacrifices that they have made.

6. Conclusions

Education is an important factor in the development of a country and its people. Undeniably, challenges do exist, but they are there to be solved. This study managed to examine the challenges and the initiatives of a rural school, developed into an underlying theme not covered by previous research. The nuances in the data shed light on themes that were special for the case study of SK Sabur. These themes then had grouped the challenges into dimensions that were clearer and specific. With the country moving forward into an ever-inclusive technological and fast-paced economy, the population that would be the backbone of this entity should have the skills and knowledge to operate and innovate it. This crucial factor in developing such human capital lies in the schools all around the country regardless of the locality. Teachers and rural schools are the frontlines to reach those who are located remotely. To ensure that they are not left behind, addressing the challenges of a rural school is crucial. Future talents should come from schools all over the country, not just from the urban schools. In sum, the study has offered a novel thematic development as per the findings. The main finding theme of the role of the government in creating and amending policies that would help to address the challenges of learning in a rural setting is paramount.

7. Acknowledgements

The researcher would like to thank the teachers of SK Sabur for their valuable time and hospitality during the researcher's field trip to the school.

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