

CHALLENGES AND INITIATIVES IN TEACHING SCIENCE AND MATHEMATICS IN RURAL AREA: A CASE STUDY

Azwan Ahzran Bin Perman^{1*}

*Faculty of Administrative Science and Policy Studies,
Universiti Teknologi MARA, Sabah Branch, Kota Kinabalu Campus
azwan0574@uitm.edu.my*

Abstract: Education is one of the fundamental needs of focus for a developing country. Within geographical factors, urban and rural areas seem to vary in their challenges in providing education. One of the remotest places in Sabah, which is Pulau Banggi, sets as the location of this case study, where specifically the school of SK Sabur is the main focus. This study attempted to understand the challenges and initiatives of teachers for teaching science and mathematics in a rural school. Rural elementary school is in itself a challenge for teachers. According to facts, rural schools generally have inferior equipment and infrastructure than urban schools mainly due to location and funding. Teaching Science and Mathematics can be even more challenging than non-technical ones there. Being a qualitative study, it has 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 in the rural area, (II) personal sacrifices, and (III) local-based innovation for teaching. The study emphasizes that the government must continue improving ways to mitigate the challenges that teachers face in teaching Science and Mathematics in rural schools as well as the local rural infrastructure to ensure the delivery of quality education across all areas of the country. Future studies should also include challenges teaching in the rural area during Covid-19-lockdown and restricted movement phases.

Keywords: Education, Policy, Rural, Sabah, STEM

1. Introduction

The Malaysian government is dedicated to implementing and promoting scientific knowledge throughout the country, as evident in the programs and policies that it has induced over the years (Chia & Maat, 2018; Sumintono, 2017). This commitment should have ensured that all parts of the country be handled accordingly. However, the apparent reality shows that the policies did not sufficiently cover the rural areas. This weak point in the education system has created a significant gap in quality education delivery between rural and urban schools. Furthermore, Malaysian studies on rural schools are limited (Ardi, Bambang, & Nora, 2012), thus allowing for more ambiguity than clarity.

Students' achievement is inherently affected by the school's locality, i.e. urban or rural (Ministry of Education, 2012; Phang, Abu, Ali & Salleh, 2014). Students in urban areas have higher marks in Mathematics and Science when compared to their rural 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, Liu, & 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 et al., 2020). Around 3 million people live in remote areas in Malaysia, as of 2019 (Adnan, 2019), showing that a large section of the population still needs focus for development by the government. East Malaysia constitutes only two states, nevertheless, more than half of the Malaysian land area is there, where the states of Sabah and Sarawak, in particular, are the two states with the most inferior infrastructure developments of all states in Malaysia, thus with the most numbers 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 Orders (RMCOs) due to the Covid-19 pandemic. Schools are closed, and classes

* Corresponding author: Azwan Ahzran bin Perman, *Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA, Sabah Branch, Kota Kinabalu Campus. Email: azwan0574@uitm.edu.my*

have to be conducted online during these phases. However, it proves to be difficult for many, especially in the two states. In Sabah, 52% of the students have neither internet access nor gadgets for online learning (Nasrah, 2020).

SK Sabur opened in 1984 on Pulau Banggi, where it currently has 120 students, from the age of seven (Standard 1) to 12 years old (standard 6). Pulau Banggi is one of the remotest places in Sabah, which located SK Sabur. SK Sabur or its full official designation *Sekolah Kebangsaan Sabur* (in English verbatim, National School Sabur) and is a public elementary school. Pulau Banggi being the largest Island in Malaysia, means that the population is scattered in many places, as can be seen when some of the students live in nearby smaller islands, making 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. 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 hours. 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. 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 challenges do teachers face in teaching Science and Mathematics in a rural area in SK Sabur, Kudat?
- (ii) How did teachers teaching Science and Mathematics in a rural area in SK Sabur, Kudat overcome these challenges?

2. Literature Review

2.1 Education Performance and the Factor of Locality

Studies involving locality and the relation with academic performance are abundant. Urban students are outperforming their rural counterparts, and this shows that the school's location exists as a factor in their achievement (Ministry of Education, 2012; Phang et al., 2014; Young, 1998). In explaining this, multiple factors across studies were found. One of it is the environment (Zainudin Abu Bakar & Haridas, 2011), while others revolving with 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) was also recorded to explain such situation. However, 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 Rural Areas and Educational Challenges

Rural areas challenges in terms of education had involved access to the internet and expanding to communication access (Sern, Kamarudin, Lip & Hasnan., 2017; Soe, 2018). A Malaysia study in rural areas presents that the usage of ICT is effective in aiding teachers to impart Science (Shanmugam. & Balakrishnan., 2020). However, constraints in infrastructure in rural schools might have hindered this (Mansor et al., 2020). Other existing 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), competency of the student (Condy & Blease, 2014) and mindset of the student (Febriana et al., 2018; Phang et al., 2014).

2.3 Rural Area Science and Mathematics Achievement

The disparity between urban and rural are also reflected in kindergartens. A study shows that the urban kindergartens had higher marks than the rural ones (Graham. & Provost., 2012). China also displayed similar results, where elementary students have lower Mathematics outcomes than their urban counterparts (Zhou et al., 2020). Negative perception towards Mathematics is one of the factors found that made the students (both urban and rural) uninterested in Science, Technology, Engineering, and Mathematics (STEM) subjects (Phang et al., 2014). Motivation to learn Mathematics is moderate, according to a study in Malaysia (Wan Naliza & Siti Mistima, 2020), and the urban areas also lead the percentage in obtaining "A"s for mathematics and science, (Phang et al., 2014). In Malaysia, when the language of delivery was changed from Malay to English in 2003, rural students suffered in the examination results (Sumintono, 2017). Critical thinking seems to be affected in Science for rural students in one study in Africa (Domike & Odey, 2011). One study in rural Malaysia found that the role of teacher and student's attitude plays a role in student's achievement in science, and female students perform better than males (Veloo, Perumal, & Vikneswary., 2013). Based on the literature, 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, descriptive case study. A descriptive case study is a study where the purpose is to describe a phenomenon in its real-world setting (Yin, 2018). It had obtained its primary data through in-depth interviews and observations. Secondary data were derived from articles concerning the topic. 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 study starts. 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 sampling. 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 a Thematic analysis. The first one is familiarisation with data, following generating initial codes, then searching for themes, next reviewing themes, then 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 who has a Doctorate and has conducted similar methods in previous researches.

4. Findings

Four themes were developed by this study, which the following section will discuss. Table 1 shows the respondents as well as their details during the interview. Academic qualifications wise, 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 in the Rural Area

The first theme that was developed using thematic analysis is the theme of the governmental role in the rural area. The study as the main theme is deemed it due to its presence in all respondents' responses. The governmental role is then focused on two main issues, mainly education and social.

4.1.1 Education

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, the insufficient funds allocated to the school had impacted the way things were done in the school, which will be discussed in this theme. The main concern and challenge 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 do 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 less interesting for the students. Initiatives have been taken to overcome this, in the form of teachers replacing experiments that they could not do with 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 internet and communication access. The school has a Wi-Fi connection, however, the coverage is limited as the school and its surroundings had weak phone signals, preventing teachers from getting information and communication for 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 Quick Response Code (QR code) generated for teachers and students to access extra information relevant to their studies. However, this was seen to be not practical 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 climbed up a hill to get a good connection to get the information to teach or for personal usage. The challenge of getting to 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 of 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.

For some time, Mathematics option teachers were absent from the school. 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 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 that the syllabus was more challenging for rural students to understand, especially 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.

4.1.2 Social Infrastructure

Social infrastructures serve as an essential public good for any modern country. As much as the infrastructure issue impacted the school's ability to teach and getting good internet and communication, it also mirrored in the surrounding environment that the school is based on. Social infrastructure refers to civil support systems that would allow for a comfortable life for the locals. This may encompass basic electricity, water, communication, roads, healthcare, and other public amenities. The apparent absence of poorly developed public services and infrastructures in the surrounding area had affected the way the community has formed. This lack of support is reflected in the school's issue of students in school accommodation. The school provided a dormitory for students located far from the school to stay and study. However, it could only accommodate a certain number of students. Thus, parents whose children did not 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 to the need of their children at the school. They would usually return to their home during the weekend. According to the teachers, with no running water and electricity, students could not study comfortably at night. To counter this, teachers often communicated and advised parents to emphasize helping out their children as best as possible, especially ensuring that the students completed their homework.

Another extension to social infrastructure was job opportunities for the locals that are mainly focused on fishery and plantation-based. This has led to a limited amount of income for the families there. One such effect is the rampant poverty in the adjacent community. In retrospect, the researcher recalls one of the students in the school who had hunted a squirrel for lunch since having no other alternatives for sustenance.

The challenges, as mentioned earlier, have an underlying theme, whereby the governmental role of providing education in the rural area can be hampered by its policy and administration that does not cater to the uniqueness of the location of the schools. This then is aggravated by the condition of the surrounding rural area that was not fully developed for ease of life of the locals and the job market to go along with it.

4.2 Personal Sacrifices

Personal sacrifices is the second theme that was developed. 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, weekend time was also dedicated to getting information from the internet by reading or downloading videos and relevant information for their classes. Therefore, the teachers had to sacrifice some of their time during weekends to do work they could have done during weekdays. So, before they left school for the weekend, they had to plan what they needed to download during the weekends.

Another reason for establishing this theme is that certain teachers 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 specialising in a particular subject or field are called option teachers, such as science-option teachers or mathematics-option teachers. Being an option teacher for a specific 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, blocking 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 from their home and limited access to communicating or seeing family. P1, who was recently married, only got the chance to meet his wife when he got off the island.

4.3 Local Based Innovation 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 mainly 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 left behind in their studies, the school would send them to extra classes to help them grasp the subjects better.

P1 is a teacher with an option in music a minor in science. When he was teaching non-science subjects, he would sometimes include science teaching in the class 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 it, 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 correctly. 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 they 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 near 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 to study or play around with them after school. This then is in hopes of imparting not mere knowledge but a relationship that can foster the students' progress through support and aspirations. 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 presented in this study indicate that teaching Science and Mathematics has its unique attributes in the rural area, especially Science, compared to other subjects that do not need the use of a laboratory. The factorization of students' exposure is also 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 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) 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 (Phang 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 (Velloo et al., 2013; Zhou et al., 2020). In SK Sabur, since both students and teachers were technically 'stuck' until the weekend, it had allowed for frequent interaction amongst them. Student's interest in Science in the school was higher than in Mathematics, which can be demonstrated in the poor achievements of Mathematics in the school. This can be seen in a previous study where Mathematics was considered the most difficult for students in school while science was 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 with 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 rural areas. Whereby the governmental role in providing proper 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 study results 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 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 than 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 schools all around the country regardless of the locality. Teachers and rural schools are the front lines 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 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 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.

8. References

- Adnan, H. (2019). Revitalising rural Malaysia. *New Strait Times*.
<https://www.nst.com.my/opinion/columnists/2019/02/463706/revitalising-rural-malaysia>
- Ardi, M., Bambang, S., & Nora, M. (2012). Revitalizing Rural Schools: A Challenge for Malaysia. In *Educational Issues, Research and Policies* (Vol. 11, pp. 171–188).
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology* 3(2), 77–101.
- Chia, P. L., & Maat, S. M. (2018). An Exploratory Study of Teachers' Attitudes towards Integration of STEM in Malaysia 45. *International Journal of Electrical Engineering and Applied Sciences*, 1(1), 2600–7495.
- Clarke, V., & Braun, V. (2017). Thematic analysis. *Journal of Positive Psychology*, 12(3), 297–298.
<https://doi.org/10.1080/17439760.2016.1262613>
- Condy, J., & Blease, B. (2014). What challenges do foundation phase teachers experience when teaching writing in rural multigrade classes? *South African Journal of Childhood Education*, 4(2), 21.
<https://doi.org/10.4102/sajce.v4i2.203>
- DailyExpress. (2019). Sabah rural students outperform urban peers. *Daily Express*.
<https://www.dailyexpress.com.my/news/132404/sabah-rural-students-outperform-urban-peers/>
- Davadas, S. D., & Lay, Y. F. (2020). Contributing factors of secondary students' attitude towards mathematics. *European Journal of Educational Research*, 9(2), 489–498. <https://doi.org/10.12973/eu-jer.9.2.489>
- Domike, G. C., & Odey, E. O. (2011). Teachers pattern of instruction and location on pupils critical thinking in science achievement in Imo state. *Global Journal of Educational Research*, 10(1), 1–6.
- Febriana, M., Nurkamto, J., Rochsantiningasih, D., & Muhtia, A. (2018). Teaching in Rural Indonesian Schools: Teachers' Challenges. *International Journal of Language Teaching and Education*, 2(2), 87–96.
<https://doi.org/10.22437/ijolte.v2i2.5002>
- Graham., S. E., & Provost., L. E. (2012). *Mathematics Achievement Gaps Between Suburban Students and Their Rural and Urban Peers Increase Over Time* (Issue 52).
- Mandina, S. (2012). Quality Rural Secondary School Education in Zimbabwe: Challenges and Remedies. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, 3(5), 768-774.
- Mansor, A. N., Hamid, A. H. A., Medina, N. I., Vikaraman, S. S., Abdul Wahab, J. L., Mohd Nor, M. Y., & Alias, B. S. (2020). Challenges and strategies in managing small schools: A case study in Perak, Malaysia. *Educational Management Administration and Leadership*, 100, 1–17.
<https://doi.org/10.1177/1741143220942517>
- Miller, P., Votruba-Drzal, E., & Coley, R. L. (2019). Poverty and academic achievement across the urban to rural landscape: Associations with community resources and stressors. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, 5(2), 106–122. <https://doi.org/10.7758/RSF.2019.5.2.06>
- Ministry of Education, M. (2012). *Preliminary Blueprint Executive Summary*. 66, 37–39.
- Moidunny, K., Lee, W. E., Kaman, R., Kuslan, N. L., Husien, M., Khalid, G. B., & Rahman, N. M. F. N. A. (2019). Amalan Kepimpinan Sekolah Rendah Pulau di Sabah : Satu Kajian Kes. *Journal of Educational Research and Indigeneous Studies*, 1(1), 1–29.
- Nasrah, R. (2020). *BERNAMA - Pembelajaran Dalam Talian: 52 peratus pelajar Sabah tiada akses internet*. Bernama.
https://www.bernama.com/bm/am/news.php?id=1839551&fbclid=IwAR1vNIY75gTNRg0v3Sn7T5d1K7WY0iNQC_E_MV0qvrahwnGwLUJjYXp8n3c
- Nayak, R., Mohanty, N., Beriha, S., Mohapatra, & S. (2017). *Journal of Child & Adolescent Behavior Study of Risk Factors of Academic Underperformance in Rural School Children in a Coastal District of Odisha*. 5(1), 4–6. <https://doi.org/10.4172/2375-4494.1000332>
- Phang, F. A., Abu, M. S., Ali, M. B., & Salleh, S. (2014). Faktor penyumbang kepada kemerosotan penyertaan pelajar dalam aliran. *Sains Humanika*, 2(4), 63–71.
- Ramos Lobo, R., Duque Cardona, J., & Nieto, S. (2016). Decomposing the Rural-Urban Differential in Student Achievement in Colombia using PISA Microdata. *Estudios de Economía Aplicada*, 34(2), 379–411.
- Şahin, D., Meltem, A. G., Oya, O. K., & Erdal, P. (2014). Which elementary school subjects are the most likeable, most important, and the easiest? Why?: A study of science and technology, mathematics, social studies, and Turkish. *Educational Research and Reviews*, 9(13), 417–428.
<https://doi.org/10.5897/err2014.1755>
- Sern, L. C., Kamarudin, N., Lip, R., & Hasnan, N. (2017). Tahap Penggunaan Pembelajaran Maya Dalam Kalangan Guru Reka Bentuk Teknologi: Satu Tinjauan Di Sekolah Rendah Luar Bandar. *Online Journal for TVET Practitioners*, 1–8.
- Shanmugam., K., & Balakrishnan., B. (2020). Perisian Microsoft Power Point Sebagai Peranti Persembahan Semasa Pdpc Sains Di Sjk(T) Luar Bandar Di Negeri Perak. *Malaysian Journal of Social Sciences and Humanities*, 4(1), 49–65.

- Soe, H. Y. (2018). *Challenges for the Development of Education in Rural Area of Myanmar*. 12(2), 289–303.
- Sumintono, B. (2017). Science education in Malaysia: Challenges in The 21st Century. *Jurnal Cakrawala Pendidikan*, 36(3), 1–10. <https://doi.org/10.21831/cp.v36i3.16761>
- Tayyaba, S. (2012). Rural-urban gaps in academic achievement, schooling conditions, student, and teachers ' characteristics in Pakistan. *International Journal of Educational Management*, 26(1), 6–26. <https://doi.org/10.1108/09513541211194356>
- Veloo, A., Perumal, S., & Vikneswary, R. (2013). Inquiry-based Instruction, Students' Attitudes and Teachers' Support Towards Science Achievement in Rural Primary Schools. *Procedia - Social and Behavioral Sciences*, 93(2002), 65–69. <https://doi.org/10.1016/j.sbspro.2013.09.153>
- Wan Naliza, W. J., & Siti Mistima, M. (2020). Hubungan antara motivasi dengan pencapaian matematik dalam kalangan murid sekolah luar bandar (The relationship between motivaion and mathematics achievement among rural school students). *Jurnal Pendidikan Sains & Matematik Malaysia*, 10(1), 39–48.
- Yin, R. k. (2018). *Case Study Research and Applications Designs and Methods* (6th ed.). SAGE Publication.
- Young, D. J. (1998). Rural and Urban Differences in Student Achievement in Science and Mathematics: A Multilevel Analysis. *School Effectiveness and School Improvement*, 9(4), 386–418. <https://doi.org/10.1080/0924345980090403>
- Zainudin Abu Bakar, & Haridas, D. S. (2011). Pencapaian akademik di sekolah jenis kebangsaan (Tamil) yang berstatus sekolah kurang murid di daerah Kota Tinggi, Johor. *Fakulti Pendidikan, Universiti Teknologi Malaysia*, 1–8.
- Zalika, A., Kassim, F., & Salleh, M. J. (2009). Memperkasakan pendidikan luar bandar. *"Persidangan Kebangsaan Pendidikan Luar Bandar 2009*, 3–5.
- Zhou, D., Jinqing, L., & Jian, L. (2020). On the different effects of teacher-student rapport on urban and rural students ' math learning in China: An empirical study. *Psychology in the Schools*, October. <https://doi.org/10.1002/pits.22446>