The Challenges of Virtual Learning: An Exploratory Study among *Orang Asli* Pupils from the Mathematics Teachers' Perspectives

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Abstract

The prolonged Covid-19 pandemic subsequently led to the digitalization of education, whereby globally virtual learning was implemented to sustain learning. This study aims to explore the challenges faced by *Orang Asli* pupils when carrying out virtual learning from the mathematics teachers' perspectives. By employing exploratory qualitative research design and purposive sampling, five teacher participants from two schools in two states in Malaysia were selected. Data was collected from two online and face-to-face focus group interviews. Thematic analysis identified four major themes, which are challenges related to language proficiency, logistic, home and classroom. Based on these emergent themes, various stakeholders can focus their efforts to address these challenges to mitigate *Orang Asli* pupils' potential learning loss in the post-Covid era and thus, ensure they remain abreast to current mathematics learning. Further studies should explore on mobile and modular learning as promising alternatives means of content delivery for their future virtual learning.

Keywords: Challenges, Indigenous Orang Asli pupils, Mathematics, modular learning, Mobile learning, Virtual Learning

Introduction

The United Nations (UN) 2030 Agenda advocates for equality in Goal 10 and Quality Education in Goal 4. Goal 10 resonates on 'leaving no one behind' and Goal 4 is committed in ensuring that all communities have the right to education. In 'leaving no one behind', the Malaysian Education Blueprint 2013- 2025 stipulates equal access to education for Malaysian *Orang Asli* pupils through the Shared Vision Prosperity 2030, which carries an overarching objective of *Development for All* that focuses on the Indigenous community as one of its priority groups. This conviction is rooted to the fact that the *Orang Asli* pupils, just like the mainstream Malaysian pupils, deserve equal access to education and fair assessment. However, in reality, young Indigenous pupils face conflict as they originate from a tribal social culture

and migrate into a seemingly foreign school culture during their early years of schooling. This poses a major threat to cultural validity and provide a biased learning experience since enculturation is not typically faced by the mainstream pupils.

Amidst this foreground, a new educational landscape brought upon by the Covid-19 pandemic emerged. This pandemic raged the globe, whilst disrupting various aspects of everyday life across nations. The education sector was particularly affected as there was a sudden need for implementing school closures across the country as an effective measure deemed imperative to curb the spread of the virus (Smith, 2021). In sustaining the delivery of the educational content during the school closures, many governments resorted to establishing virtual learning whereby the teaching and learning processes were shifted to online modes of delivery.

Despite the urgent dependence on virtual learning as an alternative to sustain learning, one major hindrance is that virtual learning has been perceived to be non-conducive for learning among some pupils due to its over-reliance on digital infrastructure in implementing it (Adedoyin & Soykan, 2020). When compounded with factors such as remote location and tribal culture, many Indigenous pupils experience greater hurdles compared to mainstream pupils (Flack et al., 2020a).

If no attempt is made to examine the issues of implementing virtual learning among *Orang Asli* pupils, the mathematics achievement gap between them and their counterparts will be even more pronounced when schools resume. This preliminary study is an attempt to highlight the challenges faced by the Indigenous *Orang Asli* pupils in Malaysia from the perspectives of primary school mathematics teachers' during the school closures on mathematics virtual learning in an attempt to address the potential learning loss experienced by the *Orang Asli* pupils in the post-Covid era.

Problem Statement

Mathematics has a seemingly increasing role for the global advancement, national relevance, and personal development (Silver, 2017), especially when the knowledge in mathematics lay the foundational learning blocks for all knowledge. Without a solid foundation in mathematics, the field of science, technology and engineering will cease to thrive. As the famous English philosopher, scientist and scholar of the 13th century, Roger Bacon once stated in 1968 that the "neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or the things of the world."

Mathematics is critically important for sustainability in the context of globalism and graduate marketability. For this reason, it is highly crucial for the mathematical learning to occur without interruption or interference due to non-academic related factors such as personal characteristics, social mobility, economic status, culture or ethnicity. With the looming Covid-19 pandemic, virtual learning has become a viable measure to continue the educational processes among the pupils. With the immediate acceptance towards video conferencing platforms such as Google Meet and Cisco Webex, virtual learning has become a learning enabler between teachers and their pupils (Zainal et al., 2022). However, virtual learning has its own assortment of setbacks when compared to the age-old traditional face to face learning environment (Anderson & Dron, 2011; Imel, 2002).

Mathematics learning is considered a difficult subject comprised of abstract topics that requires teachers to present them effectively to their pupils (Yohanes et al., 2021). The move to virtual learning had subsequently exacerbated the difficulties in learning mathematics as pupils lack the interest and motivation to learn mathematics online which have reduced the learning outcomes achieved during the pandemic (Dinata & Setyawan, 2022). This is because the shift from face to face learning is more convenient and personalised when compared to face to screen learning (Grieve et al., 2013).

As the learning difficulties are also experienced among high achieving pupils, this issue is more pronounced among low achievers and the general mainstream pupils resulting in a significant learning loss (Schult et al., 2022). Therefore, as mathematics is already a difficult subject to learn during normal face to face classroom sessions, this issue is further compounded during the mathematics virtual learning, especially among Indigenous pupils who face other learning challenges due to their socioeconomic background. Therefore, there is a need to better understand the challenges of the virtual mathematics teaching and learning experienced by the Indigenous pupils, and its potential impact on their learning loss in the post-Covid era.

Other than that, the location of the primary schools has also contributed to the differing learning experiences faced by the Indigenous pupils living in both urban and rural areas (Lembani et al., 2020). The digital divide between these groups of pupils was pronounced, particularly within the Malaysian context (Lopez et al., 2022; Umar, 2021). For instance, the lack of the required technological resources such as Internet access in most of the rural areas had led to the challenges of implementing virtual learning, subsequently affecting the pupils' learning processes compared to the pupils living in urban areas (Ang & Ang, 2021; Faizah Idrus et al., 2021; Lopez et al., 2022). The learning context among the *Orang Asli* pupils is

therefore different than the urban and rural mainstream pupils, whereby there is a need to study their unique learning experiences during virtual learning as these group of pupils have seldom been included in comparison studies (Faizah Idrus et al., 2021).

Moreover, as there are limited studies on the challenges faced by the *Orang Asli* pupils when conducting mathematics virtual learning based on locality of their primary schools and settlements, this study could provide novelty to the current literature on the challenges faced by them and explore the measures undertaken by the teachers to supplement virtual learning specially for the *Orang Asli* pupils.

Furthermore, teachers ensure that the virtual learning carried out are adapted to cater to the needs of the pupils (Ferri et al., 2020). In particular, the *Orang Asli* pupils have more tendency to converse in a language that is different than the academic language used during classroom instruction, whereby they lack the necessary language proficiency needed to comprehend the mathematics instruction (Ruzlan Md-Ali et al., 2021). Therefore, it is also important to understand the extent to which their language proficiency plays a role in virtual learning of mathematics.

When examining challenges related to virtual learning, there is also a need to examine another aspect of assessment for learning (i.e., formative assessements) as it will add more perspective to the exploration of the assessment practices employed during virtual learning to measure the Orang Asli pupils' academic performance. As the virtual learning method employed are different from the mainstream pupils, these challenges should be examined to address the potential learning loss in the post-Covid era (Angelico, 2020; Halili & Sulaiman, 2018). Hence, the purpose of this study, which is a part of a bigger study is focused on addressing only one vital research objective that is to explore the challenges faced by the *Orang Asli* pupils during virtual learning from their teachers' perspective.

Literature Review

Challenges of Virtual Leaning

Managing the teaching and learning processes during virtual learning was a global challenge (Babbar & Gupta, 2022). Haeck and Lefebvre (2020) found that the lack of technological resources and access to Internet among low-income families were the main factors that impeded the teaching and learning processes carried out during virtual learning. They further suggested that the inequalities experienced among the low socioeconomic groups were exacerbated during the school closures as a result of destitute technology. However, despite the lack of necessary resources such as computers, laptops and internet access to conduct virtual

learning, it was found that teachers and school administration had still provided alternative measures such as providing educational materials, modules and worksheets to pupils who were from low-income families (Aliyyah et al., 2020).

Apart from technological resources, Ferri et al. (2020) found that teachers themselves faced difficulties when teaching pupils during virtual learning. For instance, the study found that the low digital skills among both the teachers and pupils, lack of structured content and pupils' lack of motivation were some of the challenges that influenced teachers' ability to effectively carry out virtual learning during the pandemic. Hence, their study proposed the need to establish clear guidelines for both teachers and pupils when conducting virtual learning to ensure that the teaching quality and learning processes were not compromised, and subsequently affect the pupils' academic performance.

When developing assessments that caters to the needs of the pupils, Reimers et al. (2020) proposed that clear and concise materials should be developed for the pupils during virtual learning. They highlighted the need for teachers to ensure that the content to be assessed are aligned and caters to the current condition and needs of their pupils. This was further supported by Rasmitadila et al. (2020), whereby assessment materials used during the virtual learning processes should consider the pupils' cognitive ability and the lack of interaction between the teacher and pupil when measuring academic performance.

Other than that, as most pupils are situated at home, parents also need to assume bigger responsibility during the implementation of virtual learning (Ewing & Cooper, 2021). Their findings revealed that during the school closure, parents were less engaged with the teachers and played supervisory role during their children's virtual learning. These findings were also in line with the study by Garbe et al. (2020), where it was found that parents found it difficult to balance the responsibility of ensuring their children are positively engaged in their virtual learning experience with their job demands.

Challenges of Virtual Leaning in the Indigenous Context

The Covid-19 pandemic had also impacted Indigenous pupils due to the remote location of the indigenous schools, which greatly influenced poor access to reliable internet connection and financial support from various stakeholders (Flack et al., 2020a). Flack et al. (2020a) who surveyed on the impact of the Covid-19 pandemic on the disadvantaged Indigenous pupils in Australia and New Zealand found that lack of technological devices had widened the academic achievement gap between them and their mainstream peers. The locality of most Indigenous primary schools was deemed a major challenge that had affected the virtual learning process

implemented for the pupils during the school closures. Additionally, in a separate study on the teachers experiences of the issues faced during the Covid-19 pandemic, Flack et al. (2020b) found that teachers exhibited concern over the Indigenous pupils' well-being, isolation, and potential learning loss that negatively impacted the academic performance of the pupils in the post-Covid era. Furthermore, the study suggested that the disruption to the teacher-pupil relationship that occurred during the school closure may have marginalized them further and may impede the Indigenous pupils' engagement in school, which could further add to their potential learning loss.

Within the context of Malaysia, similar findings were also observed among the Indigenous *Orang Asli* pupils (Lopez et al., 2022; Nuraini et al., 2020). For instance, Lopez et al. (2022) indicated that the lack of technological resources such as computers and laptops were unavailable in many *Orang Asli* household, which made it difficult to carry out virtual learning. Other than that, the study also found that the drop-out rates were significantly higher during the pandemic. It was proposed that this may have been aggravated by the low socioeconomic status, low-educated parents and poor academic achievement in most *Orang Asli* primary schools (Noor Azlan & Noor Asyhikin, 2022).

Vygotsky's Socio-Cultural Theory (1962)

The socio-cultural theory has long been used to assist in the development of pupil-centred teaching and learning process. With the advancement of virtual learning spurred by the pandemic, this Vygotsky's Socio-Cultural Theory (1962) provides support to the relevant roles played by both the teacher and pupils within the social context. Based on this theory, Vygotsky (1978) stipulated that learning is a social endeavour whereby the environment and the pupils' culture fundamentally shape and develop the individual. In relation to learning, the theory highlights the need for collaboration among others within the social environment such as teachers, parents and peers to promote learning (Newman & Latifi, 2021). Immersing their culture allows the *Orang Asli's* culture to be recognised and integrated into their learning of the Western school mathematics, which is also learnt by the mainstream students, and therefore, reduces the threat to cultural validity.

Therefore, teachers undertake the crucial responsibility of ensuring that social learning is incorporated within the virtual learning processes (Freeman, 2010; Karpov & Kozulin, 2019). For instance, teacher can assimilate synchronous and asynchronous interaction using social media and WhatsApp to mediate interaction between pupil-pupil and teacher-pupil during

virtual learning (Youmans, 2020). The social interaction that takes place during these interactions could help improve the *Orang Asli* pupils' engagement, participation and involvement during virtual classroom discussions, and in some cased sustain their motivation to learn.

Other than that, the parents' involvement in the virtual learning process is also an important component in the pupils' successful learning (Oribiana, 2022). As parents are considered as the pupils' first teachers, teachers must ensure productive collaboration with the pupils' parents to effectively implement virtual learning (Al-Mahdi, 2019). Therefore, socially mediated teacher-parent interaction may be able to enhance the learning experience of the *Orang Asli* pupils, which could improve the pupils' attitude and classroom engagement when learning mathematics virtually. Therefore, rooted to this theory, this study explores the challenges faced by the *Orang Asli* pupils during Mathematics virtual learning from the mathematics teachers' perspectives.

Malaysian Orang Asli Pupils

The *Orang Asli* people are the initial settlers and considered the original people of the land. According to the *Jabatan Kemajuan Orang Asli* (JAKAO) (2021), or Department of *Orang Asli* Development, there are three main ethnic groups, which are Proto-Malay, Negrito and Senoi, and numerous unique sub-groups. Each sub-group is unique with their own culture and native languages that are still practised to this day (Abu Talib Ahmad et al., 2021). The adults primarily have limited formal education and work as farmers or labourers. The *Orang Asli* pupils attend Government primary schools that are usually situated nearby their villages. Usually there are a few villages located near to a school. These schools are also equipped with infrastructure and facilities as in the other national primary schools.

Within the context of *Orang Asli* pupils' education, just like in many other countries, there is still a gap in mathematics achievement between the Indigenous *Orang Asli* pupils and their mainstream peers (Abu Yazid Abu Bakar, 2022). A probable contributing factor is the mismatch between the academic and native languages (Ruzlan Md-Ali et al., 2021), and reading difficulties that affect mathematics comprehension (Abidin & Mohamad, 2019). As most Indigenous pupils begin their formal schooling equipped with their native language, this language mismatch with the academic language have affected their ability to understand mathematics (Barwell, 2020; Preston & Claypool, 2021).

Materials and Methods

Research Design

The main aim of this preliminary study is to highlight the challenges faced by the Indigenous *Orang Asli* pupils by examining the primary school mathematics teachers' perspectives on the challenges faced by the pupils during virtual mathematics learning. Therefore, to achieve this study's objective, an exploratory qualitative research design was employed. Due to the uniqueness of the teachers' experiences on the challenges faced by the *Orang Asli* pupils in terms of the exploratory design was deemed appropriate as it examines the phenomenon that is bounded within its context and specific situation (Creswell & Poth, 2018). This allows the researchers to explore the perspectives of the teachers on the virtual learning processes that caters to these individuals.

Sample

This study utilized purposeful sampling whereby two rural *Orang Asli* primary schools with a class enrolment of between 15 to 20 pupils situated in the states of Perak and Pahang, (located at the Northern and Eastern of West Malaysia respectively) were purposively selected for the enculturation phase of a broader study. Purposeful sampling was employed as the main sampling technique to enable the selection of participants that shared similar characteristics and experiences that are unique to them, and the phenomenon experienced (Braun & Clarke, 2013). Within the context of this study, five Mathematics teachers from two *Orang Asli* primary schools were subsequently selected for their participation in this study in order to gather their perspectives on the challenges faced by the *Orang Asli* pupils when carrying out virtual learning during the Covid-19 pandemic. All participants were teaching mathematics to the pupils until the post-Covid school sessions. Two teachers (A1 and A2) are from School A while the other three teachers (B1, B2 and B3) are from School B. Table 1 presents the demographic profile of the participants and their relevant experiences.

Insert Table 1 Here

The participants were interviewed in two separate phases for this study, whereby they were interviewed online via Zoom followed by a face-to-face focus group discussion in their respective schools. This was to ensure the trustworthiness and validity of the data collected from the participants' perspective (Merriam & Tisdell, 2016).

The researchers deemed that the selection of participants to be appropriate as they are experienced mathematics teachers, who were directly involved in the pupils' mathematics

virtual learning, and therefore were able to provide the relevant and primary source of information on the challenges faced by the *Orang Asli* pupils during the mathematics virtual learning based on their observations made during the virtual classroom instruction that may result in learning loss in the post-Covid era.

Instrument

This study used semi-structured online and face-to-face interviews to collect the data from the participants. The semi structured interview is a data collection method that is typically utilized to gather information from the participants by asking predetermined questions (Creswell & Poth, 2018). The questions were developed to allow the participants to share the perspectives and thoughts on the challenges faced by the *Orang Asli* pupils during the virtual learning processes undertaken during school closures. Specifically, the questions were related to the challenges pupils, teachers and parents face during remote or online learning in school and at home, the lesson delivery during the lockdown including its challenges, measures taken to overcome the challenges and the role of school community and parents. These questions would help the participants to convey their opinions without being subjected to any interpretation from the researcher (Merriam & Tisdell, 2016)

For this study, a semi-structured interview guide was developed to gather the required data from the participants. The guide included a total of six open-ended interview questions focused on the challenges faced by the *Orang Asli* pupils during virtual learning for mathematics and the assessment practices.

Research Procedure

Once permission was granted from the relevant authorities, the researchers contacted the identified school administrators and Mathematics teachers from the respective schools. They were then contacted through phone calls and instant messaging platforms such as WhatsApp. The appointments on the date and time for the online interview session were set at the convenience of the participants from the two schools. Data collection for this study was carried out in two main phases. The first phase of this study involved online interview sessions with the participants by using the video conferencing platforms, Zoom. The interview sessions lasted approximately three hours and was audio recorded during the entirety of the session. In addition, relevant documents such as the test papers, worksheets and modules were requested from the participants to corroborate with the information provided during the focus group and interview sessions. The audio recordings of the interview sessions were subsequently transcribed to carry out thematic analysis.

For the second phase of the study, face-to-face focus group discussions with the participants were carried out at the respective schools to gather further information on the challenges faced by the *Orang Asli* pupils after the Movement Control Order (MCO) had been lifted for data triangulation. During the face to face interview, two more teachers who were willing to share their experience were also invited. As schools reopened and the *Orang Asli* pupils had resumed physical classroom teaching and learning, the second phase of the study allowed the researchers to conduct member checking which corroborated the data collected during the online interviews. Moreover, the second phase of this study allowed the researchers to gain a better understanding on the extent these challenges have led to the potential learning loss in the post-Covid era and verify the validity and trustworthiness of the data collected.

Data Analysis

The data obtained from the participants during the online interview sessions and face-to-face group discussions were transcribed to carry out thematic analysis (Braun & Clarke, 2013). The process of coding the data was conducted by identifying the key ideas or relationships that correspond to the underlying themes identified from the interpretations within the data (Creswell & Poth, 2018). Moreover, the analysis enabled the researchers to draw patterns and relationships on the phenomenon being studied that allows the identification of themes and sub-themes that correlates to the data (Corbin & Strauss, 2015). Certain repeated words or phrases that represented recurring themes and sub-themes from the interpretation of the relationships were drawn from the data. The analysis and interpretations were reexamined to ensure data saturation was achieved on the relevant themes and sub-themes identified from the data (Braun & Strauss, 2013). The themes and sub-themes identified corresponds to the research question established in this study.

Results

The main aim of this study was to explore the challenges faced by the *Orang Asli* pupils during the mathematics virtual learning based on the mathematics teachers' perspectives and gain a better understanding of the potential learning loss experienced by the pupils in the post-Covid era. Thematic analysis carried out on the transcribed data identified four overarching themes, which are: language proficiency challenges (sub-themes – dominant indigenous dialect, dominant indigenous language, modest academic language, and preference towards oral delivery than written form); logistic challenges (sub-themes – limited learning infrastructure, poor accessibility, and lack technological resources); home challenges (sub-

themes – pupils' attitude, parenting style); and classroom challenges (sub-themes – isolated learning, limited formative assessment, difficulty completing syllabus, and reading difficulties among pupils). Table 2 displays the detailed description of the findings for the themes and sub-themes identified from the interpretation of the data collected from the online interview sessions and face-to-face focus group discussions for the challenges experienced by the *Orang Asli* pupils during the Mathematics virtual learning.

Insert Table 2 here

Language Proficiency Challenges

Based on the findings from the data collected in this study, one of the main challenges faced by the *Orang Asli* pupils is language proficiency. Under this main theme, four sub-themes were identified, which are dominant indigenous dialect, dominant indigenous language, modest academic language, and preference towards oral delivery than written language form.

For the sub-theme, dominant indigenous dialect, it was found that there was a difference in the dialect used among the *Orang Asli* pupils from two different states within the same language, *Bahasa Semai*. This dialectical differences between the *Orang Asli* communities in the two states made it difficult for an individual from one of the tribes to fully comprehend the language of the other tribe although, technically, they are the same language. Moreover, it was further highlighted that the *Bahasa Semai* in one state is the formal elective language used in the textbooks, and therefore, is considered as the official *Bahasa Semai* language. Hence, the teachers in another stated highlighted that their pupils were unable to use the textbooks for *Bahasa Semai* as they may not fully understand the language due to the differences in the dialect when spoken. Therefore, the teachers were reliant on Bahasa Melayu when conducting Mathematics virtual learning among the *Orang Asli* pupils.

Subsequently, it was clear from the participants that the main dominant language used by the *Orang Asli* pupils are their tribal language. The participants claimed that they used *Bahasa Melayu*, which is the academic language employed during the virtual learning, when teaching Mathematics. Nonetheless, the pupils were still reliant on their tribal language to comprehend the mathematical concepts taught by the teachers. The participants also claimed that they faced problems when teaching mathematics terminology and concepts in the academic language, and therefore, had to find creative ways to simplify the concepts for their pupils to understand.

The *Orang Asli* pupils have a modest proficiency in the academic language, *Bahasa Melayu*, and has posed issues to the Mathematics teachers during the mathematics virtual learning. The

participants also asserted that pupils in the early years of their formal education (Years 1- 3) face language difficulties as they were unable to fully comprehend the academic language used in schools. This added challenge has led to difficulties in trying to teach Mathematics word problem items as the pupils could not comprehend the context of the question and devise the necessary solution to solve the word problem items. Additionally, most of the participants felt it was difficult to explain mathematical knowledge and concepts to their pupils as they are unable to converse with the pupils in their tribal language. With the little time there was to develop the required mastery in the academic language, the teachers found it a challenge to progress during the Mathematics virtual learning.

Lastly, the participants highlighted the pupils' preference towards oral delivery than written form. This was mainly observed when the participants were carrying out virtual learning where pupils had a better response when asked to answer the mathematics questions orally. On the other hand, when the pupils were provided with modules to work from home, it was found that some did not answer the mathematics questions as they had difficulty understanding the questions presented in the written form.

Logistic Challenges

The next main theme identified in this study is logistic challenges. Three sub-themes were identified from the data, which are limited learning infrastructure, poor accessibility to deliver modules, and lack of technological resources. As the shift to virtual learning from traditional face-to-face teaching took place, the need for the appropriate logistic to implement virtual learning was necessary.

One major challenge was the lack of learning infrastructure to conduct Mathematics virtual learning. As most mainstream pupils turned to online platforms set up by the Ministry of Education to continue their educational processes, the *Orang Asli* community were unwittingly sidelined due to their locality, which affected the internet connectivity. The participants claimed that the sudden closing of the schools gave little time to establish a system more convenient to and specifically for the *Orang Asli* pupils during the pandemic, However, pupils did not stop learning during this hiatus. The participants professed that learning modules were developed and delivered to the pupils to continue the teaching and learning process during the pandemic. These modules consisted of worksheets and Mathematics questions that were delivered to the *Orang Asli* pupils in their villages by public transport. The modules were also collected by their parents or delivered to the *Orang Asli* villages by the teachers themselves.

Furthermore, poor accessibility to deliver the modules and the lack of technological resources also challenged the pupils. The participants found it extremely difficult to ensure that learning continued to take place with the use of modules when virtual learning could not occur due to the remote locations of some the *Orang Asli* villages and the lack of accessible routes to these villages. However, with the help of the school teachers, lorry drivers and village headman (*Tok Batim*), the modules were still delivered and collected back every two weeks. Moreover, as most of these pupils come from a low-socioeconomic background, the lack of the required technological resources such as computers, laptops and Internet access in most of the remote *Orang Asli* villages further exacerbated the efforts taken by the teachers to devise methods for content delivery to their *Orang Asli* pupils. Nonetheless, the participants relied on the pupils' or their parents' mobile devices to conduct mathematics lessons through the use of WhatsApp. Therefore, to some extent, the *Orang Asli pupils* were engaged in mathematics using modular learning and mobile learning as a dominant form of virtual learning during the pandemic.

Home Challenges

Another major theme identified was home challenges, whereby two sub-themes were identified which are pupils' attitude and parenting style. The participants asserted that pupils' attitude also played a role during the virtual learning. The participants claimed that the pupils with positive attitude to their education were the ones who did well. On the other hand, for the pupils who exhibited disinterest in learning, the participants noticed that these students fared worse as they were impeded by both the language difficulties and lack of mathematical knowledge during virtual classroom instruction.

Parenting style is the second sub-theme identified under the home challenges where it was found that there is a close relationship between the two sub-themes of pupils' attitude and parenting style. The participants claimed that parents who were strict on their children were those who were regularly attending school and would pay attention during the online classes. They suggested that parents played an important role in the pupil's attendance during the virtual learning. Furthermore, the participants suggested that educational background of the parents or siblings was also an indicator of the pupil's attitude towards their Mathematics learning. It was found that the pupils who attended the Mathematics virtual learning, and came to school in general, were the pupils who had siblings in either secondary school or university. Therefore, it was clear that parents who valued the importance of education influenced the pupil's attitude during virtual learning.

Classroom Challenges

The last major theme found in this study is classroom challenges, whereby four sub-themes were identified which are isolated learning, limited formative assessment, difficulty completing syllabus, and reading difficulties among pupils. For the sub-theme of isolated learning, the participants posited that due to the school closure and lack of digital infrastructure to continue the teaching and learning processes, *Orang Asli* pupils were unfortunately reliant on isolated learning. As the *Orang Asli* villages were in fact located in very remote locations, the teachers were unable to conduct any face-to-face teaching and learning with their pupils. Although learning modules were developed and provided to the *Orang Asli* pupils, the participants claimed that the students had to assume some responsibility to complete their school work. Unfortunately, the pupils had to independently learn the content of the mathematics syllabus with limited guidance from the teachers, which may have botched their successful attempts to solve Mathematics problems.

Additionally, lack of digital infrastructure also led to limited formative assessment to be carried out. The participants asserted that it was difficult to conduct Mathematics assessments during virtual learning to gauge the overall progress of the students. They relied on using Whatsapp to send worksheets and simple Mathematics exercises to their pupils, and printed worksheets as part of the modules given to the pupils. These worksheets were left at the school security post for the village headman and parents to collect and subsequently given to the pupils. The participants stated that the assessments could only be carried out when face-to-face teaching resumed.

The third sub-theme identified is the difficulty in completing the Mathematics syllabus mainly due to the learning difficulties faced by the pupils. These pupils required more time and extended practice to fully comprehend the topics. These challenges faced by the *Orang Asli* pupils limited their virtual learning from taking place during the pandemic. As a result, most pupils were unable to keep abreast with the acquisition of the learning outcomes when compared to their mainstream peers who had better engagement with their teachers due to better digital infrastructure and ideal locality. Therefore, the participants asserted that they had to use the *Dokumen Penjajaran Kurikulum*, or the Curriculum Aligned Document as a standard to ensure that the *Orang Asli* pupils do not experience massive learning loss. This document stipulates the basic mathematical concepts and procedures needed to be mastered before the pupils could progress to higher grade levels. Moreover, based on the document reviewed, the teachers were required to only teach the foundational mathematical concepts and procedures

to the pupils during Mathematics virtual learning. The more complex mathematics topics were covered when schools reopened for face-to-face classroom sessions.

Lastly, the participants noted that the reading difficulties among the *Orang Asli* pupils was also a challenge when carrying out virtual learning. The low reading ability of the pupils further compounded the difficulties faced by the participants when teaching Mathematics during the virtual lesson. Moreover, most of the pupils were still reliant on their peers who could read and translate the explanations provided by their teachers into the tribal language, particularly among the weaker pupils. Furthermore, reading difficulties among the *Orang Asli* pupils had indirectly led to the difficulties of completing the syllabus as most of the participants claimed that they had to spend more time to ensure that the pupils are able to understand the topics taught during the Mathematics virtual learning.

Discussion

This study explored the challenges faced by the *Orang Asli* pupils from the perspectives of the Mathematics teachers during Mathematics virtual learning during the Covid-19 pandemic. This study found that language proficiency is one of the challenges faced by the *Orang Asli* pupils where the mismatch between the academic language used by the teachers and tribal language used by the pupils may have hindered the virtual learning process. This notion has long been observed among the *Orang Asli* pupils whereby the lack of proficiency in the academic language had significantly impacted their ability to learn mathematics (Ruzlan Md-Ali et al., 2021).

The lack of academic language proficiency would subsequently influence the pupils' mathematical proficiency during virtual learning, which may influence the mathematical development in the post-Covid era when face-to-face classes had resumed. During the pupil's early formal education, the lack of academic language proficiency during classroom instruction and assessments had led to a low display of true mathematical performance. Newkirk-Turner and Johnson (2018) posited that pupils who were unfamiliar with mathematics vocabulary and jargon in most mathematics lessons were unable to display their true mathematical ability. Therefore, this issue is further compounded when pupils were required to learn mathematics virtually and were assessed accordingly using formative assessments during virtual learning, which subsequently affected their performance. Hence, due to the sudden school closure, *Orang Asli* pupils were not be able to develop the necessary proficiency in the academic language, which is also used as the language of assessment, and therefore, these pupils found

it difficult to comprehend the mathematics concept needed to solve the mathematics items. As these younger pupils were more proficient in their tribal language, the use of their dominant tribal language could have likely to have helped more to alleviate language challenges and learning difficulties faced during the virtual learning so that they were more able to display their true mathematical ability in the post-Covid era. (Johnsen & Ryser, 2021).

Socioeconomic factors and isolated locations of the *Orang Asli* communities have also made it less easy to implement Mathematics virtual learning (Barrot et al., 2021). As the *Orang Asli* pupils were from the low-income group, the pupils lacked the technological resources needed to carry out virtual learning at their homes as some of them could not afford to own laptops and smart handphones. Moreover, the remote locations of the *Orang Asli* settlements disrupted access to established stable Internet connectivity at these areas, which subsequently affected the implementation of the virtual learning processes. As these factors were identified as significant challenges during virtual learning, the teachers had to employ alternative measures to complement the virtual learning carried out among the Orang Asli pupils.

Therefore, mobile devices with broadband services and the delivery of modules were mainly used to support virtual learning processes. This notion was also supported in the study by Nuraini et al. (2021), whereby the teachers had to deliver mathematics modules as part of the virtual learning for the *Orang Asli* pupils who do not have access to a computer or Internet. This ensured that the pupils were able to continue learning the content of the syllabus through the modules which had been developed for these pupils (Pramana, 2021). Accordingly, in this study, it was found that the teachers had developed modules that were sent to the pupils through public transportation such as lorries and buses or were collected by the parents from the schools. Moreover, it was found that the parents were an important medium in communicating the mathematics materials and content between the teachers and pupils from the home-school environment (Ewing & Cooper, 2021). As such, the teachers found that the use of modules as effective part of the virtual learning process for mathematics among *Orang Asli* pupils at that time, in addition to mobile learning.

However, poor accessibility to deliver the modules to the *Orang Asli* pupils may have disrupted mathematics virtual learning. Due to the sudden declare of the Movement Control Order (MCO) that was implemented during the Covid-19 pandemic, most teachers were unable to timely provide adequate teaching resources to effectively carry out virtual learning as everyone needed some time to embrace the emergency learning and remote teaching, which was new to both pupils and teachers of the world. In addition, the lack of Internet connectivity also prevented effective virtual learning to be conducted (Serhan, 2020). Nonetheless, the study

found that mobile learning through the use of WhatsApp and phone calls were effective to some extent as a means to complement virtual learning. This measure provided an avenue for the *Orang Asli* pupils to continue learning mathematics virtually despite the lack of the more computers, laptops and Internet access (Mohd Razali Abd Samad et al., 2021). Government, non-governmental organizations and telecommunication companies' initiatives to provide free mobile devices and broadband services to pupils in remote areas (Mohd. Firdaus Mohd. Arif & Choo Ta, 2022) further helped ease the burden of the pupils and their family during the times of virtual learning and ensured that these pupils, to a certain extent, could continue to learn with their teachers.

Other than that, the pupils' attitude towards Mathematics education is an important factor that drove pupil's motivation to do well (Mazana et al., 2019). Luaran et al. (2016) noted that *Orang Asli* pupils have a positive attitude towards information and communications technology (ICT). Therefore, innovative teaching strategies such as interactive discussion via social media and messaging platforms such as WhatsApp during virtual learning potentially induced interest and encourage the pupils' engagement during the virtual classroom activities. Moreover, by implementing more group activities among the pupils, particularly among pupils from the same tribal group, encouraged cooperation that helped develop the positive attitude to learning (Kong et al., 2018). Moreover, with the use of modules that were delivered to the pupils, group discussions among peers and parents also possibly stimulated positive learning experiences between parents and pupils and saw the robust parental involvement to help achieve the learning outcomes of the virtual mathematics lessons.

Other than that, this study further indicated that the parents' involvement is vital in the educational progress of the *Orang Asli* children during virtual learning. This notion is supported by Attar et al. (2022) whereby parents who have a more positive attitude towards education are able to invigorate the pupils' participation during the virtual learning processes. Conversely, the present study highlighted that the lack of awareness on the importance of education among the parents was an issue faced by the Mathematics teachers when implementing virtual learning. Boonk et al. (2018) proposed that for virtual learning to be effectively conducted, the parents' involvement in the education of their children is important.

As there is a need for parents' involvement in the educational development of their children, teachers can employ teaching strategies in collaboration with their pupils' parents when carrying out virtual learning (Ayda et al., 2020). The collaboration between teachers and parents may help the teachers implement correct learning practices at home for the benefit of the *Orang Asli* pupils (Parmigiani, 2021) as revealed in this study. By changing the parents'

perception on education, this may influence the *Orang Asli* pupils to do well in their mathematics education, whereby teachers become the mediator between the teacher-parent and teacher-pupils relationship that ensures effective virtual learning to take place.

The sudden transition to virtual learning has led to large workloads for teachers to ensure that the education curriculum and materials were delivered on online platforms for their pupils (Allen et al., 2020). Conversely, the pupils also had to face similar issues, whereby they had to adapt to this sudden transition (Baticulon et al., 2021). In all the pandemonium where everyone turned to virtual learning as the solution, it distracted many stakeholders from the demands of virtual learning had on the students' psychological state. This study highlights that the *Orang Asli* pupils had to experience isolated learning for a long duration due to the implementation of virtual learning during the Covid-19 pandemic. The lack of face-to-face interaction between the Mathematics teachers and the *Orang Asli* pupils had at present subsequently raised concerns over potential learning loss that may have been caused by the effects of the pandemic (Sabates et al., 2021).

The limited formative assessments carried out by Mathematics teachers during the pandemic further intensified the potential learning loss experienced by the pupils in the post-Covid era. Schult et al. (2022) found that students in elementary schools in Hamburg had significantly suffered learning loss in Mathematics after the schools resumed when compared to their pre-Covid mathematics performance. It was further highlighted that the learning loss was more prominent among students from low socioeconomic background. This notion was further supported by Contini et al. (2021) and Hevia et al. (2022). They proposed that the learning loss among students from poorer backgrounds may have been a result of the digital divide and low-educated parents. This study also confirms that the prolonged duration of the school closure and lack of any teaching and learning processes at the time might have led to potential learning loss that may widen the educational achievement gap of the *Orang Asli* pupils from their mainstream counterparts, particularly in mathematics. As these factors may be characteristics of some *Orang Asli* pupils, it is important that the teachers acknowledge that the challenges faced by their pupils during virtual learning had led to learning loss and this awareness requires their most immediate attention in the post-Covid era.

Further Studies

As this exploratory qualitative study only highlighted the challenges faced by the *Orang Asli* pupils from the teachers' perspective, further studies can incorporate the perspectives of other stakeholders such as parents on the challenges faced by the *Orang Asli* pupils when carrying out virtual learning. Findings from parents' perspective would have add more value

in understanding the emotional and mental state of the *Orang Asli* pupils, apart from their physical state when home is turned into a permanent learning environment. The convenience and the type of interference in the learning environment can help teachers to understand the *Orang Asli* pupils' psychological state as well,

In a nutshell, this study reveals that virtual learning did occur in the case of *Orang Asli* pupil, mainly with mobile devices and module. Mobile learning using smart handphones with WhatsApp installed and phone calls, and modules prepared by teachers were also used concurrently with virtual learning, particularly among pupils in rural areas (Siti Subaryani Zainol et al., 2021). With most pupils possessing a mobile device, and telecommunication companies providing affordable broadband coverage during the pandemic (Mohd Razali Abd Samad et al., 2021), pupils were able to carry out virtual learning to some extent using predominantly mobile learning and modular learning. Moreover, modules that were delivered to pupils either through correspondences, public transportation or collected by the parents themselves had provided additional educational support at that time. Therefore, as the delivery of virtual learning was different for the *Orang Asli* pupils as compared to their mainstream counterparts, further extensive exploration on the use of mobile learning and modules is necessary to gauge them as promising virtual learning platforms.

Implications

The use of virtual learning in the future will continue to be a viable option that allows for the continuation of teaching and learning processes to be carried out, despite resuming physical classes in schools. Therefore, the findings from this study can draw attention to the challenges faced by the *Orang Asli* pupils for various stakeholders such as the Ministry of Education, non-government organizations and private companies in establishing collaborative policies and measures to uplift the education of *Orang Asli* pupils, and the Indigenous pupils in general. Additionally, based on existing findings, ultimately there is a need to reflect on more viable solutions based on the challenges highlighted in this study.

In addition, by establishing the appropriate measures, necessary technological resources can also be made available and affordable for the parents of *Orang Asli* pupils as they will be able to provide the needed resources to support virtual learning in the future. Furthermore, the findings shed light on the need to establish more robust forms of virtual learning by considering the various socioeconomic groups in the country, particularly the *Orang Asli* pupils.

Other than that, the findings can also help teachers to understand the challenges faced by their pupils and devise adaptable and innovative teaching strategies that can be implemented

during Mathematics virtual learning. This will enable teachers to deliver mathematics contents that cater to the need of the pupils. Teachers should develop a broad range of teaching measures such as using mobile devices via WhatsApp and social media platforms, and utilize Mathematics modules, which can promote effective and meaningful virtual learning among the *Orang Asli* pupils for mathematics. The challenges identified in this study can potentially be mitigated to ensure pupils understand the mathematics learning better during virtual classroom instruction and alleviate the potential learning loss in the post-Covid era.

Lastly, this study also points to the potential benefits of teacher-parent collaboration in the successful implementation of virtual learning. Findings revealed that *Orang Asli* parents can play prominent and critical role in their children's education, as evident from their willingness to pick up modules from schools. Teachers' attempt to include parents in the pupils' education is seem as laudable move in the right direction that would help increase the pupils' participation and commitment in their learning during virtual learning (Lawrence & Fakuade, 2021). Looking beyond virtual learning, teachers can also build a better rapport with parents and help more parents to understand the importance of education, more specifically Mathematics in their daily lives so that they can influence their children to put in more effort in school. Therefore, parents and teachers can work together to ensure that the *Orang Asli* pupils benefit from the Mathematics virtual learning to alleviate the potential learning loss in the post-Covid era.

Conclusion

The implementation of virtual learning which replaced face-to-face classroom learning during the pandemic revealed emerging challenges that were faced by the *Orang Asli* pupils. From this study, the findings revealed that language proficiency challenges, logistic challenges, home challenges, and classroom challenges were some of issues identified by the mathematics teachers that affected the implementation of mathematics virtual learning among the pupils. Subsequently, this may have affected the teaching and learning process, which may result in the potential learning loss that could be experienced by the *Orang Asli* pupils in the post-Covid era.

While most of mainstream pupils were dependent on computer and laptops with Internet access for their virtual learning, the *Orang Asli* pupils, on the other hand, were dependent on mobile devices with broadband connectivity, where virtual learning was carried out via WhatsApp and phone calls. Additionally, the use of modules was also found to be a viable measure that aided mathematics virtual learning among the *Orang Asli* pupils. This enabled the

Orang Asli pupils to stay abreast on the current syllabus as the teachers were able to provide feedback when necessary. Accordingly, future studies can focus on mobile learning and modular learning as promising alternative learning strategies for Mathematics in a virtual platform, particularly among the *Orang Asli* pupils and perhaps even in rural areas that have limited Internet connectivity. Adding pupils' perspective to the challenges faced during the learning crisis will also shed more light and add value to their virtual learning experience.

Moreover, as teachers were more attuned to the challenges faced by the *Orang Asli* pupils, extensive and appropriate instructional support can be developed to ensure that the potential learning loss suffered during the pandemic do not impede further educational advancement of the *Orang Asli* pupils in the post-Covid era. Hence, teachers, pupils, parents, and the community should stay united to overcome the challenges faced by the *Orang Asli pupils* that would subsequently aid in the future educational achievement of the Indigenous learning community.

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References

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive Learning Environments*, 1-13.

Al-Mahdi, O. (2019). Family-School Connections: Different Theoretical Perspectives and their Implications for Teacher Education. *Humanities and Social Science Research, 2*(4), 13-21. https://doi.org/10.30560/hssr.v2n4p13

Aliyyah, R. R., Rachmadtullah, R., Samsudin, A., Syaodih, E., Nurtanto, M., & Tambunan, A. R. S. (2020). The perceptions of primary school teachers of online learning during the COVID-19 pandemic period: A case study in Indonesia. *Online Submission, 7*(2), 90-109.

Allen, J., Rowan, L., & Singh, P. (2020). Teaching and teacher education in the time of COVID-19. *Asia-Pacific Journal of Teacher Education, 48*(3), 233–236.

Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *Int. Rev. Res. Open Distance Learn*. 12, 80–97. Available online at:
http://www.irrodl.org/index.php/irrodl/article/view/890/1663/

Ang, S. M., & Ang, S. C. (2021). Malaysian university students' technology usage experience in the ongoing covid-19 pandemic. *Management, 6*(22), 188-199.

Angelico, T. (2020). Educational inequality and the pandemic in Australia: Time to shift the educational paradigm. *International Studies in Educational Administration, 48*(1), 46-53.

Attar, Z., Blom, E., & Le Pichon, E. (2022). Towards more multilingual practices in the mathematics assessment of young refugee students: effects of testing language and validity of parental assessment. *International Journal of Bilingual Education and Bilingualism, 25*(4), 1546-1561.

Ayda, N. K., Bastas, M., Altınay, F., Altinay, Z., & Dagli, G. (2020). Distance education for students with special needs in primary schools in the period of COVID-19 epidemic. *Propósitos y Representaciones, 8*(3), e587.

Babbar, M., & Gupta, T. (2022). Response of educational institutions to COVID-19 pandemic: An inter-country comparison. *Policy Futures in Education, 20*(4), 469-491. https://doi.org/10.1177/14782103211021937

Barrot, J. S., Llenares, I. I., & Del Rosario, L. S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. *Education and Information Technologies, 26*(6), 7321-7338.

Baticulon, R. E., Sy, J. J., Alberto, N. R. I., Baron, M. B. C., Mabulay, R. E. C., Rizada, L. G. T., & Reyes, J. C. B. (2021). Barriers to online learning in the time of COVID-19: A

national survey of medical students in the Philippines. *Medical Science Educator*, *31*(2), 615-626. https://doi.org/10.1007/s40670-021-01231-z

Boonk, L., Gijselaers, H. J., Ritzen, H., & Brand-Gruwel, S. (2018). A review of the relationship between parental involvement indicators and academic achievement. *Educational Research Review*, *24*, 10-30.

Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. Sage Publications.

Contini, D., Di Tommaso, M. L., Muratori, C., Piazzalunga, D., & Schiavon, L. (2021). *The COVID-19 pandemic and school closure: learning loss in mathematics in primary education* (No. 14785). IZA Discussion Papers.

Corbin, J., & Strauss, A. (2015). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Sage Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches*. SAGE Publication.

Dinata, I., & Setyawan, A. (2022). Analysis of problems in mathematics learning in elementary school post online learning. *maktab: Jurnal Pendidikan dan Teknologi*, *1*(2), 420-425.

Ewing, L. A., & Cooper, H. B. (2021). Technology-enabled remote learning during COVID-19: perspectives of Australian teachers, students and parents. *Technology, Pedagogy and Education*, *30*(1), 41-57. https://doi.org/10.1080/1475939X.2020.1868562

Faizah Idrus, Nur Afini Zainal Asri, & Nurin Najihah Baharom. (2021). Has Differentiated Instruction Gone 'Awry'in Online Teaching and Learning?. *Journal of Language Teaching and Research*, *12*(3), 501-510.

Ferri, F., Grifoni, P., & Guzzo, T. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. *Societies*, *10*(4), 86.

Flack, C. B., Walker, L., Bickerstaff, A., & Margetts, C. (2020a). Socioeconomic disparities in Australian schooling during the COVID-19 pandemic. *Melbourne, Australia: Pivot Professional Learning*, *13*, 319-340.

Flack, C. B., Walker, L., Bickerstaff, A., Earle, H., & Margetts, C. (2020b). Educator perspectives on the impact of COVID-19 on teaching and learning in Australia and New Zealand. *Pivot Professional Learning*.

Freeman, M. (2010). Vygotsky and the virtual classroom: Sociocultural theory comes to the communications classroom. *Christian Perspectives in Education*, *4*(1), 1-16.

Garbe, A., Ogurlu, U., Logan, N., & Cook, P. (2020). COVID-19 and remote learning: Experiences of parents with children during the pandemic. *American Journal of Qualitative Research*, *4*(3), 45-65. https://doi.org/10.29333/ajqr/8471

Haeck, C., & Lefebvre, P. (2020). Pandemic school closures may increase inequality in test scores. *Canadian Public Policy*, *46*(S1), 82-87.

Halili, S. H., & Sulaiman, H. (2019). Factors influencing the rural students' acceptance of using ICT for educational purposes. *Kasetsart Journal of Social Sciences*, *40*(3), 574-579.

Hodgen, J., Adkins, M., & Tomei, A. (2020). The mathematical backgrounds of undergraduates from England. *Teaching Mathematics and its Applications: An International Journal of the IMA*, *39*(1), 38-60. https://doi.org/10.1093/teamat/hry017

Hevia, F. J., Vergara-Lope, S., Velásquez-Durán, A., & Calderón, D. (2022). Estimation of the fundamental learning loss and learning poverty related to COVID-19 pandemic in Mexico. *International Journal of Educational Development*, *88*, 102515.

Imel, S. (2002). E-learning—Trends and Issues Alert. (Report No-40). Washington, DC: Office of Educational Research and Improvement.

Johnsen, S. K., & Ryser, G. R. (2021). Differentiating Mathematics Standards for Gifted Students. In *Modern Curriculum for Gifted and Advanced Academic Students* (pp. 297-318). Routledge.

Karpov, Y., & Kozulin, A. (2019). Vygotskian approach to instruction: Practical applications around the globe. *Journal of Cognitive Education and Psychology*, *17*(3), 219-222.

Kong, S. C., Chiu, M. M., & Lai, M. (2018). A study of primary school students' interest, collaboration attitude, and programming empowerment in computational thinking education. *Computers & education*, *127*, 178-189.

Kraft, M. A., & Simon, N. S. (2020). Teachers' experiences working from home during the COVID-19 pandemic. *Upbeat. Downloaded July*, *7*, 2020.

Lawrence, K. C., & Fakuade, O. V. (2021). Parental involvement, learning participation and online learning commitment of adolescent learners during the COVID-19 lockdown. *Research in Learning Technology*, *29*, 1-16.

Lembani, R., Gunter, A., Breines, M., & Dalu, M. T. B. (2020). The same course, different access: the digital divide between urban and rural distance education students in South Africa. *Journal of Geography in Higher Education*, *44*(1), 70-84.

Lopez, J., Siti Suria Salim, Zeinab Zaremohzzabieh, & Seyedali Ahrari. (2022). The role, experience, and challenges to headmasters of Indigenous primary schools amid Covid-19 in Malaysia. *Asian Journal of University Education (AJUE)*, *18*(1), 231-243.

Luaran J. @ E., Fazyudi Ahmad Nadzri, Kamarol Baharen Mohd Rom and Jasmine Jain. 2016. The importance of Information and Communication Technology in English learning: Indigenous students' perspectives. *Malaysian Journal of Distance Education 18*(1): 87–101. http://dx.doi.org/10.21315/mjde2016.18.1.6

Mazana, Y. M., Suero Montero, C., & Olifage, C. R. (2019). Investigating students' attitude towards learning mathematics. *International Electronic Journal of Mathematics Education, 14*(1), 207-231. http://dx.doi.org/10.29333/iejme/3997

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation (4th ed*). Jossey- Bass.

Ministry of Education Malaysia (2013). *Malaysian education blueprint 2013-2025* (preschool to Post-Secondary Education). Putrajaya, Malaysia: Ministry of Education Malaysia.

Mohd Razali Abd Samad, Zanaton Hj Ihsan, & Fariza Khalid. (2021). The use of mobile learning in teaching and learning session during the Covid-19 pandemic in Malaysia. *Journal of Contemporary Social Science and Education Studies (JOCSSES), 1*(2), 46-65.

Newkirk-Turner, B. L., & Johnson, V. E. (2018). Curriculum-based language assessment with culturally and linguistically diverse students in the context of mathematics. *Language, Speech, and Hearing Services in Schools*, *49*(2), 189-196.

Newman, S., & Latifi, A. (2021). Vygotsky, education, and teacher education. *Journal of Education for Teaching*, *47*(1), 4-17. https://doi.org/10.1080/02607476.2020.1831375

Noor Azlan Mohd Noor, & Noor Asyhikin Abd Razak. (2022). Overcoming learning challenges during the Covid-19 pandemic: Traditional knowledge as an educational alternative for the Orang Asli. *ICR Journal*, *13*(1), 31-50.

Nuraini, N. L. S., Qihua, S., Venatius, A. S., Slamet, T. I., & Cholifah, P. S. (2020). Distance learning strategy in covid-19 pandemic for primary schools. *International Webinar Series-Educational Revolution in Post Covid Era*, 107-116.

Oribiana, R. B. (2022). Parental involvement in homework on the students' performance. *International Journal of Research Publications*, *105*(1), 15-15.

Parmigiani, D., Benigno, V., Giusto, M., Silvaggio, C., & Sperandio, S. (2021). E-inclusion: online special education in Italy during the Covid-19 pandemic. *Technology, Pedagogy and Education*, *30*(1), 111-124. https://doi.org/10.1080/1475939X.2020.1856714

Pramana, C. (2021). Distance learning in primary schools during the covid-19 pandemic in Indonesia: Challenges, solutions, and projections. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(4), 263-270.

Rasmitadila, R., Widyasari, W., Humaira, M., Tambunan, A., Rachmadtullah, R., & Samsudin, A. (2020). Using blended learning approach (BLA) in inclusive education course: A study investigating teacher students' perception. *International Journal of Emerging Technologies in Learning (IJET)*, *15*(2), 72-85.

Reimers, F., Schleicher, A., Saavedra, J., & Tuominen, S. (2020). Supporting the continuation of teaching and learning during the COVID-19 Pandemic. *Organisation for Economic Cooperation and Development*, 1-44.

Ruzlan Md-Ali, Arsaythamby Veloo, S. Kanageswari Suppiah Shanmugam, Yus'aiman Jusoh Yusoff, & Rosna Awang Hashim. (2021). The issues and challenges of mathematics teaching and learning in Malaysia "Orang Asli" primary schools from teachers' perspectives. *Malaysian Journal of Learning and Instruction, 18*(2), 129-160.

Sabates, R., Carter, E., & Stern, J. M. (2021). Using educational transitions to estimate learning loss due to COVID-19 school closures: The case of Complementary Basic Education in Ghana. *International Journal of Educational Development*, *82*, 102377.

Schult, J., Mahler, N., Fauth, B., & Lindner, M. A. (2022). Did students learn less during the COVID-19 pandemic? Reading and mathematics competencies before and after the first pandemic wave. *School Effectiveness and School Improvement*, 1-20.

Serhan, D. (2020). Transitioning from face-to-face to remote learning: Students' attitudes and perceptions of using Zoom during COVID-19 pandemic. *International Journal of Technology in Education and Science*, *4*(4), 335-342.

Silver, D. S. (2017). The New Language of Mathematics: Is it possible to take all words out of mathematical expressions? *American Scientist*, *105*(6), 364-372.

Siti Subaryani Zainol, Suhaili Mohd Hussin, Maisarah Syazwani Othman, & Nur Hazrini Mohd Zahari. (2021). Challenges of online learning faced by the B40 income parents in Malaysia. *International Journal of Education and Pedagogy*, *3*(2), 45-52.

Smith, W. C. (2021). Consequences of school closure on access to education: Lessons from the 2013–2016 Ebola pandemic. *International Review of Education*, *67*(1), 53-78.

Umar, S. M. R. Y. S. (2021). COVID-19 Pandemic and addressing digital divide in Malaysia. *Journal of Information Systems and Digital Technologies*, *3*(2), 29-49.

Vygotsky, L. S. (1978). *Mind in society*. Harvard University Press.

Yohannes, Y., Juandi, D., Diana, N., & Sukma, Y. (2021). Mathematics teachers' difficulties in implementing online learning during the COVID-19 Pandemic. *Journal of Hunan University Natural Sciences*, *48*(5).

Youmans, M. K. (2020). Going remote: How teaching during a crisis is unique to other distance learning experiences. *Journal of Chemical Education, 97*(9), 3374-3380.

Zainal, A. G., Prakoso, G. H., Frasetya, V., Faizal, A. R., Fardiyan, R., & Sanjaya, F. J. (2022). Zoom utilization as an online learning media during the COVID-19 pandemic. *Journal of Innovation in Educational and Cultural Research, 3*(2), 242-247.