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Understanding the challenges faced by *Orang Asli* students in solving mathematics problems

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ABSTRACT

The educational attainment of *Orang Asli* students, a minority group in Malaysia, particularly in mathematics, has been a persistent concern. Despite this, research on *Orang Asli* mathematics education, especially in the southern region of Peninsular Malaysia, remains scarce. This study scrutinized the academic performance of *Orang Asli* students in whole numbers and operations at level 2 of primary school, focusing on their challenges in solving word problems in mathematics. A total of 22 *Orang Asli* students from year 4 and 5 in two *Orang Asli* primary schools participated, undertaking a mathematics test comprising five-word problems. The study identified five prevalent errors among *Orang Asli* students: i) failure to comprehend the question; ii) misconceptions; iii) inability to grasp specific terms in the question; iv) carelessness; and v) poor reading skills. The findings are thoroughly discussed, and strategies to enhance *Orang Asli* students' mathematical problem-solving abilities are proposed.

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1. INTRODUCTION

The *Orang Asli*, which refers to the indigenous peoples of peninsular Malaysia, make up 0.6% of the population of Malaysia, which is approximately equivalent to about 180,000 [1]. Despite being rarely mentioned in the country's demographics, the *Orang Asli* are a distinct group, alongside the Malays, Chinese, Indians, and Indigenous people of East Malaysia in Sabah and Sarawak. The *Orang Asli* in Malaysia, also known as indigenous people are not a homogeneous group. There are 18 subgroups, each with their own language and culture. However, they all experience marginalization in terms of socioeconomics and culture in Malaysia. The *Orang Asli* communities are still grappling with issues of poverty, which still exist at a serious level [2]. Therefore, education is crucial to enable the *Orang Asli* communities to rise and compete with the wider society and face the challenges of globalization [3]. The lack of knowledge and a good education qualification is a major reason why the *Orang Asli* struggle to secure good jobs [4]. The dropout rate among *Orang Asli* students remains a concerning issue in the Malaysian education system [5].

According to Wan and Idrus [6], *Orang Asli* students prefer to work at a young age after finishing their primary education instead of further study in secondary education. Moreover, *Orang Asli* students struggle to apply the knowledge acquired through the formal education system adapted from the West due to their different environments [7]. This could undermine the government's goals in the Malaysia Education Development Plan (PPPM) 2013-2025, which aims to commit to building student achievements through a systematic education system for all [8].

The Ministry of Education (MOE) is committed to implementing educational transformation for the *Orang Asli* and indigenous people through the PPPM 2013-2025 to ensure they receive quality and relevant education in line with current needs [9]. The *Orang Asli* community should not be marginalized in the development of the national agenda, and efforts should be made to combat the issues and stereotypes that have long portrayed the *Orang Asli* as underdeveloped and backward [10]. The consistent underachievement in the education of *Orang Asli* students is a cause for concern [11]. The majority of the *Orang Asli* in Malaysia still lag behind, especially in the education sector, compared to other ethnic groups. Issues include learning disparities and low academic achievement [12]. Studies showed that nearly 50% of *Orang Asli* students drop out of school after six years of education, and only 30% of students pass the secondary school level, which is less than half the national average [13]. To address the educational challenges faced by *Orang Asli* students, this study recommends implementing culturally responsive teaching strategies in mathematics instruction. Tailoring pedagogical approaches to align with their learning styles and lived experiences can better support their mastery of fundamental mathematical concepts and problem-solving skills. Additionally, providing targeted academic support, mentoring, and access to educational resources within *Orang Asli* communities can help improve their academic performance and reduce dropout rates.

2. CHALLENGES FACED BY *ORANG ASLI* STUDENTS IN LEARNING MATHEMATICS

Orang Asli students face challenges in learning mathematics due to their significantly different social backgrounds compared to what is depicted in the curriculum [14]. *Orang Asli* students often struggle to comprehend the standard curriculum and find that the school syllabus is not aligned with their intellectual understanding [12]. The curriculum and syllabus are typically designed with the general population in mind, but the learning abilities of *Orang Asli* students differ significantly from their peers in Malaysia [5]. Mathematics is a crucial subject in school for *Orang Asli* students [15]. Therefore, appropriate teaching and learning approaches in mathematics need to be implemented to achieve the desired outcomes [16]. In Malaysia, primary school mathematics follows the Standard Primary School Curriculum (KSSR) throughout the country, regardless of students' backgrounds. The findings of the study conducted by Mamat and Wahab [17] indicated that the root cause of weaknesses in rural students, including among *Orang Asli*, lies in their lack of mastery of fundamental mathematical concepts, encompassing all components of mathematical learning.

The primary process of teaching mathematics at the primary level emphasizes basic arithmetic operations, including addition, subtraction, multiplication, division, and solving daily life problems [18]. However, this learning process constantly evolves to adapt to current needs and align with curriculum requirements and learning conditions [19]. When students do not master these basic concepts well, it becomes challenging for them to engage in mathematics learning, as solving mathematical problems begins with a solid grasp of these fundamental concepts [20]. Once students are able to master these processes, they can progress to solving more complex problems, such as division and multiplication involving fractions. Therefore, this study aims to thoroughly examine the academic performance of *Orang Asli* students in level 2 primary school for the topic of whole numbers and operations and identify the errors they encounter in solving word problems in mathematics.

3. METHOD

This study employed a survey research design. The instrument used was a mathematics test focusing on the topic of whole numbers and basic operations. The test aimed to assess the student's ability to understand and apply whole numbers up to 100,000 using the correct mathematical language related to whole numbers and basic operations. Additionally, students were expected to understand and apply the concepts and procedural skills for basic operations and utilize their mathematical knowledge and skills to solve problems related to whole numbers and basic operations up to 100,000. Finally, in this topic, students were expected to make inferences, connections, representations, communicate, and use technology when studying whole numbers and basic operations up to 100,000.

The test consisted of five items, with questions 1 to 3 involving addition and subtraction operations, while questions 4 and 5 involved multiplication and division operations. The instrument was also validated by three experts in the field. According to Kock *et al.* [21], the validity of the instrument is crucial to maintain the accuracy of the test and prevent it from being susceptible to flaws. The higher the validity of the questionnaire, the more accurate the data obtained. This study was conducted in Indigenous national schools, or *Sekolah Kebangsaan Asli* (SK Asli) referring to schools that have a majority or 100% of students from the *Orang Asli* community. SK Asli are schools that were originally established by the Department of *Orang Asli* Affairs (JAKOA) and are now administered under the Ministry of Education Malaysia [22], with a total of 89 SK Asli throughout Malaysia [23]. In context of this research, the study was conducted in two primary

schools: SK Asli Peta in the Mersing district and SK Punan in the Kluang district. A total of 22 *Orang Asli* students from Year 4 and Year 5 of SK Asli Peta and SK Punan were involved in this study. Table 1 presents the demographic information of the sample participants in this research.

Each student was asked to answer five word problems in mathematics within one hour. The test was developed by the researcher based on the primary school mathematics curriculum following the KSSR. The test covered problems that required students to use basic mathematical operations such as addition, subtraction, multiplication, and division. Each problem was allocated two marks, making a total of 10 marks. Figure 1 shows the distribution of marks for the 22 students involved.

Table 1. Sample demographics for the study

School	Gender		Total
	Male	Female	
SK Asli Peta	6	5	11
SK Asli Punan	1	10	11
Total	7	15	22

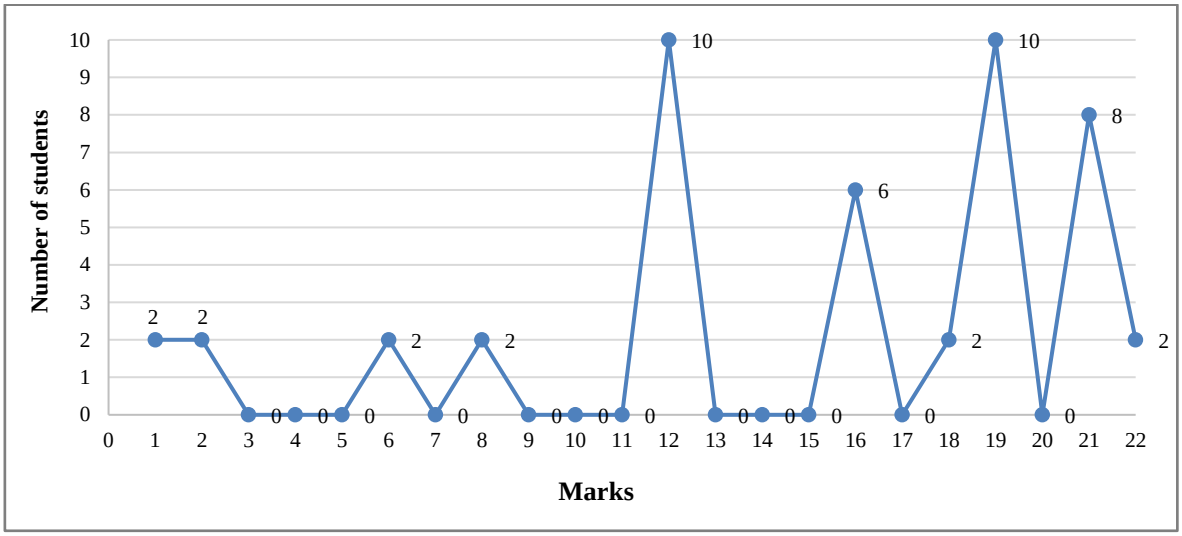


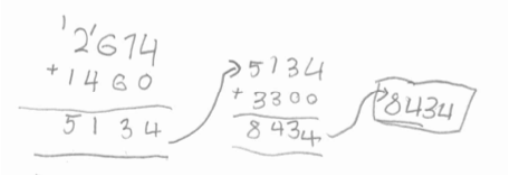
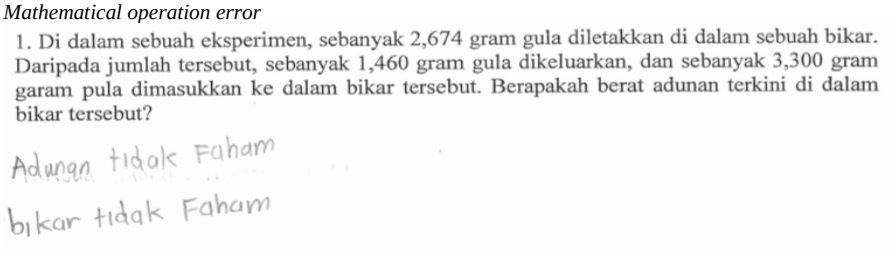
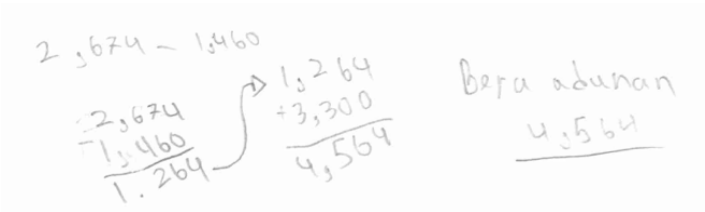
Figure 1. Distribution of marks for the involved students

From the Figure 1, it can be observed that two students (9.1%) achieved full marks, followed by one student (4.5%) each who scored 8 and 6 marks, and six students (27.3%) each scored 2 marks. However, a total of 12 students (54.5%) failed to obtain any marks. Each student's answers were then analyzed in-depth. *Orang Asli* students were found to encounter difficulties with word problems in mathematics. As shown in Table 2, the type of errors encountered by *Orang Asli* students taking this test can be divided into five types, namely i) failure to understand the question; ii) misconceptions; iii) lack of comprehension of specific terms contained in the question; iv) carelessness while solving problems; and v) difficulty in reading. The following discussion in Figure 2 presents the answers of students who successfully obtained correct answers with a systematic approach.

In the response provided by the student, she understood the question requirements and demonstrated a systematic approach to solving the problem. The operations involved in this solution are subtraction followed by addition. The information in Table 3 shows the number and percentage of students based on the type of error, as well as the students who successfully solved the problems according to the question number.

From the Table 3, for question one, 45.5% of the students made errors in mathematical concepts when solving the question, while 36.4% of the students successfully obtained the correct answer for question two. However, 31.8% of the students made errors in mathematical concepts when solving the same question. For question three, 27.3% of the students could answer the question correctly, but the same percentage made errors in mathematical concepts. When looking at questions 4 and 5, on average, students failed to obtain the correct answer due to errors in concepts, with 40.9% and 54.5%, respectively. Additionally, there is also a moderate percentage of students who struggle with reading and understanding the questions.

Table 2. The type of errors encountered by *Orang Asli* students

Type of errors	Example of student work
Failure to understand the question	1. Di dalam sebuah eksperimen, sebanyak 2,674 gram gula diletakkan di dalam sebuah bikar. Daripada jumlah tersebut, sebanyak 1,460 gram gula dikeluarkan, dan sebanyak 3,300 gram garam pula dimasukkan ke dalam bikar tersebut. Berapakah berat adunan terkini di dalam bikar tersebut? Saya tidak faham In an experiment, a total of 2,674 grams of sugar was placed in a container. From this amount, 1,460 grams of sugar was removed, and 3,300 grams of salt was added to the container. What is the current weight of the mixture in the container? Student's answer: *I don't understand*
Misconceptions	 *Mathematical operation error*
Lack of comprehension of specific terms contained in the question	 1. In an experiment, a total of 2,674 grams of sugar was placed in a container. From this amount, 1,460 grams of sugar was removed, and 3,300 grams of salt was added to the container. What is the current weight of the mixture in the container? Student's answer: *I don't understand the meaning of mixture and beaker.*
Carelessness while solving problems	
Poor reading skills	The answer sheet was left blank, and when asked, the student stated that they couldn't read.

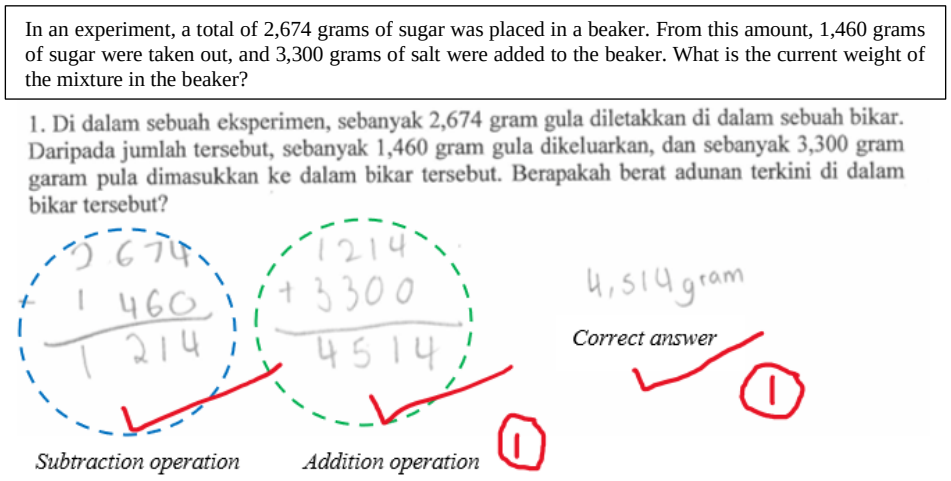


Figure 2. Sample of a correct answer with the correct solution strategies

Table 3. Number and percentage of students by type of error

Type of error	Failure to understand the question		Misconceptions		Lack of comprehension of specific terms contained in the question		Poor reading skills		Carelessness while solving problems		Successfully solved the problem	
	n	%	n	%	n	%	n	%	n	%	n	%
Question 1	1	4.5	10	45.5	2	9.1	4	18.2	1	4.5	4	18.2
Question 2	1	4.5	7	31.8	2	9.1	4	18.2	0	0	8	36.4
Question 3	2	9.1	6	27.3	2	9.1	4	18.2	2	9.1	6	27.3
Question 4	5	22.7	9	40.9	0	0	4	18.2	1	4.5	3	13.6
Question 5	3	13.6	12	54.5	1	4.5	4	18.2	0	0	2	9.1

Note: The number of students answering each question is 22

4. RESULTS AND DISCUSSION

This study highlights the significant challenges *Orang Asli* students face in solving mathematical word problems. A key finding is that over half of the students (54.5%) were unable to score any marks on the mathematics test. This indicates a critical need for intervention, particularly in developing the skills needed to interpret and solve word problems. While students also demonstrated difficulties with certain mathematical operations, such as multiplication and division, the analysis of errors suggests that the primary challenge lies in understanding the problem and selecting the appropriate mathematical operations. This aligns with previous study findings, which emphasize the importance of literacy skills in solving mathematical word problems [24]. For example, Figure 3 illustrates a student's response to question 4, which involved both division and multiplication. The student's work demonstrates difficulty in distinguishing between these basic operations, highlighting the interconnectedness of literacy and numeracy skills.

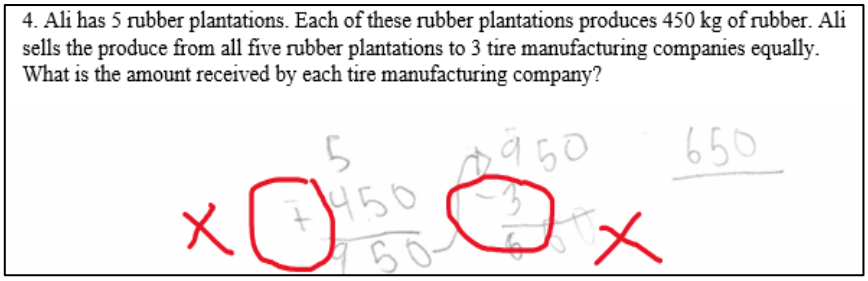


Figure 3. Misconceptions in basic operation by students

Study by Ismail *et al.* [25] explored the numeracy competency of year 5 *Orang Asli* students using written and oral tests and analyzed the results using paired samples t-tests and Pearson correlation. Based on the mean score in the written test among 87 year 5 *Orang Asli* students in Johor, numeracy competency was found to be at a moderate level. Most of the students performed better in measurement compared to other topics, but they seemed to encounter difficulties with problem-solving. Shanmugam *et al.* [26] also suggest that testing *Orang Asli* pupils in their community language, alongside the academic language, may help improve their mathematical abilities. In this study, there were students who did not understand specific terms contained in the questions. As shown in Figure 4, some of the terms they did not comprehend included "*adunan*," "*bikar*," "*kincir angin*," and "*reptilia*."

Additionally, the study recommends that teachers provide students more opportunities to practice solving word problems and develop their language proficiency to unpack the language into mathematical symbols. In a study carried out by Chikiwa and Schafer [27], it was observed that teachers in the study refrained from utilizing any mathematical resources prepared in IsiXhosa, an indigenous language of South Africa and Zimbabwe. Instead, they depended on their own comprehension and translations. Nevertheless, in the rare instances when they did switch to English mathematical terms, they did so accurately and consistently in accordance with formal definitions.

The study emphasizes improving Mathematics teaching through suitable materials and support. It highlights creating IsiXhosa teaching materials and enhancing initiatives in Indigenous languages for educators. Code switching strategies (CS) involve using terms that are clear and evident to students, as described by Meaney *et al.* [28]. In the study conducted by Chikiwa and Schafer [27], four types of CS [29] were identified: semantic transfer (SST), paraphrase (PAR), compounding (COM), and ready translated equivalent (RTE). SST involves code-switching by giving existing words new meanings or adding more

technical meanings through changes in their semantic content. PAR is a form of code-switching that provides a brief description or explanation of a word by combining related or unrelated words [30]. Meanwhile, COM is a type of code-switching in which a term is created by combining existing words to form a single word, as explained by Meaney *et al.* [28]. RTE encompasses all situations where there are no issues of non-equivalence at the word or phrase level between the source language (English) and the target language.

In a Malaysian context, according to Jalil *et al.* [31], *Orang Asli* students often struggle with mathematics when assessed in academic language they have limited proficiency in, leading to lower proficiency in classroom instruction and compromising their mathematical performance. Four major factors have been identified as impacting their learning of mathematics: language, assessment, learning style, and relevance of the mathematical activities. In line with that, a study by Veloo *et al.* [32] found that the *Orang Asli* pupils face more difficulty in answering the topics of operation on numbers, money, and time in the Bahasa Melayu version compared to the Temiar version. The study also shows that the bilingual version had improved the *Orang Asli* pupil's mathematics achievement in the topic of money and time in the mathematics computation and word problem items. In conclusion, the *Orang Asli* students in this study encountered several errors when solving mathematics problems. The most common error was misconceptions in mathematics, followed by not understanding the question, not comprehending specific terms contained in the questions, and carelessness while solving problems. It is worth noting that out of the 22 *Orang Asli* students involved in this study, four of them were unable to read.

Despite the majority of students in this study facing challenges in solving mathematical word problems, those who successfully completed some or all of the given questions also need attention. 9.1% of the students obtained full marks, which is 10 marks, followed by 4.5% who scored 8 and 6 marks each, and 27.3% who scored 2 marks. Upon analyzing their work, it is evident that they understood the mathematical problems provided and produced systematic working steps and solution strategies. Supporting students' strategic competence and productive dispositions is critical in fostering their problem-solving success among *Orang Asli* students, especially at the primary level. According to Reid O'Connor and Norton [33], when students' strategic competence was supported through scaffolded Newman interviews, their problem-solving proficiency increased. As shown in Figure 5, Newman's error analysis breaks down the five steps involved in solving a mathematical word problem: reading and decoding, comprehending, transforming, processing and encoding.

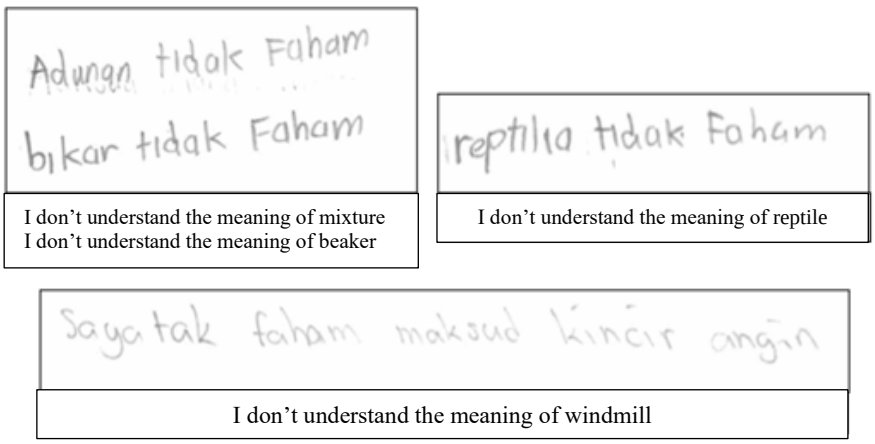


Figure 4. Students not understanding specific terms in questions

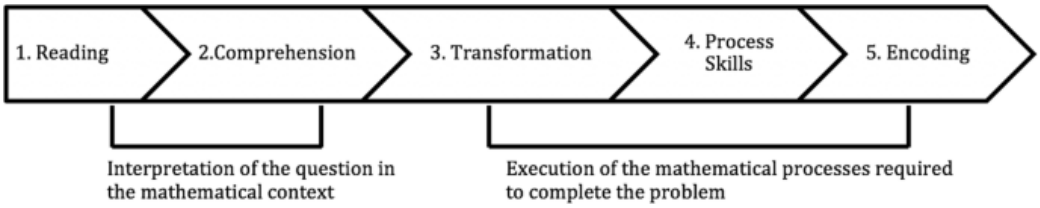


Figure 5. Newman's error analysis

The oral and personal nature of Newman interviews significantly increased students' productive dispositions towards the tasks. Many students had difficulties problem-solving on written tests, but they were more successful in problem-solving during the Newman interviews. Some students were motivated to persist in problem-solving during the interviews due to a desire to please the interviewer. Students were more willing to attempt questions in interviews compared to written tests, where non-attempts were common.

As is commonly observed, primary school students, particularly those belonging to the *Orang Asli* community, may encounter challenges when attempting to solve mathematical problems. According to Ministry of Education [34], the mathematical processes that support effective and thoughtful mathematics learning include mathematical communication. Mathematical communication can help students explain and reinforce their understanding of mathematics. Sharing mathematical understanding through written and oral communication with classmates, teachers, and parents can enhance students' confidence and make it easier for teachers to monitor their mathematical skill development. Communication plays a crucial role in ensuring meaningful mathematics learning [35]. Through communication, mathematical ideas can be expressed and understood more effectively. Mathematical communication, whether oral, written, or using symbols and visual representations (such as charts, graphs, and diagrams), can help students understand and apply mathematics more effectively. Assessment of students' ability to communicate mathematically effectively should provide evidence that students can generate, explain, and share mathematical ideas through various forms of communication in different settings. Students who are consistently given opportunities and encouragement to speak, read, write, and listen during mathematics learning will be able to communicate to learn mathematics and learn to communicate mathematically.

Ismail *et al.* [25] have proposed a comprehensive set of strategies to address the issue of low numeracy competency among *Orang Asli* students in Johor, Malaysia. These strategies encompass early intervention programs to bolster numeracy skills during the primary school years, the implementation of culturally sensitive teaching methods that integrate *Orang Asli* culture and language, opportunities for professional development to enhance teachers' proficiency in teaching numeracy to *Orang Asli* students, a focus on encouraging parental engagement to support their children's numeracy development, provision of additional resources and support to schools in remote and rural areas with significant *Orang Asli* student populations, and efforts to improve the quality and availability of assessment tools for accurately measuring students' numeracy competency and monitoring their progress over time. These strategies collectively aim to address the numeracy challenges faced by *Orang Asli* students and promote their development of numeracy skills in Johor, Malaysia.

O'Connor and Norton [33] suggest that a combination of cognitive, metacognitive, affective, and cultural factors should be considered when designing instructional strategies to improve students' skills in solving math problems. One of them is to emphasize the importance of understanding and transforming problem-solving questions into appropriate computations. This can be achieved by teaching mathematical problem structures in context. Besides that, incorporating scaffolds, such as Newman questions, can help students focus on the mathematical structures in problems. This can enhance their metacognitive awareness and problem-solving abilities. Recognize that task avoidance is a prevalent barrier to successful problem-solving. This may be influenced by cultural predispositions. Teachers should work on developing students' productive disposition towards mathematics and create a supportive learning environment. They also encourage teachers to help students develop strategic competence by providing opportunities to practice and apply problem-solving strategies. This can involve teaching students how to choose appropriate strategies to find solutions. Finally, recognize the importance of motivation in problem-solving. Encourage students to persevere with tasks and develop a belief in their own efficacy. This can be achieved by creating engaging and meaningful math learning experiences.

The study's findings have also revealed a concerning trend of *Orang Asli* students in fourth and fifth grades who are still unable to read. This issue can be attributed to various factors within indigenous communities, including poverty, inadequate infrastructure facilities, low educational attainment, and high absenteeism. Effective strategies to address these challenges comprise government funding and support allocation, implementation of engaging teaching methods, parental involvement, and targeted awareness campaigns. It is imperative that these measures be earnestly implemented to prevent the escalation of illiteracy issues among Indigenous populations and uphold their overall social well-being.

5. CONCLUSION

The challenges faced by *Orang Asli* students in mathematics and literacy require urgent attention. To address these issues effectively, early intervention programs, culturally sensitive teaching methods, teacher training, parental engagement, and additional resources are necessary. Improved assessment tools can

help measure students' progress accurately. These strategies can empower *Orang Asli* students and contribute to the social and economic development of their communities.

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