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Students' Mathematical Anxiety during the Covid-19 Pandemic and Its Impact on Deaf Students' Mathematics Learning Outcomes

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Abstract

The emergence of various problems during online learning must receive attention, especially for special needs students. For deaf children, online learning problems in mathematics lessons will become more complex due to communication barriers (hearing loss). This study aims to analyze deaf children's mathematical anxiety in learning mathematics and its correlation to the deaf children's learning outcomes during the Covid-19 pandemic. This research was descriptive and correlational research types. The subject research was deaf children at the SMP Luar Biasa Negeri Tuna Rungu. The study sample was 24 students. Research data was collected by observation, interviews, questionnaires, and tests. The data analysis used was descriptive analysis and simple regression. The results showed that deaf children's mathematical anxiety was very high. The results of the regression analysis show that mathematical anxiety has a significant effect on mathematics learning outcomes. Even though online learning during the pandemic has made the implementation of mathematics learning flexible because it can accommodate different learning styles of children, many obstacles were found in the learning process, given the limitations of deaf children, and they preferred offline learning. The implications of this research are expected to be an evaluation for teachers and deaf children to improve mathematics learning outcomes and to overcome deaf children's mathematical anxiety.

1. Introduction

The pandemic *Covid-19* made teachers, parents, and children live the new normal by using information technology and electronic media to succeed in the teaching and learning process (Farell et al., 2021; Gandolfi et al., 2021; Koutsoupidou, 2014). However, an ideal education must be on priority, because it is been worried that during the pandemic, the educational elements will relinquish their responsibilities, therefore, impacting the quality of graduation competency standards decrease (Bahasoan et al, 2020; Rasmitadila et al., 2020; Simamora, 2020). Online learning eases the students to gain information deeper through the internet network (Febrianto et al., 2020; Williamson et al., 2020). Online learning is found less complicated by normal children, only facing drawbacks of independency-not depending on the teachers' instruction.

Regulation enactment of online learning is implemented as well for special needs students. One of the special needs student categories based on its types of disabilities is deaf children. Deaf children are those who have one or more of the outer, middle and inner ear organs impaired or damaged due to disease, or other unknown causes so that these organs do not perform their functions properly (Napoli et al., 2015; Rachmat & Gazali, 2021). Special needs students are placed in the B class of the Special School, known as

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SLB-B. One of the lesson's roles in human daily life is mathematics because the subject is a science of language and service to other sciences. Mathematics is needed to be given to all students from all grades including special needs students because mathematics has the same aims for both normal students and special needs students which are to give them logical, analytical, systematical, critical, creative, problem-solving, and collaborative skills. Competency is needed therefore the children can gain, process, and use the information to survive in changeable environments, full of uncertainty, and competitive (Löbler, 2006; Rokhman et al., 2014). Mathematics subject at school develops the ability to use symbols, tables, diagrams, and other media, and so trains the students' positive character development (Daher, 2020; Minarni et al., 2016).

However, the special needs students' mathematics learning outcomes are still low (Suarsana, 2021; Suarsana et al., 2019). Their learning outcomes are lower than those of normal students (Marschark & Knoors, 2012; Tanridiler et al., 2015). For normal students, mathematics is a difficult subject for its abstract nature therefore it creates anxiety for students (Cahyani et al., 2021; Pujawan et al., 2020). Each student has different characteristics in his growth and development, and so do deaf students. For them, online learning problems are more complex because of the communication barrier (hearing loss) (Alqraini & Alasim, 2021; Tanridiler et al., 2015; Zirzow, 2015). Learning difficulties for students such as weaknesses in acquiring information, barriers in interaction with the teachers or other students, and low learning motivation influenced by inconvenience and frustration due to barriers in expressing ideas or questions (Chen, 2014; Nunes & Moreno, 2002; Reuterskiöld et al., 2010; Suarsana et al., 2021).

The pandemic has caused many structured activities in schools that support the level of children's development achievement to be hampered, and the online learning impact disrupts the students' psychological condition. The most common psychological problem experienced by children in learning mathematics is anxiety because most children with special needs think that learning is conducted when they are at school. Several factors lead to mathematical anxiety, including the mathematics poor perception within the family environment. Teachers do not provide scaffolding in learning. The surrounding environment is less supportive of learning (Barroso et al., 2021; Li et al., 2021; Smith, 2020). Based on the interview conducted with teachers of SLB-B in Bali Province, it is known that deaf children are joining online learning via *WhatsApp*, and some of them do not willing to submit the student worksheet. Moreover, when teachers are doing home visits, the children try to pull on one side. The existence of various problems when online learning also must be given attention since not all special needs students have the perception that learning can be done anywhere at any time including learning at home, additionally when inconvenience arises due to learning by using technology such as smartphones, not all students have or able to use it.

The transition from face-to-face learning to online learning and differences in curriculum achievements during the Covid-19 pandemic are two factors that also cause mathematical anxiety (Garcia & Pacheco, 2013; Gresham & Burleigh, 2019; Pirrone et al., 2022). Mathematical anxiety is a condition in which children respond to math assignments given by their teachers with feelings of fear or tension (Lai et al., 2015; Siagian et al., 2019). Mathematical anxiety is a discomfort related to the fear and anxiety that is felt when faced with mathematical problems and specific situations related to mathematics (Hill et al., 2016; Mutodi & Ngirande, 2014; Novak & Tassell, 2017). If a child feels uncomfortable, both when studying mathematics and solving mathematical problems, then it is certain that the child is experiencing mathematical anxiety which can hinder his ability to understand mathematics (Finlayson, 2014; Jameson, 2014).

The learning transition impacts negatively children's development (Asri et al., 2021; Page et al., 2021). This is because the special needs students' development achievement of the physical, cognitive, and socio-emotional aspects than the normal students. This is confirmed by the results of research in England showing that consistent evidence from research studies between 1980 and 2000 indicates that deaf children lag behind hearing peers (by 2 to 3.5 years) in mathematics (. They need intensive assistance in the learning process to develop their basic skills. Therefore, a collaboration between parents and teachers is needed to help children learn and understand abstract mathematical concepts. Based on the results of several previous studies supported by the interview results, the researchers have a suspicion that learning mathematics online will cause anxiety in children, which will certainly have an impact on decreasing the mathematics learning achievement of deaf children. Based on the description above, this study aims to analyze the mathematical

anxiety of deaf children in learning mathematics and its relationship to the learning outcomes of deaf children during the Covid-19 pandemic**.**

2. Methods

2.1. Research Design

The research used a non-experimental quantitative approach with a correlation research type (Creswell, 2014). The non-experimental research is marked by the absence of treatments for the research sample. This research was conducted to understand, assess, and analyze the statistical relationship between the two variables without the influence of other variables, in this case, the effect of the mathematical anxiety variable on the learning outcomes of deaf students. Mathematical anxiety is a predictor variable while the learning outcomes of deaf students are the response variable.

2.2. Sample and Data Collection

The research was conducted at Sekolah Menengah Pertama Luar Biasa Negeri (SMPLBN) of deaf students in Bali Province. The sample was taken by cluster random sampling by considering three different areas which are Western Bali, Center Bali, and Eastern Bali. Four SMPLB N of deaf children chosen were SMPLB Negeri 1 Jembrana for Western Bali (7 students), SMPLB Negeri 1 Tabanan for the Center Bali (5 students), and SMPLB 1 Negeri Klungkung (6 students), and SMPLB Negeri 1 Karangasem (6 students) for the Eastern Bali. Therefore, the total sample involved in the research was 24 students. The small number of samples used is because not all SMPLBN in Bali have deaf classes.

The data collection was conducted by using a questionnaire on mathematics anxiety and the learning test results. In addition, the data collection also was conducted by observation and interview. Observation aimed to evaluate learning implementation during the pandemic. The component observed was students' enthusiasm in joining the learning activity; the ability to cooperate; the ability to express an opinion; and to respond to peers' opinions. The interview was conducted with the vice principals and mathematics teachers to strengthen and deepen data about the process of learning mathematics during the pandemic and its impact on psychology, especially children's mathematical anxiety. This data is used to complement and strengthen the data on test results and the mathematical anxiety of deaf children.

Table 1. The Aspect and Indicator of Mathematics Anxiety

No.	The Aspect of Mathematics Anxiety	Indicator of Mathematics Anxiety
1	Physiological (physical reaction)	Feelings of nervousness and restlessness
		The heart is beating fast
		Hands shaking and sweating
		Difficulty speaking or stuttering
2	Affective (behavioral reaction)	Avoidance behavior
		Dependent or dependent behavior on others
		Shaken behavior
		Sensitive and irritable behavior
3	Cognitive (thought reaction)	Difficulty concentrating or focusing thoughts
		Fear of not being able to cope with problems
		Thinking that everything feels so confusing beyond being insurmountable
		Thinking about the same annoying thing over and over again

The questionnaire on mathematics anxiety used contains three aspects of mathematics anxiety, transformed into 24 questions. The instrument blueprint is presented in Table 1. The questionnaire was arranged by using a Likert scale of five answer choices, such as (1) Strongly Disagree; (2) Disagree; (3) Sufficient; (4) Agree; (5) Strongly Agree. The validity instrument test was conducted by using Aiken’s V formula resulted in the validity of the instrument. The reliability test used the Cronbach Alpha formula resulted in the reliability coefficiency amounting to 0.820 with the very high criteria of reliability. The test

used was an essay test containing five items with mixed arithmetic operations material. The instrument validity test was conducted by using CVR/CVI with the result that the instrument test was valid. The reliability test used was the Cronbach Alpha formula resulted in reliability coefficiency amounting to 0.860 with a very high criterion.

2.3. Data Analysis

Data analysis was carried out quantitatively and qualitatively. Qualitative analysis was carried out in several stages, such as data collection, data reduction, verification, and drawing the conclusion. The qualitative analysis aims to describe the qualitative data and substantiate the quantitative findings. Quantitative analysis was carried out descriptively and inferentially. Descriptive analysis is related to the description of children's mathematical anxiety levels in learning mathematics during the pandemic (online) and children's learning outcomes in working on math problems. The ideal mean value and ideal standard deviation are used in presenting the range of scores in each desired criterion, for example, low, medium, and high criteria. Data classification can be observed in Table 2. Therefore, the inferential analysis aims to analyze the effect of mathematical anxiety on learning outcomes. The analysis technique used was simple linear regression, which was preceded by a prerequisite test in the form of tests for normality, linearity, and significance of the regression direction.

Table 2. Data Classification Criteria

Score Range	Criteria
$X > M_i + 1.5SD_i$	excellent
$M_i + 0.5SD_i < X \leq M_i + 1.5SD_i$	very good
$M_i - 0.5SD_i < X \leq M_i + 0.5SD_i$	good
$M_i - 1.5SD_i < X \leq M_i - 0.5SD_i$	fair
$X \leq M_i - 1.5SD_i$	poor

3. Results & Discussions

3.1. Descriptive Analysis Finding

Mathematics anxiety data of deaf students in Bali Province are presented in Figure 1.

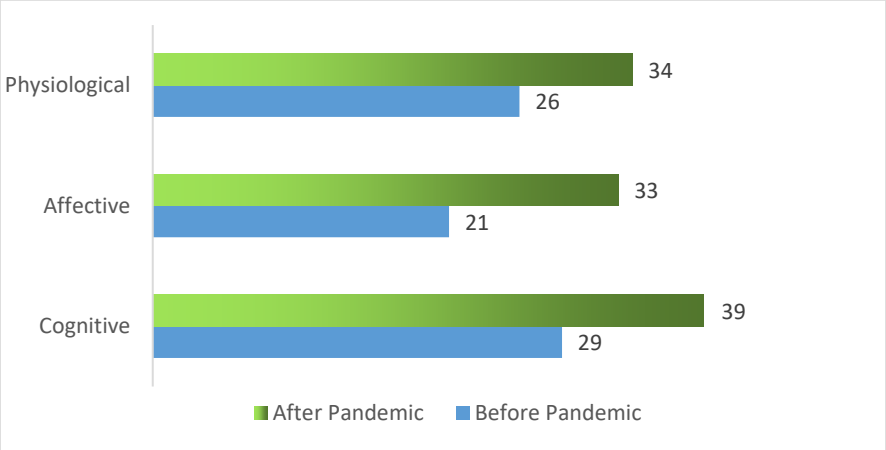

Figure 1. Mathematics Anxiety of Deaf Students

Based on Figure 1, it can be explained that before the pandemic, for the cognitive aspect, there were 29% of deaf children who had high mathematical anxiety, and this increased to 39% during the pandemic, for the affective aspect before the pandemic there were 21% of deaf children who had high mathematical anxiety and this increased to 33%, Likewise, in the physiological aspect, before the pandemic, 26% of children had high mathematical anxiety, increasing to 34% after the pandemic. Clearly shows that there is an increasing rate of mathematics anxiety among students during the pandemic. This was because children

were not ready to take part in online learning, which requires children's independence, while deaf children needed assistance, and this was justified by the teachers' statements who teach mathematics in the four schools, where online learning was only carried out through WhatsApp Group and the teachers could not force the children to use Zoom Meeting or Google Meet, considering that some children did not have personal cellphones, laptops, and their parents worked all day so they could not accompany their children while studying at home. The online learning process for special needs students faced drawbacks and challenges if there was no cooperation starting from parents in accompanying learning at home. Assistance, when children study online, could increase motivation and learning outcomes. This means that children's mathematics learning achievement could be maximized with online learning supported by parent-teacher collaboration.

Children's abilities decreased because they studied online for too long. If further analyzed the answers of deaf children, it turned out that there were several types of mistakes they made, namely technical errors, including errors in performing arithmetic operations, and calculation errors. The average number of children who experienced conceptual errors was 44.83% and 41.67% of children made math errors. Some of the children's answers are shown in Figure 2 and Figure 3.

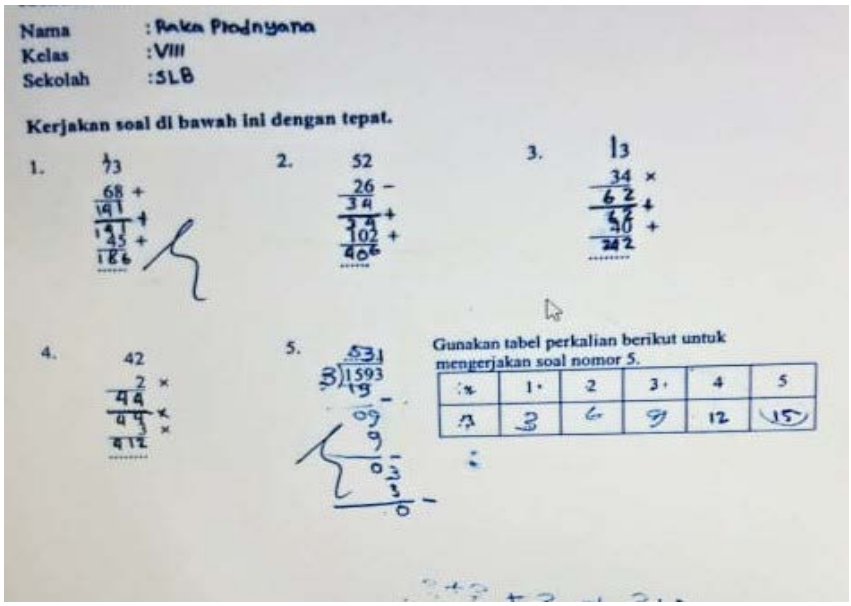

Figure 2. Example of Conceptual Mistake Made by Deaf Students

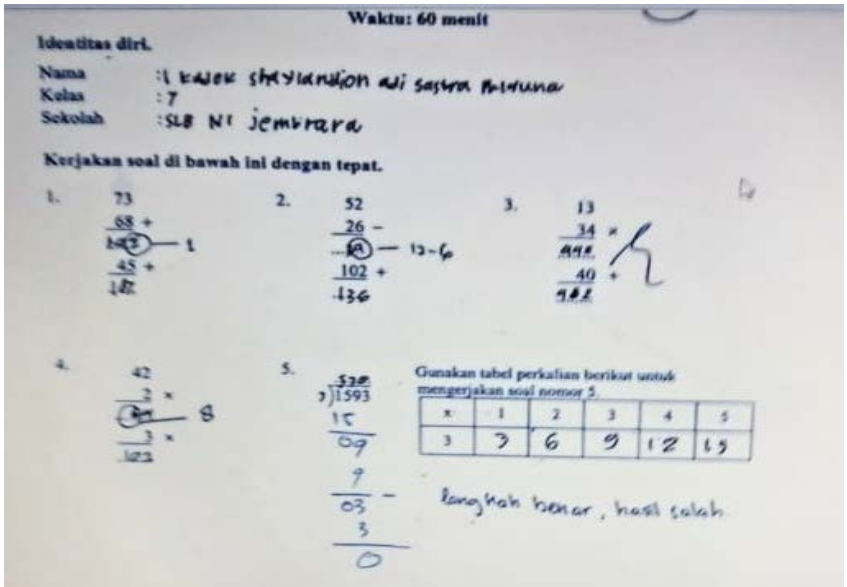

Figure 3. Example of Math Error Made by Deaf Students

Figure 2 and Figure 3 showed that deaf students mostly made conceptual mistakes and were less creative in doing the mixed arithmetic operation. The result was according to the interview results the teachers stated that deaf students' mathematics learning achievement is better in online learning compared to the limited face-to-face learning, which the teacher assumed that the students got parental help since they wanted their children to finish the worksheet soon. Different from the test conducted at school, which were pure students' learning outcomes even though during the test, the teacher in charge found that a student discussed using sign language. The finding was supported by the data stating that the student's learning outcome is increased during online learning, but their understanding is better during offline learning. This raised questions or the possibility of the children experiencing learning loss during online learning. The data analysis result showed that 70% of deaf students committed similar mistakes, even though the level of the class is different, and the VII grader deaf students committed more mistakes. This was caused since the students were independently learning therefore the conceptual understanding was weak.

3.2. Prerequisite Analysis Test Results

The normality test of the research aimed at making sure that the variable data in the regression model was distributed normally. The test was conducted by using Kolmogorov-Smirnov. The test was conducted by looking at the 2 sides of significance. If the data has a bigger significance than 0.05, thus the data is distributed normally. The test result of normality showed that the value of Asymp. Sig. (2-tailed) is above the significance level of 0.05 such as 0.686. This showed that the data were distributed normally.

The linearity result analysis showed that the significance value (*Deviation from Linearity*) was 0,160. Based on the result, it can be seen that the value of Sig. greater than 0.05. Therefore, it can be concluded that the data has a linear correlation. The results of the significance analysis test of the regression direction assisted, gained that significance value (*Linearity*) of 0.000. Based on the result, it can be seen that the value of Sig. less than 0.05. In conclusion, variables X and Y significantly correlated.

3.3. Results of Simple Regression Analysis

The results of simple regression analysis are presented in Table 3 and Table 4.

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. The error in the Estimate
1	0.825	0.681	0.669	2.45479

Table 3 showed that the value of R was 0.825 and the value of R Square was 0.681. R Square/determination coefficiency is a variation of a dependent variable (mathematics learning outcomes) that can be influenced by an independent variable (mathematics anxiety) amounted to 68.1%, and the rest 31.9% was influenced by other factors. The correlation level of both variables is included in a strong relationship (0.50-0.69).

Table 4. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	31.281	6.878		4.548	0.000
	Mathematics Anxiety	0.628	0.081	0.825	7.725	0.000

Based on Table 4, can be determined regression equation such as $31.281 + 0.628X$. According to the regression equation, the regression coefficient of 0.628 marked that each increasing one-unit X (mathematics anxiety), therefore Y (mathematics learning outcomes) will increase to 0.628, and vice versa. The value of Sig. in Table 4 amounted to 0.000 (less than 0.05), then can be interpreted that significance regression coefficients or mathematics anxiety influence the real effect towards mathematics learning outcomes.

3.4. Discussion

The research findings showed that the mathematics learning outcomes of the junior high school deaf students on the mixed arithmetic operations material are in a low category, and the mathematics anxiety level of the junior high school deaf students in Bali Province is in the high category. Even though online learning is not as varied as offline learning, teachers always try to choose learning models that can keep children active so that online learning feels warm and meaningful, during the pandemic. The observation results revealed that the lesson plans between online and face-to-face learning were different. The differences were in terms of the learning steps, the learning media and methods used, and the time allocation. When learning online was implemented, the steps were found to be shorter. Therefore, in practice online learning for deaf junior high school students was not as easy as imagined, many factors influenced the learning process including the lack of enthusiasm for children to study at home, lack of learning support facilities for children who were classified as economically disadvantaged, lack of ability of parents in accompanying children in learning at home and many others. Many parents were not diligent and did not have time to accompany them. Maybe because of the situation and conditions, the children were less enthusiastic at home so they were bored, there were no friends, and nothing motivated them. Because usually at school the teacher delivered lessons interspersed with art, applause, singing, and other creative interludes, while at home it tended to be monotonous.

The obstacles experienced by the teachers in online learning were mostly from ensuring the material understanding and making sure that the students learned at home, especially for the students who experienced signal, internet package, and facilities barriers that help the students during online learning. This is in line with similar research that revealed the lack of tools and internet access owned by deaf students which become one of the barriers to the learning process which made them were not ready to join through Zoom Meetings (Swan et al., 2015; Tomaino et al., 2022). Therefore, parents' and schools' attention are important in facilitating deaf students; the lack of support from the school in online learning influences the learning outcomes (Catalano et al., 2021). The teacher conveyed the materials by lecturing, question and answering, giving assignments, and having discussions. The learning resources used were also very limited. The learning resources used were material delivered by the teacher, but the material had adapted to competency standards and basic competencies for deaf children and children's abilities. This was due to the unavailability of special textbooks in mathematics for deaf children at the junior high school level.

During online learning, the teacher gave mathematics assignments at each meeting. Before giving the task, the teacher uploaded it on the WhatsApp Group first. Most students submit the task on time, meanwhile, some students from the village were late due to signal and internet package barriers. If the students encountered difficulties, they were welcome to ask through the WhatsApp Group. The deaf students of junior high school If the child encounters difficulties or something is not understood, the junior high school students had a low ability to reason and ask questions due to limited vocabulary. The children's abilities were varied, therefore in carrying out assignments some were already able to work independently, and some were assisted by their parents. The teacher usually gave time limitations for completing assignments within 1-3 days. For the students who had not, they would be contacted by the teacher through the parents. When they were unreachable, the teacher conducted a home visit. The home visit had to be conducted despite the pandemic. The visit was carried out when the students were unreachable for up to two weeks. Teachers also were responsible to assist in counseling since there were students who did not willing to study during the pandemic. According to the teacher, the home visit had been carried out before the pandemic, especially for children who were often absent.

The teachers at the three schools delivered that the student's learning outcomes assessment only was based on the task uploaded in the WhatsApp Group and their activeness during the learning process. Meanwhile, the summative assessment was based on the *printout* questions taken directly from the school and submitted back to the school. The assignments then were evaluated. Teachers realized that sometimes the students' answers were correct since helped by the parents. Therefore, to know the students' real abilities, the teachers did home visit several times during the pandemic. The findings also were supported by other research findings showed that students were enthusiastically learning online, and fair in task submission punctuality, but, enthusiasm, punctuality, and content accuracy were degraded time by time due to lack of direct interaction and online media learning innovation (Balkist & Agustiani, 2020). Since deaf children have different economic backgrounds, they have limitations in using devices and networks, and the determining factor for long-distance success is a technology that is a medium and means of supporting the

process of interaction between teachers and students (Dye & Hauser, 2014). Through the *home visit*, the teachers were given chances to know students' character. This could be realized if the cooperation between parents and teachers were well established. This effort was carried out by the teacher to create a pleasant atmosphere. Existence of good communication can avoid misunderstandings in the process of developing children's potential both at school and at home. The same direction between education at school and education at home could create a harmonious atmosphere for children so that they were more capable of developing their potential.

When the limited face-to-face learning, teachers delivered the materials by using oral language slowly with clear lips, and with well sign language. The material was written well on the board and used no abbreviation, therefore, helped the students' understanding, and they were given chances to answer the questions in front of the class and delivered it orally to train the students' vocal cords. Of course, this was very different from online learning, because children could not take part in learning via Zoom or Google Meet so children could see how the teacher explained an abstract mathematical concept and needed visualization, so the findings of this study also contradict the results of research which revealed that subject matter should be made easy and prepared with visual representations because mathematics deals with abstract ideas (Hopkins & Moore, 2010; Kusumaningtyas, 2021; Suarsana et al., 2019). Therefore, materials presentation also must be carried out as simply as possible with multi-representation (Cahyani et al., 2021; Prabawati & Herman, 2019). Mathematical representations could be made with concrete objects, manipulative models, pictures, sketches, tables, diagrams, graphs, and computer simulations, but from interviews with teachers it was revealed that in the process of learning mathematics during a pandemic, teachers did not use media or props, because the learning process was only done through WhatsApp Group. This was certainly contrary to the characteristics of deaf children who were visualizers, even though the use of interactive media would make children learn in a happy atmosphere and were motivated to learn mathematics, and could accommodate the characteristics of deaf children to minimize learning barriers due to their limited communication (Adnyani et al., 2021; Chen, 2014; Suarsana et al., 2019).

During online learning, students became irresponsible and lazy in conducting school assignments. This is due to the students' habit of playing at home and being helped by their siblings or parents. The effort to minimize the negative impacts of limited face-to-face learning in the post-pandemic, so schools should always prepare fun learning spaces, interesting material delivered by teachers, always give appreciation to children who want to do assignments, always motivate children and present context-based or realistic learning, so that children are not bored and are always enthusiastic in participating. learning. Deaf individuals tend to have difficulty understanding the concept of something abstract (Lopes et al., 2013). Various symptoms experienced when learning online cause an imbalance in the psychological components needed in the learning process caused by learning saturation (Dhawan, 2020). Behaviors that are often shown by people who experience learning burnout include irritability, sensitivity, and vulnerability to frustration which results in a decrease in concentration and ability to understand the essence of the subject matter. Saturation of learning can result in decreased concentration and absorption of the material provided (Apriyanti, 2021; Ilmanto et al., 2021). Saturation in learning can harm learning outcomes so the learning process will not be optimal. The impact of learning is often related to learning outcomes, learning outcomes in education are related to 3 aspects. As stated by other findings, changes as a result of learning that are visible to children include cognitive, affective, and psychomotor aspects (Hernawati et al., 2021). This is one of the teacher's considerations in assessing children's learning outcomes.

In addition, in the offline face-to-face learning implementation, many children experience falling behind in material, so they needed extra time and energy to catch up with them. According to the child's view, in carrying out face-to-face meetings offline, children were rarely given assignments by the teacher. So, they felt the difference, and only with the lecture method and there were no group assignments in the classroom, except for group activities outside the classroom. Based on the results of observations and interview results in the offline face-to-face learning process, children showed liveliness, a somewhat better response than online learning. This was because, in the offline learning process, children can actively participate in learning without problems like when learning online. In carrying out offline learning, the teacher stated that he felt more flexible in carrying out the learning process according to the planned model compared to online learning. Therefore, the results were very different from the implementation of online learning. The results of the interviews and observations also showed that from the several offline times that were carried out at school, students were happier when learning is carried out face-to-face. In online learning, children found

it difficult to study when accompanied by their parents, so they felt lazy, had no fear, and also had no motivation. Changes to the character values of some children and a decline in academic matters were the results of the process of transitioning from online to offline learning which had experienced many changes in negative attitudes and behavior. Even though the character values before online implementation were quite good when face-to-face learning was carried out offline some children experienced a decrease in behavior, attitude, manners, and discipline in interactions. There was a change in the child's behavior, indicating that the educational goals had not been successful. The culmination of the success of children's learning includes changes in the child for the better, supported by all the needs in the form of supporting facilities and infrastructure (Nugroho et al., 2020).

There were several learning obstacles experienced by children in online learning which result in high student's mathematical anxiety. Research by Li et al. (2023) suggested that increasing autonomous motivation and decreasing controlled motivation for math learning can effectively reduce mathematical anxiety, even in students with high levels of temperamental fear predisposing them to such anxiety. Additionally, Finlayson (2014) proposed various strategies to alleviate mathematical anxiety, including implementing diverse learning and teaching strategies, modifying assessment practices, fostering family and community support, establishing connections to prior knowledge, and actively engaging students in the math classroom. For deaf learners, positive relationships with teachers can be cultivated by introducing new mathematical concepts through entertaining stories and engaging instructional media, such as games, to alleviate mathematics anxiety (Adigun & Ugochi, M, 2020).

Students in grades VII and VIII were still experiencing a transition from elementary school. This was also because class VII students had not experienced face-to-face learning and even from them some students did not know the teacher and the school environment and did not have enthusiasm in carrying out learning in class. This finding is supported by the results of previous research which stated that students were not yet able to work together online, and also that students were not ready and experienced to do online learning, so it was difficult to get an overview of students' cognitive achievements. (Chiu, 2022; Munir & Darmanto, 2022; Rusyani et al., 2021). Lack of effectiveness and time efficiency, due to parents of students who were busy with their work, so they could not accompany their children in the online learning process, the lack of enthusiasm of students in participating in online learning, so that it had an impact on student's understanding of the material delivered by the teacher (Djidu et al., 2021). Even though online learning assistance could increase motivation and learning outcomes. This means that student's mathematics learning outcomes can be maximized through online learning supported by collaboration between parents and teachers. The problems encountered during online learning require teachers to be able to choose the right platforms, teaching materials, and media to support students learning from home. (Donnelly & Patrinos, 2021; Engzell et al., 2021).

The online learning process gives impacts several aspects, one of which is the children's psychology (Saha et al., 2021). The psychological impact on children occurs due to several complaints that are felt during online learning including the lack of signal, limited data packages, difficulties in group assignments, and many assignments, besides those children experience changes in reactions to their daily life and environment, and lack of social interaction with others makes children worry about lessons that have not been done or collected (Shah et al., 2021). This is a psychological problem for children who usually learn face-to-face with their teachers (Azhari & Fajri, 2022). While most children may be resilient and stress-free, some children experience some permanent mental health effects. The learning process that is carried out at home online has an impact on children experiencing stress easily. In psychology, there are various symptoms related to children's learning activities including sensing and perception, memory, memory and forgetting, thinking, symptoms of feelings and emotions, intelligence, and motivation. The psychological impact of children in the online learning process is anxiety. The findings in this study regarding the mathematical anxiety of deaf children who are in the high category are also in line with several previous studies which have found evidence of students indicating anxiety in learning mathematics (Baten et al., 2019; Finlayson, 2014; Novak & Tassell, 2017; Ramirez et al., 2018). Therefore, anxiety that occurs repeatedly and increases will create a negative perception of mathematics, because anxiety in learning mathematics is a subjective feeling of disturbing mental tension as a general reaction to the inability to solve a problem or the lack of a sense of security when someone is studying or is involved. math performance (Nida et al., 2020; Živković et al., 2022).

The findings in this study are strengthened by previous research which suggests that online learning is ineffective because it does not meet the learning outcomes criteria, and children's abilities decrease when learning online (Alawamleh et al., 2020; Castillo-Merino & Serradell-López, 2014). The existence of difficulties in the learning process certainly results in the emergence of learning loss (the learning process is not optimal, it will result in the results of the information obtained by children and their learning outcomes are also not optimal) (Donnelly & Patrinos, 2021; Engzell et al., 2021; Kashyap et al., 2020; Li, A., Harries & Ross, 2020; Yadav, 2021). *Learning loss* will be able to have an impact on the quality of human resources that will be born in the years during the COVID-19 pandemic (Aburto et al., 2022; Barker, 2021). Regardless of the positive results of research showing that online learning has unfavorable results, due to increased children's mathematical anxiety and decreased mathematics learning achievement of deaf children. But it is also necessary to explain the challenges and levels of difficulty for teachers in implementing online mathematics learning in the context of this study, for example, the lack of teacher skills in preparing structured learning videos, the difficulty for teachers and the school in making parents aware so that deaf children can learn optimally during a pandemic, teachers also cannot force children to learn in a virtual face-to-face way considering the economic limitations of parents, teachers also have difficulties in instilling a culture so that children do not copy other children's work. According to McClive et al. (2020), videos offering direct instruction in American Sign Language (ASL) with voice interpretation can effectively cater to the educational needs of both deaf and hard-of-hearing (DHH) students as well as hearing students. Additionally, as stated by Sugiman et al. (2022), mathematics instructional videos incorporating sign language have been found to enhance the mathematical comprehension of deaf students in inclusive classrooms. Those who watched these videos demonstrated an improvement in their understanding. The success of online learning is of course very dependent on the provision of good online learning infrastructure, digital math books, and scenarios for how to make online learning materials and activities get priority as important as offline learning.

4. Conclusion

The result of the research showed that the mathematics learning outcomes of deaf students at the junior high school level were categorized as poor, and the mathematics anxiety level of the Bali Province was categorized as high. Although online learning during the pandemic has made the implementation of mathematics learning more flexible in terms of both place and time. And yet more drawbacks were found, seeing the deaf students' limitations and they chose to learn directly. It is recommended that during online learning, deaf students needed sincere preparation including online learning infrastructure capacity by the school and parents, increase teachers' ability in preparing online learning materials, such as text, video, animation, and many more as the main material can be learned by the students through online and oriented towards the learning objectives. The research implication is expected to be an evaluation of teachers and deaf students in increasing learning outcomes.

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