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## The Effectiveness of Multiplex Teaching Method in Mastering Vocabulary for Deaf Students

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**Abstract:** This study aims to measure the effectiveness of “multiplex teaching method” in mastering vocabulary for deaf students. Multiplex teaching method consists of picture language, sign language, printed-word language, written language, and spoken language. The research was designed as a single subject research (SSR) with baseline, intervention, and maintenance phase (A-B-A' design). The research subjects consisted of two deaf students in special school of SLB Bhakti Luhur Malang, Indonesia. In addition, a special education teacher and an observer were involved in this study. The intervention instrument comprised five lesson plans (LP), each containing a vocabulary of four words. The data were analyzed using intra-condition and inter-condition graphical inspection with a focus on data stability, trends, and score changes. The effectiveness was determined by the Percentage of Non-Overlapping data (PND). The change of score from A'/A achieved by Subject-1 was 7.86 points, while Subject-2 obtained 7.68 points. Subject-1 obtained an average PND B/A of 100% and average PND A'/B of 82.5%. Subject-2 achieved an average PND B/A of 99% and PND A'/B of 90%. Thus, multiplex teaching method is very effective in helping deaf students master vocabulary.

**Keywords:** Deaf student, multiplex teaching method, vocabulary mastery.

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### Introduction

One of the studies in the field of educational psychology is investigating various things related to learners, learning, and teaching (Reynolds & Miller, 2003). Moreover, educational psychology also intends to provide principles of solution based on experience and thoughts to overcome educational problems (Slavin, 2012). Learning problems of children with special needs are no exception. They also experience difficulty in reading words, reading comprehension, written expression, and mathematics which represents spectrum disorders of approximately 5% to 15% of the school-age population (Grigorenko et al., 2020).

One of students with special needs is those who experience deafness, including those with early cochlear implantation. They are inhibited from absorbing speech signals and spoken language, leading to limited phonological awareness (Johnson & Goswami, 2010). Hearing loss often causes setbacks or even loss of speech ability because they experience a partial or total loss of hearing ability (Sudarmilah et al., 2020). In relation with listening process, orthographic processing involves seeing the written words without the need to pronounce them. However, phonological decoding is more effective for absorbing new vocabulary because it helps 'open' pronunciation of words, allowing children to identify and understand new vocabulary (Mathews & O'Donnell, 2020).

The research on communication of people with deafness associated with the Effects of McGurk suggests that visual stimuli affect the processing of auditory stimuli in adulthood and in children although weaker (Heikkilä et al., 2018). Several other studies have shown that children with hearing impairment have language skills (such as vocabulary and syntactic knowledge) that are more predictive in reading ability, compared to their phonological awareness (Geers & Hayes, 2011; Mayberry et al., 2011). Adult deaf phonological skills improve relatively to their listening peers, but in reading comprehension they lag far behind their listening peers (Mathews & O'Donnell, 2020).

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Vocabulary understood through exposure and formal instruction can be stored in long-term memory ((Geers & Hayes, 2011). In reading comprehension, knowledge of vocabulary is absolutely necessary in order to provide a kind of guidance for students to learn a language in a structured manner; and recently linguists have increasingly paid attention to vocabulary mastery, emphasizing the importance of assessing how vocabulary is learned (Cristina, 2010). Related to the learning process of reading for deaf students, Andrews and Mason (1986) classify three stages of reading: 1) pre-reading with a mastery of less than 100 words; 2) reading contexts that combine two or more words to communicate; 3) integration of word meanings, i.e. having a broad vocabulary of cues and communication skills that have evolved. It is recommended that focus on the text is needed to strengthen understanding and develop strategies to improve understanding (Strassman et al., 2019).

Another relevant study states that teaching reading to deaf students is a form of bilingualism that combines sign language and language used by the wider community in written or spoken form, and even hand signals (Polinsky, 2018). Understanding vocabulary, especially the broader meaning of words, is an important step in helping deaf students understand writing independently (Alqraini & Paul, 2020) even though written language is their second language after sign language (Pelayo et al., 2018). It is done to achieve a broader objective of understanding vocabulary such as the results of a case study conducted in Jambi, Indonesia, indicating that deaf people acquire language through total communication consisting of speech, signs, finger spelling, hearing, speech reading, and sign reading (Haliza et al., 2020).

Another experiment was conducted by Bhakti Luhur Foundation in Malang, Indonesia by implementing a method called "multiplex teaching" for teaching reading and writing to deaf students (Janssen, 2007). The multiplex teaching method bears some similarities with the conclusion of a case study in Jambi which revealed language acquisition through total communication (Haliza et al., 2020). Sequentially, teaching reading using multiplex teaching method consists of picture language, sign language, printed-word language, written language, and spoken language (Janssen, 2007). When observed, multiplex teaching approach has a common thread with Piaget's theory of concrete operational stage (Vida, 1980), where teaching reading moves from real things (images of objects) to written language that is more abstract.

Based on the interviews conducted with the school principal and classroom teachers at Bhakti Luhur as a preliminary study, it can be concluded that multiplex teaching method has been implemented but it does not meet the requirements. Therefore, the researchers intended to carry out an experiment to measure the effectiveness of multiplex teaching method in teaching reading to deaf students, especially for vocabulary mastery in the pre-reading stage.

### Literature Review

Cognitive theory developed by J. Piaget states that cognitive development follows a pattern of four stages: sensorimotor (ages 0 to 2 years), pre-operational (ages 2 to 6 or 7 years), concrete operational (ages 6 or 7 to 11 or 12 years), and operational (ages 11 and up) (Amalia & Khoiriyati, 2018; Hanfstingl et al., 2019). Piaget highlights the theory and concept of cognitive development regarding the concrete operational stage of reading comprehension skills that emphasize categorization and sorting. Mastery of vocabulary which is represented by symbols should also be emphasized at this stage (Vida, 1980). In concrete operational stage, a child begins to understand conversation tasks, develops logical reasoning, and understands classification patterns. However, they have yet able to switch from concrete to abstract concepts in general sense because this ability will only develop at the final stage, i.e. the logical operational stage (Hanfstingl et al., 2019).

Although Piaget's theory was developed based on the observation of children development in general, deaf children learn vocabulary in a similar way to their peers who can hear although more slowly (Alqraini & Paul, 2020; Sterne & Goswami, 2000). Therefore, these children need extra and more focused teaching (Alqraini & Paul, 2020). Children who are hearing impaired, especially those who are deaf since birth receive limited language input during a sensitive period at the stage of cognitive development for language acquisition (Friedmann & Szterman, 2011). For that reason, it is essential to create a motivating learning environment that includes the presentation of effective learning strategies and the introduction of autonomous learning methods (Csizér & Kontra, 2020).

The research article entitled "Vygotsky, Sign Language, and the Education of Deaf Pupils" explicitly states that deaf children can see more common phenomena through bilingualism. Through bilingualism, language becomes a system among many people, and eventually awareness of linguistic operations is gained (Zaitseva et al., 1999). Furthermore, Vygotsky mentions that sign language was not created independently, so there is no full linguistic characteristics. The use of sign language by deaf students is also limited. It is imperative that sign language is combined with spoken or written language which is the dominant language in society. This combination is what Vygotsky calls bilingualism (Zaitseva et al., 1999).

Furthermore, Charlotte J. Enns, Ph.D. from the University of Manitoba also expressed her view on the importance of sign language for deaf-speech students. She states that sign language is an important asset that really determines learning methods and strategies. She further explains that the function of requirements of sign language has linguistic, social, and neurological similarities with spoken language (Enns, 2006). In a particular time, deaf students can directly understand written symbols in the form of words, but on other occasions they cannot do so and require certain conditions. A diagram

that states the interplay of relationships between printed symbols, sign forms, pronunciation, and concepts is presented as follows:

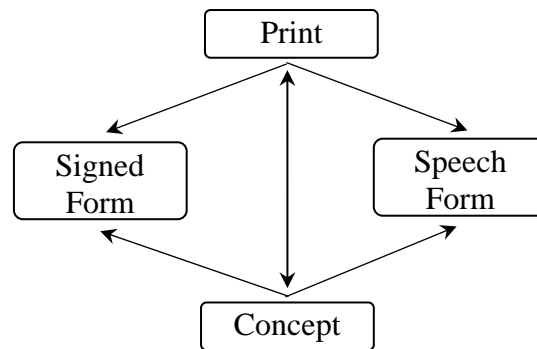


Figure 1. Adaptation of Linking Meaning Point (Enns, 2006, p. 20)

The experience of interacting with and educating deaf students often gives the impression that they are individuals who rely solely on their vision in learning. There is even a tendency to associate such situations with visual learning style. The assumption is based more on the visual nature of the language used by many speech-deaf learners ((Marschark et al., 2013; Marschark & Hauser, 2011). In general, deaf students are categorized as visual learners. However, their learning needs are the same as regular students. Deaf students have natural ways of processing visual sense of information. Therefore, taking the visual needs of the deaf to communicate into account, employing visual materials during the learning process is critical (Karal Şilbir, 2010). It is supported by the fact that the worse the deafness experienced, the more the students rely on their eyesight. Such situation also implies that the deafer person is exposed to written language, the more likely the writing will be more efficient and open (Salehomoum & Pearson, 2020). "Therefore, interventions in the language learning of students with hearing loss which can affect their language competency in general is essential and it can be done by providing support for academic writing" (Gunawan et al., 2020, p. 535). Nevertheless, the question of whether individuals with hearing loss are more likely to be visual learners than students who can hear still needs to be explored empirically (Marschark et al., 2013). In the book entitled 'How Deaf Children Learn', learning to read through a top-down approach and vice versa is explained by Marschark and Hauser, (2011) as follow:

Knowledge	
conceptual (words, things)	strategic (problem solving)
Metacognitive / metalinguistic	
discourse structure	
grammar	
vocabulary	
morphology	
phonology/orthography	

Figure 2. Learning Concepts, Language, Academic-Social

Researchers from *Lamar University* classify deaf students' reading into three levels: a) pre-reading, having less than 100 manual marks and the ability to identify about 10 printed letters; b) reading context, having more vocabulary and the ability to combine two or three words in communication; c) reading integration, having a broad range of vocabulary and more developed conversational skills (Andrews & Mason, 1986). There is a marked difference in reading level between hearing children and deaf children who are prevented from learning spoken language since they were babies. The difference in language skills is also caused by the educational interventions they receive (Berke, 2013).

Teaching practices that focus on vocabulary based on reading guides make reading comprehension process explicit, enabling students to reach fluency and comprehension. Equally important, teaching reading that focuses on conversational texts is also recommended to strengthen comprehension (Strassman et al., 2019). Research on reading

comprehension of deaf students has been conducted in various countries according to the language conditions. All studies have concluded that deaf-mute students have much lower reading comprehension skills compared to other students who hear (Aleksandrowicz, 2019; Rezaei et al., 2016; Takahashi et al., 2016; Wauters et al., 2006). More concrete research reported that deaf children lag behind children who hear on reading comprehension at least five years (Kyle & Harris, 2006).

By studying several theoretical concepts about deaf students' reading ability and reviewing various studies that have been carried out, the researcher formulated the research problem: is multiplex learning method effective for improving vocabulary mastery of deaf students?

## Methodology

### *Research Goal*

This study aims to measure the effectiveness of multiplex teaching method (Janssen, 2007) in improving vocabulary mastery for deaf students. This research is an experimental study of a single subject research which aims to determine the causal relationship between variables by treating them. The measurement of the dependent variable as a target behaviour is carried out repeatedly based on a certain time period (Jhangiani et al., 2019). The causal relationship between variables is not identified by comparing between individuals and groups but by comparing them to the same subject under different conditions (Jhangiani et al., 2019; Sunanto et al., 2005). The conditions in question are baseline and intervention conditions. The baseline is a condition for measuring target behaviours before intervention, while the intervention is a condition in which a treatment has been given and the target behaviour is measured during intervention condition (Sunanto et al., 2005). This single subject research applied the A-B-A' reversal design (Jhangiani et al., 2019). Conclusions were drawn based on the Percentage of Non-overlapping Data (PND) of inter-conditions (Scruggs & Mastropieri, 2015).

### *Sample and Data Collection*

This research involved professional teachers in the field of special education and experienced observers as caregiver and a deaf coach. Students with severe deafness who do not receive structured language intervention from an early age and do not know written language were chosen as subjects in this study. Two out of seven deaf students in a class that meet the criteria were selected as samples. Subject-1, a male, born in Malang, 8 years old. He is the first child in the family and has a younger sister. He lives with his family who does not use official sign language for communicating. He was in the first grade of Special School for the Deaf at the time of the study, and his class teacher reported a difficulty of teaching him reading. The subject-2, a male, the only child, born in Jember, 10 years old. At the time of the research, he was a new dormitory resident and in the same grade as subject-1.

The data were collected using a checklist form which was equipped with filling-in instructions and developed by the researchers and the teachers. The intervention instrument used was a multiplex teaching method (Janssen, 2007). In this study, the multiplex teaching method was integrated into the lesson plan (LP) which consisted of five units. Each unit contained a vocabulary of four words which were taught through five plies of instruction: 1) reading pictures, 2) cue reading the sign language, 3) reading printed words, 4) writing words, 5) pronouncing words. Each ply of teaching carried out in each lesson plan was assessed to measure the level of score achievement. The vocabulary materials were taken from Indonesian Language for the first-grade students in the school for the deaf, especially the reading section of theme 1 and 2. The list of vocabulary for each sub-theme is as follows: "Myself" consists of the words *saya* (I), *nama* (name), *laki-laki* (male), and *perempuan* (female). The words for "My body-1" sub-theme are *mata* (eye), *hidung* (nose), *mulut* (mouth), and *telinga* (ear), while the words for "My body-2" include *kepala* (head), *tangan* (hand), *jari* (finger), and *kaki* (leg). For vocabulary of "My family" sub-theme, the words are *bapak* (father), *ibu* (mother), *kakak* (older brother/sister), *adik* (younger brother/sister), whereas for "My house" sub-theme the words consist of *pintu* (door), *jendela* (window), *meja* (table), and *kursi* (chair) (Hendrifiana et al., 2017).

Table 1. The intervention procedure uses the multiplex teaching method

Plies (Multiplex)	Teacher's Action	Students' Action
Picture language	Showing (presenting, holding, touching, pointing) pictures vocabulary, while asking (through gestures, facial expressions, pronouncing "what").	Pay attention and express something as an expression of knowing or not knowing or giving certain answers.
Sign language	Show pictures, show sign language card, signing the pictures, and ask student to do the same sign language, assist him so that he can do it himself.	Pay attention to the sign language card, imitate to do sign language shown by the teacher, repeat several times until the sign language is done correctly.
Printed-word language	Show to student: picture, sign language card, and printed-word (that match the pictures) and explain (with gesture) that the printed-word is the "name" of the picture.	Pay attention to the picture, sign language card, and printed word, and pay attention to teacher explanations. Student expressions can be sign language, or speech, or certain gestures.
Written language	Shows printed-word cards of the pictures being studied and asks student to observe. Provide ballpoint and metacards for students. Furthermore, students are asked to imitate the writing and the teacher helps him to get the correct writing. If students have difficulty, the teacher gives dotted letters on the metacard to be bolded.	Observe the printed-word card shown by the teacher and imitate the written word on the metacard paper provided, until the correct writing is obtained. If imitating writing directly is difficult to do, then it is necessary to add dotted writing to students and to be assisted by the teacher.
Spoken language	Pronounce the printed-word cards with clear pronunciation and clear lip movements. Ask students to do the same in front of a mirror. Help him by placing the back of his hand on the underside of the teacher's chin to feel the vibrations of the sound produced. Ask the student repeated and help him with some basic articulation teaching techniques.	Paying attention to the teacher's lips when articulating printed-word card, following teacher instructions and imitating speech repeatedly, even though the sound production is not perfect.

The table shows the teaching instructions that must be performed by the teacher in each ply and the expected response from the students.

Overview of Lesson Plans

















Vocabulary (LP-1)	Picture Language	Sign Language	Printed-Word Language	Written Language	Spoken Language
saya (I)			saya	saya	sa - ya  
nama (name)			nama	nama	na - ma  
laki-laki (male)			laki-laki	laki laki	la-ki - la-ki  
perempuan (female)			perempuan	perempuan	pe-rem-pu-an  

Figure 3. Overview of Lesson Plan-1

Figure-3 illustrates lesson plan-1 for teaching vocabulary using multiplex method. The vocabulary is related to self-identification.













Vocabulary (LP-2)	Picture Language	Sign Language	Printed-Word Language	Written Language	Spoken Language
mata (eye)			mata	mata	ma-ta  ▶
hidung (nose)			hidung	hidung	hi-dung  ▶
mulut (mouth)			mulut	mulut	mu-lut  ▶
telinga (ear)			telinga	telinga	te-li-nga  ▶

Figure 4. Overview of Lesson Plan-2

Figure-4 illustrates lesson plan-2 for teaching vocabulary using multiplex method. The vocabulary is related to sense organs on the head.













Vocabulary (LP-3)	Picture Language	Sign Language	Printed-Word Language	Written Language	Spoken Language
kepala (head)			kepala	kepala	ke-pa-la  ▶
tangan (hand)			tangan	tangan	ta-ngan  ▶
jari (finger)			jari	jari	ja-ri  ▶
kaki (foot)			kaki	kaki	ka-ki  ▶

Figure 5. Overview of Lesson Plan-3

Figure-5 illustrates lesson plan-3 for teaching vocabulary using multiplex method. The vocabulary is related to body parts.

















Vocabulary (LP-4)	Picture Language	Sign Language	Printed-Word Language	Written Language	Spoken Language
bapak (father)			bapak	bapak	ba-pak  
ibu (mother)			ibu	ibu	i-bu  
kakak (old brother)			kakak	kakak	ka-kak  
adik (young sister)			adik	adik	a-dik  

Figure 6. Overview of Lesson Plan-4

Figure-6 illustrates lesson plan-4 for teaching vocabulary using multiplex method. The vocabulary is related to family members.

















Vocabulary (LP-5)	Picture Language	Sign Language	Printed-Word Language	Written Language	Spoken Language
pintu (door)			pintu	pintu	pin-tu  
jendela (window)			jendela	jendela	jen-de-la  
meja (table)			meja	meja	me-ja  
kursi (chair)			kursi	kursi	kur-si  

Figure 7. Overview of Lesson Plan-5

The figure-7 illustrates lesson plan-5 for teaching vocabulary using multiplex method. The vocabulary is related to house and furniture.

#### Data Analysis

The research data were collected with comprehensive supervision. To ensure the reliability of the measurement, the researcher involved teachers and observers in measuring the target behavior. The data were analyzed using visual graphic inspection, i.e. converting the research data into polygon charts. This visual graphic analysis was carried out on each subject, analyzing the intra-conditions and inter-conditions which included trend, latency, and level changes (Jhangiani et al., 2019). The analysis, which combines trends and levels, aims to ensure the reliability of the effects of controlled interventions. The changes of level will be declared successful if the intervention given is able to lead the Subject to achieve the minimum criteria of mastery learning (passing grade) in reading lesson. The guidelines published by the Ministry of Education and Culture of the Republic of Indonesia state that schools can determine the passing grade in the 2013 curriculum (Kebudayaan, 2016). In this case, the minimum score determined by the researchers was 75.0, following the general standard set by schools for Indonesian language subject. On the other hand, the effectiveness of the

intervention was confirmed using the Percentage of Non-overlapping Data (PND) (Scruggs & Mastropieri, 2015; Sunanto et al., 2005). PND is the number of data points on the intervention conditions that do not overlap within the range of the upper and lower limits of the baseline conditions. The number is divided by the total number of data points in the intervention conditions and multiplied by 100%. The upper limit is the mean plus 1/2 of the stability range, while the lower limit is the mean minus 1/2 of the stability range. The mean is obtained by adding up all the data in a condition and dividing it by the number of data points in that condition. In order to obtain the stability range, the researcher determines the stability criteria first. In this study, the stability criterion is 15% (Sunanto et al., 2005). Furthermore, 15% of the highest score achieved under this condition becomes the score of the stability range. When PND is >90% it means that the intervention is interpreted as very effective, 90%≤ 70% as effective, 70%≤50% as questionable, and <50% as ineffective (Olive & Franco, 2008).

**Results**

*SUBJECT-1*

*Lesson Plan-1: saya (I), nama (name), laki-laki (male), perempuan (female).*

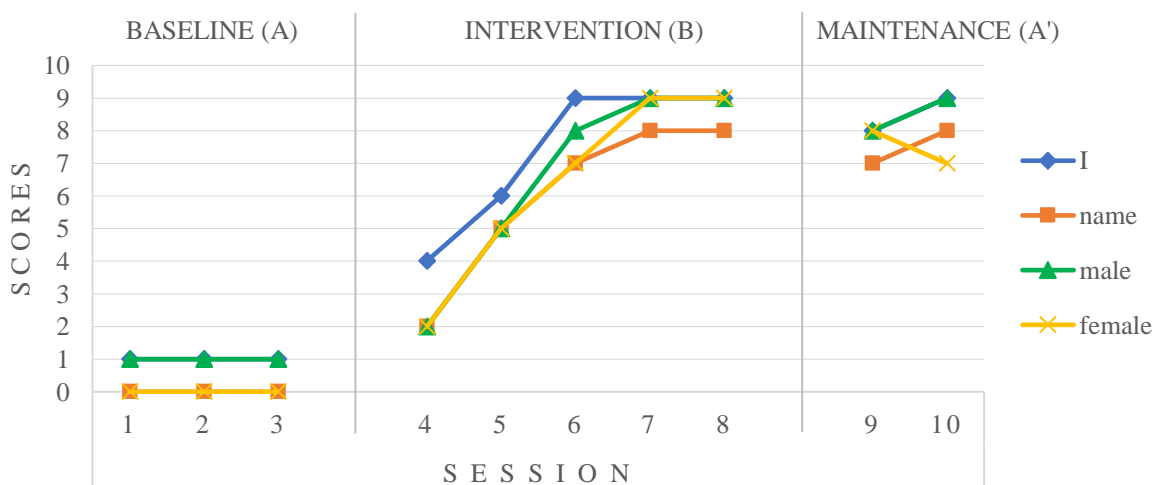


Figure 8. Mastery of vocabulary by applying multiplex teaching method on lesson plan-1

The trend or directional tendency in the baseline phase showed a plateau for all four words. Higher levels were recorded for the words *saya* (I) and *laki-laki* (male) compared to *nama* (name) and *perempuan* (female) which did not obtain score. In intervention phase, the scoring trend increased significantly starting from the first session for all four words. There was a decrease in score at the beginning of the maintenance phase but the same highest score as in the intervention phase was obtained again, except for the word *perempuan* (female) which experienced a 2-point decrease in score.

Table 2. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-1

Phase/Condition	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Vocabulary									
I ( <i>saya</i> )	1.00	0.15	1.08	0.93	7.40	1.35	8.08	6.73	8.50
name ( <i>nama</i> )	0.00	0.00	0.00	0.00	6.40	1.50	7.15	5.65	7.50
male ( <i>laki-laki</i> )	1.00	0.15	1.08	0.93	6.60	1.35	7.28	5.93	8.50
female ( <i>perempuan</i> )	0.00	0.00	0.00	0.00	6.40	1.35	7.08	5.73	7.50
SR: Stability Range	UL: Upper Limit				LL: Lower Limit				

Based on the mean score in the baseline to maintenance condition, there was an increase in the vocabulary mastery level of the words *saya* (I), *nama* (name), *laki-laki* (male), and *perempuan* (female) by 7.50 points. The comparison between the intervention condition (B) and the baseline condition (A) showed that the Percentage of Non-Overlapping Data (PND) was 100% for the four words. In contrast, the comparison between the maintenance condition (A') and intervention condition (B) showed that the PND was 50% for *saya* (i), *nama* (name), and *perempuan* (female), and 100% for *laki-laki* (male).



Lesson Plan-2: mata (eye), hidung (nose), mulut (mouth), telinga (ear)

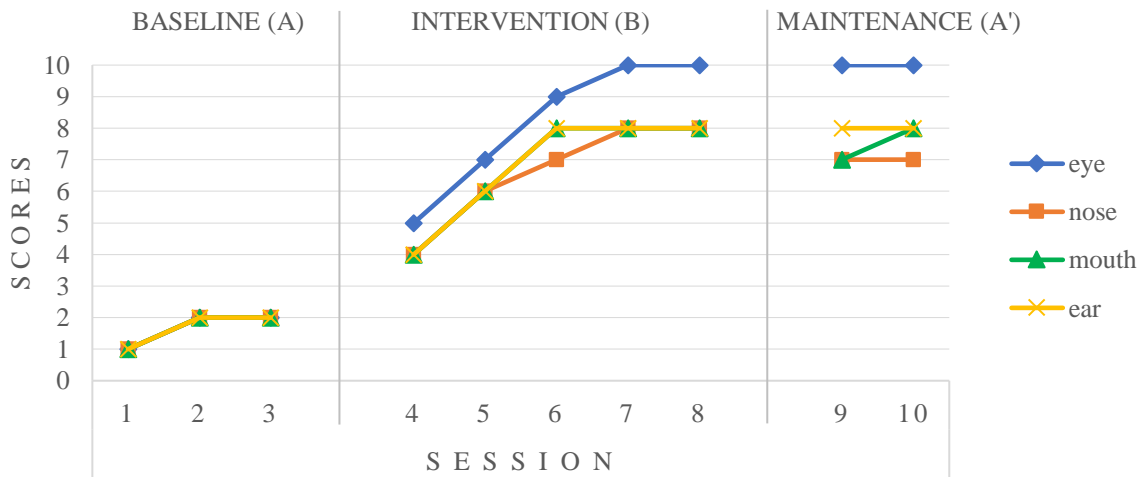


Figure 9. Mastery of vocabulary by applying multiplex teaching method on lesson plan-2

In the baseline phase, the four words showed the same directional tendency, increasing from the first session to the second session and subsequently levelled off until the third session. After the intervention, all four words showed an upward trend. The word *mata* (eye) obtained the highest score, while the words *hidung* (nose), *mulut* (mouth), and *telinga* (ear) reached a score of 8. In the maintenance phase, the words *mata* (eye) and *telinga* (ear) remained to obtain the highest score with the same score as in the intervention phase. The score for the word *mulut* (mouth) decreased in the first session of maintenance but rose in the second session. The word *hidung* (nose) showed a horizontal direction in maintenance condition and remained in the high score level although decreased compared to the highest score it achieved in the intervention phase.

Table 3. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-2

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Eye ( <i>mata</i> )	1.67	0.30	1.82	1.52	8.20	1.50	8.95	7.45	10.00
Nose ( <i>hidung</i> )	1.67	0.30	1.82	1.52	6.60	1.20	7.20	6.00	7.00
Mouth ( <i>mulut</i> )	1.67	0.30	1.82	1.52	6.80	1.20	7.40	6.20	7.50
Ear ( <i>telinga</i> )	1.67	0.30	1.82	1.52	6.80	1.20	7.40	6.20	8.00

SR: Stability Range      UL: Upper Limit      LL: Lower Limit

Based on the mean score, the level of vocabulary mastery of the words *mata* (eye), *hidung* (nose), *mulut* (mouth), *telinga* (ear) from the baseline to maintenance phase increased by 8.33, 5.33, 5.83, 6.33 points, respectively. The Percentage of Non-Overlapping Data (PND) obtained from the comparison of intervention condition (B) and baseline condition (A) was 100% for all the four words. The PND from the maintenance condition (A') compared to the intervention condition (B) was 50% for the words *hidung* (nose) and *mulut* (mouth), and 100% for the words *mata* (eye) and *telinga* (ear).

Lesson Plan-3: kepala (head), tangan (hand), jari (finger), kaki (leg)

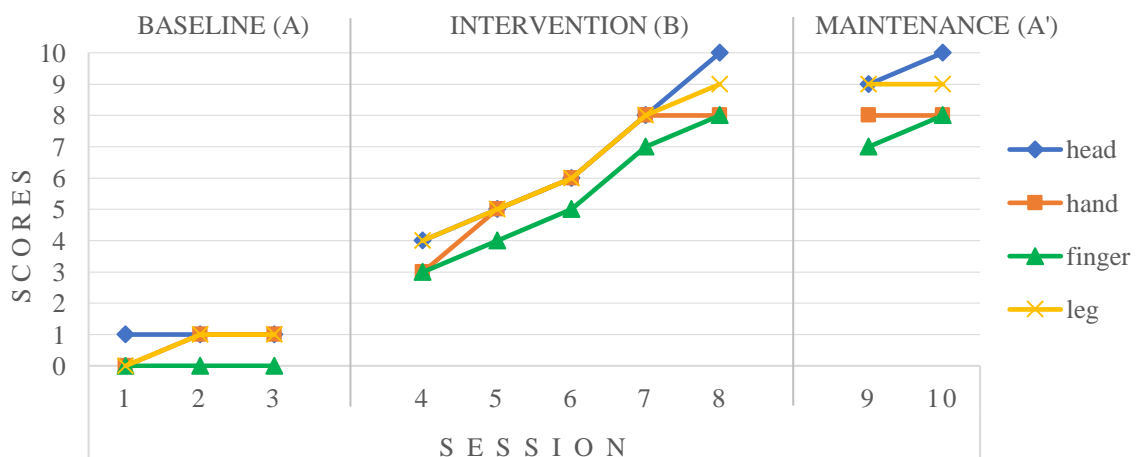


Figure 10. Mastery of vocabulary by applying multiplex teaching method on lesson plan-3

In the baseline phase, the trend or tendency of the direction indicated by the words *kepala* (head) and *jari* (finger) levelled off. The score for the word *kepala* (head) was 1, while the word *jari* (finger) did not obtain any score. While the words *tangan* (hand) and *kaki* (leg) did not obtain a score in the first session, in the second and third session they experienced an increase of 1 point. In the intervention phase, there was an increase in score from the first session to the fifth session, where the word *kepala* (head) could reach the maximum score. Furthermore, in the maintenance phase, the score for the words *kaki* (leg) and *tangan* (hand) remained stable, maintaining the highest score obtained in the intervention phase. As for the words *kepala* (head) and *jari* (finger), the score decreased in the first session of maintenance phase but rose again in the second session and achieved the highest score as in the intervention phase.

Table 4. Mean, Stability Range, Upper - Lower Limit of Research Data of Lesson Plan-3

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Head ( <i>kepala</i> )	1.00	0.15	1.08	0.93	6.60	1.50	7.35	5.85	9.50
Hand ( <i>tangan</i> )	0.67	0.15	0.74	0.59	6.00	1.20	6.60	5.40	8.00
Finger ( <i>jari</i> )	0.00	0.00	0.00	0.00	5.40	1.20	6.00	4.80	7.50
Leg ( <i>kaki</i> )	0.67	0.15	0.74	0.59	6.40	1.35	7.08	5.73	9.00
SR: Stability Range	UL: Upper Limit				LL: Lower Limit				

The level of vocabulary mastery of the words *kepala* (head), *tangan* (hand), *jari* (finger), and *kaki* (leg) based on the mean score from the baseline to maintenance condition increased by 8.50, 7.33, 7.50, and 8.33 points, respectively. The Percentage of Non-Overlapping Data (PND) obtained from the comparison of intervention condition (B) and baseline condition (A) was 100% for all the four words. Similarly, the PND from the maintenance condition (A') compared to the intervention condition (B) was also 100% for all of the four words.

Lesson Plan-4: *bapak* (father), *ibu* (mother), *kakak* (older brother/sister), *adik* (younger brother/sister)

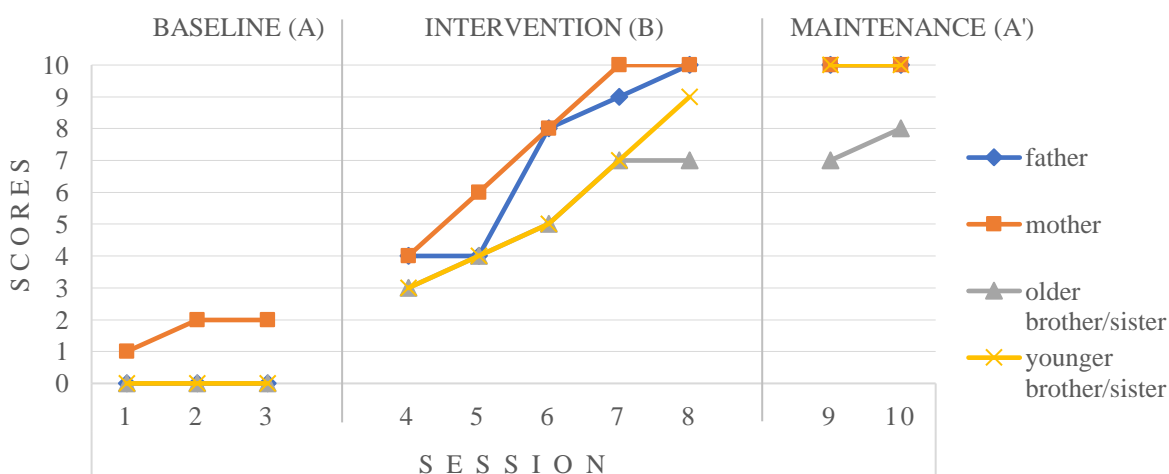


Figure 11. Mastery of vocabulary by applying multiplex teaching method on lesson plan-4

In the baseline phase, there were three words in lesson plan-4 which did not obtain a score, i.e. *bapak* (father), *kakak* (older brother/sister), *adik* (younger brother/sister). On the other hand, the word *ibu* (mother) obtained a score of 1 in the first session, increased in the second session, and levelled off until the third session. Furthermore, a consistent score increase in the intervention phase was demonstrated by all the four words. The words *ibu* (mother) and *bapak* (father) even reached the maximum score. On the contrary, the words *kakak* (older brother/sister) achieved the lowest score in the maintenance phase. The other three words, however, achieved a maximum score of 10, including of the word *adik* (younger brother/sister) which only reached a score of 9 in the intervention phase.

Table 5. Mean, Stability Range, Upper - Lower Limit of Research Data of Lesson Plan-4

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Father ( <i>bapak</i> )	0.00	0.00	0.00	0.00	7.00	1.50	7.75	6.25	10.00
Mother ( <i>ibu</i> )	1.67	0.30	1.82	1.52	7.60	1.50	8.35	6.85	10.00
older brother ( <i>kakak</i> )	0.00	0.00	0.00	0.00	5.20	1.05	5.3	4.68	7.50
younger sister ( <i>adik</i> )	0.00	0.00	0.00	0.00	5.60	1.35	6.28	4.93	10.00
SR: Stability Range	UL: Upper Limit				LL: Lower Limit				

The research data showing the level of points achieved based on the mean differences in the baseline and maintenance condition for each word in lesson plan-4 are as follows: *bapak* (father) 10.00, *ibu* (mother) 8.48, *kakak* (older brother/sister) 7.50, and *adik* (younger brother/sister) 10.00. The Percentage of Non-overlapping Data (PND) obtained from the intervention condition (B) compared to the baseline condition (A) was 100% for the four words. Likewise, the PND from the maintenance condition (A') compared to the intervention condition (B) was also 100% for the four words.

Lesson Plan-5: *pintu* (door), *jendela* (window), *meja* (table), *kursi* (chair)

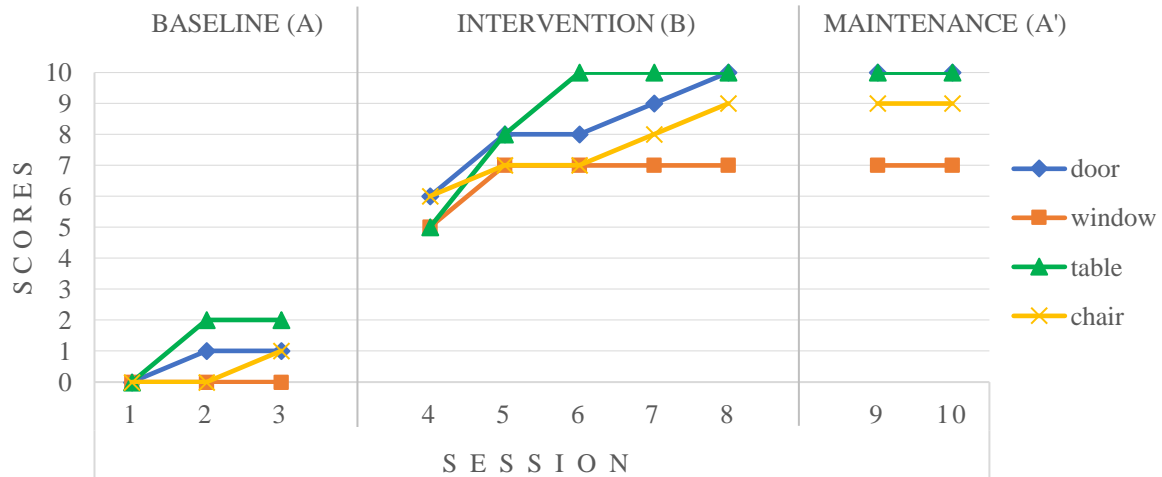


Figure 12. Mastery of vocabulary by applying multiplex teaching method on lesson plan-5

In the baseline phase, the score of the four words in lesson plan-5 was stable at the lower level. Moving on to the intervention phase, the four words showed an increase in direct score and were able to achieve the maximum score of vocabulary mastery for the words *pintu* (door) and *meja* (table). In contrast, the words *kursi* (chair) and *jendela* (window) could not reach the maximum score as the word *jendela* (window) had the lowest score of 7.

Table 6. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-5

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Door ( <i>pintu</i> )	0.67	0.15	0.74	0.59	8.20	1.50	8.95	7.45	10.00
Window ( <i>jendela</i> )	0.00	0.00	0.00	0.00	6.60	1.05	7.13	6.08	7.00
Table ( <i>meja</i> )	1.33	0.30	1.48	1.18	8.60	1.50	9.35	7.85	10.00
Chair ( <i>kursi</i> )	0.33	0.15	0.41	0.26	7.40	1.35	8.08	6.73	9.00
SR: Stability Range		UL: Upper Limit			LL: Lower Limit				

The research data showing the level of points achieved based on mean differences in the baseline condition and maintenance condition for each word in lesson plan-5 are as follows: *pintu* (door) 9.33, *jendela* (window) 7.00, *meja* (table) and *kursi* (chair) 8.67. The Percentage of Non-overlapping Data (PND) from the intervention condition (B) compared to the baseline condition (A) was 100% for the four words. In addition, the PND from the maintenance condition (A') compared to the intervention condition (B) was 100% for the words *pintu* (door), *meja* (table), and *kursi* (chair), while the PND for the word *jendela* (window) was 0 %.

SUBJECT - 2

Lesson Plan-1: *saya* (i), *nama* (name), *laki-laki* (male), *perempuan* (female).

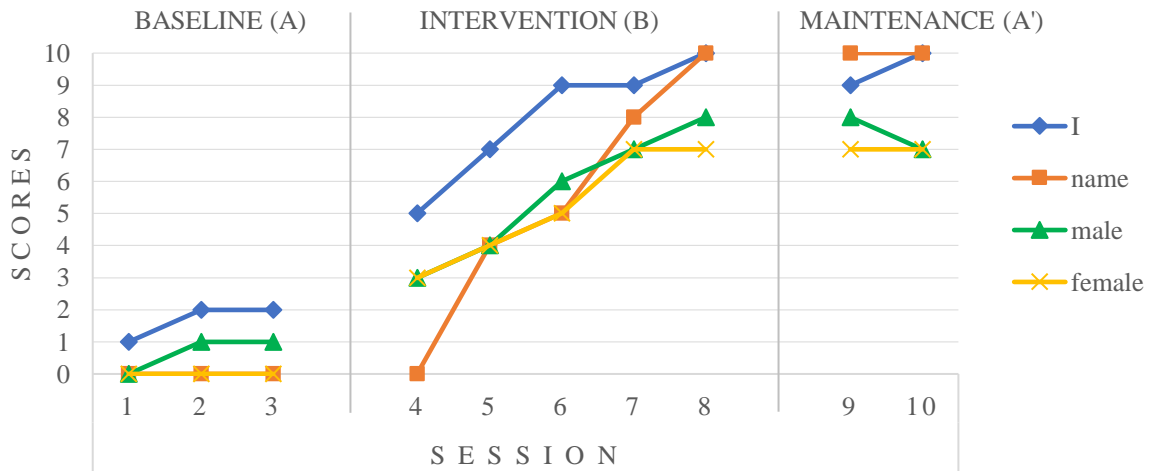


Figure 13. Mastery of vocabulary by applying multiplex teaching method on lesson plan-1

In the baseline phase, all the four words taught obtained a low score. Although the words *saya* (I) and *laki-laki* (male) gained a score, it was very low. The words *nama* (name) and *perempuan* (female) even did not score at all. In the first session of the intervention phase, the word *nama* (name) still did not experience an increase in score, but the other three words showed a significant increase in score. It happened continuously until the fifth session of intervention when the words *saya* (I) and *nama* (name) obtained the maximum score. The vocabulary mastery of the words *laki-laki* (male) and *perempuan* (female) reached a score of 8 and 7, respectively at the end of the intervention session. Furthermore, in the maintenance phase, the words *saya* (I) and *nama* (name) remained obtaining the maximum mastery score, while the words *laki-laki* (male) and *saya* (I) reached a score of 7.

Table 7. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-1

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
I ( <i>saya</i> )	1.67	0.30	1.82	1.2	8.00	1.50	8.75	7.25	10.00
name ( <i>nama</i> )	0.00	0.00	0.00	0.00	5.40	1.50	6.15	4.65	10.00
male ( <i>laki-laki</i> )	0.67	0.15	0.74	0.59	5.60	0.96	6.08	5.12	7.50
female ( <i>perempuan</i> )	0.00	0.00	0.00	0.00	5.20	1.05	5.73	4.68	7.00
SR: Stability Range	UL: Upper Limit			LL: Lower Limit					

It can be seen from the table that there was an increase in the vocabulary mastery score based on the mean differences in the maintenance and baseline condition. The increase was as the following: *saya* (I) 8.33, *nama* (name) 10.00, *laki-laki* (male) 6.83, and *perempuan* (female) 7.00. The Percentage of Non-Overlapping Data (PND) from the intervention condition (B) compared to the baseline condition (A) was 100% for the words *saya* (I), *laki-laki* (male), *perempuan* (female), and 80% for the word *nama* (name). The PND from the maintenance condition (A') compared to the intervention condition (B) was also 100% for the four words.

Lesson Plan-2: mata (eye), hidung (nose), mulut (mouth), telinga (ear)

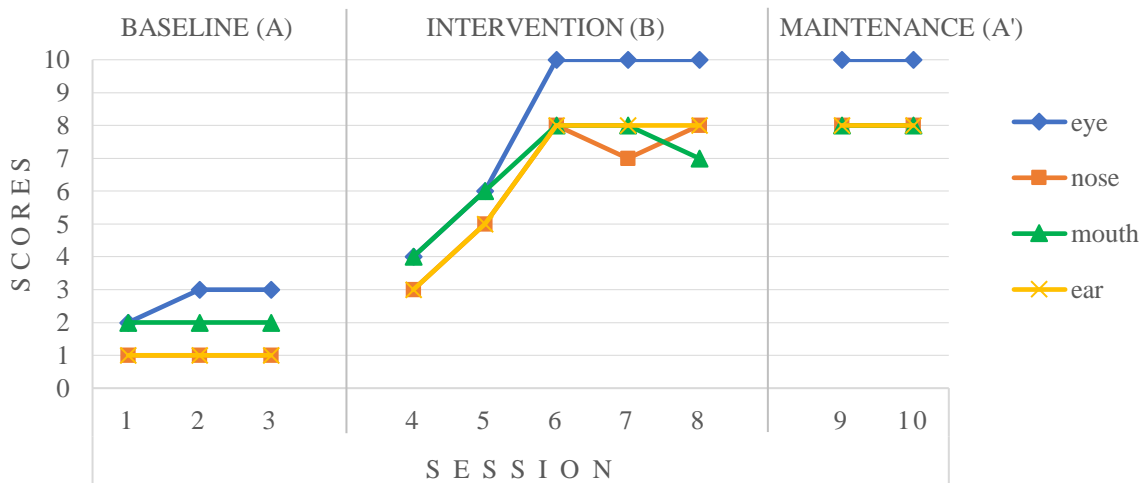


Figure 14. Mastery of vocabulary by applying multiplex teaching method on lesson plan-2

In the baseline phase, the vocabulary mastery of the words *hidung* (nose) and *telinga* (ear) only achieved a score of 1, while *mulut* (mouth) and *mata* (eye) obtained a score of 2 and 3, respectively. It means that the vocabulary mastery achieved in lesson plan-2 is still at a low level. In the intervention phase, it took three sessions for the word *mata* (eye) to achieve the highest score. On the other hand, the other three words showed a fluctuating achievement between 7 and 8 until the end of the intervention session. Furthermore, in the maintenance phase, the word *mata* (eye) managed to maintain a perfect score in both sessions, while the mastery of the other three words showed a stability at a score of 8.

Table 8. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-2

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Eye ( <i>mata</i> )	2.67	0.45	2.89	2.44	8.00	1.50	8.75	7.25	10.00
Nose ( <i>hidung</i> )	1.00	0.15	1.08	0.93	6.20	1.20	6.80	5.60	8.00
Mouth ( <i>mulut</i> )	2.00	0.30	2.15	1.85	6.60	1.20	7.20	6.00	8.00
Ear ( <i>telinga</i> )	1.00	0.15	1.08	0.93	6.40	1.20	7.00	5.80	8.00
SR: Stability Range		UL: Upper Limit			LL: Lower Limit				

From the table the vocabulary mastery from the baseline to maintenance condition increased significantly. Based on the differences in mean in both conditions, there was an increase of 7.33 for *mata* (eye), 7.00 for *hidung* (nose), 6.00 for *mulut* (mouth), and 7.00 for *telinga* (ear). The Percentage of Non-Overlapping Data (PND) from the intervention condition (B) compared to the baseline condition (A) was 100% for the four words. On the other hand, the PND obtained from comparing the maintenance condition (A') and intervention condition (B) showed a percentage of 50% for the word *mata* (eye) and 100% for the other three words.

Lesson Plan-3: kepala (head), tangan (hand), jari (finger), kaki (leg)

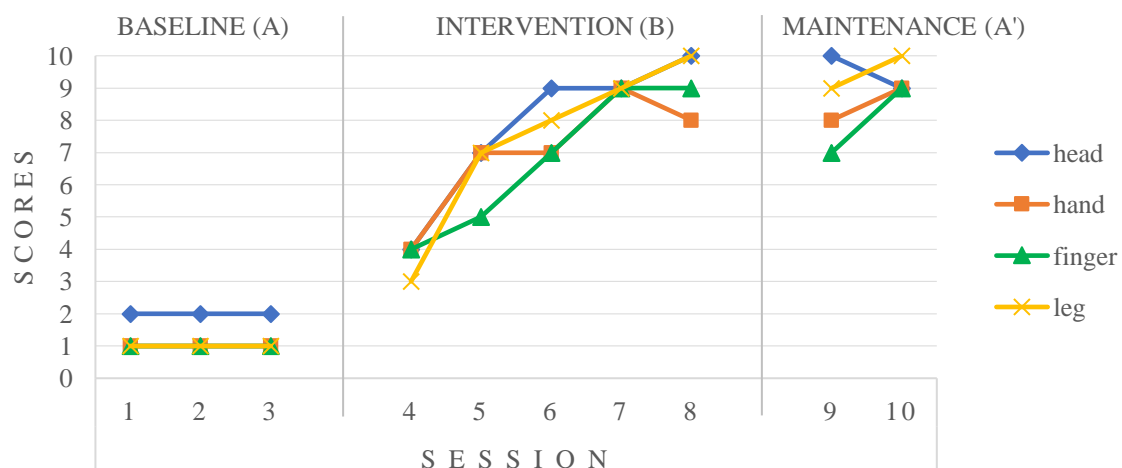


Figure 15. Mastery of vocabulary by applying multiplex teaching method on lesson plan-3

As can be seen in the graph, the vocabulary mastery of the four words was still at a low level, where the words *tangan* (hand), *jari* (finger), and *kaki* (leg) only scored 1, and the word *kepala* (head) was slightly better with a score of 2. In the intervention phase, the mastery score of all four words gradually improved. In the fourth session of the intervention, the four words had the same score of 9. In the fifth session, the words *kepala* (head) and *kaki* (leg) achieved the highest score, while the word *tangan* (hand) decreased by 1 point, and the word *jari* (finger) remained the same. Furthermore, in the maintenance phase, the achievement of high-level scores at 9 and 10 could be maintained.

Table 9. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-3

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Head ( <i>kepala</i> )	2.00	0.30	2.15	1.85	7.80	1.50	8.55	7.05	9.50
Hand ( <i>tangan</i> )	1.00	0.15	1.08	0.93	7.00	1.35	7.68	6.33	8.50
Finger ( <i>jari</i> )	1.00	0.15	1.08	0.93	6.80	1.35	7.48	6.13	8.00
Leg ( <i>kaki</i> )	1.00	0.15	1.08	0.93	7.40	1.50	8.15	6.65	9.50
SR: Stability Range		UL: Upper Limit				LL: Lower Limit			

As presented in the table above, the increase in score from the baseline to maintenance condition based on differences in mean for the four words can be described as follows: *kepala* (head) 7.50 points, *tangan* (hand) 7.50 points, *jari* (finger) 7.00 points, and *kaki* (leg) 8.50 points. The Percentage of Non-Overlapping Data (PND) from the intervention condition (B) compared to the baseline condition (A) was 100% for the four words, while the PND from the maintenance condition (A') compared to the intervention condition (B) was 50% for the word *jari* (finger) and 100% for the other three words.

Lesson Plan-4: *bapak* (father), *ibu* (mother), *kakak* (older brother/sister), *adik* (younger brother/sister)

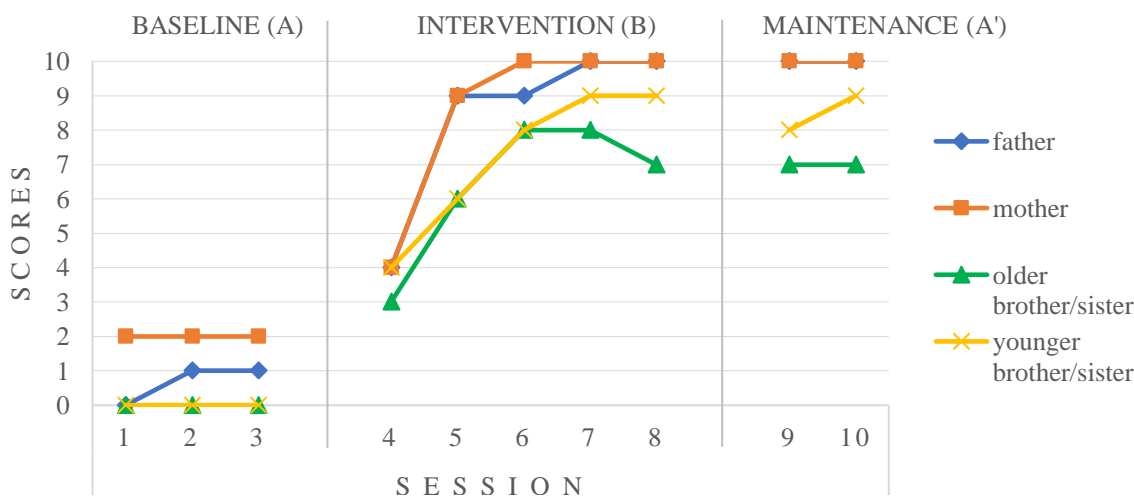


Figure 16. Mastery of vocabulary by applying multiplex teaching method on lesson plan-4

The graph in lesson plan-4 shows that the vocabulary mastery in the baseline phase was at a low level, and the words *kakak* (older brother/sister) and *adik* (younger brother/sister) even did not score. While the word *bapak* (father) obtained a score of 1, the word *ibu* (mother) obtained the highest score of 2. Moving on to the intervention phase, the effect of the teaching in the first session could be seen as the scores obtained were slightly better than the scores in the baseline phase. In fact, in the second session of the intervention, there was a sharp increase in the score of the words *ibu* (mother) and *bapak* (father) that continued to the last session of intervention where both words achieved the perfect score. However, the words *kakak* (older brother/sister) and *adik* (younger brother/sister) did not manage to achieve a perfect score. The words *bapak* (father) and *ibu* (mother) were able to maintain a perfect score in the maintenance phase, while the words *kakak* (older brother/sister) and *adik* (younger brother/sister) reached a fairly high score of 7 and 9.

Table 10. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-4

Phase/Condition Vocabulary	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Father ( <i>bapak</i> )	0.67	0.00	0.67	0.67	8.40	1.50	9.15	7.65	1.00
Mother ( <i>ibu</i> )	2.00	0.30	2.15	1.85	8.60	1.50	9.35	7.85	10.00
older brother ( <i>kakak</i> )	0.00	0.00	0.00	0.00	6.40	1.20	7.00	5.80	7.00
younger sister ( <i>adik</i> )	0.00	0.00	0.00	0.00	7.20	1.35	7.88	6.53	8.50
SR: Stability Range		UL: Upper Limit				LL: Lower Limit			

As presented in the table above, there was an increase in vocabulary mastery score based on the differences in mean from the baseline to the maintenance condition. The increase was as follows: *bapak* (father) 9.33 points, *ibu* (mother) 8.00 points, *kakak* (older brother/sister) 7.00 points, and *adik* (younger brother/sister) 8.50 points. The Percentage of Non-Overlapping Data (PND) from the intervention condition (B) compared to the baseline condition (A) was 100% for the four words. Similarly, the PND from the maintenance condition (A') compared to the intervention condition (B) was also 100% for the four words.

Lesson Plan-5: *pintu* (door), *jendela* (window), *meja* (table), *kursi* (chair)

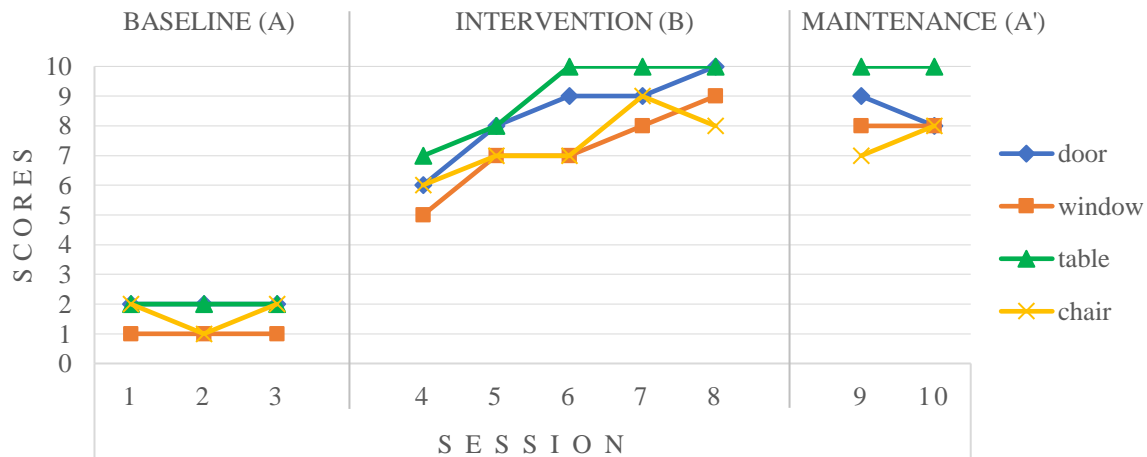


Figure 17. Mastery of vocabulary by applying multiplex teaching method on lesson plan-5

In the baseline phase, the word *jendela* (window) had the lowest score, while the other three words reached a score of 2. However, in this phase, the vocabulary mastery level of the four words was still very low. In the intervention phase, an increase could be seen after the first session was conducted. The word *meja* (table), achieved a perfect score in the third session of intervention and lasted until the fifth session. The perfect score was also achieved by the word *pintu* (door) after five sessions of intervention. However, the other two words, *jendela* (window) and *kursi* (chair) scored 9 and 8, respectively. Only the word *meja* (table) which could maintain the perfect score when entering the maintenance phase, whereas the other three words reached a score of 8.

Table 11. Mean, Stability Range, Upper-Lower Limit of Research Data of Lesson Plan-5

Phase/Condition	Baseline (A)				Intervention (B)				Maintenance (A')
	Mean	SR	UL	LL	Mean	SR	UL	LL	Mean
Door ( <i>pintu</i> )	2.00	0.30	2.15	1.85	8.40	1.50	9.15	7.65	8.50
Window ( <i>jendela</i> )	1.00	0.15	1.08	0.93	7.20	1.35	7.88	6.53	8.00
Table ( <i>meja</i> )	2.00	0.30	2.15	1.85	9.00	1.50	9.75	8.25	10.00
Chair ( <i>kursi</i> )	1.67	0.30	1.82	1.52	7.40	1.35	8.08	6.73	7.50
SR: Stability Range	UL: Upper Limit			LL: Lower Limit					

It can be seen from the table that the differences in mean scores for the four words from the baseline to maintenance condition indicate an increase in score which is presented as follows: *pintu* (door) 6.50 points, *jendela* (window) 7.00 points, *meja* (table) 8.00 points, and *kursi* (chair) 5.83 points. The Percentage of Non-Overlapping Data (PND) from the intervention condition (B) compared to the baseline condition (A) was 100% for the four words, while the PND from the maintenance condition (A') compared to the intervention condition (B) was 0% for the words *pintu* (door) and *kursi* (chair) and 100% for the words *jendela* (window) and *meja* (table).

## Discussion

Lesson plan-1 contains vocabulary that is directly related to the research subject's self, and the word *perempuan* (female) achieved the highest score only on the minimum criteria of mastery learning. In this study, the two subjects are male, and it was easier to teach the word *laki-laki* (male) in written and spoken language because the word consists of only two repeated syllables. The deaf students could not understand the words *laki-laki* (male) and *perempuan* (female) by simply teaching them that these are opposite words, as in teaching children with normal hearing who have more learning facilities. This is what causes deaf students fall far behind children who hear in terms of understanding ((Aleksandrowicz, 2019; Mathews & O'Donnell, 2020; Rezaei et al., 2016; Takahashi et al., 2016; Wauters et al., 2006). It is different from the word *nama* (name) which is more abstract and only consists of two syllables. In addition, this word is often asked or

used in communication. In this multiplex teaching method, the presentation included picture language using the identity attached on the clothes, making the word successfully mastered although it is more abstract. This means that teaching vocabulary to the deaf does require extra effort (Alqraini & Paul, 2020).

In lesson plan-2, the word *mata* (eye) achieved the maximum score for both Subjects. Picture language and sign language were used to present the word *mata* (eye) which was the easiest to understand because it is very concrete for the subjects. As stated in Piaget's theory of concrete operational stage (Vida, 1980), teaching reading at this stage moves from concrete things in the form of images of objects to written language that is more abstract (Amalia & Khoiriyati, 2018; Hanfstingl et al., 2019). In addition, the word *mata* (eye) consists of only two syllables with a bilabial speech sound which is relatively easy to pronounce. The sign language of *mata* (eye) is also not confused with other vocabulary signs, so this word can be mastered well. On the other hand, the word *hidung* (nose) had the lowest score because it is the most difficult word to teach to a deaf person in printed-word language, written language, and spoken language. The limitation of deaf people is that they have not been exposed to spoken language since infancy ((Friedmann & Sztzman, 2011). The word *mulut* (mouth) also did not reach the maximum score because it is confused with other words such as *laki-laki* (male) and *bapak* (father). In the Indonesian Sign Language System, the sign for these three words involves the same area around the mouth, so it was not easy for the subjects to interpret it. In this case, a student's visual attention to observe gestures appropriately is crucial. This is in line with the statement that deaf students need visual materials in learning, including learning to read. Therefore, it is crucial to use visual materials during the learning process (Kara & Şilbir, 2010).

In lesson plan-3, the highest score was achieved by the words *kepala* (head) and *kaki* (leg). These two words are very concrete and their position on human body is in contrasting position. In terms of a constructive syllable structure, the word *ke-pa-la* (head) consists of three syllables and is easier to articulate, while the word *ka-ki* (leg) consists of only two syllables and has the same repeated consonant (k). The words *jari* (finger) and *tangan* (hand) had the lowest score for both subjects although it was above the specified minimum criteria of mastery learning. This low score was a result of the scoring in the plies of printed-word language and spoken language. Both words have a difficulty level in terms of pronunciation, especially because of consonants r (*jari*) and ng (*tangan*). This problem is also experienced by children who have good hearing. As stated by Paul and Alqraini (2019) and Sterne and Goswami (2000), deaf children and hearing children have similarities in terms of learning vocabulary although deaf children learn more slowly.

Discussing the results of research regarding lesson plan-4 that teaches vocabulary about family members, it is inevitable to associate them with significant figures for the two students. The words *ibu* (mother), *bapak* (father), and *adik* (younger brother/sister) achieved a maximum score for Subject-1. Living in a family, a person will be exposed to these words and hear them very often. In most families, these words are always taught to children to pronounce. Subject-1 is the eldest son and has a younger sister. This means that situation and environmental condition that support children to absorb (learn) something will help develop their language (Salehomoum & Pearson, 2020). Therefore, teaching vocabulary early and continuously will generate good results (Hartshorne et al., 2018; Salehomoum & Pearson, 2020). In contrast, Subject-2 only achieved a maximum score for the words *ibu* (mother) and *bapak* (father). Based on the information about this subject, he is the only child in the family. Thus, the words *ibu* (mother) and *bapak* (father) are the words that he "experiences" more often compared to the words *kakak* (older brother/sister) and *adik* (younger brother/sister) which probably are rarely introduced. It is understandable that Subject-2 did not reach a maximum score on the two words. The fact that the two subjects had almost the same score for the lesson plan related to vocabulary of family is very relevant to the idea that vocabulary can be understood through exposure and formal instruction and can be stored in a long-term memory (Geers & Hayes, 2011).

Lesson plan-5 presents vocabulary of objects that can be found almost every time, consisting of the words *pintu* (door), *jendela* (window), *meja* (table) and *kursi* (chair). Both subjects achieved a maximum score for the word *meja* (table) from the third intervention until the end of the maintenance phase. This shows that deaf people will master a word more easily if the word has become an attachment object and is formally taught (Geers & Hayes, 2011). Reading at this stage is still classified as preliminary reading (Andrews & Mason, 1986). This multiplex teaching method at the same time shows that learning consistently changes from concrete to abstract concepts although it is related to the logical operational stage in cognitive development (Hanfstingl et al., 2019). The word *pintu* (door) also reached a maximum score for Subject-1 until the maintenance phase, while for Subject-2 it reached a maximum score in the intervention phase but decreased slightly in the maintenance phase. It must be admitted that although the entire lesson plan is taught with motivation as a strategy to achieve effective learning (Csizér & Kontra, 2020), students' internal factors also play a role in determining the success of teaching, and these factors were not measured in this study. Furthermore, the words *jendela* (window) and *kursi* (chair) did not score as high as the other two words. This was because the consonants "nd" in *jendela* (window) and "r" in *kursi* (chair) were not easy to pronounce during the spoken language ply. Therefore, the accumulation of scores for the two words from the two subjects was not optimal.

### Conclusion

Based on the results of this study, it can be concluded that multiplex learning method is effective for improving vocabulary mastery of deaf children. In detailed results of the effectiveness of the multiplex method are described as follows:



Subject-1: The score differences from the baseline to maintenance condition for the five lesson plans recorded by Subject-1 are as follows: (7.50), (6.46), (7.92), (8.99), (8.42) points. The average of changes achieved after implementing multiplex teaching method was 7.86 points. It indicates that multiplex teaching model has succeeded in increasing the vocabulary mastery of subject-1. This increase makes him exceeds the minimum completeness criteria for Indonesian Language lessons (7.50). In addition, the effectiveness of multiplex teaching method based on the PND from the intervention to baseline condition (B/A) in the first to the fifth lesson plan reached 100%. The effectiveness criteria of the intervention >90% is very effective. Thus, the multiplex teaching method is very effective in improving vocabulary mastery of subject-1

Subject-2: The score differences recorded by Subject-2 from the baseline to maintenance condition for the five lesson plans are as follows: (8.04), (6.83), (7.63), (8.21), and (6.83) points. The average of changes achieved after implementing multiplex teaching method was 7.68 points. It can be concluded that the multiplex learning method succeeded in increasing the vocabulary mastery of subject-2. Similar to Subject-1, this success also led him to exceed the minimum completeness criteria for Indonesian language lessons (7.50). Additionally, the effectiveness of multiplex teaching method based on the PND in lesson plan-1 was 95%, while the PND in lesson plan-2 to lesson plan-5 reached 100%. The average PND for the five lesson plans was 99%. Thus, the multiplex teaching method is very effective in improving vocabulary mastery of subject-2.

### Recommendations

Deaf students have a major issue with hearing sense which is the most important asset for learning to speak and read: therefore, optimizing the function of other senses is critical. Based on the experiment of implementing multiplex teaching method which is very effective in increasing vocabulary mastery of deaf students, it is crucial that special school teachers find various teaching methods and learning media. Five plies of reading control for deaf students have been implemented to complement and reinforce vocabulary mastery.

The research results showed that among teaching plies, picture language and sign language contributed to the attainment of the highest score in vocabulary mastery. However, students' responses and expressions toward picture language will be shown in sign language. It shows that deaf students' understanding of reading materials will be expressed dominantly through a sign language. This study also highlighted that the teaching during spoken language ply generated the lowest score. It can be easily understood because the two subjects are severe deaf, so they have no exposure to spoken language since birth. Teaching spoken language (pronunciation) to deaf students is more of a supplementary activity and should not be forced because it will emphasize students' disabilities. Teaching spoken language should be done collaboratively with school support system called speech therapy.

Suggestions for future researchers are as the following: 1) researchers should use varied media for teaching reading to deaf students, especially media that involves senses; 2) researchers should develop a rigid assessment system to assess deaf students' performance and progress in reading.

### Limitations

1. As a single subject experimental study, the generalization of the research results can only be conducted to subjects with the same characteristics and problems.
2. Vocabulary mastery in this study was limited to single words and the words were dominated by noun.
3. A relatively longer time was required to complete the plies of teaching individually.
4. Teaching aids and learning media that require more time, cost, and energy to prepare were needed.

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### Authorship Contribution Statement

Subasno: Conceptualization, design, analysis, writing. Degeng: Reviewing and supervision. Pali: Reviewing and supervision. Hitipeuw: Critical revision of manuscript and analysis.

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