Applied Bio-Communication For Language Competence

Deni Darmawan

Abstract: The language competence is obtained through the bio-communication stimuli given in the forms of visual presentation of still text and moving text; the pronunciation of still text and moving text; and visual, audio, and pronunciation presentations. Through the laboratory experiment method and with the support of the electroencephalography. The findings indicate that ability of the frontal lobe constantly increased from 7 to 17 MHz; the temporal fluctuated between 13 and 22 MHz; the Occipital was stable with 4 waves; the amplitude was also stable at 21 MHz, and the response rate was stable at 25.30 MHz. These findings are expected to contribute to the way learning materials are packaged to support the improvement of language competence by their teachers.

Index Terms: Bio-communication, Information Processing, Language Competencies, Learning Communication.

1 INTRODUCTION

The birth of Bio-communication studies has provided more opportunities for the study of students' learning behavior. Nevertheless, there are still challenges in the verification and determination of the level of validity and reliability of Bio-communication. In an answer to these challenges and to convince communication practitioners, bio-communication in education context has been quite widely studied; for example, studies examining the internal communication process in the development of students' language competence from an early age. In Indonesian context, language competence is important in order to face and to achieve in the international competition. Thus, it is necessary to make efforts from the very beginning to identify and get to know more deeply how individual students are able to master and develop their language competence. Efforts have been made to find out and investigate students' potential in language competence since elementary school. However, these efforts are focused more on the competence as seen from the outside. Meanwhile, the attempts to explain and describe how students' initial language competence is like have not been widely made. In the Indonesian context, there was a study carried out since 2002 focusing on an individual student at the elementary school level, particularly in the aspect of intrapersonal communication skills. Intrapersonal communication skills are related to the application of bio-communication concept. The existing research shows that language competence is given scarce attention by educators, with a considerable focus on the science of the language itself, such as linguistics. Meanwhile, how language competence can be clearly identified in terms of intrapersonal communication is very important. The study of intrapersonal communication in this context is related to the intra-bio-communication potential displayed by students during language learning activities. Herein, the present in-depth research was carried out rigorously, starting from the study of the brain's potential of students and their individual speed of language learning at the elementary school level. This research has attempted to explain a number of phenomena which include: (a) Speed of information processing in language competence through seeing and reading still text: (b) speed of information processing in language competence through reading and seeing moving texts; (c) speed of processing information in language competence by pronouncing still text; (d) speed of processing information in language competence by pronouncing moving text; and (e) speed of information processing in language competence through the activities of listening, seeing, and reading. All of them were analyzed based on laboratory experiment data with a focus on bio-communication ability in the form of speed analysis described in the amplitude of the specific parts of the brain of students when they do the activities of reading, seeing, pronouncing, and listening.

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2 LITERATURE REVIEW

2.1 Language Learning Acceleration

Students' learning acceleration is actually influenced by logical and rational thinking patterns which are a combination of the left and right brain hemispheres[1]. This is so because the main concern of speed is that individuals feel that what is learned is something that is appropriate to think about logically and rationally in meeting the immediate needs for information. Research has shown that acceleration requires systematic thinking starting from the ability to analyze, synthesize, and interpret. All three are needed in creating psychological and physiological readiness in learning. Through systematic thinking, students are expected to be able to empower their association to learn the language in their brain. [2] state that the association represents events, people, and places that are formed when the brain decides to connect different types of linguistic information, especially if the connection will be useful in the future. This opinion entails that individual learners will understand what is learned based on the ability of the two parts of the brain to make linguistic association from the information in their memory, hence showing conclusions about what is being learned. [2] add that most of what we learn and remember relies on the ability of the brain to form and rediscover language associations by interpreting what is being learned. Furthermore, in supporting this language acceleration, media and tools that are able to package these

thinking patterns to be more attractive and less burdensome for students are also needed. Learning media should be integrated into the form of teaching and learning. For example, multimedia-based learning which is an adaptation of the information and communication technology under development is expected to be able to pay attention to the balance of students' thinking patterns. This is in line with the argument of [3] in [4] that, We are also capable of conceptual thinking, analytical thinking, speculative thinking, thinking with the right brain, critical thinking, silly thinking, convergent thinking, thinking out of the box, reflective thinking visual thinking, symbolic thinking, proportional thinking, digital thinking, metaphorical thinking, narrative thinking, poetic thinking, nonverbal thinking, elliptical thinking, analogical thinking, lyrical thinking, practical thinking, divergent thinking, ambiguous thinking, constructive thinking, thinking about thinking (metacognition), surreal thinking, focused thinking, concrete thinking, and thinking with fantasy. Based on the opinions above, learning that leads to the improvement of language competence for elementary school-age children can be optimized by involving all the thinking abilities of the children. Likewise, the arguments can be made the basis to support the implementation of learning acceleration in an effort to improve language competence in children through the development of learning media.

2.2 The ability to process and package language-learning information

Before students follow the process of language learning acceleration, the teachers should be assisted in preparing forms of stimuli. These stimuli are strongly needed in promoting children's ability to process information quickly. This argument corresponds to that of [5], who argued: "It is therefore obvious that language learning strategies, especially when used by informed students, place students at the center of the second language classroom, enabling them to make pedagogically sound decisions concerning their own learning." The same is true for the ability in preparing or recalling past learning experiences and rearranging information or experiences in the memory to be re-called and adapted to the latest learning information. The learning information presented includes, among others, emphasizing the visual aspects with their supporting elements aimed at presenting writing, visual symbols, and also sounds that have true meaning. Especially in relation to visual presentation,[1] argue that "Visual recognition of object is thought to proceed through a sequence of three types of representation: 1) Brightness changes and two-dimensional representation; 2) spatial and viewpoint or sketch that is called 2.5 dimensions; 3) three-dimensional representation." A presentation consisting of one to three dimensions of some information in the forms of writing, letter symbols, words, or sentences are really needed by the brain to be able to see and understand the information contained in it. Previous information that has been processed, including the results of language learning, is usually stored in long-term memory, as explained by Collin & Rose (1997: 143-144) that "review and repetition are essential stages in creating a long-term memory." These should be done by individuals so that their cognitive abilities will develop and their subsequent learning acceleration will be positively affected. One of the important factors in realizing this language competence is the ability to package information. The packaging of learning information in the form of the learning models indicated above will basically influence and demand thinking patterns. These thinking patterns, as will be revealed in this research, have something to do with and even are very closely related to the biological phenomena or processes of brain communication. This is especially true if the four learning models can be applied by students, so that the thinking patterns developed while considering the ability of the left and right brain hemispheres will be very helpful in realizing language competence that includes motivating your mind, acquiring the information, searching out the meaning, triggering memory, exhibiting what you know, and reflecting on how you have learned (Nichol & Rose, et al., 1997).

2.3 Bio-communication in specific parts of the brain that support language competence

The language competence will also be inextricable from the function of the brain in forming associations, as revealed by Gordon Dryden & Jeanet Vos (1999: 133) that "the brain stores information using associations. Everyone's brain has an association. It can connect something similar from various memory banks." What follows are studies of specific parts of the brain that support individuals' work functions and abilities in language through bio-communication.

This literature review can also be an input for teachers or language-learning designers to think about how to optimize bio-communication in the left and right brain hemispheres. The phenomenon of bio-communication can be observed from several activities before and during the provision of stimuli. The following is an illustration of several bio-communication phenomena when specific parts of the brain communicate in receiving and transforming visual, auditory, and motor messages.

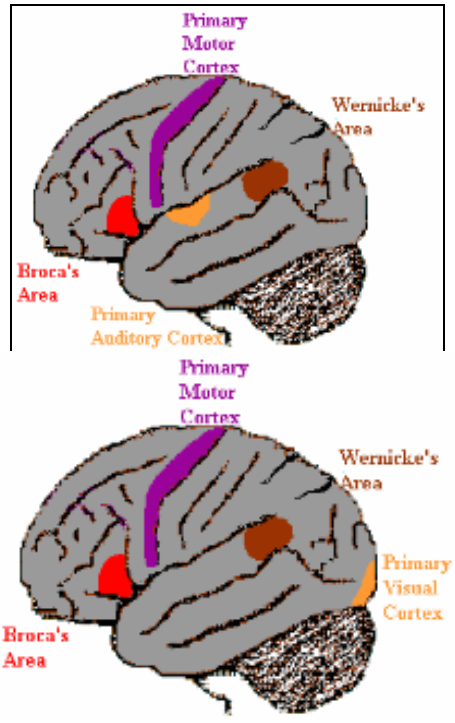

Fig.1. Auditory, visual, and motor pathways in specific parts of the brain that support language competence http\\www.brain &communication.co.id)

What follows is a discussion on communication as a biological phenomenon in terms of the activities of several individuals in learning based on information and communication technology observed through experiments in the EEG laboratory. [6], explain bio-communication process occurs in accordance with different functions and specific parts of the left and right brain hemispheres. It means that each specific part will contract differently according to the presence or absence of external stimuli. The specific parts of the brain that work when bio-communication stimuli are given include the Pre-Frontal (Fp); Frontal (F); Temporal (T); Parietal (P); Central (C); Occipital (O); and Parasagittal (P). All activities of the specific parts of the brain can be seen through their beta waves in the form of wave artifacts and their speed. The participants in this study are under the age 18.

2.4 Research Methodology

The present research was conducted using the laboratory experiment method [7] with a sample of elementary school students analyzed for their language competence. During the laboratory experiment, the researchers were assisted by experts in brain neurosurgery and neuroscience. The diagnosis and examination of the language competence of elementary school children were done following[8]. The diagnosis and examination lasted for 4 hours. Various phenomena were found and recorded as materials for analysis to prove that there is a communication process between specific parts of the brain in supporting language competence through the activities of seeing, reading, pronouncing, and listening which are stimulated by visual forms of still and moving visuals and audio. As explained by [9], "The use of coherence and correlation is based on the assumption that electroencephalographic similarity between two cortical areas reflects similarity in the underlying neurophysiological processes, such as the same inputs, similar information processing, or broad connections between them."

4. Result and Discussion

During the experiment to find the brain's language competence pathway of the elementary school students, an analysis was carried out in several stages in accordance with the stimuli of language learning given. The laboratory experiments show how different bio-communication behaviors support language competence. The occurring phenomena, especially those observed through [8], can be interpreted and explained as evidence of different language competences according to the types of stimuli given. Thus, the language competence should be supported by well-prepared messages in the forms of still visuals, moving visuals, audio, even color, and multimedia so that the language responses or behaviors can be optimized. It was clearly shown that the language competence acquired by the children basically serves to understand the messages conveyed through the bio-communication stimuli given. The findings of this research reinforce the argument that when individuals learn something such as a language, the left, and right brain hemispheres will communicate. This is also confirmed by [10], [11], who explain that the corpus callosum is the band of nerve fiber which connects the left and the right hemispheres of the cerebral cortex. [12], a neurologist, points out that the left and right brain hemispheres are designed to handle certain specific tasks; for example, the left hemisphere handles speech, language processing, logical reasoning, mathematical calculations, reading, and writing. The following are findings of language competence based on the types of stimuli given.

4.1 Information-Processing Rate in Language Competence through Seeing and Reading Still texts

The findings on this competence can be visualized through the following figure, in which there are several artifacts of bio-communication processes supporting children's ability to respond.

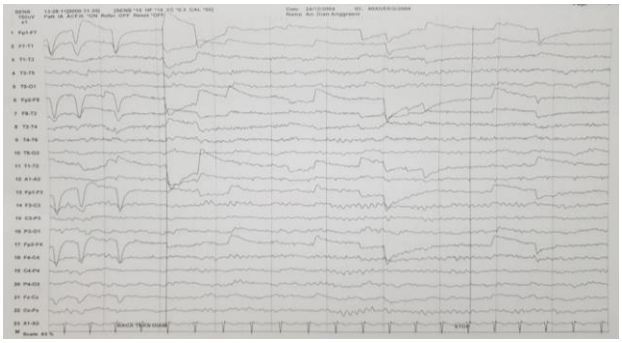

***Fig. 2**. Artifacts illustration of language competence through the stimulus of still texts*

Figure 1 shows that in terms of the language competence of elementary school students, when stimulated using bio-communication messages in the form of still text, a response occurred in Fp1-F7 (Prefrontal and Frontal lobe) pairs or thinking ability and FP2-F8 pairs with an amplitude of 6, where the response rate obtained were 12-13 Hz. The next response appeared in Fp1-F3 and Fp2-F4 pairs with a 6 amplitude and a response rate of 7-8 Hz. Meanwhile, the ability of specific parts of the brain that function in hearing (Temporal) at the T1-T2 waves (Left and Right) accelerated by 13-14 Hz. The occipital (O) rates occurred at waves 5, 10, 16 and 20 with stable amplitude. From the two pairs of Fp and F, it turns out the children's language competence was only indicated through the bio-communication responses in the Beta waves of X1 - X2 and with an amplitude of 23 and a response rate of 21/83 x 100 = 25.30 Hz. Given the bio-communication stimulus, it can be seen that the specific parts of the brain that works were the Wernicke' and Broca's regions which both support language competence, especially to speak with understanding and talk with action. One of the studies that confirm the ability of the Broca's area of the brain to support language competence is that of [13], explaining that traditionally Brodmann areas (BA) 44 (pars opercularis in the left hemisphere) which correspond with Broca's area are referred to as the neural seat of language production (Ardila, A. et al., 2016). Recently, a good number of studies using neuroimaging technology have provided us with a better understanding of brain organization of language production. Foundas et al. (1996), reported that BA45 (pars triangularis) is active in language production. In certain conditions, the specific brain regions that support language competence are the Wernicke's [14] and Broca's [13]. It is explained that an area with a rate of 25.30 MHz works to process language and movement to understand the message contained in the stimulus through the gestures of language. With the presentation of this stimulus in the form of still text, there are many opportunities for students to be able to read the text

over and over again. This finding is important, considering that an individual memorizes a new term (vocabulary) with the help of drill patterns, which is in line with the explanation of [15] that students can get information such as spelling, pronunciation, etymology and the usage of the word by using dictionaries because entries in any dictionary usually contain common, widespread, and high-frequency use of words [16].

4.2 Information-Processing Rate in Language Competence through Reading and Seeing Moving Texts

Language competence in the experiment was proven through the administration of bio-communication stimulus in the form of visual presentation of moving text read by the elementary school children, whose results can be seen in Figure 3.

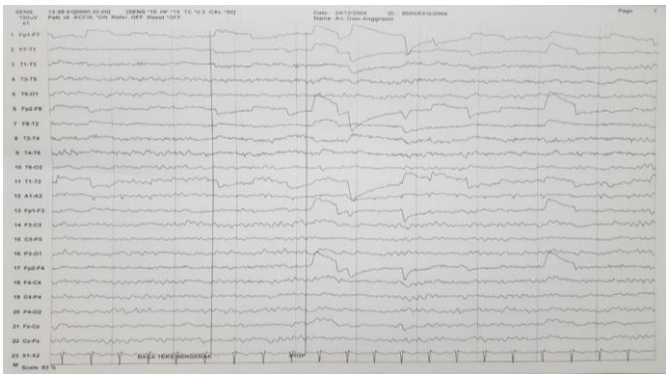

Fig. *3. Bio-communication artifact illustrating language competence through moving text stimulus.*

The difference between artifacts in figure 2 and figure 3 is very clear, as the stimuli given were different. Figure 3 shows when stimulated using bio-communication messages in the form of moving text, a response was observed in the elementary school students only in the Fp1-F7 and Fp1-F3 pairs, represented by Beta wave artifacts with stable (even) amplitude, where the response rate was at 12-13 Hz. Furthermore, the response appeared only in Fp2-F4 pairs as illustrated by the Beta wave artifacts with an even amount of amplitude and a response rate of 13-14 Hz. Meanwhile, the ability of specific parts of the brain that function in hearing (Temporal) in the T1-T2 waves (Left and Right), accelerated by 14-15 Hz. As for the Occipital (O) related to vision, the responses occurred at waves 5, 10, 16 and 20 with stable amplitude. From the two pairs of Fp and F lobes, it is clear the children's language competence was indicated by their bio-communication responses in the form of beta waves for X1 - X2 with a total amplitude of 21 and a response rate of 21/83 x 100 = 25.30 Hz. In this regard, with moving text individuals will tend to receive messages and answer the messages [17]. This condition, after being analyzed, is able to influence the level of synthesis of the important linguistic meaning of the information presented during learning. This includes the introduction of forms, patterns, or learning models that can be designed such as drill models, tutorials, simulations, and games[18];[19]; [20]. However, as has been found in this research, learning has different characteristics when the information is presented differently. Thus, the information speed must be taken into account; more specifically, bio-communication stimuli must be prepared with presentations of selected learning information. According to [21], this activity is often referred to as an effort to acquire the information.

4.3 Information-Processing Rate in Language Competence through Reading and Seeing Moving Texts

The next experiment was aimed at exploring language competence by providing a bio-communication stimulus in the form of still text pronunciation, the results of which can be seen in the following figure.

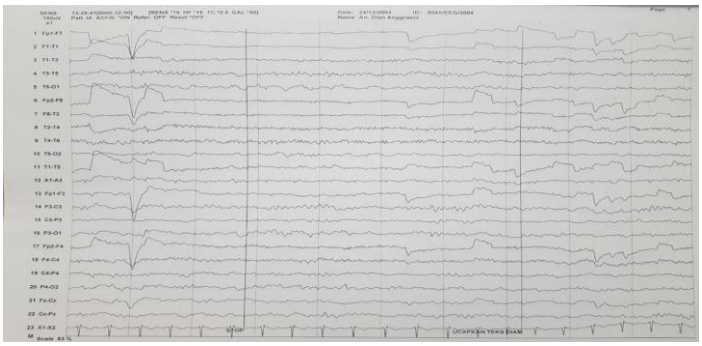

Fig. 4*. Bio-communication artifacts illustrating language competence through the stimulus of pronouncing the silent text.*

The difference from figure 3 is very clear, as the stimulus given was different. Figure 4 above shows that in terms of language competence, when stimulated using bio-communication messages in the form of still text, the response rate of the elementary school students occurred only in Fp1-F7 and Fp1-F3 pairs as depicted by the Beta wave artifacts with high amplitude with shock waves observed in numbers 1, 6, 13, and 17, where the response rate was 12-13 Hz. On the other hand, the ability of specific parts of the brain that function in hearing (Temporal)[22], in the T1-T2 waves (Left and Right), accelerated by 13-14 Hz. As for the Occipital (O) or vision, the rates were observed at waves 5, 10, 16 and 20 with stable amplitude. From both pairs of Fp and F lobes, it turns out the language competence [23] of the children was indicated by the bio-communication responses obtained in the beta waves for X1 - X2 with an amplitude of 21 and a rate of 21/83 x 100 = 25.30 Hz. The responses were obtained in the forms of verbal responses, considering that these verbal abilities will support language competence further into complete speaking skills. This finding reinforces previous findings, including those by [24], stating that "Academic achievement in language competence may tend to be in the average range in the verbally gifted." Once individuals are able to use intuition in discovering the meaning of language material presented in the form of still text to be pronounced, holistic thinking skills are needed, as stressed by [25] and [1]. Through the process of pronouncing the still text, students are expected to make a reflection. Reflection is one of the stages in accelerated learning that [26] term as the stage of "reflecting on how you've learned", which is a reflection of how individuals learn to find solutions to the problems faced. As previously explained, this language ability is also influenced by the condition of the other important brain hemisphere, namely the Broca's area. In this case, [27], suggest that "acquired language is more susceptible to brain damage than the native language. This might be a deficit in speech. It can be influenced by the size of the lesion in the Broca's complex or region."

4.4 Information-Processing Rate in Language Competence through Reading and Seeing Moving Texts

The findings of the experiment were subsequently aimed at exploring language competence by providing a bio-communication stimulus in the form of the pronunciation or reiteration of moving text, the results of which can be seen in the following figure.

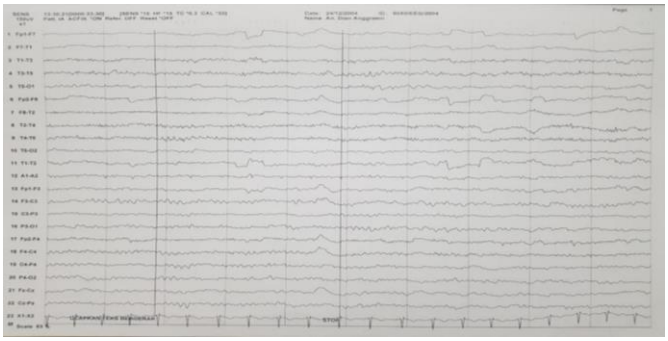

Fig. 5*. Bio-communication artifact illustrating language competence through the stimulus of pronouncing the moving text.*

From figure 5 above, when stimulated using bio-communication messages in the form of moving text, the response rate of the elementary school students on all the specific parts of the brain was recorded in the Beta waves that were even and stable, starting from wave no. 1 to no. 22. Figure 5 also shows that when stimulated using bio-communication messages in the form of moving text, the response rate of the elementary school students occurred only in the Fp-F regions, with the responses being stable and evenly distributed with a rate of 13 -14 Hz. Meanwhile, the ability of the specific parts that function in hearing (Temporal) in the T1-T2 waves (Left and Right) [1], experienced an even and stable acceleration of 15-16 Hz. As for the Occipital (O), the rates were recorded at waves 5, 10, 16, and 20 with stable amplitude. Based on the stable and evenly distributed amplitude, the language competence of the children with bio-communication responses in the Beta waves X1 - X2 was indicated by the amount of amplitude of 21 with a response rate of 21/83 x 100 = 25.30 Hz. If students still experience difficulties in following language learning that displays moving text and requires them to speak, it is highly recommended to try to do a random thinking process on the moving text being observed. This can be done by the students themselves or using the principle of “motivating your mind”[26]. The finding of this research supports this suggestion of random thinking, namely through alternative answers, procedures or steps that are constructed during learning. This random thinking is one of the thinking abilities of the right brain [25]. The resulted construction in an effort to understand the message of moving text is a combination of biological communication between the right brain and the left brain that are connected through the corpus callosum. According to [4], the corpus callosum connects the left side of the brain that emphasizes words, logic, numbers, meanings, and sequences to the right side that emphasizes rhyme, rhythm, music, images, and imagination. The words and logic in the form of speaking activity are the findings of this study that support what[24] have argued, “These results are consistent with other evidence that assessment of verbal endophenotypes are both relevant to diagnosis of SLDs-WL.” Thus, the findings of the beta wave artifacts in this research provide sufficient evidence that language competence is supported by the activities of the Prefrontal, Temporal, and Occipital parts of the left and right hemispheres of the brain with stable rates. When all parts of the brain work and the working of the brain are repeatedly carried out by students during language learning, these parts will be able to produce strong short-term and long-term memory, as confirmed by [15]. The findings regarding short-term memory and long-term memory also confirm those by [28] who reported that the vocabulary of a foreign language will disappear in a short time if the students do not use specific vocabulary learning strategies such as repetition and drills. According to [29], the repetition strategy will enhance long-term memory of a vocabulary.

4.5 Information-Processing Rate in Language Competence through Listening, Seeing, and Reading

Fig. *6. Bio-communication artifacts illustrating language competence through the stimuli of seeing, reading, and listening.*

When different stimuli were given, differences can be clearly observed in figure 6. The figure shows that the elementary school students, when stimulated using bio-communication stimuli in the form of text by seeing, reading, and listening the text demonstrated responses that only occurred in the pairs of waves number 1, 6, 13, and 17 as indicated by the Beta waves with active and even amplitude in all three areas of language activity. The responses only took place in the Fp-F regions with a stable and evenly distributed rate of 16-17 Hz. Meanwhile, the ability of specific parts of the brain that function in hearing (temporal) on T1-T2 waves (left and right) accelerated by 21-22 Hz. From both Fp and F regions, it turns out that the language competence of the children was shown by the bio-communication responses obtained in the beta wave for X1 - X2 with a total amplitude of 20 and a response rate of 21/83 x 100 = 24.10 Hz.[30]. It was interesting to find that the beta waves produced by specific parts of the brain that function to capture the ability to hear in the Temporal Lobe (T) turned out to be very stable with a lot of high and balanced amplitude. This can be seen from waves number 3 (T1-T3), 4 (T3-T5) in the left brain, and 8 (T2-T4) and 9 (T4-T6) in the right brain. Both pairs were terminated by the sending of T6-O2 auditory-to-visual messages (right temporal to right occipital lobe) with the support of Occipital (O) rates observed at waves 5, 10, 16, and 20 with stable amplitude. The last power measured was in reading ability at waves 18, 19, 20, 21, 22, and 23. Regarding the visualization of language

competence in elementary school children, the results of the experiment can be classified as in the following table.

TABLE 1
UNITS FOR MAGENTIC PROPERTIES
LANGUAGE COMPETENCE BASED ON BIO-COMMUNICATION STIMULI IN ELEMENTARY SCHOOL STUDENTS AGED UNDER 18 YEARS

Types of Bio-communication Stimuli	Fp-F (Frontal)	T1-T2 (Temporal)	O (Occipital)	The Amount of Amplitude X1-X2	Response rate
Seeing and Reading Still Text	7-8 Hz	13-14 Hz	Wave 4 Stable	21	25.30 Hz
Seeing and Reading Moving Text	13-14 HZ	14-15 HZ	Wave 4 Stable	21	25.30 Hz
Pronouncing Still Text	11-12 Hz	13-14 Hz	Wave 4 Stable	21	25.30 Hz
Pronouncing Moving Text	13-14 Hz	15-16 Hz	Wave 4 Stable	21	25.30 Hz
Listening, Seeing, and Reading	16-17 Hz	21-22 Hz	Wave 4 Stable	20	24.10 Hz

Based on the findings of the research, the packaging of linguistic material or information should be appropriately done, in terms of visual, color, shape, or animation in order to support the ability of specific parts of the left and right brain hemispheres. In this case,[26] explained that the objectives of accelerated learning are to:

1) actively involve the emotional brain—thereby making things more memorable;
2) synchronize left-and-right brain activity;
3) mobilize all eight intelligences so that learning is accessible to everyone and the resources of the whole mind are used; and
4) introduce moments of relaxation to allow consolidation to take place. Although understanding something and memorizing it is different, all learning—to be useful—needs to be stored in the memory.

The above arguments, when linked to the findings on the influence of the brain's language pathway and the speed of language competence based on the bio-communication stimuli in the left and right brain hemispheres, sufficiently provide a strong foundation that the packaging of learning messages or linguistic material must be balanced,[5]. The balance works from the specific parts of the brain that support stronger language competence, which are the frontal and temporal lobe, capable of supporting the Broca's and Wernicke's regions. This finding is in accordance with the opinion of [31] who stated that "Language areas of the brain have been categorized into movement language center and sensory language center. Movement language center is located at the rear of the inferior frontal gyrus, which is the well-known Broca's area. Sensory language center consists of auditory language center and visual language center, where auditory language center is located in the superior temporal gyrus and the rear of middle temporal gyrus and visual language center is located in angular gyrus, i.e. Wernicke area [32];[33]. With the linguistic skills derived from seeing the still and moving texts, a stability and balance between the left brain and the right brain in students will be created. The results of this research are relevant to the principle of accelerated learning [21]; [26], particularly in relation to triggering the memory, in the stages of feeling learning while relaxing, obtaining new information, connecting with old information, and finally finding a new understanding. The new understanding is formed from the analytical and synthesis abilities of students which are shown when they are able to sort out which stimulus stimulates vision or hearing so that they are able to tell the correct meaning of the language, and vice versa. The argument on analysis and synthesis is in accordance with the finding of [34] when the students perform analytical thinking processes, it should be accompanied by a synthesis of the thinking process. An individual will be able to think positively and productively if s/he is able to do both analytical and synthesis thinking processes quickly. In other words, there are specific parts of the brain working to support each other. In addition to the thinking ability above, the success of language competence is influenced by the ability of students in imagining something that is being learned, especially if it is difficult to understand that particular thing directly. This ability is usually related to the procedure of working on something in the form of a simulation. Hence, in completing a job, individuals are highly required to carry out complex imaginations so that alternative solutions and understanding of problems can be produced mainly in the form of concrete objects (exact lessons). This is where the students are able to implement the principle of accelerated learning, which is reflecting on how you have learned[26], which is alternatively called "metacognitive" behavior.

5. CONCLUSION

Elementary school children's language competence should continuously be analyzed and its development should always be supported. The language competence is acquired through the provision of bio-communication stimuli in the forms of visual presentation of still text and moving text; the pronunciation of still text and moving text, reinforced by language messages in the form of text presentations that challenge vision, hearing, and pronunciation. Through the laboratory experiment with the support of the Electroencephalography, a variety of artifacts in the language competence of elementary school-age children were obtained, demonstrating the work function of the specific parts of the left and right brain hemispheres, especially the prefrontal, frontal, temporal, and occipital regions. The findings indicate that the ability of the Frontal lobe increased constantly from 7-17 Hz, the Temporal oscillated between 13 and 22 Hz, the Occipital was stable with 4 waves, a 21 amplitude, and stable response rate at 25.30 Hz. Drawing on the findings, it can be specifically emphasized that the rate of information processing in language competence stimulated by seeing and reading still text was characterized by the rate of prefrontal and frontal lobe of 12-13 Hz and the rate of the temporal lobe of 13-14 Hz, with the occipital being stable with a response rate of 25.30 Hz. The information-processing rate in language competence through seeing and reading the moving text was 12-13Hz for the prefrontal lobe, 14-15 Hz for the temporal, and the occipital had a constant response rate of 25.30 Hz. The information-processing rate in language competence by pronouncing still text was characterized by the prefrontal and frontal rate of 12-13 Hz and the temporal rate of 13-14 Hz, with the ability of the

occipital being stable with a response rate of 25.30 Hz. The information-processing rate in language competence stimulated by the pronunciation of moving text was characterized by the prefrontal and frontal rate of 13-14 Hz and the temporal rate of 14-15 Hz, with the response rate of the vision (occipital) being stable at 25.30 Hz. Finally, the information-processing rate in language competence stimulated by the activities of listening, seeing, and reading, is characterized by the prefrontal and frontal rate of 16-17 Hz and the temporal rate of 21-2 Hz, and with the response rate of the vision (occipital) being stable at 24.10 Hz. It is expected that these findings can contribute to the packaging of materials that support language competence of elementary school children. The language competence can, in turn, facilitate accelerated learning and learning communication with appropriate linguistic materials.

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