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# The impact of online instruction integrated with brain-based teaching approach to EFL students with different motivation level

Rukminingsih [a, 1], Januarius Mujiyanto[a], Joko Nurkamto[b], Rudi Hartono[a]

[a]*State University of Semarang – Semarang (Indonesia)*

[b]*University of Sebelas Maret – Solo (Indonesia)*

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**Abstract**

In the Covid 19 pandemic, teachers and students have to implement the distance education by using online learning. It creates new obstacles for them but also stimulates potential methods for teaching and learning process to meet the digital era. This study investigated the difference effect of implementing online instruction integrated with brain-based teaching (BBT) approach as an experimental group. A quantitative research design with factorial 2 x2 was applied, then two classes involving each 33 students for experimental group and 30 students for a control group of a private college in Indonesia were chosen as the sample. The instruments used were a questionnaire and a test. Two-way ANOVA was applied to analyze the data. The findings showed that (1) There was distinct impact between experimental class and control class in students' reading achievement, (2) The achievements of the students in the Reading course with high motivation were higher than those with low motivation., (3) There was an interaction between teaching strategies and the level of students' motivation in EFL reading achievement. These findings also can stimulate teachers to teach brain-based teaching approach with online instruction to students to enhance their motivation in reading. have to integrate BBT with technology support for the meaningful learning Further research and development on different brain-based teaching approaches is suggested. These findings can encourage teachers to teach EFL learners in brain-based approach integrated with online instruction with the purpose of improving their motivation for reading.

**KEYWORDS**: Brain- based Teaching Approach, Online instruction, students' Reading Achievement, Reading motivation level.

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## 1. Introduction

Nowadays coronavirus pandemic has affected educational systems worldwide, leading to the widespread closures of schools and universities. Efforts to stop the spread of COVID-19 through non-pharmaceutical interventions and preventive measures such as social distancing and self-isolation have prompted the widespread closure of primary, secondary, and tertiary schooling in over 100 countries. Teachers have changed their teaching method by using full online. On 1 April 2020, the number of confirmed COVID-19 cases in Indonesia has reached more than 1.500 cases (WHO, 2020). The National Disaster Management Authority of Republic of Indonesia has decided to extend the period of disaster emergency caused by COVID-19 pandemic until 29 May 2020 (BNPB, 2020). The global spread of COVID-19 pandemic causes class suspensions resulting in the need for online learning (Moorhouse, 2020).

[1] corresponding author - email: rukminingsih19@yahoo.co.id

Since 17 March 2020, the Indonesian Minister of Education and Culture has instructed schools to undertake online education in COVID-19 affected areas (Mendikbud, 2020b). Shortly after that, because of the increasing spread of COVID-19 and the preservation of students. teachers and all educational staff health (Mendikbud, 2020a). the Minister of Education and Culture of the Republic of Indonesia ordered all schools to run online studies from 24 March 2020. These policies lead students to learn from home and teachers to work from home, too. It fully replaces face-to-face learning in a classroom setting with online learning which possibly lasts till the end of the semester due to the COVID-19 pandemic. It becomes a new challenge for both students and educators to run online learning. According to Cao t al., (2020), these actions certainly give an impact on education, particularly students' growth.

In pandemic Covid 19 era, all higher education students are learning fully online However, educators still have to know how learning can be maximized by considering the students' brains learn in online learning. Brain-based teaching can be implemented by integrating ICT tools which are the gateway of ease learning. Making learning is meaningful. Learning is the main goal of the brain-based teaching approach. Brain-based teaching is meaningful involving a motivating, positive way of maximizing teaching and learning (Raghavendran & Begum, 2019). Some strategies of brain-based approach with online instructions were implemented in this research such as activating students' engagement in the online class, increasing multi-modal sensory learning, using online brain break, implementing synchronous and asynchronous learning, beginning with what the learners already know and use stories and metaphors to help learners make brains' connection.

Teaching English as a foreign language is a challenging. As English foreign language educators, they must learn to constantly adapt to their students' brains work. One of the language skills is reading. In EFL reading classroom, educators may work harder to find out what teaching techniques can stimulate students' motivation in reading class. According to Ghaith (2003), teaching strategies can also enhance students' engagement or involvement in the learning process. Reading has become an important skill in EFL teaching and learning process.

Understanding reading is an activity designed to understand the messages of a specific text (Williams, 1998). Learning as a foreign language in Indonesia (EFL reading) can usually be included in the reading understanding lessons. It aims to improve students' skills in understanding the meaning of a written text by using English as a foreign language. However, it is considered more difficult to read foreign language materials than first language material most often. They found it difficult and boring to read English texts. It makes them less motivated, especially in reading, to learn English. Tahir (2012) has been supporting that that most of the students have low vocabulary mastery which hindered them to read the English text. In fact that students may feel bored when they get reading class. Moreover, some educators may just instruct the students to read the text without knowing whether the students are ready with the educators' instruction.

To accommodate educators' expectations for the teaching and learning process successful needs to consider how the students' brains work and learn. The human brain has the largest area of cortex that is not designated for a specific function (Jensen, 1998). How the brain learns foreign languages should be considered by educators. According to Conboy (2013), in stimulating foreign language learners, a greater understanding of the brain's language acquisition of a second language on brain function supports and informs the best practices in education. Weber et al. (2015) stated that learning a new language is a difficult task. It requires skills for memorizing new words, grammatical aspects, and linguistic knowledge. That is why an understanding of how the brain receives and saves information will help educators to make informed choices for effective teaching models (Srikoon et al., 2017). A brain-based can positively impact students' motivation, attitudes, and academic achievement. Much of the research is situated in a quantitative paradigm designed to measure motivation, attitudes toward learning, and academic achievement.

Studies on brain-based teaching have been recently conducted by some scholars however, there have been few studies on brain-based teaching integrated with online instruction. Some researchers commonly focus on the implementation of brain-based teaching and brain-based learning in the classroom which doesn't implement in virtual classes (Srikoon et al., 2017; Raghavendran & Begum, 2019; Weber et al., 2015; Schwartz, 2015; Gozuyesil, 2014). Thus, this study is to fill the gaps from previous studies by combining brain-based teaching with online instruction. It also shows that online instruction brings different qualities depending on the motivation of the students, which is to be considered for the use of technology.

## 2. Related Works

### 2.1 Brain - Based Teaching Approach

The brain-based teaching approach is an example of the student-centered approach. In a brain-based approach, a teacher facilitates a learning process that also creates a positive learning environment and students' engagement in the class. The purposes of this approach create students' attention, understanding, and long-term memory toward their lessons. It is based on the principles of brain-based learning developed by (Caine & Caine, 1991 and 2003; Sausa, 1995). They stated that brain-based learning involves the engagement of emotions, positive learning environments, music,

movement, meaning-making, and no threatening for maximum learner participation and achievement. Instructional technique, relaxed alertness, orchestra immersion, and active procession are the main principles of brain-based learning.

Brain-based learning may also influence the development of social-emotional students development to understand and regular emotions while they are learning. Studies have found that brain-based learning strategies can enhance students' motivation and achievement in the learning process (Sani, et al., 2018; Jamdar & dasila, 2020; Mekarina & Ningsih, 2017) intrinsic motivation can be enhanced when students have an intrinsic love of learning with the right mindset. Some studies about brain-based learning have been conducted since 1990. The findings confirmed how the brain works and learns. Caine & Caine (1994) and argue that the human brain is unique and it can do multiple complex and concrete experiences which are important for the learning and teaching process. Harvard established an initiative called Mind, Brain, and Behavior to focus on the influence of research emerging from neuro and cognitive science (Schwartz, 2015). Uzezi & Jonah (2017) stated that the brain-based teaching approach creates progress on students' achievement, motivation, and long-term memory.

## 2.2. Reading Comprehension in EFL Setting

Reading has become an important skill in the EFL teaching and learning process. Reading comprehension is an activity aimed to understand the messages of a particular text (Williams, 1998). The teaching of reading like a foreign language (EFL reading) in Indonesia can be generally included in the teaching of reading comprehension.

Kweldju (2000) stated that even though reading is one of the important language skills, many students become reluctant EFL readers. Moreover, EFL reading is found that many students consider reading as uninteresting activity (Kweldju, 1996; Rukmini, 2004). Kweldju (1996) found that students were not interested in reading their content area textbooks although they thought such textbooks were useful. She stated that reasons behind this lack of interest included students' limited background knowledge, inability to understand the content of the text, and complicated organizational structure of the text. Successful comprehension requires coordination of skills at many levels to extract and construct meaning. The complexity of the language used was determined by the level of difficulty comprehension of a certain content of the text (Qarqes & Rashid, 2017). There are so many differences between the native language students use in everyday conversations and English as a foreign language in Indonesia.

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## 2.2 Reading Motivation

The differences between spelling and pronunciation between L1 (2017) and target language that affect students' low motivation have been identified by Tahir and Hanapi (2007). It was also supported by Salikin & Tahir, (2017) that the students get bored and low motivated to comprehend the text since they often misunderstand of English text they read and are confused to answer the question of English text. Admuson (2015), Castle (2015) and Anne (2014) state that motivation is very essential to encourage the language learning process. Reading motivation stimulates students to be involved in reading and improves students' reading skills to achieve reading comprehension.

Komiyama (2013) reports that engagement is the pleasure of reading interesting topics in books, papers, and websites. The level of engagement and participation in reading can also be defined (Wang & Guthrie, as cited in McGeown, 2013). Komiyama (2013) defines curiosity as a wish to learn a very interesting subject. The preference for the challenge is the last factor in inherent motivation. The wish to work with or control complex reading materials is defined (Wang & Guthrie as cited in McGeown, 2013). Intrinsic motivation is an activity because it offers satisfaction, pleasure, and even interest.

Intrinsic motivation as stated by Deci & Ryan (2000) can cause someone to do an activity because it is interesting. It means that someone who is motivated intrinsically tends to do an activity for pleasure only. In this study, we used the motivation for the reading questionnaire (MRQ) adapted from Wingfield, et al., (1996) to assess students' reading motivation levels involving high and low. A motivation reading questionnaire is used to know students' alteration in reading activities. It also can be used to generate students' descriptions of reading motivation. Komiyama (2013) says that the satisfaction gained through mastering or assimilating complex ideas in the text is the priority for the challenge. Learners are motivated if they end up reading such hard material or text by this factor.

2.4. Online Instruction Integrated with Brain Based Teaching in EFL Reading Comprehension Course

Brain-based learning (BBL) is a teaching approach that combines cognitive neuroscience and education. Some studies have suggested teachers implement it in the classroom. BBL strategy is employing a brain-based strategy in the classroom. Gozuyesil (2014) found that a brain-based approach is powerful for a successful teaching process. The models of teaching and learning associated with brain-based teaching are brain-based learning (BBL) which was developed by Eric Jensen and whole brain-based teaching developed by Chris Biffle (2013). The whole brain-based teaching model is dealing with the brain system as the foundation in designing a learning model which employs an instructional approach based on the left and the right hemisphere (Biffle, 2013).

There are three main approaches to brain-based learning: 1) creating a positive classroom atmosphere that can stimulate students' ability to think; 2) bringing students to a comfortable environment when they are learning; 3) creating meaningful learning activities. When teachers implement the BBL approach, there are three ways: (1) creating a classroom atmosphere that is capable of stimulating the student's ability to think; (2) bringing students into an environment that are pleasant enough; (3) creating an atmosphere of active and meaningful for students. Based on this theory, students should be provided a learning environment that is safe and free from threats. Handayani & Corabima (2017) confirmed that students learn the meaning and content of the brain to prepare students to store, process, and retrieve information in a fun way.

Jensen (2008) stated that understanding brain-based education is needed by all educators. If they neglect it, it would cause failure in the learning process. Brain-based teaching, on the other hand, examines how instruction and pedagogy may provide a foundation for facilitating learning when aligned with best practices for brain engagement. Hardiman (2012 b) states that teaching to the brain also termed brain-based teaching brain targeted teaching focuses on the transformation of pedagogy influenced by knowledge of how the brain learns best.

Brain-based teaching with technology integration enhances a positive learning environment. Duman (2010) said that using technology such as online instruction in teaching enhances the quality of a good learning environment such as emotional safety, novelty, repetition, problem-solving having time to learn and pursuit of a learning goal is catered by online instruction. In this research, the researchers employ Google classroom and zooming as online platforms in reading classes. Google Classroom is an online learning management tool that helps change the classroom set-up from being teacher-centered to learner-centered learning. It also enables students the opportunity to open inquiry, dialogue, and creative thinking as active participants in the class. Shaharanee (2016) found that using Google Classroom as a blended learning tool is perceived to be useful in helping the learning process of students. Using zooming can create students' engagements and positive atmosphere in online learning.

## 3. Methods

*Design*: This research was carried out in a private college in Indonesia, STKIP PGRI Jombang, by using factorial design 2 × 2 to compare two teaching strategies (such as online instruction based on brain-based teaching and online instruction integrated with flipped classroom and two types of students' motivation (high and low). In addition, there were three variables in this research, namely two independent variables (online instruction based on brain-based teaching and online instruction integrated with flipped classroom strategies), and the moderator variable was students' motivation, and one dependent variable is called reading comprehension. The research design was presented in Table 1. In doing the research internal and external validity were controlled as well as possible.

| Teaching Strategy (A) | Online Instruction integrated with Brain Based Teaching (A1) | Online instruction integrated with flipped classroom (A2) |
|---|---|---|
| Students' Motivation (B) | As an experimental class | As a control group |
| High (B1) | A1 B1 | A2B1 |
| Low (B2) | A1 B2 | A2 B2 |

**Table 1** - Factorial research design 2x2.

A1 B1: Students who have high motivation are taught by using online instruction based on brain-based teaching approach.
A2B1: Students who have high motivation are taught by using online instruction integrated with flipped classroom.
A1 B2: Students who have low motivation are taught by using online instruction based on brain-based teaching.
A2 B2: Students who have low motivation are taught by using online instruction integrated with flipped classroom.

*Participants*: The location of this research was held in one of the private colleges in Jombang East Java, Indonesia. This college now implemented distance education by employing full online learning. The population of the research was the fourth semester of English Department students in STKIP PGRI Jombang who were taking Critical Reading class. The samples were semester of English Department students in STKIP PGRI Jombang who were taking Critical Reading class from two different classes. The samples were around 21 years old, The sampling technique was Cluster Random

in class. Fraenkel, Wallen, and Hyun (2012) stated that cluster random sampling is obtained by using groups as the sampling unit rather than an individual. Two classes involving 33 students for the experimental group and 30 students for the control group in the fourth grade were chosen as the sample.

*Instruments*: There are two kinds of instruments used in this study. They are motivation reading questionnaires and reading comprehension tests. The questionnaire was used to measure students' reading motivation levels to classify students into high and low levels of reading motivation. The questionnaire with Likert scale in which the questionnaire was designed with related indicators of students' reading motivation. A reading comprehension test was used to assess students' achievement in EFL reading comprehension. The questionnaire, which was constructed with A lot like me (4), A little like me (3), A little different from me (2), and Very different from me (1) adapted from Wigfield and Guthrie (1997) and Komiyama (2013). The dimension involves both intrinsic and extrinsic motivation.

## 4. Results

The data analysis used in this study was a two-way Analysis of Variance (ANOVA) at the significance level $\alpha = 0.05$. The three hypotheses were tested. There were two requirements before applying the two-way ANOVA, namely normality and homogeneity. The normality test used the Lilliefors test which can be seen in Table 2. The homogeneity of variants was measured by Levene's test can be seen in Table 3.

| | *Kolmogorov-Smirnov*[a] | | | *Shapiro-Wilk* | | |
|---|---|---|---|---|---|---|
| | *Statistic* | *df* | *Sig.* | *Statistic* | *df* | *Sig.* |
| Standardized Residual for achievement | .093 | 63 | .200* | .983 | 63 | .535 |

**Table 2** - Tests of normality.

a. Lilliefors Significance Correction

Based on the result of the normality test in Table 2, the significance of the standardized residual for students' reading achievement is 0.535 and it is higher than 0.05 Alpha. It means that the data is normal.

*Dependent Variable: Reading Achievement*

| F | df1 | df2 | Sig. |
|---|---|---|---|
| 2.569 | 3 | 59 | .063 |

**Table 3** - Levene's test of equality of error variances.

a. Lilliefors Significance Correction

Based on the result of the no test in Table 2, the significance of equality of error variances for achievement is 0.63 and it is higher than 0.05 Alpha. It means that homogeneity of variants was reached.

*Dependent Variable: Reading Achievement*

| *Teaching strategies* | *Motivation level* | *Mean* | *Std. Dev* | *N* |
|---|---|---|---|---|
| online instruction with BBT | high motivation | 79.88 | 2.497 | 17 |
| | low motivation | 78.13 | 2.579 | 16 |
| | Total | 79.03 | 2.651 | 33 |
| online instruction with flipped classroom | high motivation | 78.27 | 4.590 | 15 |
| | low motivation | 71.40 | 4.188 | 15 |
| | Total | 74.83 | 5.553 | 30 |
| Total | high motivation | 79.13 | 3.661 | 32 |
| | low motivation | 74.87 | 4.815 | 31 |
| | Total | 77.03 | 4.745 | 63 |

**Table 4 -** Descriptive statistics.

Table 4 displays the means score from students' reading scores based on teaching strategies and reading motivation levels. It can be seen that the students' means score who are taught by online instruction with BBT strategy with the high reading motivation levels is higher than students with low motivation levels. Then it also can be seen that the students' means score who are taught by online instruction with flipped classroom strategy with the high reading motivation levels higher than students with low motivation level. However, the table shows that the total mean score between online instruction with BBT strategy is higher than online instruction with flipped classroom strategy as a control group. A flipped classroom is a sort of blended learning that is implemented online at home or outside of the classroom (Yang et. al., 2019).

The following is the summary of the two -way ANOVA computation which contains the variance related to the score of means, teaching strategies, students' motivation, interaction, error, and means of treatment. By looking at this description of the analysis of variance, it is easier to take into account the analysis related to two-way ANOVA as shown in the Table 5.

This summary of the computation result of the two-way ANOVA could be used to verify or to describe testing hypotheses. By considering the idea of the above table, it could be related to the testing of hypotheses. Based on these testing hypotheses, it could be concluded that hypotheses were verified. To decide whether the alternative hypothesis is accepted or rejected from the result of tests of between-subject effects. The significance of teaching strategies is 0.000 which is 0.000 is lower than 0.05 so there are different scores based on factor variables. The significance of the reading motivation level is 0.000 which is 0.000 is lower than 0.05 so there are different scores based on factor variables. The interaction between teaching strategies and motivation toward students' reading score is at 0.006 which is lower than 0.05. It can be concluded that the

three hypotheses are verified at alpha 0.05, as seen in the following.

1) The students' achievement in Reading Comprehension taught by using online instruction based on brain-based teaching. strategy is higher than those taught by using online instruction integrated with flipped classroom strategy is true,
2) The students' achievement in Reading Comprehension with high motivation gets higher than those low motivation is true,
3) There is an interaction between teaching strategy and students' motivation level in reading comprehension is true.

*Dependent Variable: Reading Achievement*

| *Source* | *Type III Sum of Squares* | *df* | *Mean Square* | *F* |
|---|---|---|---|---|
| Corrected Model | 655.888[a] | 3 | 218.629 | 17.430 |
| Intercept | 371728.848 | 1 | 371728.848 | 29635.917 |
| Strategies | 273.180 | 1 | 273.180 | 21.779 |
| Motivation | 292.055 | 1 | 292.055 | 23.284 |
| Strategies * motivation | 102.511 | 1 | 102.511 | 8.173 |
| Error | 740.048 | 59 | 12.543 | |
| Total | 375231.000 | 63 | | |
| Corrected Total | 1395.937 | 62 | | |

**Table 5** - Tests of between-subjects effects.
R Squared = .470 (Adjusted R Squared = .443)

*Dependent Variable: Reading Achievement*

| *Motivation level* | *Mean* | *Std. Error* | *95% Confidence Interval* | |
|---|---|---|---|---|
| | | | *Lower Bound* | *Upper Bound* |
| high motivation | 79.075 | .627 | 77.819 | 80.330 |
| low motivation | 74.763 | .636 | 73.489 | 76.036 |

**Table 6** - Motivation level.

*Dependent Variable: Reading Achievement*

| *Teaching strategies* | *Motivation level* | *Mean* | *Std. Error* | *95% Confidence Interval* | |
|---|---|---|---|---|---|
| | | | | *Lower Bound* | *Upper Bound* |
| online instruction with BBT | high motivation | 79.882 | .859 | 78.164 | 81.601 |
| | low motivation | 78.125 | .885 | 76.353 | 79.897 |
| online instruction with flipped classroom | high motivation | 78.267 | .914 | 76.437 | 80.096 |
| | low motivation | 71.400 | .914 | 69.570 | 73.230 |

**Table 7** - Teaching Strategies * motivation level.

## 5. Discussion

Based on Tables 5, 6, and 7, it can be concluded that students' achievement in Reading Comprehension by employing online instruction based on brain-based teaching there is a great increase in conceptual understanding after the implementation of online instruction based on brain-based teaching in Reading comprehension class. Pourhosein (2014) "maintained that using technology can create a learning atmosphere centered around the learner rather than the teacher that in turn creates positive changes". Sabitzer, (2012) stated that technology contributes to integrating brain-based learning principles because it can also support the learning success of other subjects. The principles of brain-based teaching related to the implementation of technology are (1) individual differences in maturation, development, and prior learning are taken into consideration, and (2) the environment is supportive, empowering, and challenging (Caine, 2012).

By employing online instruction, such as in Google classroom, teachers can use feedback loops to find out whether the students' perception matches their expectations. This step is used to organize information in the brain at different levels. Students must transform information as to their learning with the use of working memory and prior knowledge to form long-term allow students to use that information into different products that can become a trigger for conceptual understanding. Laurence & Maricar (2020) and Rukminingsih (2018) found that teachers should make use of brain-based teaching strategy and the concept of brain-based learning in the classroom with online instruction.

The result of the two ways ANOVA calculation shows that motivation significantly affects students' achievement in reading comprehension. The total mean indicated that the students' achievement with high motivation is higher than students who have low motivation. The total mean indicated that the students with high motivation get higher achievement than the students with low motivation. It is because the students with high motivation tend to be more active in learning, more enthusiastic with the tasks given by the teacher, and never feel bored to retry in their attempt to achieve the maximal result in reading comprehension.

On the other hand, the students with low motivation attempt less than the students with high motivation. They involve less in the learning process, do not like challenging actions and teaching-learning process that needs much-thinking action. They do less attempt in achieving the maximal result in learning reading comprehension. This condition can be observed directly during the teaching-learning process. As a matter of result of their motivation, they get lower achievement in reading comprehension than those who have high motivation. The group of students with high motivation has higher achievement than the group of students with low motivation. The students with high motivation get a

higher result in reading comprehension than the students with low motivation. Thus, it is clear that different levels of students' motivation affect the students' abilities in reading comprehension. This exploratory analysis shows that the brain-based learning Approach has improved the Science attitude and motivation of learners once appropriately implemented is encouraging teaching strategy (Akyurek, 2013; Admuson, 2015; Castle, 2015 & Anne, 2014). Reading motivation encourages students to engage in reading and improves students' reading skills to improve students' reading comprehension.

The finding of two ways ANOVA calculation indicated that there is a significant interaction between teaching strategies and motivation. Teaching strategy and motivation are two of several important factors that influence learning achievement. Thus the interaction was computed to find out the better achievement in reading comprehension among the cells. It indicates that the students were taught by online instruction integrated with brain-based teaching strategy with high motivation and the students that were taught by employing online instruction integrated with brain-based teaching strategy with low motivation have the most significant difference among others. The students that were taught by employing online instruction integrated with brain-based teaching strategy with high curiosity have higher achievement in reading comprehension than the students that were taught by employing strategy with high motivation. On the other hand, the students with low motivation get higher students' achievement in reading comprehension if they were taught by using online instruction integrated with flipped classroom strategy than they were taught by using online instruction integrated brain-based teaching strategy.

The interaction could be continued to the use Tuckey test to verify the interaction itself. The Tuckey test described and showed that students' lower motivation is matching to the use of online instruction integrated with flipped classroom and students' higher motivation is also matching to the use of online instruction integrated with a brain-based teaching strategy in teaching reading comprehension.

## 6. Conclusion

Based on these findings, we have concluded that online instruction brain-based teaching had a statistically significant influence on the students' motivation. Therefore, it proves that brain-based learning activities improve students' motivation. The Covid 19 Pandemic has influenced many things in the world especially the system of education. Schools employ distance education via online learning. It also occurs in Indonesia which should employ full online. The advancements in technology have triggered the expectations of the present generation learners as digital technology and ICT have created a great impact among the users. In such a scenario and also to face these challenges, teachers should ensure that the contents shared inside and outside the classrooms lead to a meaningful, productive learning environment. Rukminingsih (2021), and Retone & Maricar, (2020) state that technologies may contribute to integrating brain-based teaching principles because technology may support students comfortable learning environment and motivate to have various sources of their knowledge,

The finding of this study confirms that online instruction with brain-based teaching is meaningful involving a motivating, positive way of maximizing teaching and learning (Caine and Caine, 1994; Raghavendran & Begum, 2019 ). Schwartz ( 2015) and Uzezi & Jonah (2017) also find that the brain-based teaching approach creates progress on students' achievement, motivation, and long-term memory Therefore it is suggested that educators need to know how the students' brains work by online instruction to meet the technology era. The virtual learning environment has transcended time and space of the present age learner as it creates a new world of learning that triggers the interest and creativity of every learner who experiences it.

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