The Effect of Using a Brain-Based Learning Approach on EFL Students' Reading Attitude and Reading Self-Efficacy

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Abstract

This study seeks to explain the effect of using a brain-based learning approach on students' reading attitude and reading self-efficacy in an EFL context at Jimma University. This study employed a quasi-experimental design with 109 freshman undergraduate social science students. Purposive sampling was employed to choose these students. Students in the social sciences program were assigned in seven sections. The researchers used simple random sampling to choose the experimental and control groups, both of which are intact. Questionnaires were employed to measure attitudes toward reading as well as self-efficacy in reading. A control group (N=55) continued using the conventional method, while an experimental group (N=54) used the brain-based learning approach. A multivariate analysis of variance (MANOVA) was conducted-by IMB SPSS 23. The paired samples t-test was also performed using to ascertain the variations in mean scores between each group's pre- and post-intervention values. The results showed that students' reading attitudes and reading self-efficacy were significantly improved by a brain-based learning approach. These results have important implications for EFL instructors and textbook writers.

Keywords: *Brain-Based Learning Approach, Reading Attitude, Reading Self-Efficacy.*

I. INTRODUCTION

In a rapidly evolving world, educators are constantly seeking innovative approach to engage students and enhance their learning experience. One such approach gaining popularity worldwide is brain-based learning (Jensen, 2005; Jensen & McConchie, 2020). However, as educators embrace this innovative approach, it becomes crucial to explore deeper into its effect on reading skills and emotive elements like self-efficacy, motivation, and attitude etc., to fully understand its potential in enhancing the overall learning experience. With this in mind, we tried to examine the potential effect of implementing a brain-based learning approach on students' reading attitudes as well as self-efficacy.

Several traditional approaches to teaching reading skills, including whole language approaches and memorization, have been criticized for failing to accommodate the demands of learners with various learning style (Moats, 2020; Phajane, 2014; Richland, 2023). According to Jha (2014), methods for teaching English as a second language often struggle to teach reading comprehension. While teachers often have good intentions, they fail to meet the array of learning trends and demand of their students, resulting in many students struggling to grasp basic reading skills. Furthermore, psychological studies such as those of John Watson and B.F.Skinner influenced theories of human behavior in the 1940s and 1960s by explaining how

the brain responds to external stimuli. Observing brain function, behaviorists were able to make reasonable assumptions. A behaviorist approach, however, ignores the brain's immense inner potential. Therefore, an alternative approach was necessary to satisfy the demands of the educational world (Jensen, 2008).

During the late 1980s, cognitive neuroimaging educational neuroscience emerged as a response to a lack of knowledge about the brain's learning process (Jensen, 2005, 2008, 2010). To fully understand the inner functioning of the brain adequately, scientists and medical professionals have utilized brain imaging technologies like Functional Magnetic Resonance Imaging (MRI) and Positive Emission Tomography (PET) over the past twenty years (Erlauer, 2003; Jensen, 2008; Sousa, 2001). The development of cognitive neuroscience and the application of brain-based approaches to learning have been supported by the utilization of neuroimaging technologies. The brain-based learning approach gained popularity as an alternative to traditional instruction in the 1980s, drawing on neuroscience research (Caine & Caine, 1991, 1994; Jensen, 2005, 2008; Sousa, 2001).

Caine and Caine (1994) stated, "Brain-based learning involves recognizing the principles of meaningful learning as dictated by the brain and structuring instruction in alignment with these principles" (p. 4).This approach aims to enhance learning and teaching by maximizing students' learning potential. It has been demonstrated that brain-based learning approach is a promising alternative to traditional English language teaching, focusing on the natural processes of learning. It provides a deeper understanding of the language and can be integrated into educational settings to enhance students' affective factors and reading skills (Salem, 2017; Lombardi, 2008). According to Grabe (2009), effective teaching methods are essential for enhancing students' reading skills. Grabe (2009) stressed the importance of equipping students with the essential skills and strategies for comprehension. In the same vein, Hedge (2000) highlighted the significance of accommodating students' learning styles by suggesting a range of teaching approaches to meet diverse needs. This personalized approach improves comprehension and reading proficiency.

Reading comprehension is influenced by a range of emotional elements, including motivation, attitude, and self-efficacy. Studies consistently demonstrate that students' motivation and value beliefs are powerful predictors of their reading comprehension performance, and self-efficacy beliefs have a significant impact on reading achievement. It is essential for educators and researchers to comprehend these factors to improve reading skills (Wigfield & Guthrie, 1997). Brown (1987) defines affective factors in reading as the emotional and motivational aspects that influence an individual's reading experience. These factors include attitudes towards reading, self-efficacy beliefs, reading anxiety, and the level of interest and enjoyment in reading. Brown emphasizes that addressing these affective factors is essential for creating a positive reading environment and fostering a lifelong love for reading (Brown, 1987)

A study conducted by Smith (1990) found that individuals with a favorable outlook on reading were more likely to read for pleasure on a regular basis and to explore different genres and authors. Conversely, those with a negative attitude toward reading were less inclined to participate in reading activities and reported less enjoyment and comprehension from their reading. In addition to affective states such as attitude, self-efficacy is crucial to improving reading comprehension. Albert Bandura (1997) was among the early pioneers in defining self-efficacy and described it as "the belief in one's ability to organize and execute the actions necessary to achieve specific outcomes" (p.3). Having a high level of self-efficacy promotes

reading with courage, perseverance, and the willingness to use sophisticated comprehension techniques. In contrast individuals with reduced self-efficacy may feel less confident of their reading skills, which may impair their motivation and comprehension (Bandura, 1997)

Several studies have shown the strong link between self-efficacy and reading comprehension skills. According to (Guthrie et al., 2013; Jones et al., 2012), for example, students who felt more confident about their ability to read did better on comprehension tests than those who felt less confident. Another study by Son (2017), demonstrated that interventions targeting improved self-efficacy in reading resulted in notable enhancements in students' reading comprehension abilities. These results indicate that self-efficacy significantly influences individuals' reading comprehension skills.

II. STATEMENT OF THE PROBLEM

According to well-documented research (Collins & Gillies, 2010; USAID, 2014), reading comprehension instruction in English language schools remains largely abandoned. Collins and Gillies' (2010) study revealed a significant gap in English language learners' reading comprehension proficiency, which has been linked to a decline in reading comprehension instruction in recent years. USAID (2014) emphasized the crucial role of reading comprehension instruction in advancing educational outcomes in developing nations, as students encounter challenges in meeting demanding reading requirements. Furthermore, low reading proficiency in students has skewed academic expectations, resulting in a distorted perception of academic requirements and the need for rigorous reading tasks (Eshetie, 2010; Jeylon, 2010; Jha, 2014).

English is the main language used in Ethiopian universities and plays a vital role in education. Despite receiving over a decade of English education, Ethiopian students struggle with reading proficiency. This highlights the need for further research and interventions to bridge the gap between their reading requirements and abilities. Traditional English teaching methods often fail to provide effective reading comprehension instruction, leading to difficulties in analyzing complex texts and hindering overall language proficiency development (Eshetie, 2010; Jeylon, 2010; Jha, 2014; Yenus, 2018).

English was introduced into Ethiopian education under Minilik II's reign, but students lacked proficiency before the 1990s. Reforms in 1991 aimed to improve English communication skills through Communicative Language Teaching principles, but teachers struggle with uncertainty, time constraints, and confidence (Haregewoin, 2008; Kebede, 2019; Tekle, 2016; Teshale & Yemaneberhan, 2015). Abdureheman (2019) also found that Ethiopian students often lack adequate reading skills by the time they enter secondary school or higher education.

As lecturers at Jimma University, researchers have noted a decrease in students' reading proficiency. Due to time constraints, instructors tend to neglect essential reading skills to expedite the course. The traditional exam-focused approach is commonly used in the classroom. When given reading tasks, students often lack crucial skills such as using background knowledge, making inferences, predicting, summarizing, and visualizing comprehending the text. Moreover, during exams, students show little interest in reading comprehension passages and tend to guess the answers to the questions, resulting in poor academic performance. Recent findings indicate that students' reading proficiency is impacted

by their inability to employ reading strategies, insufficient linguistic competence, and a lack of teachers' dedication (Teshale & Yemaneberhan, 2015).

Utilizing brain-based learning approach has been shown to enhance the attitudes of students regarding reading and their self-efficacy. According to research, brain-based learning approach show a positive effect on students' attitudes toward science and technology, academic success, overall learning outcomes, and English language learning (Akyurek & Afacan, 2013; Bas, 2010; Ekemen & Beyhan, 2020; Tufekci & Demirel, 2009). Additional research suggests that the brain-based learning approach can positively influence students' attitudes towards reading by creating a positive and stimulating learning environment that fosters a love of reading (Gessa, 2018).These results imply that integrating brain-based learning approach can establish a conducive learning atmosphere, ultimately resulting in enhanced performance and academic accomplishments.

It is further supported by several studies that brain-based learning approach is effective at improving students' self-efficacy at various levels of foreign language proficiency (Habibian and Roslan, 2014). Studies (Riskiningtyas et al., 2012; Shehzad et al., 2019; Yagcioglu, 2014) offer valuable insight into the effects of learning through the brain-based approach on students' self-efficacy. The findings indicate that a brain-based learning approach can greatly enhance students' confidence and belief in their abilities, ultimately leading to improved academic performance and motivation. This expanding research emphasizes the potential of brain-based learning approach as an effective educational approach for promoting students' self-efficacy and overall learning outcomes.

An examination of the approach underlying brain-based learning is crucial. Internationally, few published studies evaluated the possible impact of brain-based learning approach on EFL students' attitudes towards reading and self-efficacy. In Ethiopian context, there is no evidence that teachers use this approach in reading classes. To the researchers' knowledge, no published studies exist on the application of learning approach based on brain research on students' reading attitude and reading self-efficacy in Ethiopia. Thus, the purpose of this research is to address the existing gap in academic literature, situational context, and research methodology by investigating the potential benefits of the brain-based learning approach on these important aspects of students' development. The purposes of the present study are to:

1. Measure whether attitude toward reading is affected by a brain-based learning approach;

2. Assess the possible effect of brain-based learning approach on students' self-efficacy in reading.

In relation to the primary aims of this study, we constructed these hypotheses for further assessment.

1. Ha1: A statistically significant distinction exists among the reading attitudes of students participating in brain-based learning approach compared to those using conventional method.

2. Ha2: The reading self-efficacy of students using the brain-based learning approach differs statistically significantly from that of students employing the conventional method.

III. REVIEW OF RELATED LITERATURE

1. The rise of brain-based learning

The basic principles of human behavior were influenced by the psychologists John Watson and B.F. Skinner's teachings in the 1940s and 1960s (Jensen, 2005). Their perspective focused on understanding the brain's response to external stimuli. This behaviorist model was prevalent in many educational institutions (Sousa, 2001, 2017; Jensen, 2005). However, it did not fully consider the brain's immense inner capacity. Consequently, there arose a need for an alternative approach to meet the demands of the educational world. In the late 1980s, cognitive neuroimaging played a significant role in the development of educational neuroscience (Jensen, 2005, 2008). Technological innovations, like functional magnetic resonance imaging (MRI) and positive emission tomography (PET) scans, over the past two decades have enabled physicians and scientists to observe the brain's activity during thinking or performance (Erlauer, 2003; Jensen, 2008; Sousa, 2001). These imaging technologies have facilitated the emergence of brain-based learning, which emerged as an alternative mode of instruction based on neuroscience research (Jensen, 2005, 2008; Sousa, 2001; Caine & Caine, 1991, 1994).

2. Definition of brain-based learning

Caine and Caine (1991, 1994) propose that brain-based learning involves recognizing and adjusting teaching methods to adhere to the brain's principles for effective learning (p. 4). A brain-based learning strategy is an approach based on principles that are currently believed to be true about the brain, according to Jensen and McConchie in 2020 (p. 10). "Brain-based learning entails the active use of practical strategies derived from brain-related sciences"(Jensen,2008, p.414).What appeals to these definitions is the emphasis on providing teaching and designing materials that are consistent with the brain's basic expectations and guiding principles.

3. Principles of brain-based learning

Caine and Caine's (1991, 1994) brain-based theory of learning presents twelve essential principles for classroom instruction. These concepts, as outlined by Caine and Caine, encompass the brain's function as a parallel processor; engaging the entire physiology; natural meaning search; patterning; emotions; simultaneous processing; each brain is different; learning is both promoted and prevented by fear; focused attention and peripheral perception; conscious and unconscious processes; two forms of memory; comprehending and remembering are best when anchored in natural spatial memory.

4. Techniques of brain-based learning

Caine and Caine (1991, 1994) suggest three interactive strategies derived from the twelve principles of brain-based learning: orchestrated immersion, relaxed alertness, and active processing. Orchestrated immersion entails creating learning settings that effectively engage students in their learning process. Creating an optimal environment for learning follows once students are immersed in a safe and stimulating setting. Relaxed alertness aims to put students in a state of comfortable yet challenging mindset. The theory behind active processing is that the student consolidates and internalizes information in a meaningful and conceptually coherent way rather than simply retaining memories (p.156).It is the path to understanding, and its importance cannot be overstated.

5. Defining attitude

Attitude has been a topic of debate for decades, with various definitions proposed. Good (1973) definition indicate that "attitude is a predisposition to react specifically towards an object or value, usually accompanied by feeling and emotion" (p.49).In fact, "attitude is a psychological tendency expressed by evaluating a particular entity favorably or disfavorably" (Albarracin et al., 2005, p.4). According to the American Psychological Association (2015), "attitude is a general evaluation of an object, person, group, issue, or concept" (p.88). Fishbein and Ajzen offer a more plausible and conventional definition of attitude. Fishbein and Ajzen (1978) defines that "attitude is a learned predisposition to consistently respond favorably or unfavorably towards a given object"(p.6). This definition is appealing because it includes the learned behavior of individuals to react to situations in a consistent and predictable manner.

6. Reading attitude

According to Smith (1990), attitudes influence reading by determining feelings and emotions (p.215). Alexander and Filler (1976) define reading attitude as a collection of emotions associated with reading that influence the learner's inclination towards or away from reading (p.1).These definitions take into account how reading attitudes influence behavior. Additionally, McKenna et al. (2012), defined reading attitude as "acquired predispositions to respond in a consistently favorable or unfavorable manner with respect to aspects of reading" (p.285). An individual's reading preference can be described by their overall attitude level in addition to showing differentiation towards a specific genre or topic.

7. Models of reading attitude

Three models of reading attitude were identified by Matthewosen (1994): cognitive (evaluative belief), affective (feeling), and conative (behavioral intents). The cognitive aspect of reading involves an individual's perspectives, attitudes, and evaluations about the activity, focusing on perceived benefits such as language skills, intellectual growth, or practical advantages. For example, "Reading English will help you get a job in the future" (Lee & Schallert, 2014, p.554). These subjective instrumental values likely stem from anticipations of the future impact of reading or from reflecting on past experiences. In terms of the affective element, McKenna et al. (2012) contend that an individual's overall self-perception and emotional reaction to a task shape their approach to reading. Additionally, a person's emotional aspect and their responses to reading are interconnected.

This encompasses readers' actual behaviors; negative emotions and concerns leading to adverse sentiments about reading; self-assessment linking to students' perceptions of their reading ability. "I feel anxious if I do not know all the words in reading passage" is a well-known illustration of the emotional aspect of reading attitude (Lee & Schallert, 2014, p.554). These feelings are likely influenced by external factors such as friends, family, or the academic environment. This example vividly demonstrates why it's crucial to recognize reading instruction as a factor that affects students' emotional domain.

The last component of reading attitude is conative attitude. Conation is described as "a self-determined action involving a conscious decision to execute it" (Gerdes & Stromuall, 2008, p. 236). One might be diligent about learning a second language but not committed to putting in the necessary effort to master it. The notion of conation revolves around demonstrating one's feelings about reading through their actions, for example, "I go to the library to borrow or read English books" (Lee & Schallert, 2014, p.554).

8. Reading self-efficacy

According to Burrows (2012), "reading self-efficacy is one's perception of his/her ability to perform various reading tasks in English"(p.20).

9. Concept of self-efficacy

Bandura's article established a paradigm in contemporary psychology by emphasizing cognitive processes in human behavior. His social cognitive theory, formulated in the 1980s, suggests that learning is influenced by cognitive, behavioral, and environmental factors, rather than just direct experience (Bandura, 1977, p.191).Social cognitive theory identifies three primary factors influencing individual behavior: Personal characteristics (age, cognitive capacity, prior experience), contextual influences (access to resources, safety, family support), and the behavior itself (vigor, effort, outcome, competency). Bandura (1977) defined self-efficacy as the belief in one's capability to effectively plan and carry out actions to attain a specific goal (p.79).Self-efficacy is influenced by previous achievements, observation, and encouragement from educators and parents. It is essential for students to grasp and uphold this self-efficacy in order to overcome setbacks and sustain their drive. Educators should assist students in building self-efficacy by offering meaningful, attainable, and successful language tasks, as this can greatly affect their behavior and perseverance (Dornyei, 1994).

10. Sources of self-efficacy

Bandura (1977, 1997) identified four primary sources that influence the development of self-efficacy: verbal persuasion, physiological states, vicarious experiences, and performance accomplishments. According to Bandura (1977), performance accomplishments, also known as personal mastery experiences, serve as the main source of information regarding self-efficacy. Belief in one's own abilities rises with success and diminishes with failure. Although observing others and considering the consequences of their actions can be influential, vicarious experiences have a less pronounced effect on self-efficacy expectations. Verbal persuasion, despite its frequent use, is less successful in creating efficacy expectations due to the absence of real experience. According to Bandura (1977), a person's physiological state affects their sense of self-efficacy. This association links unpleasant stimulation with inadequate performance, anticipated incompetence, and failure, leading individuals to be hesitant in questioning their own competence. Conversely, a pleasurable physiological state fosters self-assurance in one's competence in a particular situation (Bandura, 1977; Maddux, 1995).

11. Self-efficacy and educational achievement

By the 1980s, systematic efforts to explore self-efficacy of learning and performance in educational settings began to gain ground, with integrated models and self-regulation research emerging (Schunk & Greene, 2018).Bandura (1977) suggested a connection between self-efficacy and behavioral change, where cognitive processes impact behavior acquisition and regulation. Performance-based approaches were determined to be the most effective in promoting psychological change, with achievement replacing code-based experiences and performance being influenced by expectation. Self-efficacy is associated with learning choices, effort, and persistence, influencing student motivation and academic accomplishment (Burrows, 2012). Studies suggest a positive link exists between belief in one's abilities and strong academic achievement (Bhati et al., 2022; Goulao, 2014; Pajares, 1996; Phan, 2011).

12. Self-efficacy and reading achievement

Academic success is heavily influenced by self-efficacy, particularly in the area of reading comprehension. Researchers studying motivation have explored how factors such as self-efficacy can improve cognitive processes, impacting performance in reading, math, language arts, sports, and career choices (Guthric et al., 2013).

Shell et al. (1995) found that students' reading self-efficacy grows as they advance through grades, which in turn affects their reading comprehension. This discovery underscores a positive link between reading comprehension achievements, beliefs in reading self-efficacy, and grade level. In a longitudinal study by Burrows (2012), the relationship between increased reading self-efficacy and improvements in reading comprehension was underscored through the examination of extensive reading and reading strategies (Burrows, 2012).

13. Social cognitive theory

Albert Bandura's social learning theory, later known as social cognitive theory, posits that human behavior is influenced by interaction with others and the environment. It suggests that individuals learn behavior based on their desire for a specific outcome, rather than conditioning.

Bandura emphasizes the importance of self-influence in human behavior, with self-regulatory mechanisms involving self-monitoring, judgment, and affective self-reactions. Self-efficacy, a critical element of social cognitive theory, is impacted by mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective indicators (Bandura, 1977, 1997).

14. Theory of planned behavior

The concept of planned behavior contends that an individual plans to participate in a behavior at a particular time and location (Ajzen, 1991, 2012). The theory states that person's behavior is driven by intentions to act, which are impacted by three components: an individual's attitude toward behavior, subjective norms, and the perceived level of control over behavior.

According to (Ajzen, 1991, 2012), attitude toward behavior refers to judgments of whether one has positive or negative feelings toward the behavior of interest. It considers the outcomes of executing the behavior. The subjective norm is the notion that others will expect him or her to engage in the behavior. It relates to how a person interprets the social context of a behavior. Perceived behavioral control refers to an individual's sense of how easy or difficult a behavior is for them (Ajzen, 1991, 2012).

IV. METHODS

1. Design

The current research utilized a quasi-experimental design to assess whether EFL learners' attitude toward reading and self-efficacy were affected by the use of a brain-based learning approach. The researchers employed the post-positivist paradigm. Two intact groups were involved: while the control group received instruction using the conventional method, the experimental group was taught utilizing a brain-based learning approach. Both groups were given pre and post-tests to assess any changes in reading attitude and self-efficacy related to reading.

2. Context and Participants

The participants were freshman undergraduate social science students enrolled in the 2023 academic calendar at Jimma University. They took Communicative English Skill I course in the 2023 academic year. The reason for selecting these students was that it was clear they were perceived to struggle with reading comprehension skills, as noted in the problem statement section. Purposive sampling was employed to choose these students. The researchers selected two sections from the seven social science sections using simple random sampling. For the study, a coin was tossed to designate one section as CG (N=55) and the other as EG (N=54). Therefore, the before and after data were collected from 109 students.

3. Data gathering instrument

The Lee and Schallert (2014) reading attitude questionnaire was adopted to assess students' attitude towards reading before and after intervention. It comprises 30 items evaluated on a scale of five points, designed to assess cognitive, affective, and conative factors. This makes it suitable for measuring students' reading attitudes. Kosar et al.'s (2022) reading self-efficacy questionnaire was adapted to better understand how the adoption of a brain-based learning approach affects students' self-efficacy in reading.

This questionnaire includes 16 items assessed on a 5-point Likert scale and aligns with Bandura's principles of self-efficacy measure. Bandura (1997) suggests that self-efficacy questions should be clear, tailored, challenging, and randomized, emphasizing beliefs and predictive power. Kosar et al.'s questionnaire focuses on beliefs and predictive power, ensuring a well-designed tool for self-efficacy assessment. Prior to administering the questionnaires, the researchers obtained input from experts regarding the extent to which the items address all aspects of reading attitude and reading self-efficacy.

Two sets of standard questionnaires were completed by 109 students. Reliability was calculated using Cronbach's alpha. The questionnaires were reliable, with alpha values of 0.731 and 0.795 for reading attitude and reading self-efficacy, respectively. According to Pallant (2020), for a study to be credible and useful as a means of gathering data, The Cronbach's alpha value for a questionnaire ought to exceed 0.7.Therefore, the questionnaires were reliable.

4. Time plan and schedule of the intervention

The control (CG) and experimental (EG) groups attended the Communicative English Skills I course twice a week, with the exception of data collection time. CG sessions took place on Tuesdays (10:00 a.m. to 12:00 a.m.) and Fridays (10:00 a.m. to 11:00 a.m.), while EG sessions were scheduled for Mondays (10:00 a.m. to 12:00 a.m.) and Thursdays (9:00 a.m. to 10:00 a.m.).

Conventional teaching was employed for the CG, whereas brain-based learning approach was utilized for the EG. Following a 16-week brain-based learning approach intervention, all data collection instruments were re-administered to evaluate score changes between the groups.

5. Procedures

The study at Jimma University involved first-year undergraduates from the social science program. Two questionnaires (attitude regarding reading and self-efficacy) were administered to both experimental and control groups. The control group received the conventional method, while the experimental group was exposed to a brain-based learning approach. This approach involves various activities, including kinesthetic, energizers, short stretches, role playing,

positive reinforcement, reflection and brain gymnastics (such as cross-crawls), designed to improve cognitive functions.

The researchers developed training materials for the experimental group based on Jensen's (2007) brain-based learning approach model, which comprises seven stages (pre-exposure, engagement, framing, acquisition, elaboration, memory strengthening, setting time, and review) and three phases (pre-reading, while-reading, and post-reading).The material was designed to be engaging, relevant, and multi-modal, ensuring its effectiveness in engaging participants.

6. Data analysis

Data was collected quantitatively using questionnaires requiring statistical analysis. Inferential statistics were calculated with SPSS version 23. The mean scores were subjected to multivariate analysis of variances (MANOVA) to examine the influence of learning to read utilizing a brain-based learning approach on the combined dependent variables-reading attitude and self-efficacy. The MANOVA method is advantageous due to the simultaneous comparison of a number of related dependent variables and better controls over type I errors (Tabachnick et al., 2001). A paired sample t-test was conducted to evaluate the variance in mean scores before and after intervention for the two dependent variables in both the experimental and control groups. Furthermore, the paired sample t-test results, as well as the MANOVA means and standard deviations, were computed.

V. RESULTS OF THE STUDY

Data were obtained prior to and following the intervention. Before the intervention, data was collected to determine if the control and experimental groups were comparable in their reading attitude and self-efficacy, and after the intervention, data was also gathered to analyze how the brain-based learning approach impacted students' attitudes towards reading and their self-efficacy belief to read.

1. Pre-intervention multivariate test

Improvements in reading attitude and self-efficacy were identified using Multivariate Analysis of Variance (MANOVA). A series of initial assumption tests was conducted to assess a range of parameters, including normality, linearity, outliers, multicollinearity, and variance homogeneity.

To assess the variations in the experimental group's (EG) pretest and posttest results and control group (CG) learners regarding reading attitude and reading self-efficacy, a one-way MANOVA was utilized. This statistical test is employed when there is one or more independent variables (in this case, the brain-based learning approach which surfaces as the experimental and control groups) and two or more related dependent variables (reading attitude and reading self-efficacy in this instance). Wilk's Lambda, a commonly reported statistic, yielded a value of 0.623.

In Table 1, the results of the MANOVA show that there was no statistically significant difference between the two groups, EG and CG, in terms of the combined dependent variables: reading attitude and reading self-efficacy. Wilks' Lambda=.991, $F_{(2,106)}$=.476, $p<.001$, partial eta square=.009 (Table 1). This suggests strong evidence that the two groups had similar levels of reading attitude and reading self-efficacy before the intervention.

Table 1: Preintervention multivariate test

Multivariate tests						
Effect	**Value**	**F**	**Hypothesis df**	**Error df**	**Sig**	**Partial Eta Squared**
Groups						
Wilks' Lambda	.991	.476[a]	2.000	106.000	.623	.009
[a]Exact statistics						

2. Separate tests of dependent variables (ANOVA)

Following MANOVA, each dependent variable was exposed to ANOVA. It can provide more insight into the MANOVA results by examining the variations in the dependent variable means between the groups. This method is used to reduce the chance of false-positive results (type I error). Typically, the Bonferroni adjustment is employed, which divides the number of analyses by the significance level (e.g., .05/2). The Bonferroni correction involves modifying p-values when multiple dependent and independent statistical tests are conducted concurrently using the same dataset (Tabachnick et al., 2001). The significance level in this instance should be divided by two because there are two dependent variables (resulting in a new significance level of 0.025).

Table 2: Preintervention separate tests of dependent variables

Source	Tests of between-subjects effects						
	Dependent variable	**Type III sum of squares**	**df**	**Mean square**	**F**	**Sig**	**Partial eta squared**
Corrected Model	Reading Attitude	.142[a]	1	.142	.709	.402	.007
	Reading self-efficacy	.237[b]	1	.237	.651	.421	.006
Intercept	Reading Attitude	1050.073	1	1050.073	5256.172	.000	.980
	Reading self-efficacy	1364.721	1	1364.721	3745.426	.000	.972
Groups	Reading Attitude	.142	1	.142	.709	.402	.007
	Reading self-efficacy	.237	1	.237	.651	.421	.006
Error	Reading Attitude	21.376	107	.200			
	Reading self-efficacy	38.988	107	.364			
Total	Reading Attitude	1098.136	109				
	Reading self-efficacy	1404.391	109				
Corrected Total	Reading Attitude	21.518	108				
	Reading self-efficacy	39.225	108				

[a] R Squared = .007 (Adjusted R Squared = −.003)

[b] R Squared = .006 (Adjusted R Squared = −.003)

Upon reviewing the data in table 2, it was observed that the *p*-value for the two dependent variables exceeded 0.025, suggesting that there is no statistically significant distinction between the control and experimental groups. The tests of between-subject effects for reading attitude (1,107)=.709, p<.001, partial eta square=.007, and reading self-efficacy, $F(1,107)$ =.651, p<.001, partial eta square =.006 supported this conclusion. Therefore, the participants in the control and experimental groups displayed similar levels of reading attitude and reading self-efficacy when examined separately.

3. Descriptive statistics

Descriptive statistics provided a general overview of the data, such as the mean and standard deviation. Table 3 indicates the descriptive statistics for dependent variables disaggregated by the independent variables.

Table 3: Descriptive statistics

Descriptive statistics		Groups	Mean	Std. deviation	N
Reading Attitude		Control Group	3.14	.489	55
		Experimental Group	3.07	.399	54
		Total	3.10	.446	109
Reading self-efficacy		Control Group	3.58	.600	55
		Experimental Group	3.49	.615	54
		Total	3.54	.602	109

As shown in table 3, the mean score of reading attitude for the CG (M=3.14, SD=.489) were similar with that of the EG (M=3.07, SD=.399). Furthermore, both CG (M=3.58, SD=.600) and EG (M=3.49, SD=.615) had similar pretest reading self-efficacy scores before the intervention.

4. Post-intervention multivariate tests

The MANOVA results showed a significant statistical difference between the experimental group (EG) and control group (CG) regarding the overall dependent variables, reading attitude, and reading self-efficacy, Wilks'Lamda=.160, F(2,106)=277.808, p< .001, partial eta square=.84. This suggests strong evidence of differences between the two groups regarding reading attitude and reading self-efficacy.

Table 4: Post intervention multivariate test

Multivariate tests						
Effect	Value	F	Hypothesis df	Error df	Sig	Partial Eta Squared
Groups						
Wilks' Lambda	.160	277.808[a]	2.000	106.000	.000	.840
[a] Exact statistics						

5. Post-intervention Separate tests of dependent variables (ANOVA)

A subsequent ANOVA analysis, adjusted using the Bonferroni method (p = 0.05/2 = 0.025), was performed to examine the two dependent variables individually.

Table 5: Post intervention separate tests of dependent variables

Source	Tests of between-subjects effects						
	Dependent variable	Type III sum of squares	df	Mean square	F	Sig	Partial eta squared
Corrected Model	Reading Attitude	10.320[a]	1	10.320	53.166	.000	.332
	Reading self-efficacy	128.094[b]	1	128.094	501.890	.000	.824
Intercept	Reading Attitude	1168.118	1	1168.118	6017.966	.000	.983
	Reading self-efficacy	1136.778	1	1136.778	4454.043	.000	.977
Groups	Reading Attitude	10.320[a]	1	10.320	53.166	.000	.332
	Reading self-efficacy	128.094[b]	1	128.094	501.890	.000	.824
Error	Reading Attitude	20.769	107	.194			
	Reading self-efficacy	27.309	107	.255			
Total	Reading Attitude	1197.291	109				
	Reading self-efficacy	1285.285	109				
Corrected Total	Reading Attitude	31.089	108				
	Reading self-efficacy	155.403	108				

Data in table 5 indicated that *p*-values for both dependent variables were less than 0.025, indicating significant results. The tests of between-subject effects for reading attitude (F(1,107) = 53.166, p < .001, partial eta square = .332) and reading self-efficacy (F(1,107) = 501.890, p < .001, partial eta square = .824) provided sufficient evidence to support the alternative hypothesis. This signifies a statistically significant difference between the two dependent variables, suggesting a correlation and ruling out the possibility of chance.

The two dependent variables showed a large effect size. The relationship between brain-based learning approach and reading attitude score was strong, with the type of group accounting for 33.2 % of the variance. Additionally, the relationship between brain-based learning approach and reading self-efficacy was also strong, with the type of group accounting for 82.4% of the variance. These results suggest that the brain-based learning approach significantly and powerfully influenced both dependent variables, with the type of group accounting for a substantial proportion of the variance in each of them.

Table 6: Descriptive statistics

Descriptive statistics				
	Groups	**Mean**	**Std. deviation**	**N**
Reading Attitude	Control Group	2.97	.559	55
	Experimental Group	3.58	.271	54
	Total	3.27	.545	109
Reading self-efficacy	Control Group	2.14	.600	55
	Experimental Group	4.31	.507	54
	Total	3.54	.504	109

Based on Table 6, in terms of reading attitude, EG (M=3.58, SD=.271) achieved a higher posttest score than CG (M=2.97, SD=.559). Additionally, EG (M=4.31, SD=.507) outperformed CG in the posttest for reading self-efficacy, where CG scored (M=2.14, SD=.60)

6. Paired samples t-test results

To evaluate the effect of a brain-based learning approach on students' reading attitude and self-efficacy in relation to the Experimental Group (EG) and the Control Group (CG) for the two dependent variables, a paired sample t-test was also conducted.

Table 7 Experimental group paired samples statistics

Paired samples statistics					
		Mean	**N**	**Std. deviation**	**Std. error mean**
Pair 1	Pre reading Attitude	3.07	54	.399	.054
	Post reading Attitude	3.58	54	.272	.037
Pair 2	Pre reading self-efficacy	3.49	54	.607	.083
	Post reading self-efficacy	4.31	54	.504	.069

In table 7, the pre-intervention mean score of the experimental group for reading attitude (M = 3.07, SD = .399) was significantly lower than the post-intervention mean score (M = 3.58, SD = .272), t (53) = − 7.337, p < 0.05 (two-tailed) (Table 8). With a 95% confidence interval for the mean difference of -.654 to -.373, the mean increase in test score was -.514. A significant effect size was shown by the eta square statistics of 0.50. Similarly, the results demonstrated a significant increase in students' score for reading self-efficacy before (M = 3.49, SD = .607) and after intervention (M = 4.31, SD = .504), t(53) = -8.268, p < 0.05. With a 95% confidence interval spanning from -1.021 to -.622, the mean increase in test scores was -.823. A substantial effect size was demonstrated by the eta square statistics (0.56).

Table 8: Experimental group paired samples t-test

		Paired samples test							
		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
					Lower	Upper			
Pair 1	Pre reading Attitude– post reading Attitude	— .514	.514	.070	− .654	− .373	− 7.337	53	.000
Pair 2	Pre reading Self-efficacy Post reading Self-efficacy	— .823	.730	.099	− 1.021	− .622	− 8.268	53	.000

Table 9: Control group paired samples statistics

Paired samples statistics					
		Mean	N	Std. deviation	Std. error mean
Pair 1	Pre reading Attitude	3.14	55	.489	.066
	Post reading Attitude	2.97	55	.559	.075
Pair 2	Pre reading self-efficacy	2.63	55	.347	.048
	Post reading self-efficacy	2.57	55	.192	.026

The study employed a paired-sample t-test to assess the variations in mean scores within the control group. The control group's mean score following the intervention (M = 2.97, SD =.559), t (54) = 1.807, *p* > 0.05 (two tailed), and the reading attitude pre-intervention mean score (M = 3.14, SD =.489) were proportionate (Table 9) (also refer to Table 10) below. In a similar vein, the control group's mean score following the intervention (M = 2.57, SD =.192) and the reading self-efficacy mean score prior to the intervention (M = 2.63, SD =.347) were in proportion, with t (54) = 1.131, p > 0.05 (two tailed).The mean score difference for reading attitude was .174 with a 95% confidence interval ranging from -.019 to -.367.With a 95% confidence interval spanning from -.047 to -.167, the mean score difference for reading self-efficacy was.060. This led to the acceptance of the alternative hypotheses.

Table 10: Control group paired samples t-test

		Paired samples test							
		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
					Lower	Upper			
Pair 1	Pre reading Attitude– post reading Attitude	.174	.714	.095	− .019	− .367	1.807	54	.076
Pair 2	Pre reading Self-efficacy Post reading Self-efficacy	.060	.395	.053	− .047	− .167	.131	54	.263

VI. DISCUSSION

This quasi-experimental study looked at how a brain-based approach to learning affected the reading attitudes and self-efficacy of EFL students. It was hypothesized that the brain-based learning approach would enhance students' reading attitude and reading self-efficacy. The research had two distinct goals: 1) To measure how the brain-based learning approach impacts

students' attitudes toward reading; 2) To assess how the brain-based learning approach affects their reading self-efficacy. Both descriptive and inferential statistics were used in the data analysis process. The hypothesis was tested using both descriptive and inferential statistics, such as mean and standard deviation, as well as one-way MANOVA and paired sample t-tests.

In light of the first research hypothesis (Ho1: There is a statistically significant difference between students who are enrolled in a brain-based learning approach and students who are enrolled in a conventional method), the present study indicated that in EGs, a brain-based learning approach seems to be more effective in developing students' reading attitudes. Using a brain-based learning approach may engage students in the learning experience, making it easier for them to remember what is being taught. It is possible for students to cultivate a positive learning atmosphere by taking into account their emotions and including activities such as stretching, relaxation, rhythmic drumming, and singing. This can also contribute to fostering a positive attitude towards reading, thereby making it a more pleasurable and fulfilling experience for learners. In theory, the findings are justifiable in Roseblatt (1978) transaction theory of reading which states that affective factors of readers such as feelings, beliefs and attitude positively influence learners reading. Therefore, understanding the affective components of readers is essential for successful reading instruction. Moreover, the brain-based learning principle of (Caine & Caine, 1991) reveals that students' feelings and attitudes affect future learning and will play a role. Cognitive and emotive domains cannot be separated. Consequently, recognizing the emotional components of readers is essential for successful reading instruction and is an integral part of the brain-based learning principle of learning. The point is further addressed in Ajzen's (1991, 2002) theory of planned behavior. This suggests that an individual's actions are influenced by three factors: their attitude towards the behavior, the subjective norm, and the perceived level of control over the behavior. Attitude toward behavior refers to the feeling of whether one has positive or negative feeling toward the behavior of interest. This theory emphasizes that attitudes toward a behavior are the most important factor when deciding if a person will participate in the behavior. It considers the outcome of executing the behavior. Ajzen also argue that the stronger the urge to act, the more likely its performance.

Based on the above ideas, the current research suggests that students who cultivate a positive attitude toward reading are more likely to be motivated to read more and achieve better reading comprehension. This is because when students have a positive attitude towards reading, they derive enjoyment and satisfaction from it, leading to a stronger desire to learn and a greater willingness to put in the necessary effort to succeed. Moreover, a positive attitude towards reading also results in students paying closer attention to the material and absorbing information more effectively. The present study's findings align with other research (Akyurek & Afacan, 2013; Bas, 2010; Gessa, 2018; Ekemen & Beyhan, 2020; Tufekci & Demirel, 2009). Tufekci & Demirel (2009) discovered that the brain-based learning approach had a positive impact on students' attitudes toward English language courses. Similarly, Bas (2010) concluded that brain-based learning activities showed a significant difference in attitude scores between experimental and control groups. Akyurek and Afacan (2013) also revealed a positive impact of the brain-based learning approach on students' attitudes. Gessa (2018) also discovered that students' attitudes toward reading were positive, and that favorable attitudes led to greater reading test scores for students than negative attitudes. This suggests that students' attitudes towards reading play a crucial role in their reading success. Therefore, it is essential to cultivate a positive attitude towards reading in order to improve reading performance. To put it differently, developing a positive attitude towards reading is a crucial step in helping students

to enhance their reading skills. The study's findings supported the second research hypothesis, which states that there are statistically significant differences in reading self-efficacy between students who use conventional method and those who use a brain-based learning approach.

The study revealed that the reading self-efficacy of EG learners significantly improved through the use of a brain-based learning approach. By employing methods such as Brain Gym and positive reinforcement, students may have enhanced their understanding and confidence in their reading abilities. The increased self-efficacy in the experimental group likely played a role in their improved performance. The experimental group surpassed the control group, primarily due to their higher self-efficacy resulting from the brain-based learning approach, demonstrating that the intervention provided students with a deeper understanding of their reading skills. Theoretical conclusions are well-founded. Bandura (1997) explains that self-efficacy in social cognitive theory refers to an individual's confidence in their capability to execute a specific task within a specific domain. An individual's choice of behavior is influenced by both internal and external influences, including their surroundings, the model they choose, and their prior experiences, according to Bandura. Bandura posits that perceived self-efficacy arises from the integration of four main kinds of information: verbal persuasion, mastery experience, vicarious experience, and physiological and affective markers. Research indicates that every action that fosters a sense of accomplishment and well-being will aid in the promotion of self-efficacy (Bandura, 1997).

The brain-based learning approach implemented in the current study also had various components contributing to positive feelings and less emotional disturbance. The brain-based learning approach focused on the connection between the brain and the body. It used techniques such as guided imagery, affirmations, and breathing exercises to help students relax and focus on their learning. It also encouraged students to be mindful of their emotions, so they can learn to recognize and manage their feelings in a healthy way. Additionally, the approach emphasized providing positive reinforcement and feedback to help students stay motivated and engaged in their learning. By providing learners with an environment conducive to learning, learners can better focus on the task at hand and be more successful in their academic endeavors. This finding is also congruent with some other previous studies which evidence the profound influence of brain-based learning approach in boosting learners' self-efficacy (Riskiningtyas et al.,2012), the source of reading self-efficacy was substantially related to reading self-efficacy belief. (Shehzad et al., 2019), students' belief in their self-efficacy were highly correlated with their academic success (Yogurtcu, 2012), the brain-based model might have a significant impact on experimental group students' self-efficacy level. These findings are further supported by recent research that suggests that brain-based learning approach can have a positive impact on students' reading self-efficacy in different levels of foreign language proficiency (Habibian and Roslan, 2014).

It can be inferred that fostering university students' self-efficacy through brain-based learning approach gives them a sense of self-worth, self-confidence and help them increase their reading self-efficacy. In educational research, (Bandura, 1977), it has been shown that students who evaluates their capabilities and flaws and strives to improve their self-efficacy are more likely to succeed. By providing students with strategies to cope with their lack of self-efficacy, such as positive reinforcement and encouragement, students become more confident in their ability to read and comprehend texts. This increases their reading self-efficacy and therefore increases their overall academic performance.

VII. CONCLUSION

The current research aimed to investigate the impact of employing a brain-based learning approach on EFL students' reading attitudes and self-efficacy. Based on the data analysis and discussion of the results, the following conclusions can be drawn regarding how brain-based learning approach has impacted the reading attitude, and self-efficacy of freshman undergraduate students in Jimma University. First, this study concluded that brain-based learning approach helped learners' cultivate a positive attitude towards reading. The result from the descriptive statistics, paired sample t-test and the one-way MANOVA analysis showed significant differences in the two groups post mean on reading scores in the EG. Various brain-based learning activities demonstrate the benefits of this approach for fostering a positive attitude. Second, this study concludes that the brain-based learning approach could increase learners reading self-efficacy. The result of the descriptive statistics, paired sample t-test and the one-way MANOVA analysis indicated significant differences in the two groups' post mean scores on reading self-efficacy in favor of the EG. While the study's findings demonstrated the benefit of incorporating a brain-based approach to learning into reading instruction, all research has limits, and this one is no exception. Since the study was not conducted with a sample that was randomly selected, the results may not be generalizable to the larger population. The present study also happened to be quantitative. To have a better understanding of the phenomenon, investigations should be conducted using a qualitative or mixed-method study design.

VIII. RECOMMENDATIONS

1. English as Foreign Language (EFL) instructors should integrate effective learning strategies and interesting reading activities into their students' regular classrooms, aligned with brain-based learning principles and practices that boost students' reading attitude and self-efficacy.

2. EFL instructors should provide a safe, secure, and supportive learning environment through application of brain-based learning approach. They should also incorporate health management concepts such as stress management, relaxation, brain gym (kinesthetic components) into the learning process.

3. EFL Instructors should use positive reinforcement techniques such as praise, recognition, and rewards to motivate learners and help them develop a positive attitude towards the learning process. Furthermore, instructors should provide favorable feedback on their students' reading abilities to increase their reading self-efficacy beliefs. Furthermore, they should aim to reduce student anxiety to boost their reading self-efficacy.

4. EFL instructors should be provided with training to explore the effectiveness of brain-based learning approach, they can more confidently utilize the approach in their classrooms, leading to improved student outcomes.

5. Textbook writers must also think about how to incorporate interactive brain-based learning approach activities, as well as how to adapt their material to diverse learning preferences and styles, and use brain-based learning approach effectively in order to maximize its effectiveness in teaching.

Declarations

Ethical approval and consent to participate

To gather data ethically, consent must be obtained. The privacy of participants is protected by using numbers instead of names for identifying returned research instruments and maintaining confidentiality. Therefore, participants were informed of the study's objective and consented to take part in the study. In addition, the researchers' work has been approved by the Jimma University Research Review Committee for Social Science and Humanities.

Declaration of conflict of interest

No potential conflict of interest with respect to the research, authorship, and/or publication of this article

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