Effects of brain breaks on EFL students' writing skills at the tertiary level

Efectos de las pausas cerebrales en las habilidades de escritura de los estudiantes de EFL en el nivel terciario

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ABSTRACT

There is increasing evidence for the connection between emotion, social functioning, and cognition in the education system. Research suggests that the application of brain breaks is a bridge between these relations and academic achievement and can serve as a viable approach to enhancing learners' outcomes. However, existing studies on this approach are generally from elementary and secondary levels, thus leaving a gap in reports in higher level educational contexts. For the present study, an EFL university class was chosen as the sample subject of study to demonstrate the impact of brain breaks on students' writing outcomes. Data were collected from both an experimental and control group during an 8-week intervention through a pre-test and a post-test. Qualitative data was collected through teacher observation and students' surveys. Thus, an embedded sequential mixed methods design was implemented to understand the participants' perceptions within the context of an experimental intervention. Given that university students spend more than 2 hours sitting, this study suggests that short brain breaks every 45 minutes enhanced cognitive operations associated with writing academic performance.

Keywords: Classroom research; University students; second language; Brain breaks.

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RESUMEN

Cada vez hay más pruebas de la conexión entre emoción, funcionamiento social y cognición en el sistema educativo. Las investigaciones sugieren que la aplicación de pausas cerebrales constituye un puente entre estas relaciones y el rendimiento académico y puede servir como enfoque viable para mejorar los resultados de los alumnos. Sin embargo, los estudios existentes sobre este enfoque proceden por lo general de los niveles elemental y secundario, lo que deja un vacío de informes en contextos educativos de nivel superior. Para el presente estudio, se eligió como muestra una clase universitaria de EFL para demostrar el impacto de las pausas cerebrales en los resultados de escritura de los estudiantes. Se recogieron datos tanto de un grupo experimental como de un grupo de control durante una intervención de 8 semanas a través de un pre-test y un post-test. Los datos cualitativos se recogieron mediante la observación del profesor y las encuestas de los alumnos. Así, se implementó un diseño secuencial integrado de métodos mixtos para comprender las percepciones de los participantes en el contexto de una intervención experimental. Dado que los estudiantes universitarios pasan más de 2 horas sentados, este estudio sugiere que las pausas cerebrales breves cada 45 minutos mejoran las operaciones cognitivas asociadas al rendimiento académico en la escritura.

Palabras clave: Investigación en el aula; Estudiantes universitarios; Segunda lengua; Pausas cerebrales.

1. Introduction

Recent advances in neuroscience have highlighted connections between emotion, social functioning, and cognition (Immordino-Yang & Damasio, 2007). Teaching and learning in schools have strong social, emotional, and academic components (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Donelly, 2011), and finding the association between them has become a practical teaching paradigm. Given the results of the investigation into these connections, a call for more research has been put forth. The interest in the implementation of brain breaks has been growing in education because findings report a broad range of benefits on students' academic achievement (Stone, 2015; Weslake & Christian, 2015), productivity, and social interaction improvement (Jensen, 2005; Lengel & Kuczala, 2010; Kuczala, 2015; Desautels, 2016).

Ecuador's higher education system requires its students to have a B1 English level as a compulsory prerequisite to obtaining a bachelor's degree (Sevy-Biloon, Recino, & Munoz, 2020). However, when students are expected to produce everyday topics and write for an intended purpose with sufficient accuracy and coherence (Ministerio de Educación, 2016) many don't reach basic communicative competencies by the end of high school. (León, 2013). In this regard, some research on teaching practice has demonstrated that students feel disappointed in themselves when they cannot write as they want (Cheng, 2002; Woodrow, 2011), and online translators are commonly overused in ESL/EFL writing outcomes (Ducar & Schocket, 2018). As a result, those clashes frequently affect students' learning potential and their attitudes toward English in general, and the quality of their writing outcomes (Warner & Brown 2005). Considering these issues and the need to innovate current practices, brain breaks have emerged as a new method in education that allows students feel more motivated and hence more willing to learn. This study centers on

an EFL tertiary-level class based on the premise that students need regular downtime throughout an intensive study program in the form of brain breaks to support their concentration as well as their cognitive abilities. Studies consider them a reliable approach for young learners; however, it should be noted that research related to higher-level students is scarce. Despite research in higher level educational contexts is scarce, the debate centers on whether they can have similar effects on adult learners. Therefore, noticing this gap in the literature one question that needs to be answered is what effect brain breaks have on EFL university students' writing productive skills. With this in mind, the primary aim of this mixed-method study was to gain a better understanding of the effect of brain breaks activities on students' writing performance an EFL class and their impact on students' writing performance at the tertiary level in a university level.

1.1 Historical background

Some studies have revealed that the brain develops in relation to opportunities to engage dynamically and securely with rich and significant environments, social relationships and emotions, and socially transmitted ideas and information (Immordino-Yang, Darling-Hammond, & Krone, 2019). Those investigations are tightly attached to consistent foundational work in education and psychology (Bruner, 1990; Vygostsky, 1978). The use and application of brain breaks is focused on brain function and the process of learning, that is what Jensen (2005) calls brain-based learning. Jensen (2001, 2004, 2005, 2008) demonstrated that brain breaks are an effective cognitive strategy to strengthen learning, improve memory and retrieval, and enhance learner motivation and morale.

The following theories illustrate that brain functioning that funds learning is related to physical development and depends on social and emotional experience:

Vygotsky's Sociocultural Theory of Cognitive Development

Vygotsky's theory stresses the fundamental role of social interaction in the development of cognition (Vygotsky, 1978), as he believed strongly that community plays a central role in the process of making meaning and that cognitive functions are the products of social interactions, and brain breaks can be viewed as a social activity.

Bruner's Learning Theory in Education

Bruner's theory puts considerable emphasis on socio-cultural context believing that it influences one's intellectual development. He believed that the intellectual development of an individual should be the primary goal of education instead of rote memorization (Bruner, 1990).

Jensen's Brain-based learning Theory

Brain-based learning activities engage both hemispheres of the brain simultaneously, resulting in stronger and more meaningful learning experiences and permanent brain connections.

According to Jensen (2005) educational techniques that are brain friendly provide a biologically driven framework for creating effective instruction. Jensen's brain-based learning approach focuses on practical strategies linking brain research to student achievement. An expanding body of educational research focuses on these theories, including emotion regulation and awareness, social communication, collaboration skills, and the like (CASEL, 2015). However, it is gaining evidence, and there is not a wide awareness in education research, policy, and practice that emotional and social competencies impact learning (Immordino-Yang, Darling-Hammond, & Krone, 2019).

1.2 Conceptual background

Social brain development

Studies have demonstrated that planning group projects and activities help students to learn from their peers. There is evidence on how cooperation is a highly effective way to internalize knowledge in students' brains. The opportunity to socialize with others allows them to retain more information and promote memorable learning experiences (Lieberman, 2012). The application of brain breaks is thought to stimulate the brain's emotional center to reach students in a more engaging environment so their brains can process new material more efficiently (Materna, 2007).

Emotional brain development

According to Damasio (2000), emotions help redirect students' learning, attention, memory, decision making, motivation, and social functioning. Some evidence indicates that emotions can cause mental changes as well as physiological effects on the body (Immordino-Yang & Damasio, 2007). In an educational setting, emotion is strongly attached to cognition. Neuroscience studies have warned that negative emotions may have a detrimental effect on learners of any age (Materna, 2007). In this respect, when students are doing intensive tasks, independent writing or evaluations, their affective filter tends to be high. To lower it, some investigators claim that activities based on brain breaks (Dennison & Dennison, 1997) allow students to achieve a sense of calm (Gay, 2009) and refocus their neural circuitry with stimulating or quieting practices in the prefrontal cortex, where problem-solving and emotional regulation occur (Desautels, 2016).

Brain-based learning

Some studies have concluded that students increase retention and understanding of topics when a brain-based teaching environment takes place. It involves a teaching method that limits

lectures and encourages exercise breaks, team learning, and peer teaching. Brain-based learning centers around neuroplasticity, or the remapping of the brain's connections when learning new concepts (Swan, 2019). Jensen (2008) has recalled these principles and proposes brain-based planning strategies and how to integrate them in the classroom. These breaks have also a vigorous physical component (Jensen, 2005) as they provide an opportunity to alleviate stress, improve physical activity and develop motor skills. If physical activity is being introduced to a traditional class can generate impressive results in learning outcomes, as well as games or ludic activities (Weslake & Christian, 2015). They are considered as brain breaks focused on mental tasks. They allow students to improve their fine motor skills and refocus after a long period of concentration (Donner, 2017; Maskell et al., 2004;).

Brain breaks: Definition

The brain is the organ which directs the voluntary and involuntary movements of the human body, thinking and learning are also directed by it. This is why Caine and Caine (1991) focused on brain function and the process of learning, which they call brain-based learning. They have maintained that the brain has the ability to detect patterns, memorize, self-correct, learn from experience and create. Although it is thought that the brain is designed for continuous input, it can only take up to 45 minutes of information before it starts losing steam and it needs downtime for reflection, consolidation, and integration (Jensen, 2004). It is also demonstrated that brain breaks are an effective cognitive strategy to strengthen learning, improve memory and retrieval, and enhance learner motivation and morale. Thus, the more relaxed students are, the better they learn (Jensen, 2005).

Morton (2016) has stated that brain breaks are short periods of movement, two to three minutes of frequent movement through standing, stretching, or exercise; this increases engagement without spending too much valuable class time. Scientists have shown that the action of taking breaks shifts attention and rest from what the brain was previously focusing on (Jensen, 2008). This means doing something that truly takes students out of their academic realm and into places where they are in a more relaxed state.

Mori (2014) conceives of brain breaks as short and well-structured recesses during an intensive educational program. They may include movement, mindfulness exercises, or even sensory activities. They can be executed by individuals or groups. Mori also states that these activities provide students' brains the opportunity to shift concentration and get more energized and engaged to work and learn.

Enablers and cons of the application of brain breaks at higher level education

Brain breaks have been mostly applied in primary and secondary education levels, while there have been fewer cases reported and studied in the tertiary setting (Felez-Nobrega et al., 2018; Keating et al., 2022; Lynch, O'Donoghue, & Peiris, 2022; Paulus et al., 2021). The use of brain

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breaks in higher education has potential in cognitive conditions (Paulus et al., 2021), however results in this setting have mainly been addressed to acceptability and feasibility to acutely increase students' engagement, physical activity (Ferrer & Laughlin, 2017), concentration, alertness, enjoyment (Peiris et al., 2021), and well-being (Blasche et al., 2018). In this context, it would be transcendental if traditional methodologies or ESL courses at tertiary level could demonstrate the same outcomes as elementary schools have had through brain breaks' application. Students who have been struggling in an EFL class for years would experience an alternative method which allows them to break down their language obstacles. Some of these clashes have been under studies, Dos Santos et al. (2020) stablished that Ecuadorian high school students possess a lack of confidence that blocks them in an ESL class and claimed for the application of new and different methods to create an environment to develop students' well-being and motivate them to participate actively.

That is not so far from university, students have experienced stress figuring out how to approach effective productive skills outcomes, especially when they are under an intensive course program (Argudo, 2021; Hashemi, 2011). Despite many years of studying English, studies confirm that there are still tertiary level students with an unsatisfactory level in academic writing. (Argudo, et al., 2018; Argudo, 2021;). Therefore, including refocusing activities as brain breaks may enhance students' confidence and accuracy in productive skills outcomes.

Effects of brain breaks on students' outcomes and perceptions

Some teaching practices have demonstrated that students feel disappointed in themselves when they can't write or speak as they want (Cheng, 2002; Woodrow, 2011; Stuart, 2000), in addition, online translators are commonly overused in the EFL classroom (Bhooth, Azman, & Ismail, 2014; Chen & Deng, 2011; Ducar & Schocket, 2018; Samardali & Ismael, 2017). In this respect, studies also mention that clashes frequently affect students' learning potential and their attitudes toward English and toward learning in general (Fageeh, 2011; Jensen et al., 2013; Warner & Brown, 2005; Walker et al., 2004). Facing these issues, the need to innovate current practices brings up brain breaks in an educational context (Caine & Caine, 1991; Cloes & Cloes, 2016; Donner, 2013; White & Smith, 2020). Research has repeatedly shown that quieting the mind ignites the nervous system, reducing heart rate and blood pressure while enhancing coping strategies to retrieve information, engage with new concepts (Jensen, 2001; Rice, 2017) and handle everyday challenges (Godwin et al. 2016) which will help students boost their skills and provide them with opportunities to develop creativity (Dijksterhuis et al., 2006) and social skills, refresh their thinking and process new information (Donner, 2013; Popeska et al., 2018; Stevens-Smith, 2016; Stone, 2015).

Preliminary evidence suggests that brain breaks may be beneficial for university students to reduce sedentary behavior and increase physical activity, concentration, enjoyment, engagement (Blasche et al., 2018; Webster, et al., 2017) participation and attention as well as declines in restlessness, fatigue, boredom, and cell phone use (Keating et al., 2022; Paulus et al., 2021). However,

the feasibility of including them in a university lecture setting is yet to be quantitatively assessed (Keating et al., 2022; Paulus et al., 2021; Peiris et al., 2021).

In the lenses of Ferrer and Laughlin (2017) university students have the potential to enhance their cognitive functioning by having opportunities to move in the classroom. Thus, the brain is able to integrate more information more simply than it is consciously working through a problem (Dijksterhuis et al., 2006).

Many suggestions came across to help lecturers to consolidate new learning and then it can be recalled later (Jensen, 2005). Marzano (2012) suggests in his study that "movement in the classroom is a small, but potentially important, part of effective teaching", by including time for brain breaks in a lesson, learners can improve their attention level and learning.

Teachers' perceptions on brain breaks and class formats

Recent studies have investigated teachers' attitudes towards brain break applications as an educational strategy in the classroom. Although, the common scenario has been elementary schools, interventions among university students in a tertiary setting is limited (Felez-Nobrega et al., 2018; Keating et al., 2022; Lynch et al., 2022; Paulus et al., 2021). Studies have found that teachers and principals showed a positive attitude towards brain breaks (Donnelly, 2011; Infantes-Paniagua et al., 2021; James & McClure, 2020; Morgan & Hansen, 2008; Popeska et al., 2018; Van den Berg et al., 2017). They basically noticed that students released their energy and recovered attention after active breaks application. Resulting in students' time on-task increasing, as well as, in academic content reinforcement (Carlson et al., 2017; Dinkel et al., 2016; McMullen et al., 2014). With respect to the largest barriers, studies identified predominantly the following ones: lack of time, issues, behavior management, and lack of training or administrative support (Campbell & Lassiter, 2020; Dinkel et al., 2016; McMullen et al., 2014; Van den Berg et al., 2017; Webster et al., 2017). With regard to class formats, there are strong common aspects in terms of brain braks feasibility in the classroom. Studies agreed that brain breaks need to be of short duration, classroom-based, easy to manage and content- related (Campbell & Lassiter, 2020; Cline et al., 2021; Stylianou et al., 2016; Webster et al., 2017).

Objectives

This study posed the following aims: To evaluate the effect of brain breaks on university EFL students' productive skills; to evaluate the effect of brain breaks on productive skills outcomes among university EFL students' who participate in a class with this method and students who do not; and to recognize university ESL/EFL students' perspectives after being exposed to brain breaks.

2. Methodology

Design of the study

The current study followed a mixed-method research design with both quantitative and qualitative data to answer the research questions. The study involved two groups, a control group with no intervention and an experimental group for which brain breaks were introduced.

An embedded sequential mixed methods design was implemented to understand participants' perceptions within the context of an experimental intervention (Creswell, 2014). The study sample was n=50 young adult students (18-26 years of age) enrolled in an A2 ESL/EFL course at Universidad Católica de Cuenca, La Troncal campus. Quantitative data was collected for 8 weeks in both the experimental and control group through a pre-test and a post-test, while qualitative data was collected during the 8-week intervention through teacher journal observation (see Appendix A and B) (Cambridge English Teacher; Cambridge University Press; Cambridge ESOL, 2013), surveys and semi-structured student's interviews.

Participants

Participants were a convenience sample of higher-level students enrolled in an ESL program from the Universidad Católica de Cuenca, Campus La Troncal, aged 18-26 from A2 class during October – December 2022 (Table 1). A total of 50 students from two classes were analyzed. It was emphasized that students who were enthusiastic as well as those who were skeptical on "brain breaks application" were welcome to participate by signing a consent form. Students were divided randomly into different classes, so the intervention considered a control group (Class A n=25) and experimental group (class B n=25) from the same level. The experimental group was comprised of 18 females and 7 males, while control group consisted of 19 females and 6 males (Table 2).

Table 1. Participant demographic

	N=50 % (n)	
Gender	Male	26 (13)
	Female	74 (37)
Age	18-20	80 (40)
	21-24	8 (4)
	≥ 24	12 (6)

Table 2. Participant demographic per class

N=50 % (n)		
Class A (EXPERIMIENTAL GROUP)	Male	14 (7)
	Female	36 (18)
Class B (CONTROL GROUP)	Male	12 (6)
	Female	38 (19)

Instruments

- CEFR A2 testing system-based communicative writing tasks

This is a paragraph writing test based on some of the topics dealt with in A2 CEFR (CEPT exam). The test required two parts that consisted of writing two e-mails. It required approximately 35 words in length for each exercise. Inter-rater validity for the test was assessed by judging the writing items against the opinion of the researcher and another peer-professor. The analysis included a code for matching the pretest and posttest data: spelling (S), grammar (G), punctuation (P), and capital letters usage (L) errors; and content, organization and language (Cambridge Assessment English, 2019).

- Numbered questionnaire

To measure the effect of brain breaks on the attitudes of EFL students towards writing skill development, an attitudes scale was developed by the researcher to tap into the students' attitudes towards developing writing skills after a brain break based classroom. For the development of the questionnaire, a variety of sources for developing the attitudinal scale towards brain breaks application in a similar environment were reviewed (Graham, Berninger, and Fan, 2007; Storch, 2005; Yoon & Hirvela, 2004). Students' perceptions (Responses to the items were on a 4-point Likert scale ranging from 1 ("Strongly disagree"), 2 ("Disagree"), 3 ("Agree") to 4 ("Strongly agree").) Table 3 shows perceptions, which were divided into 6 variables: Planning stage, writing stage, content, organization, language (Cambridge Assessment English, 2019; Cambridge English Teacher; Cambridge University Press; Cambridge ESOL, 2013), motivation and emotional intelligence (See Appendix C). Internal consistency and reliability co-efficient were measured using Cronbach Alpha, bearing evidence to the questionnaire's reliability upon piloting ($\alpha = 0.895$).

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Table 3. Students' perceptions variables

Planning stage	Brain breaks help to understand, activate new ideas, review previous knowledge and vocabulary, rest, refresh memory and grammar–vocabulary identification.
Writing stage	After a brain break, the text is easy to write.
Content	After brain breaks students feel more confident on what they need to write. All content is relevant to the task. The target reader is fully informed.
Organization	All content is relevant to the task. Target reader is fully informed.
Language	After brain breaks students write a connected and coherent text, using basic linking words and a limited number of cohesive devices.
Motivation	The student is motivated to quality in their academic performance.
Emotional Intelligence	Brain breaks promote activities to socialize the student's achievements. Everyone is treated fairly and equity.

Source: Adapted from Cambridge English Teacher (2003).

- Brain breaks-based lesson plans to develop a particular skill, which included 3–5 minutes of brain breaks during the intervention.

- Teacher's journal

This observation tool aimed to detect brain breaks impact on students' writing stages, motivation, and emotional intelligence. The purpose of the report was to collect students' records from the researcher point of view (See Table 4).

Table 4. Teacher Observation report

	Observation criteria	No	Not really	Sort of	Yes	(n)
Writing Task	Did they have lots of ideas?					
	Did they have the language needed?					
	Did they complete the first draft in time?					
	Are they happy with their first draft?					
What further help do they need?	Grammar					
	Vocabulary					
	Ideas					
	Model of text type					

Procedure

Prior to starting the research, a script was read to the participants outlining their role in the study. Consent forms approved by the Universidad Católica de Cuenca, La Troncal Campus, were signed and collected from students enrolled in an ESL A2 classroom preceding implementation of brain breaks and data collection. Afterwards, participants in the experimental and control groups were instructed on the application of brain breaks. Then, a CEFR A2 test was administered to participants. The test comprised writing skills to set the baseline before the experiment, and the same examination took place after the intervention.

Student's writing accuracy after the implementation of brain breaks was evaluated through an analysis of variance (ANOVA) of their scores. Second, a self-report survey, which combined both quantitative and qualitative items, was adapted and developed based on the work of Dörney and Csizér (2012) for designing and analyzing surveys in second language acquisition research.

The implementation was realized in three phases: The first phase considered the preparation and familiarization of brain breaks with students.

The second stage corresponded to the application of brain breaks in situ. Table 5 outlines the frequency of the implementation of brain breaks under teacher's observation. Once per week, students had six hours, 3 hours' classes back-to-back on the same day from 7 to 10 in the morning. Students in Class A (Experimental) completed every session with brain breaks, and students in Class B (Control) one traditional desk-based class without movement breaks for over an 8-week period. Classroom brain breaks were 3-5 minutes long and consisted of partial-body movements (Sladkey, 2013; Sladkey 2014). A journal was used by the researcher to record observations on students' performance.

Table 5. Schedule of the implementation of brain breaks.

| Period	Time	Class A	Class B
October 28th, 2022 December 17th, 2023	7h00 – 10h00	Tuesday Thursday	Wednesday Friday

The researcher aimed to complete three brain breaks inside the classroom before a learning outcome activity. Classroom brain breaks were incorporated after approximately 45 min of sedentary classroom time in one three-hour class per study day so that a total of 15 min of brain break was incorporated into the three-hour class (Table 6 & Figure 1).

Three-hour classes with no scheduled brain breaks were used as a comparison. Attempts were made to tailor the class structure to fit the breaks by modifying learning activities to be completed whilst partially moving and by having changes in topic planned for movement break times. Movement breaks conducted in the classroom were led by the researcher. Participation in each movement break was voluntary and all students were invited to participate. Finally, the third stage included gathering data on the students' perceptions through a questionnaire, which was previously assessed by a group of ten people (students and colleagues) prior to its application. The final version of the questionnaire was tested with the participants. The numeric results were analyzed through the SPSS Version 23 program.

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Table 6. 3-5 minutes' brain breaks options.

1	Pen flipping
2	Aerobic finger patterns
3	Finger aerobics ripple
4	Ear and noise switch
5	Different direction circle thumbs
6	Figure eights
7	Choir director
8	Pretzel outline index
9	Blink brain break
10	Palm tapping

Figure 1. Example lesson plan schedule.
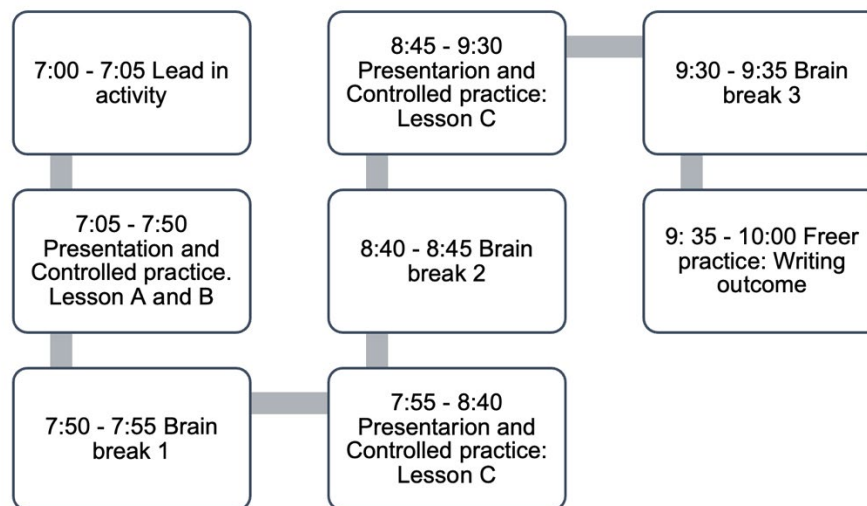
3. Results

Pre- and post-testing

Twenty-five students were assigned to the experimental group, and twenty-five more were included in the control group, with the latter receiving traditional ESL desk-based instruction. The students assigned to the experimental group were involved in an active methodology in dealing with the A2 course syllabus and participating in brain breaks before a writing task. All participants in the experimental and control groups were checked through the use of a pre-test for their proficiency in writing, which was administered to the students at the beginning of the term. The purpose of pretesting students on writing was to establish both groups' equivalence on writing proficiency before the initiation of the experiment, and later to use the pretesting information for later comparisons with the posttest. Table 7 presents a summary of the results of the paired samples t-test comparing performances of both groups on the pretest:

Table 7. Paired samples t-test at the start of the intervention

Group	Mean	SD	t-value	Sig.
Experimental	9.360	1.766352	.086957	.9314275195
Control	9.312	1.9062		

The p-value was used to measure the significance of the observational data. They were found using Excel spreadsheets p-value tables. These data were calculated from the deviation between the observed experimental value and a control value as reference. Analysis of pretesting data confirm that both groups achieved similar results on writing proficiency as there were no statistically significant differences between both groups. The means and the standard deviations of the experimental and control groups were 9.36, 1.76 and 9.31, 1.90 respectively and the t-value was .086957 significant at p ≤ .9314. This indicates that the students were comparatively same level in writing skills at the start of the study.

On the other hand, analysis of post-testing indicated a slight statistically significant difference between both scores' groups. The means and the standard deviations of the experimental group were 12.7944 and 1.803969, while the control group had a mean score of 11.832 and a standard deviation of 1.717003. The t-value was 1.843521, significant at 0.07763633 (Table 8). As part of the post-assessment, the researcher also tracked the quantity of words and considered the quality of writing and effort and assigned grades accordingly.

Table 8. Paired samples t-test after the implementation of brain breaks

Group	Mean	SD	t-value	Sig.
Experimental	12.7944	1.803969	1.843521	0.07763633
Control	11.832	1.717003		

As seen in Table 8, the comparison of the post-test scores of the experimental and control groups yielded no significant difference in the achievement test (t=1.808; p>.007). The results of post-test yielded a minor difference in favor of the experimental group, considering the post-achievement test scores of the students in the experimental and control groups (t=1.84; p<.01). Both scores were close, however the experimental group had higher post-test mean scores (Mean experimental=12.79) compared to the control group (Mean control=11.83). Thus, the application of brain breaks was positive in enhancing students' writing skills.

Teacher observation

During the period of study, six clearly staged writing tasks were defined by the researcher and a peer-teacher following the A2 course syllabus program to support learners' understanding of texts. Tasks included personal profiles, forms, informal email invitations, procedure blog posts, descriptive paragraphs and timeline stories. Before setting the activity, a brain break was applied

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to analyze its impact on students' writing performance. The researcher registered and compared students' outcomes in an observation report, which took into account: planning stage, writing process, and further feedback. At the start of the intervention the teacher observations show that groups were equivalent on writing as seen in Figures 2 and 3.

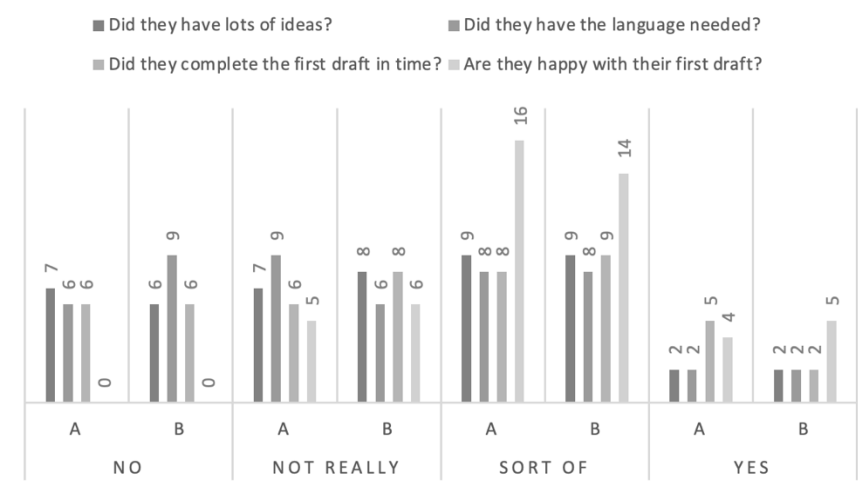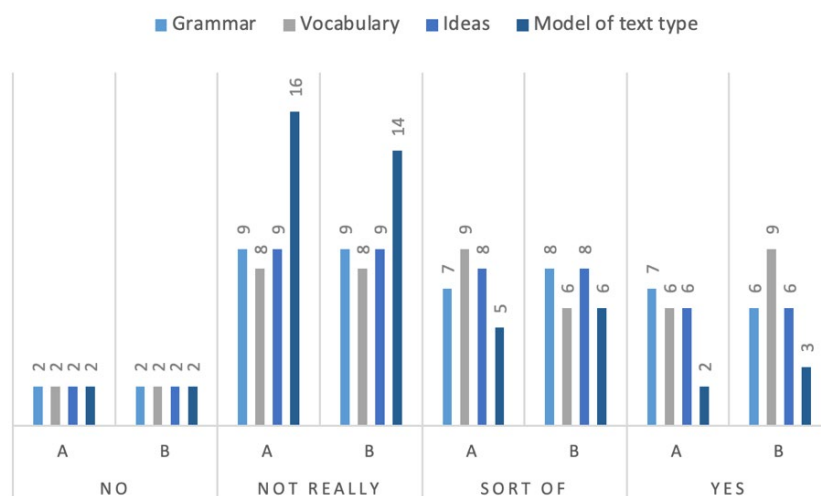Figure 2. Teacher observation at the start of the intervention: Writing and planning process

Figure 3. Teacher observation at the start of intervention: Further feedback

By completing the tasks, students also recycled and consolidated the core language from prior lessons. The students' writing outcomes were analyzed by the researcher and discussed in class for fostering collaborative peer work, after which the texts were evaluated, and subsequently, revised. a difference was established in comparison with the control group (see Tables 9 and 10).

Table 9. Experimental group (Teacher Observation Means)

	Learners' outcomes with brain breaks intervention	No	Not really	Sort of	Yes	(n)
Writing Task	Did they have lots of ideas?	3	3	13	6	25
	Did they have the language needed?	2	2	16	5	25
	Did they complete the first draft in time?	0	3	2	20	25
	Are they happy with their first draft?	0	0	10	15	25
What further help do they need?	Grammar	13	7	3	2	25
	Vocabulary	15	6	2	2	25
	Ideas	13	8	3	1	25
	Model of text type	18	6	0	1	25

Table 10. Control group (Teacher Observation Means).

	Learners' outcomes with no brain breaks intervention	No	Not really	Sort of	Yes	(n)
Writing Task	Did they have lots of ideas?	4	4	13	4	25
	Did they have the language needed?	4	4	14	3	25
	Did they complete the first draft in time?	0	3	7	15	25
	Are they happy with their first draft?	0	2	8	15	25
What further help do they need?	Grammar	12	7	3	3	25
	Vocabulary	13	6	3	3	25
	Ideas	12	7	3	3	25
	Model of text type	15	5	3	2	25

Table 11 shows the data variation, which corresponds to the differences between experimental and control group during the observation process.

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Table 11. Differences among Experimental and Control group (Teacher Observation end of intervention)

		No		σ	Not really		σ	Sort of		σ	Yes		σ	n	
		E	C		E	C		E	C		E	C		E	C
Writing Task	Did they have lots of ideas?	3	4	0.5	3	4	0.5	13	13	0	6	4	2	25	25
	Did they have the language needed?	2	4	2	2	4	2	16	14	2	5	3	2	25	25
	Did they complete the first draft in time?	0	0	0	3	3	0	2	7	12.5	20	15	12.5	25	25
	Are they happy with their first draft?	0	0	0	0	2	2	10	8	2	15	15	0	25	25

		No		σ	Not really		σ	Sort of		σ	Yes		σ	n	
		E	C		E	C		E	C		E	C		E	C
What further help do they need?	Grammar	13	12	0.5	7	7	0	3	3	0	2	3	0.5	25	25
	Vocabulary	15	13	2	6	6	0	2	3	0.5	2	3	0.5	25	25
	Ideas	13	12	0.5	8	7	0.5	3	3	0	1	3	2	25	25
	Model of text type	18	15	4.5	6	5	0.5	0	3	4.5	1	2	0.5	25	25
	S.D.			1.53			0.84			4.25			4.12	50	

From the observation analysis in writing tasks and the need for further help, Table 11 shows an average of ±2 students as the difference between experimental and control group. The experimental group had +2 students with better skills and -2 students who needed further help based on the observations.

Students perceptions

Overall, all students thought brain breaks were important for them as a scaffolding technique in writing process (93.3%). The majority of students felt more comfortable planning and brainstorming after a brain break (P1-P6). However, a difference was noted in the writing stage. When asked about their perceptions on the effectiveness of brain breaks, respondents indicated varying levels of agreement (P7-P24). A similar pattern could be seen when students self-assessed their writing outcomes: content, organization, and language. Regarding motivational and emotional intelligence components, 93.3% of students expressed that brain breaks fostered their achievement recognition, quality in their academic performance (P25-P28) and fair and equal treatment during the intervention (P29-30) (See Appendix C). Figure 4 presents a graphical representation of the percentage of agreement with questionnaire statements for all participants.

Figure 4. Students' percentage of agreement with the effectiveness of brain breaks
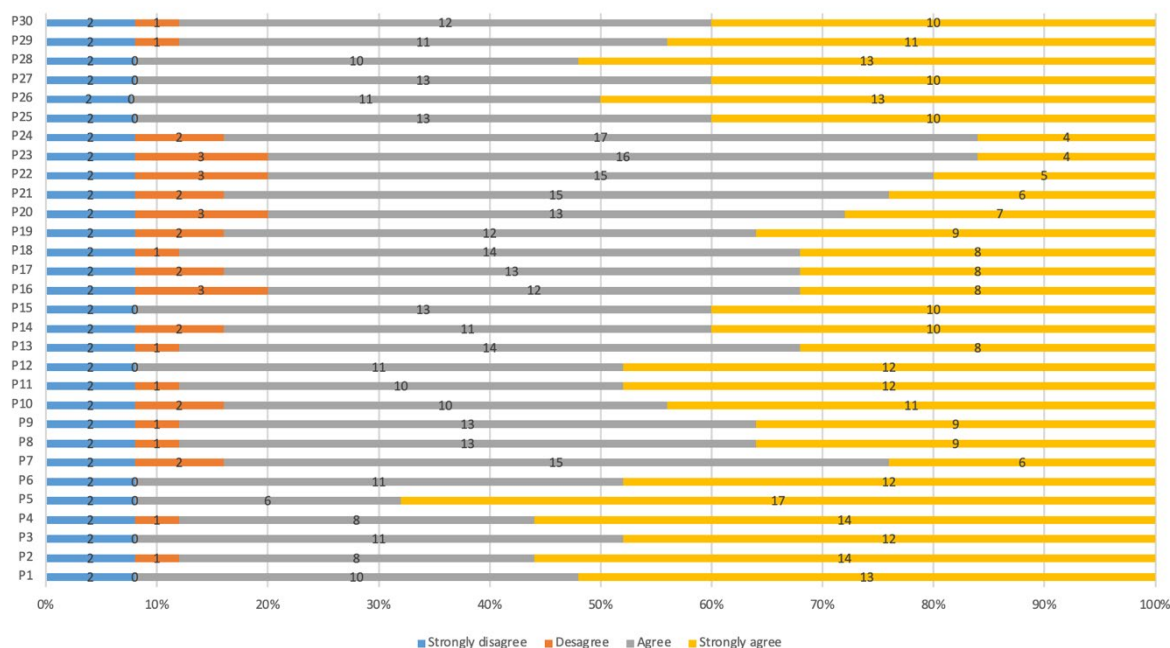
4. Discussion

Initiated by the idea that university students need regular downtime throughout an intensive study program in the form of brain breaks to support their concentration as well as their cognitive abilities, this study examined the impact of the application of brain breaks on and EFL tertiary-level class and their impact on students' writing skills. Consistent with Bruner's (1990), Vygostsky's (1978) theories, this study also highlights the importance of socio-cultural relationships and emotions in the education field, particularly in how students' brains respond differently when they develop in a more dynamic environment (Immordino-Yang, Darling-Hammond, & Krone, 2019).

With these results in mind, the research questions can be answered as follows: What effect do brain breaks have on university ESL/EFL students' writing productive skills?

Analysis of post-testing shows that brain breaks caused a positive impact on learners' writing outcomes. When students were doing collaborative and independent writing tasks, brain breaks allowed them to feel calmed and refocused after 45 minutes of desk-based classes in accordance with what was investigated by Gay (2009) and Dennison and Dennison (1997). Although the reported significance is minor, it indicates that brain breaks have potential in cognitive conditions at the tertiary level.

The results from teacher observation showed that brain breaks increased retention and understanding of writing structures in the experimental group. Students recalled prior knowledge and new vocabulary after a brain break, which confirms what was studied by Carlson, et al. (2017);

Dinkel, Lee, and Schaffer (2016); Donner (2017); Jensen (2008, 2005); Maskell et. al (2004); McMullen, Kulinna, and Cothran (2014); Swan (2019); and Westlake and Christian (2015).

To what extent can brain breaks affect university ESL/EFL students' writing skills in comparison to university students who do not participate in a class with brain breaks?

The teacher observation report highlights four students from the experimental group with a better writing performance than the control group. These students had more ideas, and language needed, and they were more confident with their tasks. On the other hand, students in control group developed the same written activities, but they seemed less engaged than the students in the Experimental group. The results indicate a slight variation in their outcomes scores, which can be explained by the fact that brain breaks were randomly chosen from similar contexts and were not content-related. It is suggested that class-personalized breaks were developed in regard to the cognition variable and the established students' learning outcomes, which implies a complete design from zero.

What are the perspectives of university students who participate in a class with brain breaks?

At the end of the intervention, both students and researcher realized that brain breaks before a writing task activate students' motivation and makes them more alert to be able to shift concentration and become more energized and engaged to write and learn. These results are consistent with other studies (Infantes-Paniagua et al. 2021; James and McClure; 2020; Popeska et al., 2018; Van den Berg et al. 2017).

One negative side of applying brain breaks in an EFL class at the university level is the lack of time, which has also been found by other authors as one of the largest barriers (Campbell and Lassiter, 2020; Dinkel et al., 2016; McMullen et al., 2014; Van den Berg et al. 2017; Webster, et al. 2017). Brain breaks can last more than 5 minutes, and students want to continue in the break. As a result, it causes difficulties in lesson time management. In contrast with research on children and adolescents (Campbell & Lassiter, 2020; McMullen et al., 2014) chaos inside the classroom does not happen with adult learners. This is inferred because age is a behavior correlated factor and the current range of age of the participants in the study is 18-24. On the other hand, disagreeing with Webster, et al. (2007), it was observed that the majority of students have positive attitudes toward brain breaks, this means, just two students were not too interested in participating. They saw brain breaks as just a mere class requirement. The use of brain breaks in the university classroom has potential, as long as they are of short duration, conducted indoors, are content-related, and easy to manage (Cline et al., 2021; Campbell & Lassiter, 2020; Stylianou et al., 2016; Webster et al., 2017).

Generally, the data gathered from students are rich and captures their experience, because the majority provided important information related to brain breaks' feasibility and their positive impact on writing outcomes. There is a scarce number of studies that have objectively measured the effect of brain breaks on EFL students' writing skills at the tertiary level. Therefore, this study may serve as a baseline for future experimental research to better explore the characteristics of

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brain breaks to improve academic achievement at university and to corroborate these findings. The results attained that brain breaks work as a cognitive strategy for the sake of pedagogical strengthening in any of the social branches at adult age, in congruence with what Jensen calls brain-based learning (2001, 2004, 2005, 2008) getting brain breaks as friendly techniques that link movement with student achievement.

4. Conclusion

The results of this study confirm the positive effects of the application of brain breaks every 45 minutes during an EFL 3-hour session twice a week related to progress in writing achievement. Frequent use of brain breaks demonstrated positive changes at the tertiary level. Given that university students spend the majority of their time in prolonged sitting sessions, these data suggest that brain breaks may optimize cognitive operations associated with EFL receptive and productive skills performance. In this regard, this technique is recommended at the university setting, not just as a tool for motivation, but also a significant cognition educational tool.

The primary limitation of this study is the small sample size with representation from only one university. Thus, caution should be employed when applying these findings to their own unique tertiary setting. Given the limited number of studies on the impact of brain breaks on young adult students at a higher education level, implementing new studies can be challenging due to the possibility of the unknown.

Another limitation of the study was that the CEPT does not include a component to measure written production (Vega & Moscoso, 2019). While every effort was taken to ensure student performance was assessed subjectively by engaging a peer-teacher and standardized rubrics there is always the possibility of subjectiveness given the content. Despite these limitations, this study provides a real-life picture of some of the benefits surrounding the adoption of brain breaks at the university level. Future research examining the effects of brain breaks at tertiary instruction is warranted.

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STATEMENT

APPENDIX A

Cambridge English
Teacher

After the lesson

1 Read your learners' reflections.
2 Tick the boxes to record your observations for two learners.

Learner 1

	No	Not really	Sort of	Yes
Did they have lots of ideas?				
Did they have the language needed?				
Did they complete the first draft in time?				
Are they happy with their first draft?				
	Grammar	**Vocabulary**	**Ideas**	**Model of text type**
What further help do they need?				

Learner 2

	No	Not really	Sort of	Yes
Did they have lots of ideas?				
Did they have the language needed?				
Did they complete the first draft in time?				
Are they happy with their first draft?				
	Grammar	**Vocabulary**	**Ideas**	**Model of text type**
What further help do they need?				

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APPENDIX B

Assessment of Writing scale

Band	Content	Organisation	Language
5	All content is relevant to the task. Target reader is fully informed.	Text is connected and coherent, using basic linking words and a limited number of cohesive devices.	Uses everyday vocabulary generally appropriately, while occasionally overusing certain lexis. Uses simple grammatical forms with a good degree of control. While errors are noticeable, meaning can still be determined.
4	*Performance shares features of Bands 3 and 5.*		
3	Minor irrelevances and/or omissions may be present. Target reader is on the whole informed.	Text is connected using basic, high-frequency linking words.	Uses basic vocabulary reasonably appropriately. Uses simple grammatical forms with some degree of control. Errors may impede meaning at times.
2	*Performance shares features of Bands 1 and 3.*		
1	Irrelevances and misinterpretation of task may be present. Target reader is minimally informed.	Production unlikely to be connected, though punctuation and simple connectors (i.e. 'and') may on occasion be used.	Produces basic vocabulary of isolated words and phrases. Produces few simple grammatical forms with only limited control.
0	Content is totally irrelevant. Target reader is not informed.	*Performance below Band 1.*	

(Cambridge Assessment English, 2019)

APPENDIX C

Universidad Católica de Cuenca - Unidad Académica de Posgrados				
Estimado usuario, respetuosamente solicito su valiosa colaboración, para obtener sus opiniones mediante este cuestionario, cuya finalidad es recabar información para la tesis de Maestría **"Maestría en Enseñanza de Inglés como lengua extranjera"**. El objetivo de la investigación es explicar la **"Impacto de aplicación de *brain breaks* en el resultado de aprendizaje: escritura, en los estudiantes de nivel A2 de la Universidad Católica de Cuenca, Campus La Troncal".**				
A continuación, entregamos un cuestionario en el que encontrará las preguntas que deberá responder con una escala del 1 al 4, solo se requiere su opinión que será garantizada por una estricta confidencialidad y utilizada únicamente con fines académicos.				
INSTRUCCIONES PARA EL ENCUESTADO: a. Lea los enunciados atentamente y revise las posibles opciones de respuesta. b. Seleccione la opción correspondiente a su opinión. c. Cada pregunta debe tener una única respuesta. d. La escala de medición con respecto al enunciado del ítem tiene las siguientes opciones: FD (1) = Totalmente en desacuerdo ED (2) = En desacuerdo DA (3) = De acuerdo FA (4) = Totalmente de acuerdo				

No.	ITEMS	1	2	3	4
	PLANNING STAGE / Aplicación de brain breaks en la etapa de planificación de escritura				
1	Brain breaks help to understand what I should write. (La aplicación de brain breaks ayuda a enteder lo que debo escribir).				
2	Brain breaks activate new ideas to plan what is going to be written. (Los brain breaks activan nuevas ideas para planificar lo que se va a escribir).				
3	Brain breaks that include games allow you to review previous knowledge and vocabulary. (Los brain breaks que incluyen juegos permiten revisar conocimiento y vocabulario previo).				
4	When the teacher applies a brain break, I rest, and then I reconnect with the activity in a short time. (Cuando el docente aplica un brain break, descanso y luego me reconecto con la actividad en poco tiempo).				
5	The rest or brain break allows you to refresh your memory and encourages you to resume activities with pleasure. (El descanso o brain break permite refrescar la memoria, y anima a retomar las actividades con agrado).				
6	After a brain break, it was possible to identify the grammar and vocabulary that I need to apply. (Después de un brain break, se pudo identificar la gramática y vocabulario que necesito aplicar).				
	WRITING STAGE / Aplicación de brain breaks en la etapa de escritura				
7	After a brain break, the first draft is easy to write. (Después de un brain break, el primer borrador es sencillo de escribir).				
8	I understand the components to cover, even if I need to improve them later. (Entiendo los componentes a cubrir, aunque deba mejorarlos luego).				
9	I feel happy when I write my first draft, after a brain break. (Me siento feliz cuando escribo mi primer borrador, después de un brain break).				
10	By rereading my homework, I identify spelling errors and punctuation. (Al releer mi tarea, identifico errores de escritura, y puntuación).				
11	I complete the activity in the time established by the teacher. (Cumplo con la actividad en el tiempo establecido por el docente).				
12	Feedback from the teacher or classmates is essential for editing my homework. (La retroalimentación del docente o compañeros, es primordial para la edición de mi tarea).				
	CONTENT/ RESULTS				
13	I can write about everyday aspects of his environment e.g., people, places, a job or study experience in linked sentences. (Puedo escribir sobre aspectos cotidianos, ejemplo: personas, lugares, trabajo, estudio, experiencias en oraciones).				
14	I Can write very short, basic descriptions of events, past activities and personal experiences. (Puedo escribir cortas y básicas descripciones de eventos de vida en pasado, actividades del pasado y experiencias persoanles).				
15	I can write a series of simple phrases and sentences about their family, living conditions and their educational background. (Puedo escribir una serie de simples frases y oraciones sobre la familia, condiciones de vida y su antecedente estudiantil).				

16	I have a range of basic language, which enables them to deal with everyday situations with predictable content. (Tengo un amplio de rango de lenguaje básico, lo que me permite lidiar con situaciones cotidianas de contenido predecible)				
17	I can produce brief everyday expressions in order to satisfy simple needs of a concrete type: personal details, daily routines, wants and needs, requests for information. (Puedo producir expresiones breves cotidianas para satisfacer necesidades básicas de tipo concreto: detalles personales, rutinas diarias, lo que quiero y necesito, pedir información).				
18	I can use basic sentence patterns and communicate with memorized phrases, groups of a few words and formulate about myself and other people, what they do, places, possessions etc. (Puedo usar patrones básicos en oraciones y comunicarme con frases memorizadas, grupos de palabras y formular información sobre mí mismo, otras personas, lo que hacen, lugares, y lo que poseen)				
ORGANIZATION					
19	I can write paragraphs as dictated by the level and genre required. (Puedo escribir párrafos como indica el nivel y el tipo requerido)				
20	I can organize my ideas and structure logical paragraphs. (Puedo organizar mis ideas y estructurar párrafos de manera lógica y secuencial).				
LANGUAGE					
21	I can write vocabulary words accurately. (Puedo escribir vocabulario de manera correcta).				
22	I can write correctly words withouth mistakes - Spelling (Puedo escribir correctamente las palabras, sin errores)				
23	I can use grammatical structures and lexical chunks with any problem - Grammar (Puedo escribir estructuras gramaticales y fragmentos lexicales sin inconveniente).				
24	I can structure sentences accurately. (Puedo estructurar las categorias gramaticales en una oración).				
MOTIVATION					
25	Student achievement is recognized. (Se reconocen los logros del estudiante).				
26	The class promotes and values personal development. (La clase promueve y valora el desarrollo personal).				
27	Student engagement with the module objectives is encouraged. (Se fomenta el compromiso del estudiante con los objetivos del módulo).				
28	The student is motivated to quality in their academic performance. (Se motiva al estudiante a la calidad en su desempeño académico).				
EMOTIONAL INTELLIGENCE					
29	During the application of brain breaks: Everyone is treated fairly and equity. (Durante la aplicación de brain breaks: Todos son tratados con justicia y equidad).				
30	Brain breaks promote activities to socialize the student's achievements. (Los brain breaks promueven actividades para socializar los logros del estudiante).				
THANK YOU FOR YOUR TIME AND COOPERATION / GRACIAS POR SU TIEMPO Y COLABORACIÓN					

(Cambridge Assessment English, 2019; Cambridge English Teacher; Cambridge University Press; Cambridge ESOL, 2013)