Methodology to evaluate the levels of attention and meditation in the development of virtual classes through BCI devices

Wilver Auccahuasi[a], Christian Ovalle[b], Zoila Ayvar[c], Justiniano Aybar[d], Rubén Quispe[e], Denny Lovera[f], Angel Tongo[g], Luis Romero[h], Monica Diaz[i] and Iván Perez[j]

[abcdefghij] *Universidad Continental, Huancayo, Perú*

Abstract

The purpose of this work is to be able to identify the levels of attention and meditation at the time the virtual classes are held, as a result of the COVID-19 pandemic; the conventional way of studying change considerably, and to a greater extent the physical place where the classes are held. Faced with this situation, children tend to be distracted by many distracting agents such as television. The proposed methodology allows evaluating the levels of attention and meditation in children when they are in their virtual classes, it is evaluated using a device for measuring brain signals better known as the brain-computer interface, which provides us with a level of attention and of meditation from 0 to 100%. The results that are presented are related to average values of the measurements made, to demonstrate the methodology was evaluated by two situations, the first is the measurement of a 6-year-old child and the second that of a 15-year-old, each of them With totally different situations in the realization of virtual classes, the measurements show that the 6-year-old child tends more to be distracted with values of 20% of attention and meditation when he is preparing for the class, achieving levels of attention of 72% When they are concentrated on the completion of the tasks, the results in the 15-year-old student show that they are less likely to be distracted, registering levels of attention of 30% when they are entering their classes and reaching high levels of attention above from 90% to 100% when they are solving math problems, the study concludes that students, depending on their age, pay different attention to virtual classes, recommending eliminating distraction agents to improve the attention of students when they are in virtual classes.

Keywords 1

Attention, meditation, registration, online class, students, class activities.

1. Introduction

The pandemic product of COVID-19 has changed the way we carry out most of the activities, the educational issue is not the exception and to a greater extent, it is the activity where the greatest changes are taking place and we are learning to be able to adapt our activities to be able to carry out educational activities in the best way possible. In a normal situation, in the process of choosing schools, parents make the decision in their facilities that is where their children will receive their classes. In this new normal, students have to adapt to a home environment to be able to receive their classes, with which, depending on the place chosen, distracting agents begin to appear, such as radio, television, toys among others. With all these new ways of developing online classes, papers are presented where different factors are studied in order to solve the problem as well as the consequences of these classes.

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EMAIL: wauccahuasi@continental.edu.pe (Wilver Auccahuasi)
ORCID: 0000-0001-8820-4013 (Wilver Auccahuasi)

The topic of studying how students concentrate at the time of playing video games in order to recommend certain aspects that are developed in video games and can be applied in classes, as a mechanism to improve attention levels. The use of devices related to measuring brain activity, such as the known BCI, are being used very frequently in different activities such as health to know the degree of concentration when physical therapy exercises are being performed [1][2][3].

We are not adapting in all aspects and children with disabilities are not alien to their therapies, so in this context many applications have been developed to continue with the therapies of these children [4]. In the use of BCIs, they are also being used in the treatment of dependencies in games, managing to measure certain reactions when conventional games are being performed with the games that are being affected by children [5]. The BCIs are being used in multiple applications such as in the case of knowing the way in which educational and learning processes are carried out, in multiple applications where inter-preter is involved as the brain works in each of the processes [6]. Not only the BCIs are dedicated to evaluating the processes, but also from the analysis of the EEG signals analyzing the Alga, beta and Gamma signals mainly in each of the educational processes, with the intention of analyzing the type of signal that what is commonly called neurolearning are presented [7][10].

On the subject of the use of BCIs, the works are not only focused on being able to analyze the signals, but also on being able to learn how these interfaces are used in the different uses and applications to optimize and improve their results [8]. The CO-VID-19 caused the change in the behavior of many students, in the development of online classes, with which papers are presented where these changes and the relationship that exist with parents are presented, because normally the Parents are monitoring the development of classes and are perceiving these changes in students [11][12]. Information and communication technologies are causing many changes in the way of learning, including the use of Augmented Reality as an educational agent and BCI as an element for measuring educational processes [13] [14]. Mental images are being used to test the use and applications of BCI in the framework of being able to understand the behavior of neurons [15] [16] [17].

Remote teaching is gaining importance in the continuity of education, at all levels educational institutions are adapting with the help of technology in order to continue providing their services [16][18][20][21]. We can indicate that BCIs are being used as a computer element in the evaluation of educational applications with the intention of measuring how the brain performs learning functions [19]. Higher studies are not alien to this reality, so it is necessary to evaluate in courses, where laboratory practices were normally carried out and now they are carried out online as are those dedicated to health [22].

Finally one of the consequences that are causing him are at home most of the day, as well as the realization of classes, they are affecting the mental health of people and with greater emphasis on children, he is unable to leave causes stress in children complicating their mental health [23]. In the present work we describe a methodology to be able to evaluate the level of attention and meditation in children in the realization of diverse activities that correspond to the realization of the virtual classes.

2. Materials and Methods

In the development of the methodology, it is proposed to measure and explain the levels of attention and meditation of the students in the realization of the classes in lines, we can understand how attention, the mechanism by which the brain is attentive to the actions that the individual performs, paying the greatest possible concentration to the action he is performing, to understand meditation, we can indicate that it is the mechanism by which the brain is relaxed without demanding much, sometimes when it is resting or not paying much attention high levels of meditation are present.

In figure 1 a block diagram of the methodology that is proposed is presented with the intention of being able to analyze each of the processes that was used for the development of the research and achieve the results, then each of them is described the processes:

Figure 1: Block diagram of the proposed methodology.

2.1. BCI equipment configuration

The equipment that is required to be able to evaluate the levels of attention and meditation, is characterized by being easy to use and apply, which is why the chosen one is the BCI of the Minwave brand, which is configured as a headband that is placed on the student's head, has an active sensor that must be placed on the forehead, port to the subject is easy to use and does not require another additional device.

Figure 2: BCI device used to demonstrate the methodology.

One of the characteristics that the BCI device has, is the wireless connection, which is not necessary to condition any cable, the transmission of the signal is carried out via the Bluetooth communication protocol, in figure 3, the connection form of the device in its three different states, disconnected, searching and connected, as well as the way to place the positive god on people.

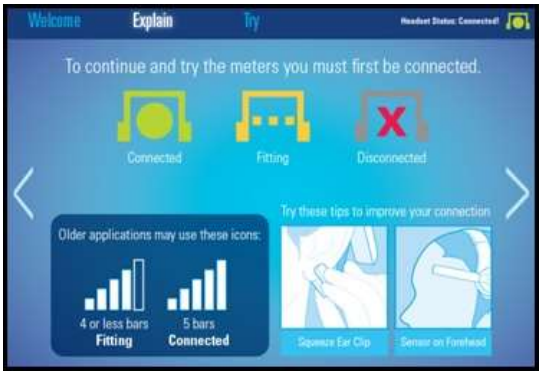

Figure 3: Wireless connection of the BCI device.

The final configuration is the placement of the device on the student's head, it must be borne in mind that the device must be connected to the computer and that the sensor is just placed on the student's forehead, Figure 4 shows the placement of the device, ready for evaluation.

Figure 4: Device placement ready for evaluation.

2.2. Record of concentration and meditation levels

The following procedure in the block diagram of the methodology is the presentation of the levels of attention and meditation provided by the application of the device, in it we can describe the levels from 0% to 100%, the application takes care of analyze the signals of the brain and present us with these values that correspond to each of the activities that is carried out when the device is being used, in the demonstration of the methodology it is considered several moments in which the student is developing activities that correspond to virtual classes.

Figure 5: Sample of the levels of attention and meditation presented by the application of the device

2.3. Analysis and evaluation of the results

The analysis and evaluation of the results of the measurements of the levels of care and measurement, will be developed by explaining the scenario where the measurement was carried out and the factors that have influenced the measured value, between the scenario we can identify the place where the measurement was carried out. I carry out the measurement, such as the living room of the house, the room or an office, as distracting agents we can mention if the television was on, a radio or other electronic object that causes distraction of the student.

3. Results

The results that are presented in the realization of the measurements are presented in two cases, the first corresponds to a 6-year-old child where different moments in the realization of the online classes are evaluated. The second case is the evaluation of a 15-year-old student, where the measurements are also presented at different times when the online classes are being carried out, in both cases the place

of the classes as the distraction agents are the same, because both students are in the same physical place, which is the living room of the house.

3.1. First case: 6-year-old student

In this first case, the student is in the living room of the house and is getting ready to enter his online class, he has the device installed in his head and connected to the computer ready to record the levels of attention and meditation.

Figure 6: The student is in the process of entering the online clase.

In figure 7, the results of the measurements of the levels of attention and meditation are presented when the student is getting ready to enter the online classes, it can be seen that the level of attention is on average 10%, which indicates Because the student is distracted, the level of meditation is 40%, which indicates that he pays little attention to the process of starting classes. We can indicate that the environment where the measurement is carried out is the living room, the television is turned off and the only distracting agent is the 15-year-old student who is located at the same table, with which this scene is very common in houses where there are more than two students taking classes online.

Figure 7: Measurements when the student is in the process of entering the online classes

A second moment in the development of the online classes, the student has to solve an exercise and send the activity, it is at this moment that the student is at the maximum point of concentration, so that he can perform the activity well and that you can send it, in image 8, you can see how the child is attentive to the activity he is doing.

Figure 8: The student is doing the class activities online.

Figure 9 shows the measurements at the time the student performs online activities, it can be seen that the level of attention increases considerably, reaching 72% as a result of the student doing the activities that are considered mandatory, the Meditation level is considered an average of 50% this value is important because because the student is attentive to the activity he is doing, he is a little distracted, which means that his attention does not present 100%.

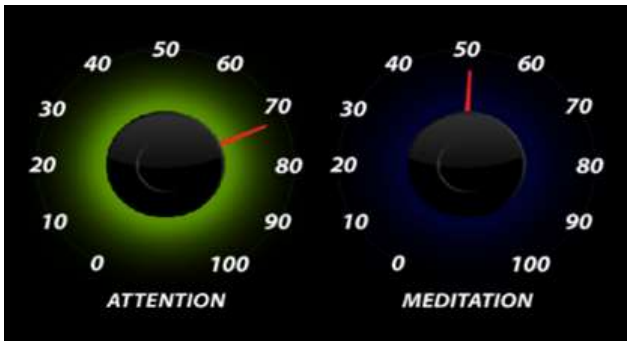

Figure 9: Measurements of the levels of attention and meditation in the process of carrying out online activities

3.2. Second case: 15-year-old student

In this second case, the evaluations will be carried out on the 15-year-old student, the measurement conditions indicate that they are in the same environment of the first case, at the same study table, located in the living room of the house, affected by the same agents distractors.

In a first measurement, the measurement is carried out when the student is browsing the internet in search of the link of his class on lines, the attention values are at 0% because he does not pay much attention to the activity that he is doing because it is from daily retina, and otherwise it presents a level of almost 100% in the level of meditation, product that is calm without any worry or stress, as can be presented in figure 10.

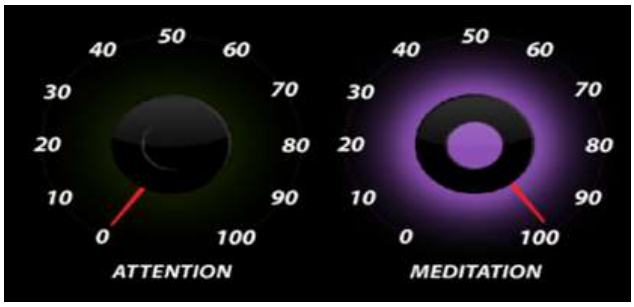

Figure 10: Measurements when the 15-year-old student is looking for the link to his class online.

A next moment of the measurement in the 15-year-old student, is the process of entering his virtual class, we can observe that the level of attention begins to present an increase close to 30% because the student is paying attention to his Online class, consequently the value of the meditation begins to fall to 80% due to the action of the concern of in their online class, as can be seen in figure 11.

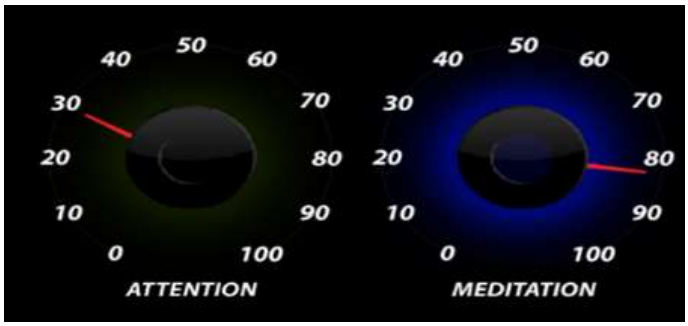

Figure 11: Measurements when the 15-year-old student enters his online class.

A third moment is the one in which the student is in his math class, where he presents levels on average of 60%, where the student is attentive to the teacher's instructions, the value of meditation begins to decline by 40% product of concern for the theme of the class, as can be seen in figure 12.

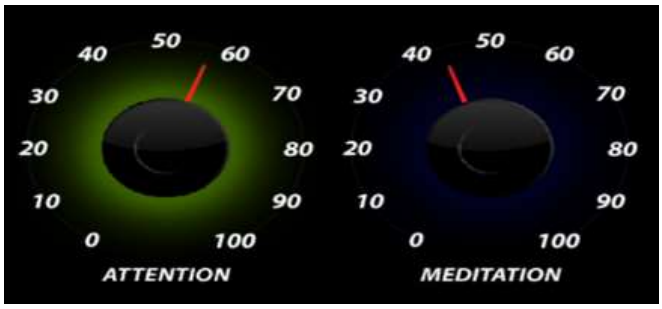

Figure 12: 15-year-old student measurements when paying attention in math class.

A fourth moment is the one in which the student is analyzing the mathematics exercises, the attention values begin to have the maximum peaks with values between 90% product of the attention that is being made to the exercises, the value of the Meditation decreases by almost 15% as a result of the completion of the task, as shown in figure 13.

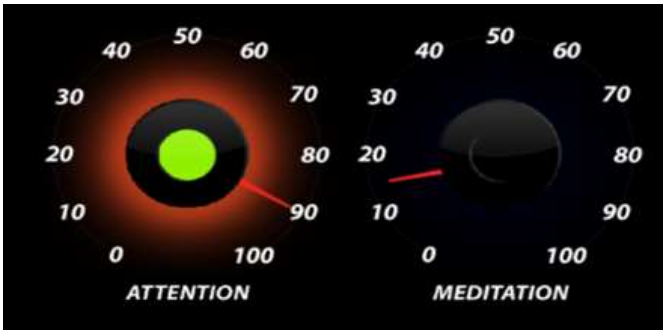

Figure 13: Measurements of the 15-year-old student when he is solving homework in his math class.

A fifth moment and the end of the record is at the time of the task where the student pays attention to the exercises he is doing, achieving a maximum attention of 100%, with a level of meditation of approximately 50%, such as presented in figure 14.

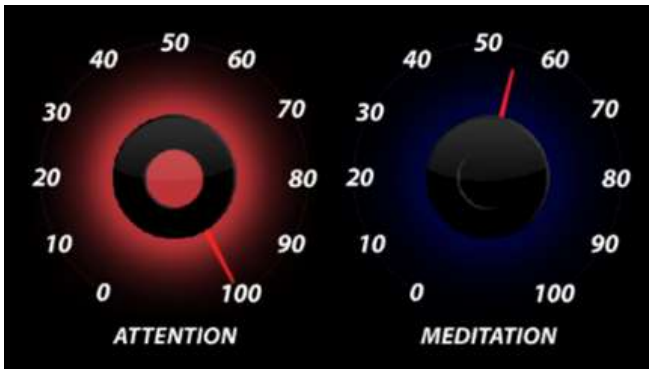

Figure 14: Measurements of the 15-year-old student when he is attentive in solving the exercises.

4. Conclusions

The discussions of the results after having carried out the evaluations of the levels of attention and meditation in two students of different ages, but who share the same study environment, as the table located in the living room of their house, being influenced by them distraction agents. We can indicate that the levels of attention are different in both students when they are carrying out similar tasks, in the case of the 6-year-old student, no matter how much they are doing the online class activities, they present a maximum attention level of 72% reaching 100% due to the fact that the student at that age of 6 years tend to be very distracted, compared to the 15-year-old student who presents a maximum of 100% attention when doing class activities. We can end by discussing that the students, depending on their age, present different levels of attention to the activities they are doing.

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section. Conclusions should provide a summary of important findings and their implicants to the area of research that is the forms of the article.

We can conclude at the end of this investigation, first that the environments of the house are not adequate to carry out school activities, but due to the effects of the pandemic produced by COVID-19, it is necessary to prepare and ensure the best conditions for Take advantage of the classes, being at home the students will always present distracting agents, such as the television, the toys among others, a second conclusion is related to the number of students who are at home, in most cases, the brothers share the same workbench, consequently as the brother in his online class, is also part of a distracting agent. A third conclusion is related to the difference in ages and its relationship with the level of attention they present, at a younger age the students tend to be distracted, in the realization of normal classes, the teachers of the students aged between 6 and 9 years old, they fight for their students to pay attention, in most cases the teachers require assistants to be able to attend the students; In this same scenario, students of those ages, being in their online classes at home, tend to be more distracted, because they are at home accompanied by parents, siblings or a relative, added to the proximity of their toys or other objects that they are of interest to him, compared to older students such as 15-year-olds who concentrate better. The measurements that were managed to register the levels of concentration and meditation can serve both teachers and parents in being able to better adapt the conditions where the students carry out their classes as well as the activities of the class in favor of the students. Can pay more attention to online classes.

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