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Digital Inclusion for Students with Attention Deficit Hyperactivity Disorder

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Abstract *— The Attention Deficit Hyperactivity Disorder is a syndrome characterized by distraction, impulsivity, forgetfulness and disorganization. The diagnosis requires considerable care and experience. There are multiples approaches to treatments available, which can be used in combination to meet specific needs. In the academic field, virtual learning environment emerges as a watershed in the life and destiny of students who suffer from the disorder. The objective of this study is to promote digital inclusion for students with ADHD, through a virtual learning environment, in web platform, which will provide tools able to attract attention and stimulate interest in academic activities, aiming to generate significant changes in the process of student development.*

Keywords— Attention Deficit Hyperactivity Disorder, Digital Inclusion, Virtual Learning Environment.

I. INTRODUCTION

Attention Deficit Hyperactivity Disorder is a neurobiological disorder, of genetic causes, that appears in the childhood of the individual and accompanies him/her throughout his/her life, being characterized mainly by symptoms of inattention, restlessness , lack of organization and impulsivity.

The conduct and inappropriate behavior of students configure one of the problems evidenced in pedagogical means and due to this situation many teachers are unprepared for the resolution of conflicts that arise in classrooms, what generates an even bigger aggravating for the developed framework [12].

The use of technological tools is increasingly part of people's lives and specially the students. Post, enjoy, comment, share files and discuss openly about any subject is a reality that students already participate, so it is necessary that educators know this scenario and know how to use such resources in favor of education. Teachers need to adapt to the new realities of the student rather than trying to adapt them to traditionalist practices limited to blackboard and chalk.

New technologies are influencing much the way we teach and learn, inside and outside of school environments. The interest in developing this project is justified by believing that the new technological tools add numerous benefits and contributions to improve the quality of teaching in the institutions, which offer their services to the community.

Currently, ADHD has been studied by scientists from diverse areas in the world, being considered by educators and researchers as a disturbing factor, mainly in the school phase. However, on the other hand, it is a subject unknown to most of the teachers of high and elementary school levels, which should be the main agents of transformation. The faculty must be attentive to the signs of ADHD to help the student, as soon as possible.

Inattention, impulsivity and hyperactivity are the main features of this disorder and we concluded that, although the majority of the students do not have enough knowledge to talk properly about ADHD, their teaching methodology allows them to observe, analyze, raise hypotheses, enabling students to adapt to the classroom and have their differences respected. And it is precisely in this change of metodology and break of paradigms that we inserted the technological tools.

Virtual learning environments have well-founded practices for school, emotional and affective development of students with ADHD. This type of system provides the power to control and manage the learning, training students, limiting the interaction and , consequently, the

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construction of knowledge ,which is directly connected to the information age [3].

Due to these problems and in order to solve them, this article had as its aim to promote digital inclusion in schools and educational institutions, where there are students with attention deficit hyperactivity disorder, through a virtual environment of learning, in web platform, which will provide tools able to attract attention and stimulate interest of these students in activities aiming to increase their academic performance.

II. LITERATURE REVIEW

The development of clinical symptoms designated by ADHD makes the children with this condition to face numerous dificulties, both emotional and linguistic as in their potential intellect [14].

The bearers of attention disorders have the targets compromised and predetermined , because of the lack of learning, so that becomes evident the school failure. Given this, the student's knowledge does not internalize itself, justifying his/her bad grades , disapproval and truancy. Given this, there is a need of a prior diagnosis so that larger problems are avoided [14].

Understand the numerous situations experienced in school environments is of great relevance, because the study, the full understanding and improved AHDH cases are important to the school and the teacher have a broad view of the teaching-learning process in which the student is submitted, helping him/her in the development of learning, as well as on his/her inclusion and acceptance in the school community. On the other hand, the teacher's unpreparedness will cause even more problems and difficulties, because the teacher does not know the student's problem will be able to label him/her unjustly of lazy, inattentive or rebel, increasing failure and truancy.

There are numerous classification for attention disorders developed by students and, because of that, those who develop ADHD inattentive type are stereotyped as slow students in relation to the teaching-learning process, however the same ones are individuals with high level of intelligence, and it can be medium or above average, although the forgetfulness and disorganization are seen as signs of limitation of intellectual capacity [11].

It is necessary to remember that children with ADHD exhibit immense difficulties in completing tasks that require concentrated attention, motor agitation, difficulty controlling impulses, restlessness, excessive activity and consequently a greater number of school repetition [2].

Academic environments represent one of the major obstacles to be overcomed by patients with ADHD. Most of the individuals who receive clinical treatment on ADHD frame does not develop good results in their learning, because of poor performance and inattentive, impulsive and restless behavior in the classroom [2].

Given this, the use of new pedagogical trends help the development of teaching and learning in the student carrying ADHD is of great importance, however, nowadays the traditionalist pedagogy is still a reality of education in our country, characterized as homogeneously. This kind of pedagogical trend does not favor the ADHD students who are often characterized as restless, slow in learning teaching process and disorganized, fruit of broken families. Hence the need to work in a new pedagogical context that favors the developing of knowledge in these individuals as students. Educational institutions and health organizations have been encountered with high growth of cases of children diagnosed with attention deficit hyperactivity disorder [4].

Information is the raw material of knowledge. A society that wishes to be inserted in the Age of Knowledge needs, as a prerequisite, to be mature with the information society. For this, it is necessary that the absolute majority of those who compose it is contemplated with digital inclusion [3].

It was identified a greater motivation, on the part of the schools, to carry out the activities. Interactive ones stimulate interest in reading and learning. In the social area, qualitative changes have created higher levels of interaction, contributing to the establishment and strengthening of interpersonal relationships. In the emotional area, the increase of self-esteem led to the creation of a motivating environment, for greater perception of themselves as learners. In the school area, these new forms of exchange have awakened a desire for conversation and search for information, expressed primarily by the desire to read and write not observed earlier. With regard to the behavior, can be identified, during the activities, an increase in attention and a decrease of the turmoil at the school that presents the predominantly hyperactive/impulsive type [10].

As a result, it is of great importance the favouring of a sound childhood education, besides stimulating the parents as to the growth and development of their children, so that his/her educational base is well structured [8].

Being and educator these days is not easy, because of the devaluation of salaries, lack of resources and incentives to education. However, teachers are indispensable in the movement for the reconstruction of a new model of education that will contribute to the increase of interest and academic performance of students in general. By means of the strategies and the high teacher's commitment about learning that rises the self-esteem of ADHD students, promoting and stimulating the confidence and satisfaction with their achievements.

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III. MATERIALS AND METHODS

In order to answer the objectives of the research and subsidize the information collection that resulted in this project, the option of methodological choice was exploratory and descriptive, seeking to analyze the profile and the difficulties of students with attention deficit hyperactivity disorder (ADHD).

The exploratory research aimed to get greater familiarity with the problem in order to make it more explicit or to constitute hypotheses [6]. In addition, for the deployment of the virtual environment, we used a study of technological development, whose objective is to develop a new product, program or template, with the production of a software to collect information from patients to carry out the electronic medical record [1].

The Moodle software was used as a virtual learning environment (VLE), performing itself as an online didactic teaching mechanism, which provides the student essentials tools in the learning process, such as: forums, chats, diaries, calendars, educational games, polls, online activities, in order to stimulate the ADHD bearer and develop their intellectual skills.

Moodle (Modular Object-Oriented Dynamic Learning Environment) is a free software, cross-platform and learning support, which was developed in 2011 by Australian programmer Martin Dougiamas. It will be downloaded from the platform in the website moodle.org and configured on a local machine, that can be migrated later to a production environment, hosted on a local area network or in the cloud.

The architecture used in the project was client-server, as can be seen in Figure 1, in which the processing can be distributed among costumers, which are network machines that yield information to costumers.

The technical requiriments are:

- Server – Apache web Server with PHP support and technology;
- Programming Language – PHP;
- Management system database – MySQL.

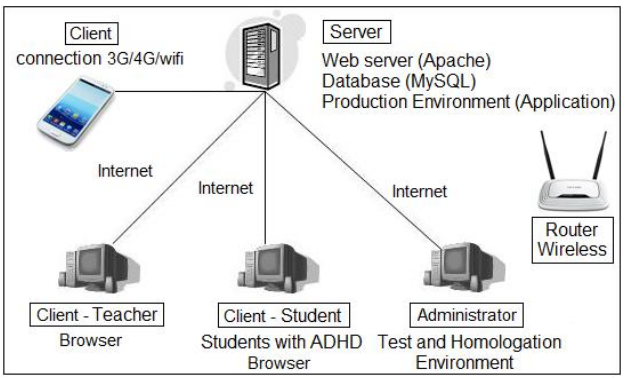

Fig. 1: Virtual Environment Architecture

IV. RESULTS AND DISCUSSIONS

4.1 IMPLEMENTATION, CONFIGUTARION AND DESIGN

Installing the virtual environment occurs very simply. Simply access the website of the developer company and download the application via the link: https://moodle.org. After the download, simply upload the files to its server, and advancing in the settings, the database tables are automatically generated, as well as can be seen in figure 2. The virtual environment will be available, and may be offered in full for up to seventy-five (75) languages [9].

The interface design of the environment can be chosen or modified by the analyst or administrator who configures it. Simply access the manufacturer's website, choose the ideal theme, download and configure. For this project, we chose the theme named Splash..

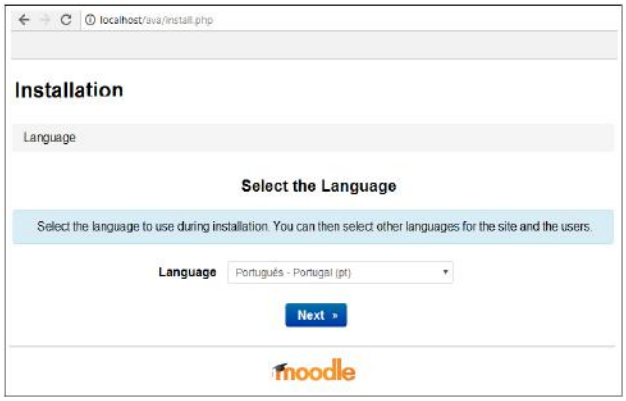

Fig. 2- Installing Moodle

4.2 AUTHENTICATION

To access the system, the student or teacher must authenticate themselves via a user name and password. In case of invalidation, the access data will be sent to the registered e-mail address. In case of first access, on screen presentation of the system there will be a message about account creation, in which the student or guardian should access, aiming at creating it, as can be shown in Figure 3:

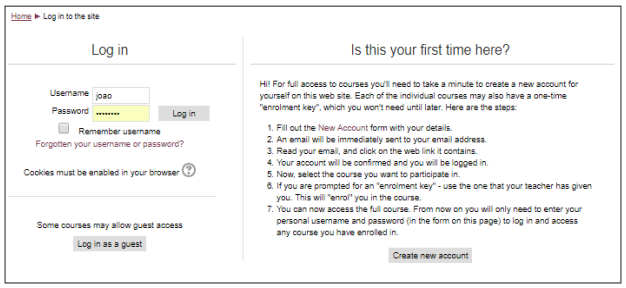

Fig. 3 - Authentication

4.3 PROFILE MANAGEMENT

Students and teachers can manage their profiles, including photos, colors for the theme, language preference,

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personal data, notes, observations, presences and absences in the classroom, among several features, as shown in figure 4:

Fig. 4 – User Profile

4.4 RESOURCES

Several resources can be added seeking deepening of teaching. They are: chats, forums and online activities, meetings, glossaries, polls, games, calendars and others, as can been in figure 5:

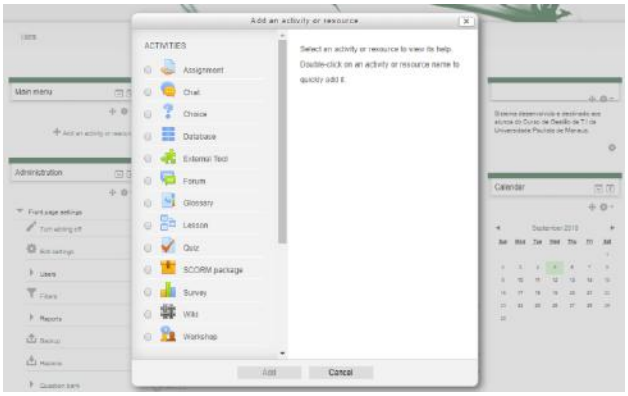

Fig. 5 - Virtual Environment Resources

4.5 METTING AND ATTENDANCES FOR CHAT

Chats are online communication protocols, which allow conversation between members participating in the dialogue. In Moodle, it works as a liaison between teacher and student, in real time. The chats enable also the exchange of files between groups or specific individuals. Due to the grueling routine of responsible for the students, this tool would provide meetings between parents and faculty, for example, a combined schedule, common at all. In this tool, students or those responsible, can still schedule meetings with teachers or Board. For correct use it is important that the teacher specify the timetables, the day and the period in which he/she or the Board will be available in the system for this service. This schedule enables the recording of calls made during the course, as shown in figure 6:

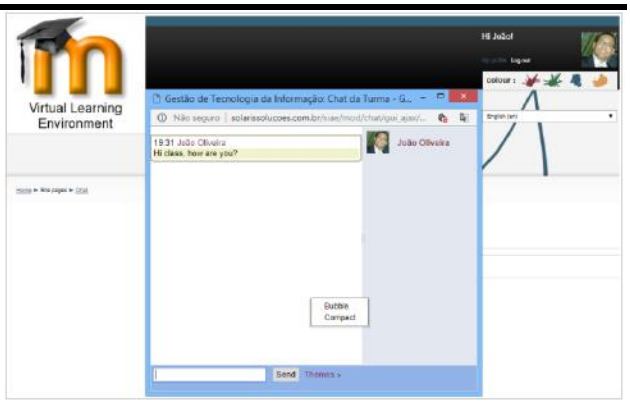

Fig. 6 - Meeting and Attendances for Chat

4.6 LIST OF COURSES

The list of subjects is organized at the discretion of the user, facilitating the visualization of activities and tasks provided by the professor responsible for each subject, as can be seen in figure 7:

Fig. 7 – List of Courses

4.7 SCHOOL CALENDAR

Within the management tasks, one of the most important is the preparation of the school calendar, which will lead the implementation of various activities throughout the year. In addition, there are several other reasons that make the definition of the calendar should be a priority.

The ADHD students tend to be disorganized and forgetful [11]. As a result, the school calendar will cause the student carrying ADHD note when activities, evidences and events will occur, in a graphical, simple and intuitive way, as can be seen in figure 8:

Fig. 8 – School Calendar

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Any global activity will be marked by the teacher or Board, however the student may also make his/her personal calendar markings in order to plan. Colors will be used to differentiate global and personal markings. The global events, such as holidays, events, parties, simulated and proofs, for instance, can be marked on the calendar only by the Board or coordination, no student has authorization or access. All activity has title, summary and full description of what will occur. In case of evaluation, the teacher may provide subjects within the description of the event, as shown in figure 9:

Fig. 9 – School Calendar Activities

4.8 FORUMS AND WORKSHOPS

The forum is a resource for public discussion about a particular subject, being an excellent teaching and communication strategy. When a teacher creates a forum, normally attaches a file to be studied. After attaching it, every student belonging to this class will receive an e-mail notifying that the document was made available for download, facilitating the teacher's work and promoting a more dynamic and accessible content sharing, as can be seen in figure 10:

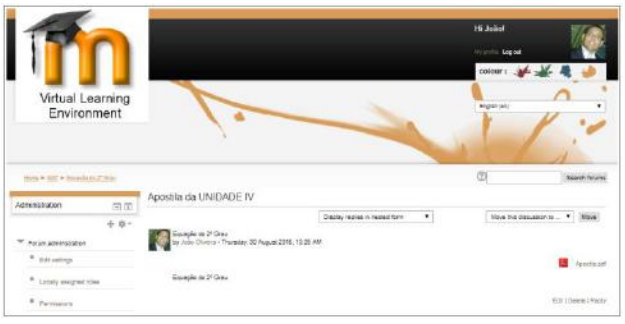

Fig. 10 – Forum Activity

This tool is also important to provide the content for the student who is not physically in the classroom, due to illness or a particular reason. This resource can also be used in the evaluation of subjects using paintings, sculptures or any other specific skill.

4.9 INTERACTIVE GAMES

Digital games are teaching strategies that are already revolutionizing the way of education through entertaining and fun resources. Among several options that can be used, chess presents itself as an example of activity that develops strategy, concentration and logical reasoning, as can be seen in figure 11:

Fig. 11 – Chess Game

There is an evidence that chess is a sport that offers respect, discipline and integration. In addition, it instigates thoughts and stimulates organization, planning, non-violence and logic [7].

In our system, we will provide logical reasoning games, chess, crossword puzzles, anagrams and questions about history, literature, geography and puzzle, as can be shown in figure 12:

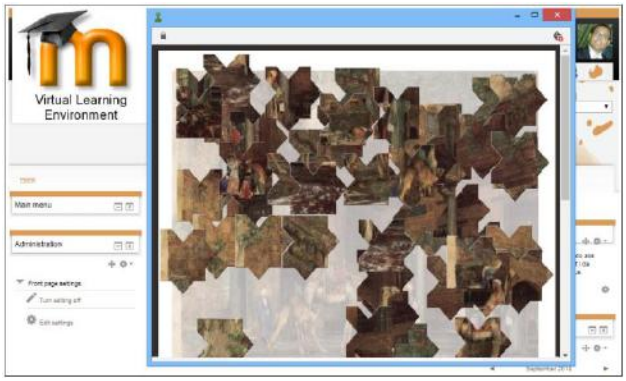

Fig. 12 – Puzzle Game

4.10 DATA DICTIONARY

The glossary is a tool that lists terms in alphabetical order, facilitating the understanding of texts and formulas provided by the teacher to the students, during the whole course. In Moodle, students have permission to add terms with dictionary definitions and links that contain explanations for each term, as can be shown in Figure 13:

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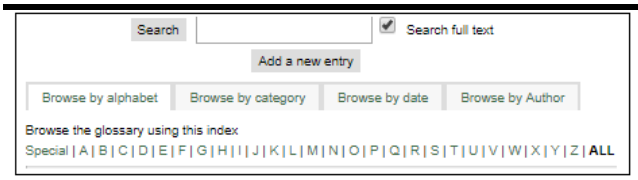

Fig. 13 – Data Dictionary

4.11 POLL

The poll is very important to store and total data that will be used for decision-making based on the common denominator. Polls can be conducted for any type of subject and the actual percentage of choices may or may not be made available to students, as shown in figure 14:

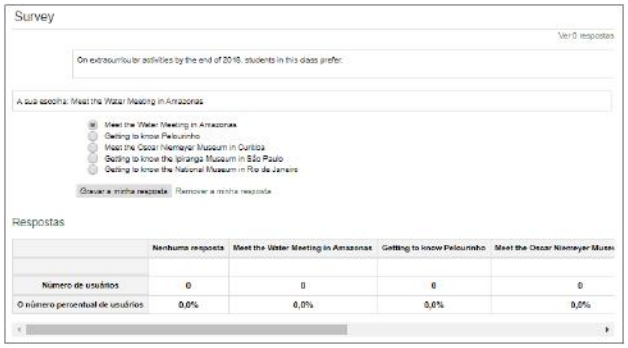

Figure 14 – Poll

4.12 ONLINE TESTS

Online tests are always made by the teachers of each subject. The questions can be associative, discourse, multiple choice or true and false. The teacher elaborates the questions and answers, indicating which is the correct one, as well as its score. However, in Moodle platform, all questions elaborated for a subject are kept in a database and can be reused by teachers or tutors for other questions, as can be shown in figure 15:

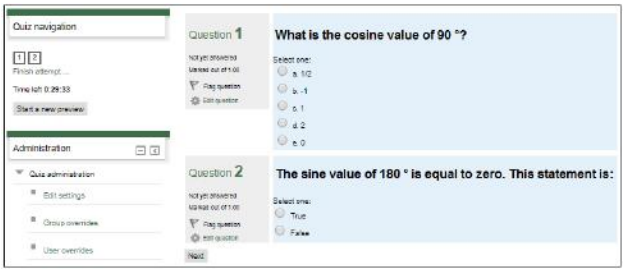

Fig. 15 – Online Test

The duration of the test is also set by the teacher, as can be seen in figure 16. The number of attempts for each question can also be set. It is quite common for the teacher to define that students are entitled to a second chance or attempt a simulated proof or test.

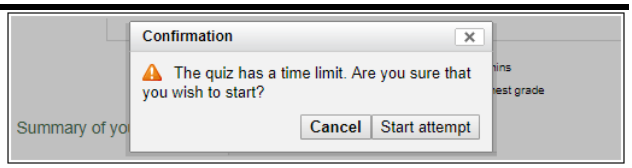

Fig. 16 – Test Duration Time

At the end of set time, the test automatically closes, computing and displaying the note in real time, after the test review. A report with the amount of right and wrong questions, such as the final grade, is displayed to the student, as can be seen in figure 17:

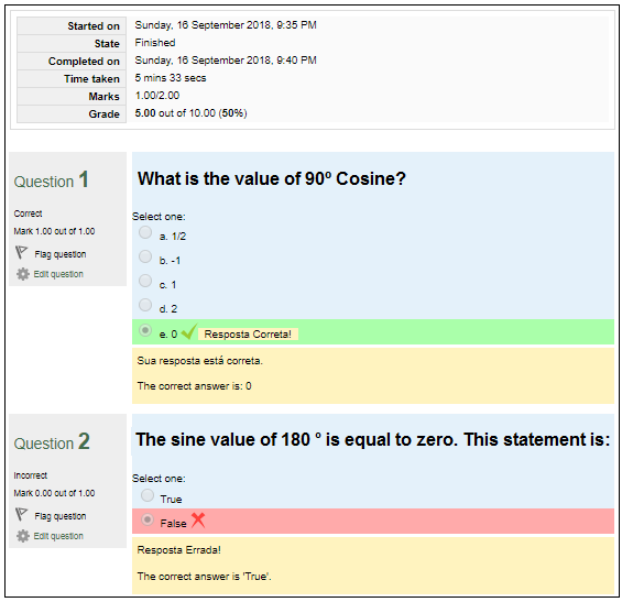

Fig. 17 – Final Test Report

4.13 TASK WITH FILE UPLOAD

The task is a simple and interesting resource. It is an activity that is passed on to the student in order to prepare and send, via file upload, the activity in any format or even compacted, as can be shown in figure 18:

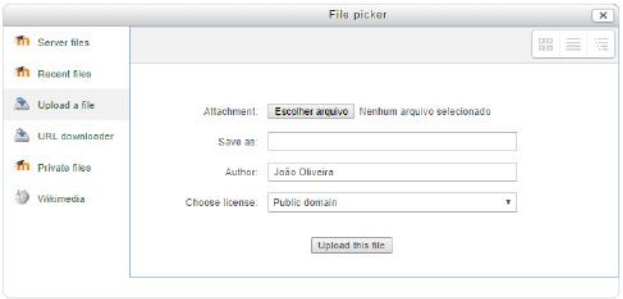

Fig.18 – File Upload Task

The teacher should provide the activity with a scheduled start and end date. After submitting it, the activity will be available for the teacher to analyze and give the grade, as

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can be seen in figure 19. Another interesting resource of this activity is that every time a student submits an activity, the teacher responsible for the subject receives a message in his/her email. In addition, students will also be able to evaluate the work of their colleagues, i.e., there is an apprenticeship by the exchange of information among students.

Fig. 19 – Upload File

V. CONCLUSION

The inclusion of digital resources in classrooms, using AVA, generates a significant change in student development process, which increase communication between students and teachers, and encourage them to participate even more in school activities that provide benefits in learning.

Through the virtual environment, it becomes possible to purpose tasks, discussions, reports, games, research sources and other tools that encourage students to interact and work as a team. In addition, the student with ADHD will have the option to manage with autonomy his/her time and place of study, according to his/her needs, having full access to all content taught in classroom, besides interacting and socializing with other students and being able to organize through a simple and intuitive academic calendar.

In the observations made using the virtual learning environment (VLE), changes in the development process of students with ADHD were highlighted. Among several positive results, it was identified a greater motivation to perform the activities. Interactivity has stimulated interest in reading and writing. In the social field, qualitative exchanges have created higher levels of interaction, contributing the establishment and strengthening of interpersonal relationships. In emotional and affective area, the increase of self-esteem led to the creation of a motivated environment. In the school context, these new forms of exchange awakened a desire for conversation and the search for information, expressed mainly by the desire to read and write not observed earlier. With the regard to behavior, an increase in attention and a decrease in agitation can be identified during activities [10].

The scientific community got to prove that computers and the internet are associated with better student performance in skills that must be developed at school, such as reading and math. This is the study carried out by the OECD, the Organization for Economic Cooperation and Development [13].

The use of technological tools is increasingly part of people's lives, especially the students. Posting, enjoying, commenting, sharing, sharing files and discussing openly any subject is a reality that students already participate, and it is necessary that educators know that scenario and know how to use such resources in favor of education . Teachers need to adapt to the new realities of the student instead of trying to adapt them to traditionalist practices of blackboard and chalk. The virtual learning environment has informed practices for school, emotional and affective development of students with ADHD. This type of system provides the power to control and manage the learning, training students, limiting the interaction and, consequently, the construction of knowledge, which is directly connected to the information age [3].

We concluded that the use of computers, internet, laptops, cellphones in class, games, data show, chats, polls, virtual learning environments and their various resources increase interactivity in classrooms and make the student set his/her own pattern of learning, research, organization and autonomy. In addition, the virtual learning environment has been excelling increasingly in helping educators, arousing more and more attention and mainly students, being a differential in the life and fate of students with ADHD, assisting positively in their evolution as a student and citizen.

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