

DEVELOPMENT OF AN INTERVENTION PROGRAM FOR THE IMPROVEMENT OF INTELLECTUAL SKILLS AND STUDY TECHNIQUES IN 9TH GRADE STUDENTS OF A COLOMBIAN RURAL EDUCATIONAL INSTITUTION

Richard Nixon Torres Moreno

Master in Neuropsychology and Education of the UNIR, Psychologist of the Foundation of Higher Studies Monsignor Abraham Escudero Montoya, University Professor of the Foundation of Higher Studies Monsignor Abraham Escudero Montoya, Guidance Teacher Magisterio del Tolima. richard.torres@fundes.edu.co

Fredy Javier Guarnizo Ante

Master in Intercultural Education, Specialist in Education, Culture and Politics, Psychologist, Psychologist from UNAD. Academic advisor at Colegio Santander, University Professor at the Fundación de Estudios Superiores Monseñor Abraham Escudero Montoya, Teacher Guidance Counselor at Magisterio del Tolima. richard.torres@fundes.edu.co

Fernando Augusto Poveda Aguja Ed.

Post-doctorate in curriculum, discourse and research training, PhD. Educational in Technology education, Doctoral student in Administration, Universidad de la Salle, Corporación Universitaria Minuto de Dios, Bogota- Colombia. fpovedaa@uniminuto.edu.co,
<https://orcid.org/0000-0001-8149-9963>

Edgar Olmedo Cruz Mican

Doctor in Business Administration/Posdoctor in Education, Social Sciences and Interculturality. Corporación Universitaria Minuto de Dios - UNIMINUTO Bogotá D.C. - Colombia
ecruz@UNIMINUTO.edu.co <https://orcid.org/0000-0001-8581-3104>

Mg. Roberto José Guzmán Villanueva

Máster en Liderazgo y Dirección de Centros Educativos, Fundación de Estudios Superiores Monseñor Abraham Escudero Montoya, Roberto.guzman@fundes.edu.co

Mg. José Joaquín Cuervo Polania

Magister en Derecho, Fundación de Estudios Superiores Monseñor Abraham Escudero Montoya,
jose.cuervo@fundes.edu.co

ABSTRACT

This article refers to the study of intellectual skills and study habits, being the main objective to analyze the relationship between intellectual skills and study techniques in 9th grade students of a

rural educational institution, in order to establish a process of improvement in teaching didactics, focused on educational quality parameters, this was done through a study with a quantitative approach, with descriptive and correlational scope, non-experimental design of transectional or cross-sectional type, the sample consisted of 36 students between 13 and 16 years old. Two instruments were applied, the first was the Primary Mental Aptitudes Questionnaire "PMA" (Thurstone & Thurstone, 2007) and the second was the Study Habits and Techniques Questionnaire "CHTE" (Álvarez & Fernández, 2015), in addition to the information on school academic performance for the first period of the school year 2019, among the most relevant results are the relationship of the reasoning factor with the factors of verbal comprehension, spatial conception and numerical calculation, as well as the relationship between academic performance and spatial conception, and the relationships between different aspects of study habits.

Key words:

Intelligence, Mental Aptitudes, Study Techniques, Academic Performance, Rural Education.

Introduction

The Colombian Institute for the Evaluation of Education (ICFES) has been in charge of designing a series of protocols to generate a way to evaluate at a national level and thus be able to make individualized analyses, by institutions, departments and even nationally, managing to monitor each year the educational level of the country.

However, development in the rural context is often limited by different factors that affect it, such as lack of economic resources, poor roads, long distances, cultural conformism and other situations that in one way or another are reflected in the communities (Montes & Díaz, 2011). At the educational level, different strategies have been generated to provide quality education in rural areas; however, the situations mentioned above tend to create a gap between educational practices and educational quality, in addition to the lack of teacher updating and technological failures due to environmental issues.

Therefore, it was necessary to review and analyze the relationship between intellectual skills (Limiñana, Bordoy, Juste, & Javier, 2010) and study techniques (Gandia, 2013) of students in a rural educational institution in Colombia who were finishing their Secondary Basic level to enter the Academic High School, where they will have to develop specific thinking skills to obtain a good level in the ICFES state tests.

Taking into account the above, it is clarified that the ICFES through its evidence-centered design (DCE), is responsible for generating the creation, application and use of evaluation instruments or tests to monitor different aspects of educational quality at the national level, their tests are called Saber tests, and in school education it is applied in four different grades, 3°, 5°, 9° and 11°, in the first three grades considered basic education, it is evaluated diagnostically, considering mainly language and mathematics, however in some versions of the test natural sciences and citizenship competencies have been evaluated (ICFES, 2018).

On the contrary, the Saber 11° Test is a test that determines not only the possibility of access to public universities, if not the evaluation of the intellectual abilities acquired throughout the school process, since these students are the ones who culminate their high school, here five tests are evaluated: Critical Reading, Mathematics, Social and Citizenship Competencies, Natural Sciences and English (ICFES, 2018).

In the institution under study, a valuation below the average score has been maintained, taking into account its contextual characteristics, with this proposal it will be intended to analyze which are the most relevant factors both intellectually and study techniques, and thus design an improvement plan for the academic middle level where they prepare for the ICFES, which is recognized from the study of Morales, & Poveda, (2022) that from the look of the educational perspectives in the focused on the futurable and futurable makes the exercise an added value of direct work.

In order to define the central problem that generates the concern with which this research is born, the document created by the Organization for Economic Cooperation and Development (OECD) in 2009, called "Teachers Matter: Attracting, training and retaining efficient teachers", in this document there is a review and approach of strategies for teacher strengthening, with this theoretical contribution the problem begins, since on several occasions what slows down the educational processes, are the inadequate teaching practices, the fact of teaching only for a salary, generates that public education in Colombia has a disadvantage (OECD, 2009).

Portela, Guarnizo & Poveda (2021) develop a model focused on the problem of cooperative and collaborative work where the scenario recognize how this value in the educational fact, establishes the dynamics of the graduates, but even in the way it is interpreted by the educational community, however, the central problem does not lie in the teachers or in any specific actor of the educational community, It is rather considered a general problem, since the national law speaks of co-responsibility in all rights, including education, therefore, the fact of witnessing the lack of a true educational quality is a situation that involves students, families, directors and teachers.

Specifically at the national level, interesting but disturbing results have been found in the 9th grade Saber tests in Language, because despite the fact that in the last two years of the test, 2016 and 2017, average scores of 307 and 314 were found, for the year 2016 54% and in 2017 52% of the students evaluated are between minimum and insufficient level, on the other hand in Mathematics an average of 313 and 306 was evidenced in these years, however for 2016 70% are between the two lower levels and in 2017 only 26% manage to place themselves in the satisfactory and advanced levels (ICFES, 2018).

However, this ICFES report provides a comparison of rural, urban and private institutions, however, focusing between urban and rural in 2017 for language tests, it is found that 19% of students in rural institutions were in an insufficient level and 51% in minimum, on the contrary in the urban it is observed 41% in satisfactory level, and 5% in advanced, in mathematics the difference is not wide, however it is observed that while 80% of rural students were found in minimum and insufficient levels, on the contrary urban students achieved up to 24% in satisfactory

and advanced levels (ICFES, 2018).

When reviewing the results of the institution in 2017, it is possible to find that in Language 23% of the 9th grade students evaluated were in insufficient level and 58% in minimum, only 19% reached satisfactory, and in mathematics, 35% were found in insufficient level, 52% in minimum and 13% satisfactory, in both tests no student was obtained in advanced level, so it is possible to identify some shortcomings at the pedagogical and educational level (ICFES, 2017).

On the other hand, speaking of the saber 11° tests, the last report being 2017, it is found that, in the institution, an overall average of 225 was achieved, placing it below the average score, finding that in Critical Reading 11% placed in performance level 1, 50% in level 2, 39% in level 3 and none managed to place in level 4, this being the maximum level (ICFES, 2017).

For mathematics, 28% were obtained in level 1, 58% in level 2, 14% for level 3, and none in level 4. In the Social and Citizenship test, it is found that 33% were scored in level 1, level 2 with 58% and 8% level 3. For Natural Sciences, similar percentages are found, since level 1 was obtained by 14%, 69% obtained level 2 and level 3 was reached by 17%. In English the highest level reached was A1 by 17%, the remaining 83% was found in A- (ICFES, 2017).

Observing the national statistics and the specific statistics of the institution, it is possible to find that there are similarities in terms of the educational quality offered and found is not as expected, then concerns begin to arise, which mobilize the design of this research, since the ICFES evaluates students cognitively, and they are at these low levels, will be that something more is missing in teaching strategies, will be that they are educating without taking into account the mental processes, and only to fill documentary requirements, then the research question is formulated as: Is there a relationship between intellectual skills and study techniques in 9th grade students of a rural educational institution in Colombia?.

Based on this problem, the general objective of the work is to analyze the relationship between intellectual skills and study techniques in 9th grade students of a rural educational institution, in order to establish a process of improvement in teaching didactics, focused on educational quality parameters.

Neuropsychological Basis of Intelligence

In order to provide a neurological explanation of intelligence, two aspects will be taken into account: firstly, the thinking and learning processes that are crucial in the development of intelligence, and secondly, the brain locations that have been identified as being present in the execution of specific thinking functions (Graham, 2008; MacKay, 2005).

It is important to recognize that talking about thinking or intelligence in neurosciences opens a broad topic, since there are many associated functions and several processes that are immersed there, in the first place, the encephalon is one of the parts with the greatest mass in the Central Nervous System, it is located in the upper part and is divided into three parts, the forebrain, midbrain and hindbrain (OECD, 2009).

In the forebrain is the telencephalon and diencephalon, the first is composed of the cerebral cortex, the striatum and the rhinencephalon, in this part is highlighted that in the cerebral cortex, are located the four cerebral lobes, which have associated different functions, in the occipital lobe, you can find the functions related to vision, and its location is in the middle back of the brain; in the parietal lobe are found the functions of sensory integration, language, as well as the control of sensations such as pain, touch, temperature and speech, its location is in the upper back area of the brain (Shoenberg & Scott, 2011).

On the other hand, in the temporal lobe located around the ears above, functions related to hearing, meaning, memory and language can be identified; the last lobe is the frontal lobe, located in the forehead, here judgment, perception and motor processes are developed, which is why it is related to acts that involve meaning, such as creativity, conflict resolution, planning, reasoning, emotions and part of speech (Shoenberg & Scott, 2011).

The epithalamus, thalamus, subthalamus and hypothalamus can be found in the diencephalon, the latter being of great importance, since it comprises a large number of functional associations in the brain, with the most relevant being emotional regulation and physical control (Graham, 2008).

The second part of the encephalon is the midbrain also called midbrain, here are the quadrate tubercles, two upper ones related to vision also called anterior, and two lower ones related to auditory phenomena, also called posterior, for a total of four tubercles, the latter is also responsible for filtering the information between the hindbrain and forebrain. The third part of the encephalon is comprised by the rhombencephalon integrated by the myelencephalon where the medulla oblongata is located, and the metencephalon, where the cerebellum related to the control of movement, posture and muscular energy, and the pons or pons can be found (Graham, 2008).

As can be seen, the whole structure of the brain has some relation with sensation, perception and information processing processes. It is worth mentioning that its largest part is called the Cerebrum, which is divided into two hemispheres, the left and the right, in which a series of functions and particular skills are coined for its development and stimulation (Shoenberg & Scott, 2011).

A key process in the development of learning, intelligence and knowledge, are the neuronal connections, taking into account that the synapses made between neurons potentiate the transmission of information, which makes the different areas, lobes and hemispheres, to communicate with each function performed, it should be noted that there are some areas of association responsible for different mental processes, these areas can be found as: parietoccipitotemporal, prefrontal and limbic (Shoenberg & Scott, 2011).

In the first area mentioned above, a high level of meaning and interpretation is provided for the signals coming from the sensitive areas, it also has subareas such as the posterior parietal and superior occipital area (continuous analysis of the spatial coordinates of the parts of the body and its surroundings), Wernicke's area (language, important for the development of higher thinking skills), and the secondary visual processing area (discovery of the meaning of words perceived

visually). In the second area, prolonged thought processes are developed, it is connected to the parietooccipitotemporal association area, and within it we find the Broca's area (word formation), also in this area are initiated and executed the plans and motor patterns for verbal expression, here is also monitored the information received from the environment and information from within each individual, such as feelings and emotions (Graham, 2008).

The last area of association is the limbic area, where processes related to behavior, emotions and motivation are carried out, it also provides most of the impulses to activate other areas of the brain, including the motivational impulse to learn, its location is in the anterior pole of the temporal lobe, the ventral portions of the frontal lobes and in the convolutions of the corpus callosum (Graham, 2008).

Finally, according to the Multifactorial theory of Thurstone and Thurstone (2007), the factors of verbal comprehension (Factor V), verbal fluency (Factor F), reasoning (Factor R), numerical calculation (Factor N) and spatial conception (Factor E) are identified in this work, so that these mental processes would be related to the following brain locations:

Factor V and Factor F: Left temporal and frontal area, Wernicke's center, Broca's center and left hemisphere in right-handers and some left-handers (language-related locations) (Armstrong, 2006; García & Llamas, 2015).

Factor R and Factor N: Left and right frontal lobe, right parietal lobe, contiguous temporal and occipital areas, laterality: dominant and subdominant hemisphere, left and right hemisphere (Locations related to logical and reasoning processes) (Armstrong, 2006; García & Llamas, 2015).

3. Factor E: Parietal lobe, sensory integration of the different senses; occipital lobe, visual functionality related to learning processes; right hemisphere functions (posterior regions of the right hemisphere) (Armstrong, 2006; García & Llamas, 2015).

Study Habits and Techniques

A habit is considered as an acquired and repeated behavior, considered to such an extent as something automatic, it is usually confused colloquially with the term habit, but it refers to the behaviors that as human beings we consider daily and systematic, on the other hand, the techniques have to do with a series of strategies to be able to carry out something (Barone, 2007).

In this section, when we refer to study techniques, we will take into account the different characteristics that exist to learn in the best way by taking advantage of our abilities through the healthy use of each of the capabilities (Baquiran, 2011).

It is important to start by understanding that the brain is trained just like any part of our body and that this training consists of the conscious use of each of its parts at the indicated moments of the learning processes, but what is learning, this concept can be understood as the action of acquiring information through experience, where better ways to solve difficulties or problems are conceived, this process is crucial in the educational field, however there may be distractors, or factors that generate not learning well (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013).

One of the first factors is time management, when it is possible to organize the activities and materials to be used, it is possible to plan and thus direct each action towards the stated objective, however, when this is not done, it is usually delayed and actions are postponed, accumulating work to the point of not doing or omitting the acquired obligations (Barone, 2007; Munyaradzi, 2013). Another factor is attention and concentration, since when participating in class, reading a book or performing an activity, if one is not able to discriminate psychological distractors, isolate oneself from noise and feed oneself adequately, these situations can generate little interest, motivation and therefore get lost in thoughts that have nothing to do with what is being studied (Barone, 2007). In third place is memory, as a mental ability focused on the encoding, storage and retrieval of information, this is divided in itself, being the most used the working memory, since this is the one that is constantly used in learning actions, this leads to generate exercises and activities that enhance memory and not diminish it as the consumption of liquor or other substances that affect the functioning of the nervous system (Barone, 2007).

It is important to consider the use of classes, effective note-taking, the management of books and theoretical resources, and the processes of deduction and reasoning (Barone, 2007).

Relationship between Intelligence, Study Skills and Academic Performance

Each of the variables mentioned throughout this project has quite notorious particularities, however, this has generated scientific interest to review, evaluate and generate intervention processes that manage to integrate and strengthen them, as is the case of Flores (2012), who through his work entitled "Influence of general and emotional intelligence, and relational skills on academic performance", where his general objective was to describe and analyze the relationship between the three variables with academic performance in a sample group of primary education. In this work discussed above, it is found that the academic performance of students has a statistically significant relationship with the three variables, so it is concluded that these three variables can be potential to strengthen the processes of academic performance in students, however, it is found that the one with the highest relationship is the ability to relate, followed by emotional intelligence and finally general intelligence (Flores, 2012).

Another work carried out in this theoretical perspective is that of Bey Silva (2013), with his work entitled "Intelligence, basic neurological processes and academic performance of students in educational reinforcement in elementary school", where the objective is to determine the relationship between neuropsychological processes and academic performance of students who attend educational reinforcement. In this work it was found that general intelligence does not have a significant relationship with academic performance, but some neurological characteristics such as saccadic movements, laterality and motor skills do, which leads to the conclusion that the reason for these deficits in academic performance is different from the intelligence variable.

On the other hand, Ortega (2012) proposes a work focused on determining whether there is a relationship between study habits and academic performance in second grade high school students,

finding that this relationship does exist and can be used for the continuous improvement of learning processes, highlighting dimensions such as motivation, interest, resources and strategies as key components to develop effective learning processes, since cases of low performance due to lack of motivation and lack of adequate study habits were evidenced.

Another work is the one carried out by Garzón (2016), in Santiago de Cali-Colombia, entitled "Relationship between planning and study habits and techniques in adolescents between 12 and 13 years of age", aiming to analyze the relationship between the executive function of planning and study habits and techniques in adolescents, finding as a result that these variables have statistically significant relationship, and that it is positive to work them together to strengthen the personal skills of students in terms of executive functions and academic processes.

With these works it is possible to identify a theoretical continuum in which a prospective focused on the analysis, evaluation and approach of educational and pedagogical methodologies based on the principles of the variables mentioned, however, it was found that there are no studies that relate the three variables mentioned in this project together, but they are usually related in isolation.

Method

It is important to recognize that the problem identified in the research lies in the need to establish adequate and contextualized processes to the characteristics of the student population, in order to achieve the expected educational quality, for such reasons this research is designed with the general objective of analyzing the relationship between intellectual skills and study habits and techniques of 9th grade students of a rural educational institution in Colombia.

Specifically it focuses on:

- a) To analyze the Intellectual Abilities of 9th grade students of a rural educational institution.
- b) To evaluate the study techniques of 9th grade students of a rural educational institution.
- c) To correlate the intellectual abilities, study techniques and academic performance of 9th grade students of a rural educational institution.

Therefore, the following hypotheses are proposed:

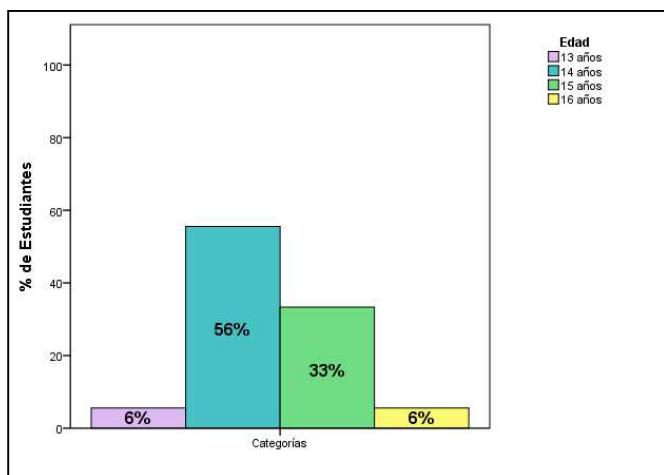
- a) Alternative Hypothesis H1: There is a significant correlation between Intelligence, the use of study skills and the academic performance of the sample.
- b) Null Hypothesis H0: There is no significant correlation between Intelligence, the use of study techniques and the academic performance of the sample.

Participants

The study population belongs to the educational community of the Institución Educativa Samaria Sede Principal, this institution is located in the municipality of Ortega, Tolima in the country of Colombia, is located in the rural sector of the municipality, has an approximate number of 1500 students, which are distributed in 25 sites, all in the rural sector, It has five sites that handle preschool, elementary school, junior high school and high school academic levels, 19 sites that

handle preschool and elementary school, and the main site with junior high school and high school academic levels. Due to its rural characteristic, the school uses Colombian pedagogical models, which are new school for preschool and elementary school and post-primary school for junior high school and high school academic levels.

Taking into account the territorial diversity of the institution, we tried to use a non-probabilistic purposive sampling, thus choosing 36 9th grade students from the main campus, who have an average age of 14.39 years, and their percentage distribution by age can be seen in Graph 1.



Graph 1 Percentage Distribution of the Sample by Age. Source: Own elaboration.

On the other hand, the distribution by gender was homogeneous, with 50% of the students being male and the other 50% being female.

Design

The research has a quantitative approach, since it is based on statistical data collected after the application of standardized tests that measure the constructs of the study variables and analyzed by means of Statistical Software, it is also highlighted that it has a descriptive and correlational scope, since its objective is to show the type of relationship between the study variables (Hernández, Fernández, & Baptista, 2010).

The research design is non-experimental, since its objective is not to manipulate the variables, but to analyze them after observing them as they occur in their natural environment, transectional or cross-sectional, since the data are collected at a single point in time (Hernández, Fernández, & Baptista, 2010).

Two instruments were used to collect the information: The first instrument was the PMA designed by Thurstone & Thurstone (2007), it is of individual and collective application, it has an estimated duration time of approximately 60 minutes (including correction and assessment), specifically in the test are 26 minutes of effective work. The evaluation is aimed at identifying the aptitudinal

level of five factors of primary mental aptitudes, which are verbal comprehension (Factor V), spatial conception (Factor E), reasoning (Factor R), numerical calculation (Factor N) and verbal fluency (Factor F).

In order to establish the scale, several normative samples were taken into account according to the criteria of sex, age and professional level, establishing the following categories: Low aptitude level from 1 to 33, medium low aptitude level from 37 to 48, medium aptitude level equal to 50, medium high aptitude level from 52 to 63 and high aptitude level from 67 to 99, these categories are also taken into account for the global index of intelligence.

The second instrument is the Study Habits and Techniques Questionnaire "CHTE" designed by Álvarez & Fernández (2015), it is of individual and collective application, with an approximate duration of 30 minutes, however it is variable, its purpose is to evaluate seven aspects of study habits and techniques which are, General Attitude Towards Study, Study Place, Physical States of the scholar, Work Plan, Study Techniques, Exams and Exercise, and Works.

In this work, percentiles were used, which are categorized as follows: Does not know how to use the skill (score less than 10), Student with important aspects to improve of that skill (between 10 and 49), Acceptable mastery of the skill, could improve some aspect (between 50 and 89) and Good mastery of the skill (Scores above 90). A general weighted score can also be obtained, with the sum of all the direct scores and this same evaluation is used, only with the scores adapted to the general sum.

Procedure

The research was developed in several phases, which were executed progressively and with the objective of fulfilling the different steps in the development of a scientific research:

The research proposal is designed and presented to the research committee for approval, after which the proposal is socialized with the directors of the educational institution in order to obtain permission for its application in the institution.

2. After obtaining permission, we proceeded to socialize and explain to the educational community, both students and parents, in order to obtain the informed consent and authorization of the parents, so that the students could participate in the research.

Once these permissions are obtained, the sample design is defined, and the characteristics of the sample, such as sex and age, are identified. In addition, information about the institutional context is collected and the spaces for the application of the instruments are established.

In the application of the instruments, the PMA is applied first, with the time and instructions estimated in its manual, then after 2 weeks, the CHTE is applied, in order to avoid inconveniences with the teachers due to the occupation of school time.

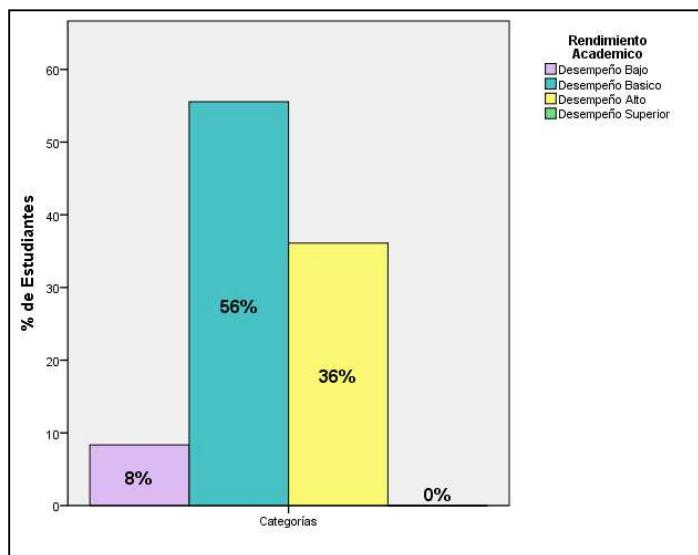
After applying the instruments, we proceeded to score each one of them and to tabulate them in a Microsoft Excel 365 software template, in order to group all the data collected. It is important to clarify that the tabulation was done with the direct and percentile scores.

After tabulation, this template is imported into the SPSS version 24 statistical software, where the different pertinent analyses are carried out for the contrast of hypotheses and the identification of the descriptive statistics in order to construct the space of the results.

7. Finally, all the theoretical and statistical information is compiled and the final report with the conclusions included.

Results

In order to establish an adequate order of the statistical data and thus understand each of the sections, we have chosen to include the data in the following order: first we will observe the academic performance, then we will find the variables of intellectual skills and study habits and techniques, and finally we will observe the correlations between the components of the variables. Academic performance is valued according to the national scale, where for its descriptive analysis it was codified, finding that low=1, basic=2, high=3 and superior=4. It is highlighted that the academic performance has a mean of 2.28, which means that the performance of the students evaluated is between basic and high, and a standard deviation of 0.615.



Graph 2 Percentage Distribution of Academic Performance. Source: Own elaboration.

Graph 2 shows that most of the students have a low performance with 8% and a basic performance with 56%, and there are no students with superior performance.

In the intellectual skills variable, the WFP assessment parameters described in previous sections will be taken into account; it should be noted that the specific percentage distribution will be shown; the descriptive statistics can be observed in Table 2.

Table 1 Descriptive Statistics Intellectual Abilities

	N	Media	Standard deviation
--	---	-------	--------------------

Verbal Comprehension (Factor V)	1,00	,000
Spatial Conception (Factor E)	1,39	,803
Reasoning (R Factor)	1,22	,722
Numerical Calculation (N Factor)	1,03	,167
Verbal Fluency (Factor F)	1,67	1,146
N valid (per list)		

Source: Own elaboration

It can be seen in detail that in the percentage distribution among the factors proposed in the PMA, it can be found that in all the factors the level with the highest percentage is low, being above 67%, only in verbal fluency does it reach the high level with 3%.

In the variable of Study Habits and Techniques, the categories established in the CHTE are taken into account, and as in the previous variables the descriptive and frequency statistics will be shown, it can be observed that the average in all categories is between 2 and 3, considering according to the coding that the students evaluated on average are in need of important improvements in their way of studying and some are in an acceptable manner, but with some aspects to improve.

Table 2 Descriptive Statistics for Study Habits and Techniques

	N	Media	Standard deviation
General Attitude towards Study (AC)	2,50	,609	
Place of Study (LU)	2,11	,708	
School Physical Status (ES)	3,00	,986	
Work Plan (WP)	2,69	,786	
Study Techniques (TE)	2,58	,692	
Exams and Exercises (EX)	2,61	,688	
Jobs (TR)	2,64	,931	
N valid (per list)			

Source: Own elaboration

To analyze the correlation, the Pearson Coefficient was used, a parametric technique, taking into account that the sample exceeds 30 subjects, and the results were obtained through the percentiles obtained in the two tests and the direct scores of the academic performance grades. First, the correlation between the factors that make up the PMA Questionnaire is observed, then the correlation between the aspects evaluated in the CHTE is analyzed, and finally, the correlation between the categories of both tests and academic performance is observed.

It was possible to identify that Factor R has a statistically significant relationship with Factors V, E and N, with a score $p=0.0$ and $p=0.1$, the only one that does not have a statistically significant relationship is Factor F, so it is interpreted that this is a key factor to strengthen primary mental aptitudes, observing that these relationships are direct and moderate, in addition it is also observed that the other factors do not have a statistically significant relationship.

On the other hand, the scales of Study Habits and Techniques are analyzed, finding that the Attitude towards study has statistically significant correlations with the study techniques ($p=0.5$), Exams ($p=0.1$) and with Works ($p=0.0$), on the other hand it is found that the place of study has a significant relationship with the work plan ($p=0.2$) and the works ($p=0.4$), *in addition the Work plan has a statistically significant relationship with the exams and the works ($p=0.0$),* also the Work plan has a statistically significant relationship with Exams and Jobs with a score of P value $p=0.0$, likewise it is observed that the physical condition of the student does not have a statistically significant relationship with any of the scales, it is also observed that the relationships are direct and moderate.

Table 3 Pearson's Coefficient Correlation Academic Performance, PMA Factors and CHTE Scales

	Academic Performance	Factor V	Factor E	R Factor	Factor N	Factor F
Academic Performance	1	-,059	,363	,285	,063	-,099
<i>N</i>	-					
<i>P</i>	-	,73	,03	,09	,71	,57
AC Scale	,019	-,004	-,282	,123	-,022	,003
<i>N</i>						
<i>P</i>	,91	,98	,10	,47	,90	,99
LU Scale	-,156	,061	-,140	,066	-,180	-,127
<i>N</i>						
<i>P</i>	,36	,73	,42	,70	,29	,46
Scale EN	,154	-,028	-,104	,068	,223	,032
<i>N</i>						
<i>P</i>	,37	,87	,55	,69	,19	,85
PL Scale	,113	-,018	-,263	,171	-,054	-,173
<i>N</i>						
<i>P</i>	,51	,92	,12	,32	,76	,31
TE Scale	-,294	,228	-,115	,122	-,059	,071
<i>N</i>						
<i>P</i>	,08	,18	,50	,48	,73	,68

EX Scale	,162	,018	-,293	,128	-,019	-,079
<i>N</i>						
<i>P</i>	,34	,92	,08	,46	,91	,65
TR Scale	,146	-,208	-,080	,109	-,145	-,037
<i>N</i>						
<i>P</i>	,40	,22	,64	,53	,40	,83

Source: Own elaboration

When analyzing the correlation index of the factors and scales of the variables with academic performance in Table 7, it is possible to identify that there is only one statistically significant relationship, which is between academic performance and Factor E with a *P* value of $p=0.3$, this relationship is shown to be direct and moderate.

Discussion

Neurosciences have managed to occupy an important place in different areas of knowledge, since they generate a fairly broad perspective on the current state and situations that can be handled in specific contexts, when hoping to achieve some changes in the behavior or conduct of the people involved, and One of these areas that has benefited is education (Woolfolk, 2010; Martin-Lobo, 2015).

This research project has a particular focus due to the context of its application, since in Colombia the rural area has certain disadvantages compared to the urban area to achieve an adequate education process, however, aspects such as strengths and key points for improvement were found (Taneri & Engin, 2011).

It is important to review in the first instance how the Primary Mental Aptitudes are identified, since it was found that 100% of Verbal Comprehension is at a low level, the other factors are above 84% of students at medium-low and low levels, only in the factors of spatial conception, reasoning and verbal fluency reached a medium-high level between 6% and 11% of the population, and in the last factor mentioned, 3% reached a high level, for which it can be deduced that 3% of the population reached a high level, reasoning and verbal fluency reached a medium-high level between 6% and 11% of the population, and in the last factor mentioned, 3% with a high level, for which it can be deduced that probably the mental processes of these students are not being developed and executed adequately, which could generate difficulties for optimal learning (Perez, Carpintero, Beltran, & Baillo, 2012). Baillo, 2012).

Taking into account the above according to the multifactorial theories of intelligence, it could be interpreted that for these students it is necessary to strengthen and stimulate different aspects of their cognition, however this work is of institutional and family commitment, since stimulation is needed on a frequent basis (Maureira, 2018).

On the other hand, the study habits and techniques, show relevant data and with enough heterogeneity, in this variable an index of error can be found, by the management of the situation and the perception of the student in front of his own academic progress, however it is found that

very few students do not know how to use some skill or technique of study, but they do require important aspects of improvement, with this aspect highlighting the two categories that obtained the highest percentage, which are the attitude towards study (56%) and the place of study (75%), which in previous sections were denominated as key factors in the problems of rural education in Colombia (Arias, 2017).

In addition, it is found that the categories of work plan, exams and exercises, and work are mostly with an acceptable mastery, as for the study techniques a percentage of 44% is evident for the number of students who need important aspects of improvement and have an acceptable mastery, The only category that scored mostly a good command of the skill with 44% was that of physical condition. When analyzing these data, it can be found that there is a positive perception towards their own work, even though the results are not the highest, it could be interpreted as a social and cultural conformism, since the context does not provide a greater challenge for the academic effort (Perfetti, 2004).

In terms of academic performance, it can be observed that a considerable percentage of the population has a basic performance, and in second place there are students with high performance, and rather few students with low performance, but none of them reached the superior performance. It is important to highlight that these levels are legally stipulated in a general way, since each institution is autonomous to define the ranges for each performance, this is clarified, because it could be deduced that there is a continuum of academic and cultural conformism, which may affect the teaching practice, where the challenge of learning is permeated to comply with the minimum (OECD, 2009).

When reviewing the relationship between the variables, some important factors can be found. First, it can be inferred that by working on strengthening processes in reasoning, a reinforcement in skills such as verbal comprehension, spatial conception and numerical calculation will be evidenced, since it was the only factor that had a relationship with these three factors, In addition, it is possible to evidence that verbal fluency does not show a significant relationship with the other factors, when it should have been evidenced at least with verbal comprehension, this can be interpreted as a deficiency in the language processes, in terms of its comprehension and conceptualization, since words are known, but it is not recognized with which other words have similar meanings (Velasquez & Barreto, 2019; Sanchez & Barreto, 2019; Sanchez & Barreto, 2019; Sanchez & Barreto, 2019; Sanchez & Barreto, 2019). Barreto, 2019; Sanchez, 2015).

On the other hand, in the study techniques and habits, the dimension of work is related to most of the aspects, which can be interpreted as a personal desire of the students to study to obtain a grade in the completion of a work, but not to learn through the activities developed, since if the attitude of the students is identified, it is possible to observe that this is related to exams, On the other hand, the physical condition of the student, in spite of being the aspect with the highest score, was the only one that did not obtain a relationship, this can be attributed to the fact that in rural contexts it is usually possessed and made aware at the family level to maintain energy and disposition to carry

out different guided activities, but not in an autonomous way (Arnold, Newman, Gaddy, & Dean, 2005). Dean, 2005).

When relating academic performance with the variables of intelligence and study techniques, it is found that the only relationship framed is with Factor E that corresponds to spatial conception, which points as in previous studies where intelligence factors do not influence with considerable impact on academic performance (Flores, 2012), however it has been found that motivational and emotional aspects do have an influence with this variable, but it was not evidenced through attitude towards study.

Conclusions

The application of the theories and strategies of neuropsychology in educational processes broadens a space of knowledge and methodologies to be able to intervene in confusing cases that can be found at the academic level. In this project, key factors to intervene were evidenced as some components that are not very clear in terms of their identification and analysis; however, it is notorious that by intervening in the key factors, considerable results can be achieved in all the other factors. As a first conclusion, it is possible to find that the intellectual skills of the students evaluated show different deficiencies in terms of language processes, logical processing of information, reasoning and spatial knowledge, which, without evaluating it as a general intelligence, show components to be strengthened at the curricular level to generate more adequate intellectual skills and thus demonstrate better responses to the situations that arise both at the academic and personal level.

Secondly, it could be evidenced that there is a conformist perception regarding academic results and study habits; however, aspects such as the context determined in the place of study and the attitude towards study may be key dimensions to generate a more empowered vision and projection regarding the autonomous learning process.

In spite of not finding a significant relationship between academic performance, intelligence and study habits, intervention processes can be generated based on the relationships between the factors of primary mental aptitudes and aspects of study habits, where academic performance is indirectly strengthened, since the teaching work and the educational quality of the school are enhanced.

Finally, it is concluded that the fractioned intelligence in different skills or aptitudes can be reviewed with greater specificity and thus intervene key points, as well as study habits, since, in order to contextualize neuropsychological processes of intervention to rural areas, it is necessary to be specific in order to find what is really necessary to apply.

References

- Álvarez, M., & Fernández, R. (2015). Cuestionario de Hábitos y Técnicas de Estudio "CHTE" (Study Habits and Techniques Questionnaire). Madrid, Spain: TEA Ediciones.
- Ardila, R. (2011). What do we know and what do we still need to investigate? Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales, 97-103.
- Argüelles, D., & Nagles, N. (2007). Estrategias para promover procesos de Aprendizaje Autónomo. Colombia: Alfaomega.
- Arias, J. (2017). Problems and Challenges of Colombian Rural Education. Educación y Ciudad, 53 - 62.
- Armstrong, T. (2006). Inteligencias Múltiples en el aula: guía práctica para educadores. Barcelona: Paidós.
- Arnold, M., Newman, J., Gaddy, B., & Dean, C. (2005). A look at the condition of rural education research: setting a direction for future research. Journal of Research in Rural Education, 1-25.
- Baquiran, L. (2011). Study Habits and Attitudes Of Freshmen Students: Implications for Academic Intervention Programs. Journal of Language Teaching and Research, 1116-1121.
- Barone, L. (2007). Study Systems and Techniques. Colombia: D'Vinni S.A.
- Bey Silva, J. (July 19, 2013). Intelligence, basic neurological processes and performance of educational reinforcement students in primary school. San Fernando (Cádiz), Spain: UNIR.
- Buyer, D. (2017). Neuropsychological Assessment and Schools. Brain Injury Source, 1-5.
- Calvo, A. (2015). Viaje a la Escuela del Siglo XXI: Así Trabajan los colegios más innovadores del mundo. Madrid: Fundación Telefónica.
- Dunlosky, J., Rawson, K., Marsh, E., Nathan, M., & Willingham, D. (2013). Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology. Psychological science in the public interest, pp. 4-58.
- Flores, N. (October 22, 2012). Influence of General and Emotional Intelligence and relational skills on academic performance. Madrid, Spain: UNIR.
- FOREM. (1999). Study Techniques Workshop. Madrid: Ministry of Labor and Social Affairs.
- Gandia, L. (December 20, 2013). Optimización de Estrategias y Técnicas de Estudio del Alumnado de 6º de Educación Primaria con Vistas al Cambio de Etapa Educativa. Valencia, Spain: UNIR.
- García, M., & Llamas, F. (2015). Processes and programs of educational neuropsychology. Madrid: Ministry of Education and Science.
- Garzón, Y. (June 2016). Relationship between planning and study habits and techniques in adolescents between 12 and 13 years of age. Santiago de Cali, Colombia: UNIR.
- Government of Tolima (2014). Public Policy of Educational Quality. Ibagué: Letras e Impresos S.A.
- González, D. (2003). What is Human Intelligence? Cuban Journal of Psychology, 39-49.
- Graham, J. (2008). Introduction to Neuropsychology. New York: The Guilford Press.

- Hernández, R., Fernández, C., & Baptista, M. d. (2010). Research Methodology. Mexico: McGRAW-HILL / INTERAMERICANA EDITORES S.A. DE C.V.
- ICFES. (2017). Reporte de Resultados Históricos del Examen Saber 11 Establecimientos Educativos. Colombia: ICFES.
- ICFES. (2017). Reporte Prueba Saber 9° Establecimiento Educativo. Colombia: ICFES.
- ICFES. (2018). Guía Introductoria al Diseño Centrado en Evidencias. Bogotá: ICFES.
- ICFES. (2018). Resultados Nacionales Saber 3°, 5° y 9° 2012 - 2017. Colombia: ICFES.
- Kuhn, D., Black, J., Keselman, A., & Kaplan, D. (2000). The Development od Cognitive Skills To Support Inquiry Learning. *Cognition and Instruction*, 495-523.
- Leal-Rodríguez, A. & Albert-Morant, G. (2019). Promoting innovative experiential learning practices to improve academic performance: Empirical evidence from a Spanish Business School. *Journal of Innovation & Knowledge*. 4 (97-103). Spain
- Limiñana, R., Bordoy, M., Juste, G., & Javier, C. (2010). Creativity, intellectual abilities and response styles: Implications for academic performance in the secondary school. *Anales de Psicología*, 212-219.
- MacKay, T. (2005). The relationship of educational psychology and clinical neuropsychology. *Educational and Child Psychology*, 7-17.
- Martin-Lobo, P. (2015). Procesos y Programas de Neuropsicología Educativa. Madrid: Ministerio de Educación, Cultura y Deporte.
- Maureira, F. (2018). What is Intelligence? Spain: Bubok Publishing S.L.
- Montes, A., & Diaz, D. (2011). Manual del Facilitador Rural, Métodos y Herramientas para ayudar a grupos campesinos a conseguir sus metas. Bogotá, Colombia: Corporación PBA.
- Morales and Poveda (2022). Insights from technological mediation vis-à-vis educational quality after the COVID-19 pandemic. *Universidad y Sociedad*, 14(S3), 624-629.
- Munyaradzi, E. (2013). Teaching Methods and Students' Academic Performance. *International Journal of Humanities and social science invention*, 29-35.
- OECD (2009). Understanding the Brain the Birth of a Science of Learning. Chile: LOM Ediciones.
- OECD (2009). Teachers Matter, Attracting, Training and Retaining Effective Teachers. OECD.
- Ortega, V. (2012). Study Habits and Academic Performance in Secondary School Students of an Educational Institution in Callao. Lima, Peru: San Ignacio de Loyola University Graduate School.
- Packiam, T., & Elsworth, M. (2012). An Investigation of cognitive skills and behavior in high ability students. *Learning and Individual Differences*, 1-5.
- Pérez, L., Carpintero, E., Beltrán, J., & Baillo, M. (2012). Estimation of Intelligence in Adolescents. *Revista Española de Pedagogía*, 461-478.
- Perfetti, M. (2004). STUDY ON EDUCATION FOR THE RURAL POPULATION IN COLOMBIA. Bogotá, Colombia.

- Portela, Guarnizo & Poveda (2021). Analysis of the processes of social appropriation of knowledge of psychology graduates. *Conrado*, 17(83), 98-108.
- Sánchez, M. (June 18, 2015). Study Techniques based on Linguistic Intelligence, Logical-Mathematical Intelligence and Spatial Intelligence for Students in 5th grade of Primary Education.
- Shoenberg, M., & Scott, J. (2011). *The Little Black Book of Neuropsychology*. New York: Springer.
- Taneri, P., & Engin, C. (2011). Quality of Education in Rural Schools: A Needs Assessment Study (Ankara-Kalecik Sample). *International online Jorunal of Educational Sciences*, 91-112.
- Thurstone, L., & Thurstone, G. (2007). *Primary Mental Aptitudes*. Madrid, Spain: TEA Ediciones.
- Velásquez, G., & Barreto, S. (2019). Guided reading as a didactic strategy to strengthen reading comprehension in eleventh grade students of I.E. Samaria, of Ortega-Tolima. Ibagué, Tolima, Colombia: Universidad del Tolima.
- Villamizar, G., & Donoso, R. (2013). Definitions and Theories About Intelligence. *Historical Review*. Psicogente, 407 - 423.
- Woolfolk, A. (2010). *Psicología Educativa*. Mexico: Pearson Educación.