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Mathematics, resilience and development of thinking of youth

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Abstract. The main objective of the research was to evaluate the relationship between academic performance in mathematics and the school success. The research follows a quantitative approach with factorial design, type descriptive-comparative and micro sociological in its sample coverage. The results obtained reflect that there is a significant relationship between emotional resilience skills, the level of application, abstraction and academic performance. It is concluded that successful students demonstrate an improvement in their creative thinking and mathematical thinking, and their resilience level improved

1. Introduction

In Mathematics, grade and the formal thinking in the student is a notion that has undergone changes in accordance with the evolution of pedagogical practical, since from a humanist approach [1], academic performance was usually expressed through school grades. The most visible aspect of performance tends to be grades, which is why it is usually analyzed from the quantitative approach that has behavioral and cognitivist nuances, or from the qualitative approach, which identifies the student's, predispositions and personal characteristics. In the context of research, performance is recognized as influenced by social factors, as they identify other elements in charge of promoting and shaping their development in and out of the classrooms. In this sense, the student as an entity is result of a series of stimuli originated from diversity of factors that influence their life both internal and external [2]. On the other hand, behaviorism emphasizes that there is learning as observable, identifiable behavior change [3] while cognitivism focuses on the elements that produce cognitive functions in the brain; in this sense, all human beings are exposed to painful, stressful, difficult situations in life, some people collapse and become unbalanced, others transform their weaknesses, assume their potential and even become airy and strengthened by those same circumstances. Different researchers have analyzed and proven the link that exists between school success and personal motivation; specify its multidimensional nature where affective and cognitive variables come into play, which in their interaction contribute to form the student's value of himself and his environment [4].

Performance and motivation are main interests in education, its complexity has generated guides and classifications in his self-evaluation model, in which he identifies students oriented [5], where, there are three type of student, who avoid failure and do not participate in school life, who accept failure, who assume a defeatist attitude and low effort [5], they influenced from the environment and family models. Another important factor in the student's school performance is motivation, which is a general process

by which behavior is initiated and directed toward the achievement of a goal. Thus, motivating students implies fostering their internal resources, their sense of competence, self-esteem, autonomy, and achievement. The need to address academic success according to its different factors and how they are articulated mainly under an emotional logic, with the ability to adapt and respond to a variety of experiences. They prepare to respond quickly to the threats of the surrounding world. Social psychologists also argue that human emotions are fundamental to attachment, interaction, and social function [6]. Recognizing the role of emotions is presented as an invaluable starting point for this research project because it allows academic performance to be correlated with a number of factors that are often ignored and sometimes thought to have no theoretical/scientific basis. Within the psychosocial sphere, psychological factors are differentiated from social and cultural factors in order to define in the former the relevance of the space or place of study, the organization of collective and personal time, as well as the study techniques employed. As for the second group, it establishes the social class, the climate of coexistence and the family influence.

2. Methodology

From the nature of the present investigation, given the characteristics of the object of study and the context where it takes place, together with the methodological perspective adopted to study it, the project is framed in the mixed approach quantitative, descriptive-comparative, primary data source, transactional in the collection of information, micro sociological in its sample coverage. This moment of the investigation is based on the ethnographic method, one that allows approaching the problem of study from three perspectives, all of great utility, since as an approach it allows to understand the situations when considering the point of view of the people involved, while as method motivates to go to the terrain where the events occur and as a text, allows to describe in a textual way the findings and behaviors [7]. This method will deal with the nature of the problem, the personal experiences of the main actors, their attitudes and practices, as well as the characteristics of the context where it takes place, in whose inner core instruments are nested for a better analysis and interpretation of the results, from a more precise perspective. All this in order to guarantee confidence in the results as a faithful representation of what happens with the phenomenon studied. For its, the quantitative field will follow the correlation method, one that favors the relationship between variables, where the researcher builds a test battery that includes the variables to be studied and the subjects -or a significant sample of them- they have to answer [7]. The subsequent statistical analysis of the data will allow the researcher to obtain the certainty of the truth or falsity of his hypothesis [8]. From a perspective it will be holistic to see the scenario and people not reduced to variables, but considered as an integral whole, which obeys a logic of organization of the institution, operation and significance to understand the events from the multiple interactions that they characterize it and naturalist by focusing on the internal logic of the reality it analyzes, trying to understand people within their frame of reference.

The research has a sequential design type with a group of 40 students, who through voluntary participation. They will be actors of the investigation, students of sixth to eleventh grade, of the Sacred Heart of Jesus Educational Institution. In a scale of 25 items, between 25 and 175 points around resilience [7], understanding it as the positive trait of personality that allows subjects to adapt to life's adversities [8], facing them with courage and thus reducing the harmful effect of stress [9]. Resilience results from protective factors such as consistent self-esteem, introspection, independence, ability to relate, initiative, humor, creativity, morality and critical thinking [10]. In Edith Grotberg's perspective, these sources can be classified into 3 categories:

a) Those that have to do with the support the person thinks he can receive (I have...).
b) Those that have to do with the person's intrapsychic strengths and internal conditions [11] (I am..., I am).
c) Those that have to do with the person's abilities to relate and solve problems (I can...) [10].

For its part, develops an emergent model from the case study where:

1. Resilient Response is an action oriented to goals, sustained response or linked to point 2.
2. An approachable vision of the problem; as recurrent behavior in point 3.
3. Self-vision, characterized by affective elements and positive cognitive or proactive to problems.
4. Basic Conditions, that is to say a system of beliefs and social bonds that impregnate the basic security memory and that recursively interprets the specific action and the results.

The material used in the research comes from the choice and application of the instrument called scale of resilience (SR) of Wagnild y Young [12], a self-administered questionnaire that is developed around 2 factors: Personal competence (17 items): self-confidence, independence, decision, invincibility, power, ingenuity and perseverance. Acceptance of self and life (8 items): adaptability, flexibility, balance and perspective of stable life represented in five areas of resilience: personal satisfaction (4 items), feeling good alone (3 items), self-confidence (7 items, equanimity (4 items), perseverance (7 items) with corrected item-test correlation coefficients or discrimination index (DI) through the Pearson correlation coefficient between 0.47 and 0.89, considered statistically significant, the results of the global Alpha coefficient with level of reliability of a measurement scale of 0.81 in the total scale, and the proportion of variation of the factors. Finally, the triangulation of the findings obtained through the different collection techniques is proposed.

3. Results

Qualitative analysis shows that the academic success of young people is associated with motivational, psychological or social, cultural factors that condition aspects such as the climate of coexistence, social class and family influence. Under this view, the student is not an isolated presence but the sum of different influences that lead him to behave in a certain way and choose certain priorities. The different factors that have been identified remain related and are expressed on a daily basis, to important that people believe in what one promises, positive acceptance of change, personal competence, control and spirituality. These factors explain 57.39% of the total variability of the data. On the other hand, the internal consistency of the factors was carried out using Cronbach's alpha model, obtaining a total scale of resilience of 0.87, for the subscales positive acceptance of change of 0.86, personal competence of 0.82, and control of 0.72 and spirituality of 0.32.

On the other hand, results of the resilience test indicate lower scores are given in items 6 ("in emergency situations, I feel aggressive and uncomfortable"), 24 ("I tend to lose control during emergencies") and 27 ("When I see someone who urgently needs help in an emergency, I fall apart"), where item 6 registered an average of 2.12 that corresponds to the sub-scale of personal suffering, item 24 on the other hand had an average of 2 also of the sub-scale of personal suffering, meanwhile item 27 reached an average of 2.07, is part of the same scale mentioned previously. While the items with the highest scores were 8 ("I try to take into account each of the parties (opinions) in a disagreement (conflict) before making a decision") and the 18 ("when I see someone who is being treated unfairly, sometimes I do not feel any compassion for him"), since the item 8 registered an average of 4.32 in the sub-scale of taking perspective and for his part the item 18 had an average of 4.15, this is part of the sub-scale empathic concern (Table 1).

Results of the average corresponding to the four sub scales evaluated show that the highest score is in resilience concern dimension (27/high), meanwhile the lowest score was registered in the dimension acceptation positive. In general, the dimensions yielded a normal assessment; only the dimension of resilience concern is located at the high level (Table 2). Regarding the four main subcategories that the instrument establishes: cognitive empathy, formed by the sub-scales of perspective and fantasy, a consistent willingness of the students has been found to put themselves in the place of the other and to feel identified by the experiences that consume through the media or entertainment.

The subcategory of affective empathy that involves the sub-scales of concern and suffering reflects a lower disposition to feel uncomfortable or anxious with the bad experiences that their classmates can experience, especially when they observe directly the situations of stress or conflict. In general terms in

the reagents a normality is established in terms of the resilience of 90 at ages 14 to 16 years old and the emotional empathy of 41 of a possible ideal score of 70, revealing a high cognitive and affective category, reason that leads to establishing a normality in the overall measure of empathy with an average score of 83.5 compared to a possible score of 40. For total resilience, there is not significant differences were observed for all strengths with probabilities between $p=0.17$ and $p=0.13$, for the total resilience scale. The control subscale did not present significant differences in the average values of the strengths humility and spirituality, however, significant differences were observed for the rest of the strengths with probabilities between zero and 0.034, for the group with greater score they were statistically inferior to those of the groups.

Table 1. Average descriptive analysis by item.

Item	Media
Adaptation to changes	4.77
There are people I can trust	4.32
I resolve conflicts	3.95
I see the positive side of things	3.85
I recover quickly from difficulties	3.77
I do not abandon what tends to have no solution	3.90
Initiatives to solve problems	3.70
I encourage myself in the face of failure	3.87
Positive thinking I'm strong	3.60
I handle unpleasant feelings	2.77
Pleased by the challenges	3.32
Achieved the proposed goals	4.10
Clarity towards where I project my life	4.30
Working to achieve goals	3.35
I am proud of my triumphs.	3.95
Make difficult or unpopular decisions	3.50
Coping with stress	3.60
Under pressure I concentrate	3.30
Life control	4.15
He is still got hunches.	2.97
Let God's help destiny situations	2.12
Situations happen for some reason	2.60
I listen to tips	2.30
Support for those in difficulty	2.82
In the face of adversity I am discouraged	2.47

Table 2. Overall results of the empathic disposition.

Sub-scale	Results	Rating
Positive acceptance of change (R1)	83.5	Normal
Personal competence (R2)	88.9	High
Control (R3)	84.6	Normal
Spirituality (R4)	76.4	Normal
Sub categories		
Recognizes and uses their strengths and capabilities developed.	82.4	Normal
Accepting the need to cultivate the less obvious ones in their common behavior	81.0	Normal
Global category		
Resilience disposition	85.5	Normal

4. Discussion

In social psychology authors consider that attitude is responsible for driving behavior, in some cases relationships of congruence are established [8], while in others considerable differences are identified regarding what someone believes and what they end up doing once they are immersed in a certain social situation. Successful student's present normal to high scores for all strengths assessed [9]. Self-perceived strength with the highest value is hope followed by gratitude, kindness, honesty and equity, representing the top five in students. The strengths with the lowest mean scores are self-regulation, prudence. There is a multiplicity of individual characters in the profile of strengths, since each subject develops them according to his or her personal history and relationship with the environment, so that necessarily the context and socio-demographic characteristics of each must be taken into account [12].

In the composition of the conglomerates two predominant attitudes are determined, the first one reveals how the empathic concern can be a source of tension and suffering for the students, who describe that when they see their classmates affected by some conflict or problem they get uncomfortable and do not know how to respond. To adapt to unforeseen situations (factor 1), possessing a positive vision of the future, and flexible to adapt to new situations (factor 2), with capacity to promote their own well-being, with abilities to act according to what they have decided to do with their life (factor 3) with positive influences in family life and associated with it spiritually (factor 4). The two dimensions that stand out dictate to a large extent the behaviors shown by the high school students, who in the interviews share mixed positions since a part of them has not felt cheated or excluded, while others do stand out among their comments that they mess with me when remind teachers of the task or the exam also highlight that one receives reproaches when something does not go well and gets a bad grade (E-021). In general, school success has a multidimensional nature in which cognitive and emotional elements participate, in this sense students conform their disposition and behavior according to their acceptance of the academic environment [12]. Faced with this it is observed that students have doubts since students with a normal or deficient performance are those who tend to feel more comfortable in school, while those who have an excellent performance are those who are more critical about how they should edit his personality and behaviors in order to please, in that perspective they point out that "we are indifferent to negative comments or congratulations, we focus on learning more and more"[12].

The results indicate that younger students have the highest levels of total resilience, positive acceptance of change, and control, especially in relation to those in grades 5 and 6. However, 11th grade students, mostly adolescents, take on the challenge of initiating actions, implementing all their capacities as human beings, adapting to changes, assuming responsibilities and using social, moral and spiritual resources for successful development in their new life [13]. The notes in the cards show a significant resistance on the part high performance students to try to form new bonds and relationships, on the other hand those who have problems with the grades are the most expressive and tend to have more friends in the backyard. Another of the behaviors that can be seen in coexistence is the superiority or self-centeredness with which students can respond when bothered by their peers, in this line they express that "I like to know more than others and always understand what is happening" expressed student-021.

The responsibility for their good performance also generates a social pressure in which their difficulties in some areas such as physical or artistic education stimulates negative comments in the other students of the group, when they are judged they show themselves withdrawn, they close each time more to your closest social circle, consisting of one or two and increases one of its characteristic behaviors [14], the achiever and stable, since they do not like the changes and reflect great distrust. The oscillation between the outstanding dimensions of suffering and perspective reveals among other things that children and young people are at a crucial stage to form their social personality, in that sense although their basic impulses instigate them to care or help, they do not know how to stop be overwhelmed and choose not to risk, feign disinterest or simple indifference to the subject of interpersonal relationships. Prevail the concepts of self-esteem and confidence in two of the weaknesses found in the students, because in them it is uncommon to see that they take positions to express their dissatisfaction with the attitudes or behavior of their peers, this situation leads them to respond in a superficial way to the questions about their experiences of coexistence and compromises their

assertiveness because most of them find it difficult to clearly define their social expectations [15]. In the results of the test applied around the levels of empathy two subcategories are prioritized, in which cognitive empathy is called a normal reach and the same with the affective empathy, despite what was found in the interviews and the observations is that most have assumed behaviors of distrust or indifference. Faced with this incongruity that is reflected between attitude and action, the empathic disposition is affected, an effort that students fail to achieve because they are more concerned with themselves than with others.

5. Conclusions

Total resilience is significantly related to all character strengths. Positive acceptance of change relates to all character strengths; personal competence relates to all strengths except prudence. The research identifies that while the multidimensional resilience shown by learners helps them to be more tolerant and understanding of what happens in the school environment, it is sometimes external behaviors that take them away from their focus, values and personality. It is precisely in those challenges that show the strengths that bring them high educational performance. The resilience construct was described through the determination of four subscales or dimensions, as they are positive acceptance of change. Personal competence. Control, Spirituality, generated from factorial analysis. The younger and eleventh grade students show significantly higher values in total resilience, as well as in the subscale positive acceptance of change. Successful math students demonstrate formal thinking skills, mathematical application, resilience that affect quality of life, each student recognizes and uses their strengths and capabilities developed, accepting the need to cultivate the less obvious ones in their common behavior.

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