Theories of Intelligence

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SUMMARY OF RESULTS

Students across generations and countries have long engaged in the great right brain versus left brain debate. Many students internalise negative perceptions about their own intelligence and simply accept that they "are not a numbers person". This paper examines the effect of stereotypes on student academic performance and proposes intervention strategies to minimise the negative impact of stereotypes. To demonstrate the impact of interventions based in theories of intelligence, Inchausti utilises an original case study that he conducted in urban South American schools. Using a LIKERT scale survey that asks respondents about the "origins" of intelligence, Inchausti finds girls with poor performance in mathematics express more agreement with fixed mindset. While the study does not have statistical power to conclude about boys and other subjects, it does reflect the general theory that students who agree more with a fixed mindset have lower grades and demonstrate the need for interventions in the classroom to mitigate the negative effectives of stereotypes relating to levels of intelligence.

1.0 INTRODUCTION

A thirteen-year-old student in rural India enters into a room with 5 other young adolescents to take a test. As the instructor verifies their identity, he learns that he plus two of the students are low caste while the other three are high caste. In the next room, one of his friends enters in a similar setting, but no personal verification procedure was run. After collecting the results of nearly 600 students in these types of settings, a stunning result was found: low-caste students that happen to know they are taking the test side by side with high-caste peers, perform worse than their mates under the non-revealed caste condition. This study was run by Karla Hoff and Priyanka Pandey (2014) with the aim of identifying the extent up to which identity plays a role in performance. They found that situations evoke identity models that mediate how individuals process information with effects on their intellectual performance. The mere saliency of a stereotype with which a young student connects, has the power to override his own personal competences.

In the following paragraphs I will discuss the effects of stereotypes in the academic performance of students and present some tools to design contexts that reduce their negative effect. In doing so, I will review the concept of stereotype threat and its impact in young adults of low income background. I will focus in particular on the identities that are built around Maths and how an intervention based in teaching the difference between a growth and a fixed mindset can reduce its negative effects. I will present and discuss the results of implementations based on the work of Carol Dweck, including primary findings drawn from experiments I conducted in South America, and discuss their applicability

2.0 DATA

2.1 Negative Stereotypes and Their Influence on Academic Performance

Introduced by Steele and Aronson (1995), stereotype threat refers to the condition by which we adopt a negative characteristic of the group with which we identify. In their original paper, they demonstrated that for African American students, the saliency of race causes them to underperform in verbal tests. On related studies, White athletes perform worse than Black ones when asked to participate in a task intended to test their "natural athletic ability" (Stone, Sjomeling, Lynch, & Darley, 1999).

Stereotype threat is particularly prevalent in academic performance, but its effect can be limited with well-designed interventions. The situational dimension of personal identity and its relation to behaviour has been evidenced in many experiments. In some situations they can contribute in positive ways, for example Asian-American women primed with their cultural identity (usually associated with superior quantitative skills) performed better on mathematics tests (Shih, Pittinsky, & Ambady, 1999). Nevertheless, the weakening power of arbitrary negative identities that students adopt gather the interest of many academics and teachers in particular due to the possibility that school settings have in reducing that negative influence. For example, treatments that target personal reaffirmation (debilitating a negative stereotype) helped Latino students in improving their academic results in standardized tests (Sherman et al., 2013).

The influence of stereotypes in performance is controlled by three type of mediators: subjective states, cognitive structures, and motivational mechanisms (Pennington, Heim, Levy, & Larkin, 2016). Subjective states refer to the way a stereotype interacts with internal representations creating anxiety or setting specific references for performance expectations thus reducing performance. Negative stereotypes also affect performance by consuming mental resources and reducing the working memory as students keep thinking in them. Finally, they can affect personal motivation in particular in relation to the level and type of effort individuals apply to solve the proposed task: "why bother in doing something that in the end I am bad at". Pennington et al suggest that a multi-threat approach should be taken when looking at the mediators recognising that different contexts may activate stereotype threat through different mediators.

2.2 Don't waste your time. I am not a numbers person

Although much of the research in stereotype threat refers to the community with which students feel identified, sources of negative identities are ubiquitous. Sometimes they are even built by caring parents trying to comfort their children when they are not good at something: "you are like your dad, we are just not good at numbers". The whole idea of intuitive and creative right-brained artists and scientific and logical left-brained thinkers is probably

one of the most negative and pervasive stereotypes that people face. Believing that we are equipped at birth with a set of skills helps when dealing with failure but at the same time creates barriers to explore other talents as it signals not to waste time in things that are simply not born with us.

Brains are not fixed and immutable and they change at a neurological level in reaction to environmental cues. Specific neural activity patterns activated in response to changes in the environment have long lasting effects on synaptic connections (Schaefer et al., 2017). A study on London taxi drivers showed a greater volume in specific areas of the brain as drivers are more experienced (Maguire, Woollett, & Spiers, 2006). Learning and mastering a specific skill is related with changes in the brain, and not the other way around. Our abilities result from the interaction of our brains and the environment to which we are exposed. This concept is captured by the term neuroplasticity, the property of the brain to change by creating new neural connections throughout life to adjust in response to new situations or changes in the environment.

Teaching students about neuroplasticity has a direct impact in their performance. Lisa Blackwell, Kali Trzesniewski, and Carol Dweck (2007) proved that students' performance increase when they learn that they are not born with a fixed amount of intelligence and that they can do things to improve it. Several studies replicated these findings and part of them were presented in the book Mindset: The new psychology of Success. Dweck argues that the belief that not much can be done to increase own intelligence (fixed mindset) leads students to see errors as a confirmation of their inability to perform a specific task. However, those students that believe they can improve their intelligence with dedication and effort, (growth mindset) see failure as another step in the process of learning. Inspired in her work many interventions on growth mindset were subsequently designed.

3.0 RESULTS

3.1 Intervention based on theories of intelligence

An effective intervention aiming at improving academic performance by removing the negative effect of a fixed mindset belief must include four stages: (1) initial assessments of the theories held by students, (2) intervention per se, (3) assessment of the effectiveness of the intervention in changing beliefs, and (4) assessment of the change in the academic performance.

Dweck proposes a very simple survey that is useful to measure beliefs of students about the origin of intelligence. The questionnaire has 8 sentences and asks students to express their degree of agreement in a 1 to 6 LIKERT scale. The questions are: (1) You have a certain amount of intelligence, and you can't really do much to change it, (2) Your intelligence is something about you that you can't change very much, (3) No matter who you are, you can significantly change your intelligence level, (4) To be honest, you can't really change how intelligent you are, (5) You can always substantially change how

intelligent you are, (6) You can learn new things, but you can't really change your basic intelligence, (7) No matter how much intelligence you have, you can always change it quite a bit, (8) You can change even your basic intelligence level considerably. Questions 3, 5, 7 and 8 are reverse coded and measure the degree to which a student believes in malleability of intelligence.

The ex-ante application of the survey is vital to test how much of past performance is explained by implicit theories of the origin of intelligence. In the replication of this methodology in urban South American schools with students in the age range 13 to 15, I was able to confirm a well-documented finding: girls with poor performance in mathematics express more agreement with fixed mindset. The study does not have statistical power to conclude about boys and other subjects, although the relation is consistent with the theory: in general those students who agree more with a fixed mindset have lower grades.

The design of an intervention should be discussed in depth with teachers of the institute and customised according to the needs of each institution. Interventions usually consist of teaching students the scientific base of neuroplasticity and some activities around it. Two classes structured as 40 minutes sessions with the aid of videos and a structured text are enough for that purpose. One activity is particularly helpful to fix the concepts worked in class: writing a letter to an imaginary student that is entering school and is facing troubles with some subjects. This activity intends to activate the "saying-is-believing" effect by which saying something helps in adopting the ideas involved. Although the content of the letters is not the objective of the intervention, usually the pieces wrote are inspiring and integrate the concepts worked in class helping in assessing the impact of the two sessions. Nevertheless, a couple of weeks after them, a new round of the survey is run will verify if the intervention was useful at changing declared beliefs.

Interventions of this kind are capable of changing the beliefs of students and impact their performance at the end of the year. As their application is easy, they are increasingly becoming part of class planning with positive effects (Yeager et al., 2016). Nevertheless, they are not a magic bullet and should not be applied without following this four step procedure: (1) ex-ante survey, (2) customized intervention, (3) ex-post survey, and (4) assessment of the effect. Not all students benefit the same from these interventions, but those coming from low socioeconomic contexts or are at risk in their academic achievement benefit the most (Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018).

As with many behaviours, those that are involved in the process of learning and succeeding in school are context dependent. Professors can help students to improve their performance by embracing techniques and methods that target and remove non-cognitive barriers. Teachers are encouraged to take care of the impact of negative stereotypes on the performance of their students. Regularly screening for them in order to select, customise and apply

tools that effectively reduce their effect, is a good practice to follow. The way students of specific backgrounds think about the origin of their intelligence is proven to impact how they deal with failure and the resilience they exhibit in their learning process.

4.0 DISCUSSION

A proud father looks at his son running to the goal line leaving behind the other team players and beating the goalkeeper in a precise shot... he thinks for himself: "this kid is a natural". That loving father builds into a stereotype, people are born with talents. Regrettably, that simple idea may have dangerous effects that can damage academic performance. Fortunately, as extensively shown in the literature and corroborated with primary data from our research in South America, there are tools available to measure its impact and to reduce it.

5.0 ABOUT THE AUTHOR

Gabriel Inchausti graduated in Economics from the University of the Republic (Uruguay). Gabriel has professional specialization in corporate finance and strategy and is currently pursuing a Masters Degree in Behavioural Sciences at the London School of Economics. He is a professor and lecturer in topics related to Behavioral Economics in Uruguay and Brazil, and is an active researcher in the field. His research focus is in the area of education and time preferences. Moreover, Gabriel served as the Executive Officer for a major South American beef group and the General Manager in an important media group in Uruguay. Currently, he is chairman of the board of a South American software company.

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