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HOPE IN THE AGE OF INEQUALITY: CAN ROLE MODELS TEMPER THE EFFECTS OF SUBJECTIVE INEQUALITY? A FIELD EXPERIMENT

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Para mi mamá y abuela.

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1 Introduction

Schooling is an important determinant of individual and social development. It allows societies to educate new generations and share their knowledge, skills and culture. Schooling allows individuals to develop mentally, physically and socially. The human capital theory states that education makes individuals more analytical and productive, increasing the economy's output and remunerations in the labor market. There is widespread evidence that earnings increase with each extra year of schooling (Acemoglu and Angrist, 2000; Card, 1999; Oreopoulos and Salvanes, 2009). In addition to direct effect on private returns, macroeconomic theories of the late 1980's equate the link between the expansion of schooling and economic growth. An economy can transition to a higher steady state when there is more human capital (Mankiwet al., 1992), new knowledge and technological progress (Lucas, 1988; Romer, 1989). Moreover, the UNESCO recognizes schooling as the key driver for economic well-being but also for attaining poverty reduction, gender inequality, public health and peaceful societies.

Yet, school remains an institution that reproduces the socioeconomic and cultural disadvantages prevailing in the rest of the society (Pierre Bourdieu, 1977). For instance, students from economically poor families are more likely to attend schools characterized by worse infrastructure, less ambitious peers and teachers, and outmoded pedagogical practices compared with those in more privileged areas. Thus, behavioral economists have contributed to the education literature by studying the constraining aspirations,

beliefs and hopes of individuals. This, to better understand -and eventually ameliorate- the way individuals make academic decisions and schooling investments.

Recent literature on aspirations argues that the capacity to aspire is inherently unequal between rich and poor (Appadurai et al., 2004; Dalton et al. 2016; Genicot andRay, 2014). Hence, unprivileged individuals are more likely to lack references of other people making successful educational investments and may become trapped in communities characterized by low beliefs, low investments and aspiration traps. Role models have been found to be a powerful way to update beliefs about the returns to educational investments (Bernard et al., 2014; Beaman et al., 2012; Nguyen, 2008).

To prove this theory empirically I designed a field experiment featuring potential roles models with the aim of boosting aspirations and hopes in students and improving their academic outcomes. According to the psychology and education literature, elementary education is an alluring framework for studying internal constraints of individuals. Investments in this educational level have the highest rates of return (Mingat, 1987) and are associated with larger externalities than any other social investment (Haveman and Wolfe, 1984). Hence, the sample was composed of 21 public elementary schools in Mexico City. To account for the high levels of inequality (Cortés and Vargas, 2017; Bustos and Leyva, 2017) prevailing in the education framework in Mexico, I also examined whether subjective inequality has a detrimental effect on students academic outcomes.

I implemented an experimental design similar to Riley (2017) and Huillery and Guyon (2014). The authors found, respectively, a positive effect of the exposure to a film about a role model on national test exams in Uganda and evidence that french adolescents behaviors are biased by psychological factors. Huillery and Guyon (2014) suggests that those who perceive themselves as more disadvantaged or excluded tend to fall in an aspiration failure with negative consequences on their academic outcomes. However, Riley (2017) shows that this effect can be tempered through a role model intervention.

The experiment consisted of randomized exposure of 1500 students in their last year of elementary school in Mexico City to a questionnaire about perceived social status and a role model intervention, versus a control group. Students in 6th grade preparing to take the district exam IDANIS (*Instrumento para el Diagnóstico de Alumnos de Nuevo Ingreso a Secundaria*) at the end of elementary school were individually randomized in one out of three groups to received a different treatment before a mock exam. This design allows me to test the impact of subjective inequality and the role model intervention on academic performance in the short run.

This study shows that behavioural change is possible after a brief (40 minutes) exposure to famous role models. Impacts of this treatment on exam outcomes are seen even as soon as 3 week after exposure I find that among students receiving the role model treatment results in an overall 0.11 standard deviations improvement on

IDANIS mock test score. It is men who benefit most from receiving the role model with an improvement in their exam scores of 0.14 standard deviations. Also, students enrolled in a morning shift school improved their test performance by 0.24 standard deviations statistically significant at the 1% level. Assuming that morning shift schools in Mexico City are those with a better academic attainment, this suggests that it is students at the best performing school who benefit most from a role model intervention.

In regard to the inequality treatment, it had a null and non significant average treatment effect. However, when I analyze heterogeneous treatment effects I find evidence that the inequality intervention has a negative impact of -0.20 standard deviations on test scores for most-able students. Also, it appears that the role models intervention has a bigger effect on these students. The positive impact for students at the top of the distribution reaches a 0.33 standard deviations improvement. Thus, my experiment shows that subjective inequality may have a harmful effect on academic performance which can be tempered by a role models intervention. This holds especially for best performance students.

This paper contributes to a growing literature on the impact of role models on economic behaviors. Particularly, the study of alternative educational approaches to improve the quality of schooling is crucial in a country with poor academic performance in international tests (OECD, 2016) like ours. In terms of policies to improve performance in school in developing countries, this intervention was extremely costs effective

and could easily be scaled up. My findings therefore demonstrate that a low cost, one-off and brief exposure to a role model can have as positive effects on education outcomes as larger and more complex programs, such as teacher incentives, instructional materials or reducing class sizes (Evans and Popova, 2015).

The rest of this paper is organized as follows: Section 2 comments the existing theoretical literature and empirical evidence. Section 3 discusses the study design. Section 4 goes over the data used in this study. Section 5 contains the econometric model and results. Section 6 analyzes the heterogeneous treatment effects. Section 7 concludes.

2 Literature review

In recent years, the role of internal constraints or behavioral biases on individual's decisions has been brought to the economic analysis. The literature has developed various approaches to explain how motivation and aspirations are crucial driving forces that direct our subsequent behavior and outcomes. Aspiration failure (Appadurai, Rao and Walton, 2004; Genicot and Ray, 2014; Ray, 2006) identity economics (Akerlof and Kranton, 2000) and returns to efforts (Dalton et al., 2016) are the most influential theories to explain the effects of individuals psychological biases on social outcomes.

Aspirations are considered as the capacity to set appropriate goals for the future, i.e. goals in line with one's potential that lead to the best possible outcome. According to Appadurai et al. (2004), social background has a direct impact on aspirations and thus on economic decisions. They argue that the capacity to aspire is socially determined because experiences are formed in the "thick of social life". This would explain that poor people individuals invest differently on education because they use comparisons and similarities with peers and relatives in forming their aspirations. An inspirational trap occurs when low aspirations induce low investments and efforts to better one's life, resulting in poor outcomes. Appadurai et al. (2004) claims that underrepresented and stigmatized groups - indigenous, female, poor - may lack the capacity to aspire, so policies that strengthen this capacity could help them to contest and alter the conditions of their social reality. Genicot and Ray (2014) embed this theory in a macroeconomic

growth model, showing that the social determination of aspirations can be the source of divergent income inequalities among countries.

Akerlof and Kranton (2000) incorporated the concept of identity economics to the utility maximization theory. Individuals have socially-dependent preferences, leading to different views on their optimally in terms of welfare. Individuals think and decide in terms of expected utility relative to a social reference point, in line with the prospect theory model and opposed to what the neoclassical utility maximization theory assumes. According to the authors identity reveals itself as a convincing approach for understanding labor market and schooling choices. For instance, it could explain why the best choice available to some African Americans in the United States is to adopt an oppositional identity and to opt-out of the mainly white job market. Although they may be economically better off if they adopt an insider identity and pursue a "white" job, deviation from the stereotypes imposed by their social category will exert a bigger cost on their utility. That is, individuals may increase their utility by investing in identity-reinforcing attitudes, because it limits disruption and maintains a sense of unity.

Dalton et al. (2016) develop a model in which poverty trap is perpetuated by the interaction between extrinsic circumstances (initial disadvantage i.e. poverty or social exclusion) and intrinsic factors such as aspirations and beliefs. Hence, it will be rational that, at a given initial aspiration level, a poor person will choose a lower level of effort

than a rich person because poverty imposes external constraints that make effort less productive. This lower effort induces lower realized outcomes, which in turn results in lower aspirations in the next period, starting a vicious cycle that locks individuals in aspiration and poverty traps. This model points out that selves draw on aspirations and efforts of their cognitive neighbors, whence the importance of improving aspirations on the neighborhood of individuals. Bertrand, Shafir, and Mullainathan (2006) claim that "small institutional barriers" that would appear insignificant in a cost-benefit analysis would become psychologically costly for vulnerable people within an aspiration trap.

Changing a role model to break an aspiration trap has been suggested as an alternative to raise aspirations i.e relaxing the internal constraints of individuals (Rao and Walton, 2004). A role model may generate an information externality on the individual who changes her action and aspirations upon observing the actions and outcome of the said role model. Thekla Morgenroth and Peters (2015) developed a theoretical model that highlights ways in which the power of role models can be harnessed to increase social outcomes. This approach claims that role models have an impact on individual through three main channels: first, they act as behavioral models because they show how to perform a skill and achieve a goal; second, they teach individuals that a goal is attainable thus, they are representations of what is possible; and third, they are inspirational because they make a goal desirable. Hence, role models are goal embodiment that influence expectancy of individuals by changing self-stereotyping and prompting

indirect learning.

Various papers provide experimental evidence on the impact of role models interventions on subsequent behavior and outcomes. Bernard et al. (2014) use an innovative experimental design in rural Ethiopia to attempt to test whether aspirations and future-oriented behaviour can be altered. The experiment involved exposure to a one-hour documentary in which four people from similar backgrounds to the audience tell their life story of how they improved their economic status. Their results point out that the intervention affected both viewers' investment in their children's education and other future-oriented behaviors six months later. Lybbert et al. (2016) created a framework for understanding the role of hope and aspirations in a field project in Oaxaca, Mexico. Their results suggest that a hope intervention among 601 micro finance borrowers raised aspirations approximately a quarter of a standard deviation, significantly raised a hope index among the treated subjects, and had positive but statistically insignificant results on enterprise performance.

In the educational context, Good, Aronson, and Inzlicht (2003) perform a field experiment to test two 90 minutes mentoring sessions. This intervention aimed to overcome the anxiety-inducing effects of stereotype threat in junior high school students. The authors find that the interventions boosted the performance of girls in mathematics tests and ability-stigmatized students' performance in reading standardized test. Cohen et al. (2009) show in a two-year field experiment in American High Schools how writing

assignments focusing students on a self-affirming value and role modeling reduce the racial achievement gap by improving significantly the performance of African American students on their GPA test.

Similarly, Stout and McManus (2011) test with two controlled experiments a stereotype model, which propose that contact with same-sex experts (advanced peers, professionals, professors) in academic environments involving science, technology, engineering, and mathematics (STEM) enhances women self-concept in STEM, attitudes toward STEM, and motivation to pursue STEM careers. Lori Beaman and Topalova (2012) finds that the exposure to female leaders in local governments raises significantly aspirations and educational attainment on girls, despite no change in the resources available for their education. Such exposures to female leaders reduce the behavioral bias on young girls in India, by helping them see the link between their current effort and future aspirations. Also, Alan and Ertac (2018) evaluate a randomized educational intervention aiming to improve grit in the classroom environment in Istanbul, Turkey. The intervention involved a teacher training program to be implemented in class by students' own teachers. The authors find that treated students are more likely to exert effort to accumulate task-specific ability, and hence, are more likely to succeed in the academic environment. In a follow up 2.5 years after the intervention, they estimate an effect of about 0.2 standard deviations improvement on a standardized math test. In the view of these experimental papers, detrimental identity-based behaviors can be

tempered through role models interventions. Indeed, they have been empirically showed to be a very effective low-cost alternative to shape perceptions and social differences in educational preferences. My paper aims to replicate these results in the Mexican context.

Another class of papers from the economics behavioral literature, studies the role of perceptions and builds theoretical model where beliefs related to social inferiority affect the perceived probability of success, self-confidence and change individual's attitudes. Payne's (2018) work on subjective poverty and marginalization claims that people, and particularly children, respond to inequality not rationally but emotionally and this has significant impact on individual's economic behavior. Payne has come to the conclusion that what is really damaging about being poor, at least in countries with a lot of inequality, is the ongoing comparison to others that make people feel deprived, resented and marginalized, leading to aspiration failures and thus inefficient educational decisions. Various papers have used subjective inequality perception tools for assessing an impact on attitudes. Kuhn (2015, 2016) developed a methodology to measure the individual perceptions of wage inequality and search for a causal effect on attitudes and beliefs about meritocracy. In the spirit of testing empirically this approach, my paper incorporates a measure of perceived inequality and subjective social status to analyze its detrimental impact on academic performance.

The objective of this study is to contribute to the role modeling and subjective

inequality theories by testing them empirically in Mexico City's elementary public education framework. The transition to junior high school is the time at which most students falter academically Eccles, Lord, and Midgley (1991) and during which the early differences in confidence manifest Aronson (1997). So, working with last graders of elementary school children seems like an optimal emotional moment to prove out two main hypothesis. I expect to observe that subjective inequality is a good predictor of the academic performance in standardized test. Also, I await to identify a lessen negative effect of perceived inequality in children exposed to a role model intervention.

3 Experimental design

For testing a causal relation of subjective inequality and role models on academic performance I designed a random experiment with two different treatments and a control group. The experiment had three parts: 1) in a first visit to schools all students took a standardized test to have a baseline test score before any treatment; 2) then, students were randomly assigned to any of the three groups:

Control group: involved recreational activities with no academic content;

Inequality group involved an intervention concerning the perception of inequality;

Treatment group involved the same intervention received by the inequality group but was followed up by a motivational intervention about role models;

3) three weeks later, a second visit to school took place. Students' academic performance was reevaluated.

3.1 Standardized tests

A standardized test was given to students in the first and second visit. They had 25 minutes to answer 25 multiple-choice questions. These questions were different in both exams but with similar format and level. The IDANIS (*Instrumento de Diagnóstico para los Alumnos de Nuevo Ingreso a Secundaria*) exam is a mandatory test for all 6th graders in a public elementary school in Mexico City. Performance in this exam

conditions to which junior high schools student are assigned. This exam takes place next on June each year.

The IDANIS test contains 60 multiple-choice questions divided in 5 sections: reading comprehension, sentence completion, arithmetic, geometry and abstract reasoning. The first mock exam used in this study didn't include reading comprehension questions because this would extended the duration of the exam significantly. Also, according with Tara Stevens et al. (2004) motivation has a bigger impact on mathematics exams than on any other subject, so we would expect to detect more easily any treatment effect. Optical bubble sheets were used to facilitate grading and to replicate the IDANIS original format.

At the beginning of the visit to each classroom I introduced myself and explained the importance of this test to measure their readiness to the IDANIS exam next June. Students were asked to put away all their books and materials and keep only a pencil and an eraser. To avoid the lack of effort during this test the students were told that their exams results were going to be taken into account for their mathematics grade. Before giving them any further detail I started the randomization, which is detailed in section 4.1

Once the students were randomized I distributed to each student three documents: a booklet with 25 questions, an answer sheet and a white sheet. Then I explained the

format of the exam and how it needed to be answered. The students were already familiarized to bubble sheet format exams but I gave an example of how to answer correctly and what were the common mistakes. The white sheet could be used for any calculus or drawing needed; students were asked to not make any annotation on the questions booklet. Both exams and bubble sheet format can be found at the appendix. Instruction explanation took around 5 minutes. If no one had a question, the timer was set and I wrote on the whiteboard the limit time. There was always a teacher supervising the students while I checked on the other classrooms. Teachers were asked not to help the students. After the 25 minutes the teacher and I collected the booklets and answer sheets.

Random assignment to treatment should ensure an unbiased estimator however, students were asked to provide some personal information so I could control for these covariates and get more precise estimators. On the answer sheet of the first exam students provided their age, gender and school shift. Also, I included two items to measure their mindset. Students needed to mark their level of agreement in a six-point Likert scale: 1) "There are people born with a mathematical ability, while others born without it"; 2) "You can learn new things, but you cannot change a person's intelligence". Claro, Paunesku and Dweck (2016) used these questions to measure the impact of students' mindset on academic performance. They found that a fixed mindset (opposed to a growth mindset) is a significant predictor of academic achievement. Whether a stu-

dent believes that intellectual abilities are immutable the negative effects of structural factors on academic achievement will be exacerbated (Burnette et al., 2013; Yeager et al., 2016). Beliefs about intelligence are important for the experimental design because various studies (Blackwell et al., 2007; Dweck, 2006; Duckworth et al., 2007; Alan et al., 2016) have found that a growth mindset has a positive impact on the effect of a role model intervention.

The application process of the second exam was exactly the same but with no randomization needed.

3.2 Inequality intervention

Students in the inequality treatment received a supplementary document after finishing the standardized test. To test empirically Payne's (2018) theory about the impact of perceived inequality on attitudes and, particularly, on academi performance I used the McArthur scale of subjective social status questions. This scale was developed by Goodman (2003) to find a relationship between perceived social status and physical and mental health in adolescents. This is a two item instrument that measures how a young person perceives their family's and their own social standing. studies that first measure adolescents' subjective social status and later examine their health strongly suggest that this indicator plays a causal role in shaping health and wellbeing (Lemeshow, et al., 2008).

One question aimed to measure the perceived inequality with respect to their close community while the second one intended to measure children a broader perception measure. The document contained the following questions: 1) "Imagine that the students with more economic resources and opportunities in your school are on the top of the ladder; those with less economic resources and opportunities are placed in the lowest rung of the following ladder. Put an "X" on the rung where you think you are placed"; 2) "Now, imagine that this ladder represents the whole country. On top of it are the most important and wealthiest Mexican families. On the bottom are the Mexican families with the worst money problems. Think about your family and place an "X" on the rung where you think your family is placed". Finally, students were asked to answer briefly: 3) "How does your position on both ladders make you feel? Have you ever felt that people treat differently those at the bottom of the ladder?; 4) Do you think that the lack of money affect the academic performance of children?".

Each rung of the ladder corresponds with numbers from 1 through 10. If a participant marks an “X” on the bottom rung, their response is scored as 1. If they mark an “X” on the middle rung, their response is scored as 5. If they mark an “X” on the top rung, their response is scored as 10.Students had 10 minutes to answer these questions.

3.3 Role model intervention

The second treatment group (T2) answered the same questions of the inequality treatment. Afterwards, they received the role model intervention.

I showed students pictures of Cristiano Ronaldo, Emma Watson, Yalitza Aparicio and Evo Morales when they were children and asked if they recognize them. The first three famous people were identified almost immediately, though no one knew Evo Morales. Then, I presented recent pictures accompanied by a brief text about the life of this people which was read aloud by volunteers. This text mentioned their family background, the struggles they faced before becoming successful and some social causes that they currently support. Then, children were asked to find some common points between these people so they could identify values and attitudes that successful people share such as growth mindset, discipline, self-confidence and clear goals. Students interacted constantly giving examples, definitions according to their understanding and reflections about what it takes to be successful in different professions. Lastly, students were asked to answer questions that nudged them to internalize the content discussed previously: 1) "Which of these people inspired you the most? why?"; 2) "Do you have a role model in your life? Who is it? Why is he/she your role model? According to you, is it important to have one?"; 3) "Mention a long-term goal that you have (it can be an academic, professional or material goal). 4) Name three short or medium-term actions that you need to make to reach your goal".

This intervention took overall around 40 minutes. In general, children were really involved and enthusiastic through all of the activity. They all wanted to share ideas, answer the questions and read for the class.

3.4 Control group

After the control group finished the standardized test, each student received a worksheet with various recreational activities such as crosswords, word puzzle and "find the differences" pictures. These activities didn't have any academic content, their objective was nothing but to entertain them while the other two classes were receiving their respective intervention. With the help of a class teacher who was always supervising the control group, the students solved the activities.

4 Sample

Elementary public schools in Mexico City were approached during early February 2019. The outreach to schools was done through school supervisors. This is because instead of asking school principals if they were keen to participate in the experiment, it was easier to have a superior contact. Indeed, supervisors have a higher administrative rank and they are in charge of around 5 school each. There were no criteria for a school being recruited into the study except for being in Mexico city and consenting to provide

registrars of students.

If a supervisor agreed to participate in the project I asked him for permission so I could attend any of the various mandatory meeting with the principals under his charge. In this meeting, I presented the work plan of the project and solved any doubts. Schools were recruited until a sample size of approximately 1500 students was reached (the choice of this sample size was based on the experiment of Campos Vázquez, R. and Medina Cortina, E. (2018)) This occurred after 21 schools confirmed their participation in the project.

The study was pitched to schools as looking at the impact of subjective inequality on exam performance. I committed to provide them the results of all of the students in both exams so they could analyze them. Details on the inequality or role models intervention were not given with anticipation.

Schools provided their entire cohort of 6th graders, such that the only untreated students in the year group were students who were absent from school on the day of the exam application. Using the lists of students enrolled in 6th grade I confirmed that schools did indeed provide their entire classes for the study and that at most 2-5 students were missing from a given class. Consenting schools were allocated a date of exam application that fit their calendars and workshops' schedules. Most of public elementary schools in Mexico city operate a double-shift system. That is, in

the same building there are two different schools. The morning shift school usually is more crowded and, there are usually three 6th grade classes and groups have around 40 students; this shift timetable starts at 8am and finished at 12:30pm. The afternoon shift school goes from 2 to 6:30pm. The first visit took place from February 28th to March 8th. The second one was from March 19th to April 5th.

4.1 Randomization

A total of 1,511 individuals were individually randomized at the beginning of the first visit to schools. This was necessary because each classroom received a different intervention after finishing the standardized test. Thus, I created a data set with all the lists that supervisors had handed me out. Then, I assigned a three-value random variable to each student's id, this was made so the three groups would have similar size. Table 1 shows the distribution of students among the three groups by school. There were two schools with only one 6th grade class where randomization couldn't be made the day of the first visit so they were deleted from the sample. This reduced the sample to 1,435 observations.

Table 1: Desegregated distribution of students by school

School	Control	Inequality (T1)	Role models (T2)	Total
1	17	8	14	39
2	40	10	13	63
3	16	10	11	37
4	41	33	35	109
5	39	11	20	70
6	31	27	60	118
7	36	36	28	100
8	36	34	40	110
9	13	21	22	56
10	34	32	33	99
11	18	11	14	43
12	31	48	35	114
13	38	69	2	109
14	19	12	28	59
15	26	21	23	70
16	30	27	38	95
17	6	7	12	25
18	11	12	7	30
19	30	28	31	89
Total	512	457	466	1,435

Distribution by school of randomization of 6th graders in any of the three treatment groups. Randomization was made in Stata and was notified to schools the day of the first visit. Two schools needed to be deleted because randomization was not allowed.

Class teachers were notified with anticipation about the arrival time of the examiner. I provided to each teacher a list of their class with each student's name highlighted in a different color: orange represented the students in the role model treatment group, green corresponded to inequality intervention and blue was for control group. They were told that every children whose name was highlighted in orange needed to go to classroom A, those in green to classroom B and the rest to classroom C. Each teacher

read the name of the student and told the classroom he or she needed to be headed and take a sit. Before leaving their original classroom, students were told to bring with them only a pencil, an eraser and a sharpener. Groups were always supervised by a teacher. From the moment I arrived to the first classroom and the start of the exam it took us around 10 minutes to finish the randomization.

In the second visit randomization was not longer needed because students had already received the treatment and I created a personal answer sheet with their id, name and treatment group, so they could take the test in their original classroom. There was a three week gap between the intervention and the second exam application so students in T1 and T2 received an extra document stapled to their personal answer sheet to refresh the intervention received in the first visit. Those in the inequality treatment group (T1) received the same questions about subjective inequality. Those in the role model group (T2) received a document with the pictures of the four celebrities we had talked about during the intervention. Their positive resemblances were mentioned in this document and students were asked to write down any information they remembered about this people. Although everyone took the exact same test, those in treatment groups (T1 and T2) needed to read and answer this extra document before starting the exam, so I gave them five extra minutes at the end of the exam if needed.

4.2 Balance test

Baseline scores and covariates before treatment were examined to test whether randomization produced balanced groups. Table 2 provides evidence on the differences between students assigned to the two treatment and the control. In the last column of table 2, The F-test computes no statistically significant differences between the samples' covariates. The randomization balances the characteristics well between the treatment and control groups.

Looking at Table 1, students were on average just over 11 years old, half of them (48%) were female and the rate of attrition was of 12% of students, that is, around 3-4 children in each classroom were absent the day of the first visit. The baseline test score was above 9 correct answers over 25. Both mindset measures are on average 3. Students had response options from 1 to 6 and the literature has found a tendency toward a more fixed mindset, in this case it would be above 3. For instance Yeager (2018) and Rhew (2018) find in their field experiments with older adolescents (14-17 years old) that this indicator is on average 4.5. The result with my sample is encouraging in the way that it suggests that mindset in younger children may still not be completely fixed, allowing

for motivational interventions to have an impact on students outcomes.

Table 2: Descriptive statistics before treatment

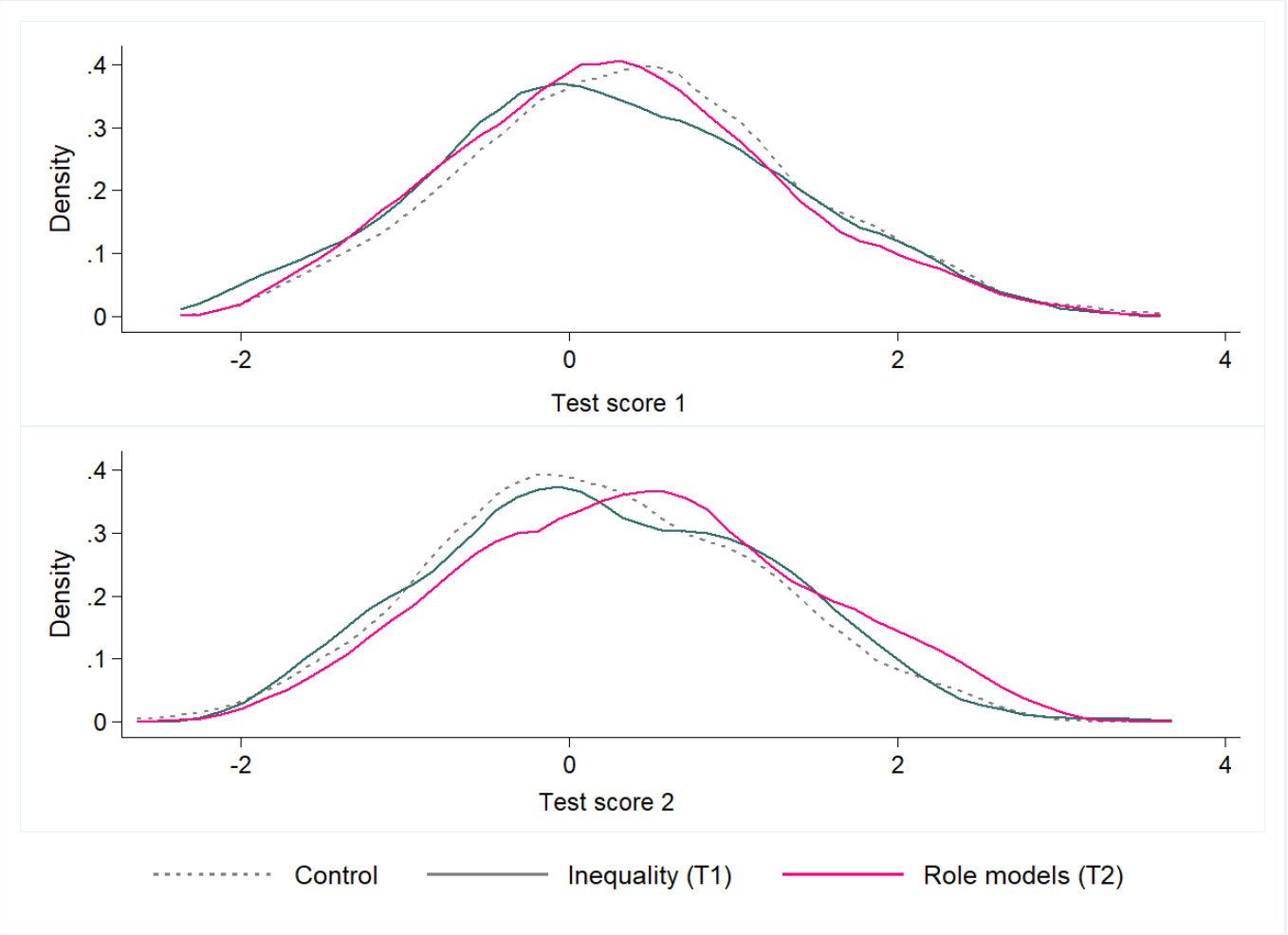
	Control		Inequality		Role Models		F-test
	mean	sd	mean	sd	mean	sd	p-value
Baseline grade	9.85	3.84	9.37	3.90	9.72	3.93	0.1881
Age	11.2	0.47	11.3	0.52	11.3	0.49	0.7276
Female	0.48	0.50	0.48	0.50	0.46	0.49	0.7648
Attrition	0.12	0.32	0.14	0.34	0.12	0.32	0.5406
Mindset1	3.00	1.52	2.98	1.47	3.07	1.46	0.6361
Mindset2	3.03	1.63	2.90	1.66	2.92	1.48	0.4755

Note: sd is standard deviation. p-values found in ANOVA variance analysis using an F-test for proving equality of all three groups. Baseline grade refers to standardized test score taken prior treatment. Attrition rate is the fraction of students that were absent the day of the exam. Female refers to percentage of girls in the group. Age is in years. All the variables are correctly balanced.

Figure 1 displays the kernel density of the average test score distributions for students in control and treatment groups. There does not seem to be a difference in the distributions before any treatment. However, after the interventions a change in the role model group (pink line) is observable: its distribution seems flatter and shifted to the right, particularly at the lower end to just above the mean. This is likely to reflect the fact that the role model intervention had a positive impact on test score. Looking at the distribution of the inequality and control group they practically did not change, suggesting that, on average, the inequality intervention did not modify the average test scores of children in this group. To formally test this I perform an F-test. For standardized test scores before any treatment the p-value on the test of equality of

the distributions is 0.1262 so I cannot reject equality of distributions, which supposes a correct randomization. By contrast, the p-value on the ANOVA test of equality of the distributions is 0.0003. Hence I can reject equality of the distributions at the 1% significance level and assert there is a non-null treatment effect on test scores, at least in the role model group.

Figure 1: Density comparison of average test score before and post treatments

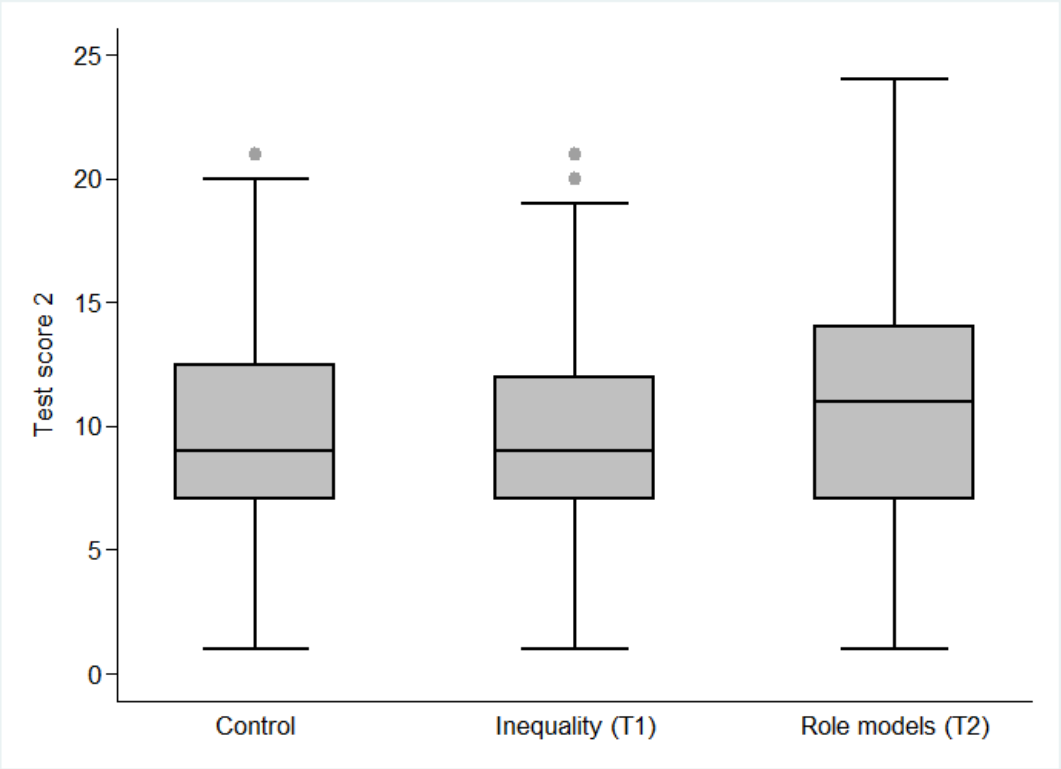


Note: Upper figure shows the kernel density of the standardized average test score prior treatment. The p-value for equality of distributions is 0.1262. Groups are balanced prior interventions. Lower figure shows the kernel density of the average standardized test score post treatment. The p-value for equality of distributions is 0.0003. So, ceteris paribus, I can assert that interventions had an effect on the test score. Particularly, the role model density (pink line) shifted to the right. This suggest that the treatment effect comes mainly from the role models intervention.

To further understand the treatment effect, figures 2 compares average test score. Figure 2 shows a boxplot with the average test scores post intervention by group. By their shape I can tell that the three of them have a normal distribution. However, the control and inequality group (T1) are slightly shifted to the left whereas role models group (T2) density is right-skewed, showing that the mass of the distribution is faintly more concentrated to the right of the figure. Also the median and spread of this last group is bigger compared to the other two groups. Students in role models group appear to have on average two extra points - over 25 - compared to those in control and inequality groups. This descriptive evidence allows me to confirm a positive treatment effect on role models sample.Inequality intervention seems to have a null-treatment effect.

Finally, figure 3 shows a non-parametric way of visualizing the relationship between the test scores before and after treatment. On the x-axis is the pre treatment test scores and on the y-axis the post treatment performance. Each pin indicates the estimated average grade in that specific bin (in this case each bin represents a score). Controlled for all the covariates I notice that before treatment test scores around the median ($\approx$ 10 correct answers) have a quasi proportional relationship with the post treatment scores. However, this tendency changes for extreme grades. Figure 3 presents three lines corresponding to linear regression fits of post treatment score on the baseline grade. Though the tendency is similar between the three linear regressions (linear and

Figure 2: Average test score by treatment group

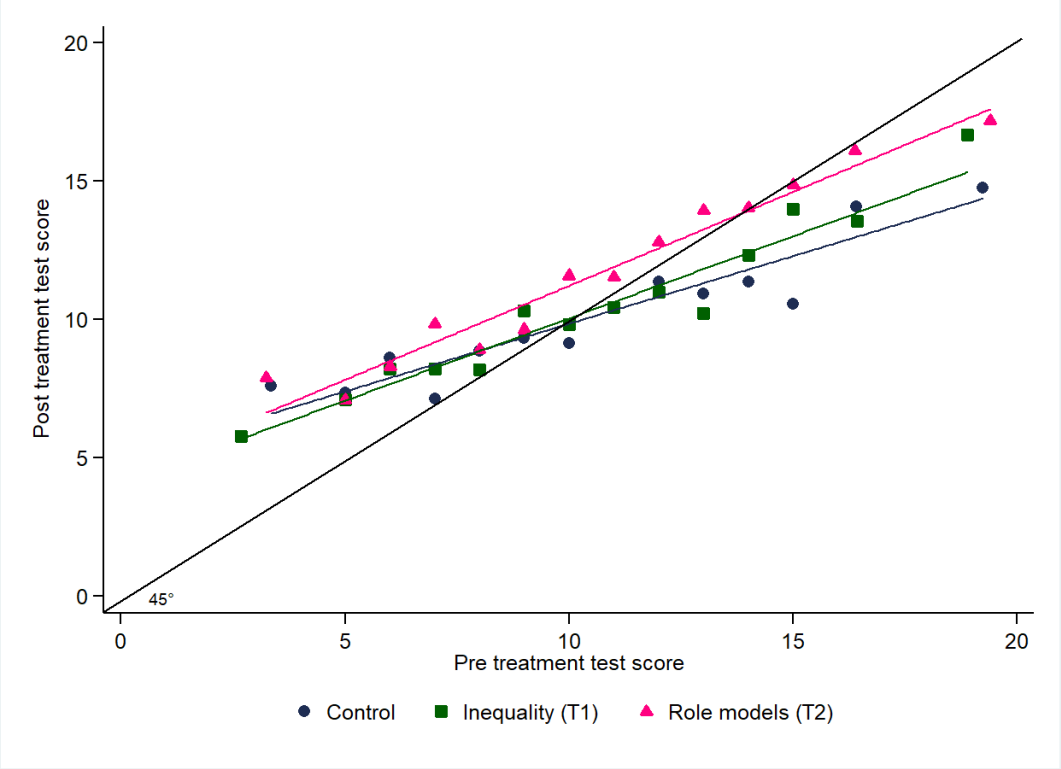


Note: Comparison of average test scores between treatment groups and control. Students in role models group (T2) scored, on average, two more points than the other two groups. Control and inequality groups median is below 10 correct answers, while the role models group is above 12 correct answers on average. Role models boxplot is right-skewed. Control and inequality group (T1) have same medians although control group is more left-skewed. Outliers are identified by gray circles.

increasing on baseline score), the role models line (pink one) is clearly above the two others. This pattern is observed for every test score but it is more intense as the pre treatment score raises. Figure 3 indicates that students in the role models group obtained, on average, a higher post treatment test score compared to students who did not receive that intervention. The inequality regression (green one) also distantiates slightly above the control line (blue one) for scores higher than the median. Inversely, it is below the control regression for lower than the median pre treatment scores. This

suggest an heterogeneous effect of inequality intervention and it is opposed to the initial hypothesis result in section 6. The rest of this study aims to show the magnitude and robustness of these findings.

Figure 3: Relationship between average test scores before and post interventions by treatment group



Note: Binned scatterplot provides a non-parametric way of visualizing the relationship between the test scores before and after treatment. The line is a regression fit of post treatment score on the baseline score. Figure shows that there is a slightly stronger relationship for those in role models treatment group which accentuates with an increase in average test score. This supposes a bigger treatment effect particularly for those at the top of the distribution. A similar but smaller effect is observed for the inequality treatment sample. Above the median the intervention appears to have a positive impact and viceversa.

5 Econometric model and results

5.1 Model

To examine the effect of the treatment on exam outcomes, I run the following model:

$$Grade_{is1} = \beta_i Grade_{is0} + \delta_1 T1 + \delta_2 T2 + X_i^{'}.\gamma + \theta s + u_{is} \quad (1)$$

where i indexes student at school s, $Grade_{is1}$ denotes the standardized test outcome. $T1$ and $T2$ are indicator variables if the student received the inequality or role models intervention, X_i' is a vector of individuals characteristics, θ_s is a vector of school fixed effects which control for school heterogeneity and u_{is} is a random error. $Grade_{is0}$ is the baseline standardized test score. Individuals characteristics, X_i', are included to improve precision. These are:

1. dummy for whether the student is female
2. age of the student in years
3. growth mindset index 1
4. growth mindset index 2

Growth mindset index explanation is detailed in section 3.1. This is a numerical index with six levels. 6 is a proxy of stronger growth mindset and 1 denotes a fixed mindset.

5.2 Main results

Table 3 shows the impact on test scores of assignment to one of the two possible treatments. The test scores were standardized at school level. I show results both with and without individual control variables. All regressions include school fixed effects. Inequality treatment results in a null effect in standardized test scores when controls are included, and -0.02 standard deviations decrease not statistically significant without controls. However, the role model treatment does results in an increase of 0.11 standard deviation in test score, significant at the 1% level when controls are included, and 0.10 still significant at the 5% level. This is a large positive effect on the exam outcome and is examined in more detail below.

Baseline exam grade is a strong predictor of post treatment test score. A one standard deviation on the baseline exam is associated with a 0.47 standard deviation better performance on the second exam. Mindset indexed do not have also a predictive power on exam performance ($\approx$ 0.07 standard deviation improvement) and their effect is statistically significant at the 1% level.

In table 3, column (4) we can see that the impact of the role models treatment is bigger and more significant for male students compared with the effect on women in column (3). Indeed, when I limit the sample to female individuals the effect of the role models intervention falls to 0.09 standard deviation. Also, the inequality treatment

seems to have a bigger negative impact (-0.03 standard deviations) on the academic performance of girls. Finally, the sample used in column 5 of table 4 excludes students enrolled in an afternoon shift school and controls for age, gender and mindset. The negative impact of the inequality treatment with respect to estimates in column 2 is fifty percent bigger. A one standard deviation on the baseline exam is associated with a 0.24 standard deviation better performance on the second exam, statistically significant at the 1 percent level. The negative impact of inequality treatment in students in a morning shifts increase slightly to -0.03 standard deviation worse performance.

These results suggest that having a motivational intervention about role models increases the effort exerted on a standardized test and hence students are more likely to succeed. The magnitude of the treatment effect on male students is noteworthy considering what recent literature has found. For instance, Sule et al. (2017) conducted a random educational experiment in Turkish elementary schools. The intervention involved a teacher training program that focused on three interrelated ideas underlying grit: growth mindset, perseverance through failures, and goal-setting; this intervention lasted 2.5 years and the improvement on mathematics performance was on average of 0.31 standard deviations. So, taking into account the fact that my role model intervention took around one hour, cost practically nothing and was conducted by me - not an expert in psychology or pedagogy -, the intervention's improvement of test score is outstanding.

Table 3: Treatment effect on test performance

	Dependent variable: standardized test score				
	(1)	(2)	(3) Female	(4) Male	(5) Morning
Baseline grade	0.49	0.47	0.46	0.48	0.47
	(0.016)	(0.016)	(0.024)	(0.023)	(0.022)
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
	{0.000}***	{0.010}***	{0.000}***	{0.000}***	{0.000}***
(T1) Inequality	- 0.02	- 0.00	-0.03	0.01	-0.03
	(0.042)	(0.043)	(0.061)	(0.062)	(0.056)
	[0.605]	[0.875]	[0.623]	[0.837]	[0.677]
	{0.0719}	{0.918}	{0.729}	{0.847}	{0.773}
(T2) Role Models	0.10	0.11	0.09	0.14	0.24
	(0.042)	(0.042)	(0.061)	(0.060)	(0.057)
	[0.0.18]*	[0.006]***	[0.147]	[0.016]**	[0.000]***
	{0.174}	{0.150}	{0.355}	{0.109}	{0.031}**
Age		0.00	0.025	- 0.022	-0.018
		(0.035)	(0.053)	(0.049)	(0.053)
		[0.968]	[0.631]	[0.650]	[0.733]
		{0.966}	{0.661}	{0.702}	{0.636}
Mindset 1		0.07	0.08	0.06	0.06
		(0.012)	(0.018)	(0.017)	(0.016)
		[0.000]***	[0.000]***	[0.001]***	[0.000]***
		{0.000}***	{0.000}***	{0.008}***	{0.000}***
Mindset 2		0.05	0.05	0.06	0.04
		(0.011)	(0.017)	(0.015)	(0.015)
		[0.000]***	[0.002]***	[0.000]***	[0.002]***
		{0.000}***	{0.003}***	{0.007}***	{0.031}**
Female		- 0.03			- 0.013
		(0.034)			(0.046)
		[0.349]			[0.764]
		{0.374}			{0.570}
Constant	1.07	0.71	0.37	0.95	0.91
	(0.030)	(0.414)	(0.597)	(0.569)	(0.612)
	(0.000)***	[0.084]	[0.531]	[0.158]	[0.059]*
Observations	1267	1208	581	627	695

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Robust standard errors in parenthesis. P-values in brackets. Cluster-adjusted p-values in braces. I estimate the effect of the treatments on standardized test scores. Specifically, the model estimated is $Grade_{is1} = \beta_i Grade_{is0} + \delta_1 T1 + \delta_2 T2 + X_i^{'}.\gamma + \theta s + u_{is}$ where $Grade_{is1}$ represents the standardized test score of each student. Standardization was made by school. $T1$ and $T2$ are dummy variables (1 if student i received the treatment and 0 if he did not, each individual received only one treatment). θs stands for school fixed-effects. $X_i^{'}$ is a vector of covariates. Column (5) includes only students in a morning shift school.

There is a debate about adjusting standard errors for clustering. According to Abadie et al. (2017) standard errors should be adjusted for clustering when there exist clusters in the population of interest that are not represented in the sample. That is, if we would like to say something about a broader population then clustered standard errors are necessary. However, if we aim to say something exclusively about a particular sample of individuals, without trying to generalize to the population, robust standard errors - those in parenthesis in table 3 - should be correct. In presence of fixed effects models, the authors prove that cluster adjustments will only pass on standard errors if there is heterogeneity in treatment effects. In section 6, I show the existence of heterogeneous treatment effects, whence the need of adjusting the standard errors for clustering.

Cluster-robust standard errors that permit heteroskedasticity can over-reject with few (less than 30) clusters. Cameron, Gelbach and Miller (2008) propose to use cluster bootstrap-t procedures that provide asymptotic refinement. I use a wild bootstrap method which computes the corrected p-values. These are shown in table 3 in braces. I notice there is some loss of statistical significance. Indeed, p-values for adjusted stan-

dard errors are slightly bigger. The results presented in table 3 suggest that conclusions on positive effects of the role model intervention must be taken cautiously due to the loss of statistical significance. It would be necessary to prove the hypothesis with a larger sample size to diminish the statistical ambiguity and corroborate the effect direction presented in table 3.

There are three more questions that arise when looking at the estimates of table 3. Firstly, the unequal treatment effect of role model intervention among girls and boys is notable. There is a positive effect on test score of 0.14 standard deviations in boys whereas this effects falls to 0.09 standard deviations girls. Besides, the treatment effect of the inequality intervention affects more female students (-0.03 standard deviations) and has a positive impact on male population (0.01 standard deviations). This result suggests that female students are more vulnerable to being questioned about their subjective inequality. This may be due to more self-consciousness about their social environment. Also it could be explained by the fact that female students did not have previously internalized as much as male students their social status, so this intervention would indeed make girls feel worse about their subjective social condition. This is also why role model intervention would have a higher positive impact on male students. If girls have a more stereotyped self-concept, a 40 minutes intervention aiming to tackle theses stereotypes may not be enough to make them feel identified with the potential role models presented. These results reinforced what literature has found about differences

in genders' prejudices and self-perception: young women are the most affected by social norms and prescriptive stereotypes (Eagly, Alice H. and Steffen, Valerie J., (1984); Eagly, Alice and Karau, Stevenn (2002)).

Secondly, the significant higher treatment effect of the role model intervention on children enrolled in a morning school shift is notorious. Indeed, a 0.24 standard deviation impact on test scores on a standardized test is an enormous effect size compared to magnitudes in the educational policy literature. To put it in perspective, Schanzenbach (2006), in a review of the existing evidence on the project STAR, concludes that being randomly assigned to a small class in the United States raises student test scores by only 0.15 standard deviations. Then, the effect of role models treatment in morning school children can certainly be considered outstanding. This result may be explained by higher payoffs that students in a morning shift may get from good grades. Children in morning shift schools are more likely to aspire to continue his further studies in a morning shift junior high school where competitiveness for a place is higher. Hence, the payoff of making an effort to stand out in a test is bigger for morning students than for children expecting to continue in an afternoon shift junior high school with no strict cut-off scores for admission.

Negative treatment effects on afternoon shift students may be also exacerbated by the tendency observed by Krueger (1999) on different size schools. The schools with better academic attainment are typically the most crowded ones, while the small schools

tend to be less academically demanding. This dynamic comes from the belief that good students need to be in a more competitive environment to foster their potential, while children with more academic difficulties need to be in a environment that allows them to have a more personalize learning process. A tacit rule like this one may create a more pessimistic perception of external barriers in students enrolled in an afternoon shift, affecting their academic aspirations and choices on education investments. It is more likely than a student in an afternoon shift feels less capable of outperforming in a standardized test due to the stereotype that afternoon schools academic attainment is worse. Hence, the lack of incentives to make bigger efforts and compete for a place in a quality junior high school.

Thirdly, there remains the question about the almost null treatment effect of inequality intervention. There are two most likely reasons. It may be possible that at 11 years old, children are already very aware about their social status and hence they have already internalized the inequality and marginalization they live in. If this were the case, there would be no reason why the inequality intervention would have any negative effect on them because they have already assumed and incorporated on their expected utility function their social condition. The intervention that I designed may have only an impact on test scores when it provokes on students an update on their aspirations and goals after social self-evaluation. The other possibility lies on the fact that the inequality intervention was not intrusive enough to make students truly reflect on the

inequality around them. If an individual is not sensibilized enough to reflect on her social status and its implications, she may never reevaluate the value and expectations on education decisions. This is an explanation that seems viable to me. Although students seemed to take very seriously the standardized exam application and the role model intervention, it appeared to me that the questions about subjective inequality were not understood completely or were simply neglected and not taken seriously.

To further analyze these effects a natural question is whether there is a type of student for whom the treatment was particularly successful. I already showed evidence that treatment effects vary across genders and type of school. However, according to the role models empirical literature, there may exist a differential impact on students with different ability levels. The next section analyzes heterogeneous treatment effects.

6 Heterogeneity

In this section I test whether treatment effects differ as a function of baseline academic performance. Gibbons, C. et al. (2018) claim that treatment effects using a fixed effects estimator (FE) tend to differ from the average treatment effect (ATE) mainly due to heterogeneous treatment effect.. Their program `GSSUtest` allows me to test for heterogeneity by computing the interaction-weighted estimator (IWE) and performing the Wald test of equality between the fixed effects model estimate and the IWE for cluster-robust standard errors. I find a percentage difference between the two estimators of -9.13%. This result suggest heterogeneous treatment effects whence the justification of the following analysis.

Heterogeneous treatment effects across variables collected at treatment assignment are tested by augmenting equation (1) to include the interaction between treatment and that variable. This gives the following specification:

$$Grade_{is1} = \beta_i Grade_{is0} + \delta_1 T1 + \delta_2 T2 + (Z_i^{'}.T1)\lambda_1 + (Z_i^{'}.T2)\lambda_2 + X_i^{'}.\gamma + \theta s + u_{is} \qquad (2)$$

where i indexes student at school s, $Grade_{is1}$ denotes the standardized test outcome. $Grade_{is0}$ is the baseline standardized test score. $T1$ and $T2$ are indicator variables if the student received the inequality or role models intervention. $Z_i^{'}$ is a vector including individual baseline score and an indicator equal to one if the student was below the

median performance in the baseline exam. X_i' is a vector of covariates specified in section 5.1. θ_s is a vector of school fixed effects and u_{is} is a random error. The parameters of interest here are λ_1 and λ_2 which account for the heterogeneous treatment effects.

Heterogeneity by baseline exam performance reveals whether students at the bottom or top of the baseline ability distribution benefited more from any of the two treatments, with the expectation being that those at the bottom of the distribution, would resent the most the inequality treatment and benefit the most from receiving the role model intervention.

In column 1 on table 4 is the original model specified by equation (1). I added two specification covariates (baseline grade^2 and baseline grade^3) to model more accurately the effect of baseline grade, which may have a non-linear relationship with the independent variable. Baseline grade^2 coefficient (0.627 standard deviations) is statistically significant. It indicates that as exam performance raises, the effect of baseline exam score is higher. Looking at baseline grade^3 coefficient, it appears that this relationship seems to invert at the end of the distribution, though this fall is insignificant.

Given the normalization of the pre-test scores, the coefficient on the treatment dummy can be interpreted as the estimated effect of the intervention for someone with an average score on the baseline test. The treatment effect for someone who scored one standard deviation above average on the baseline test is equal to this coefficient plus

the coefficient on the interaction term. Column 2 uses the specification (2) accounting for the interaction of the inequality treatment effect and the baseline test score. This interaction term is not statistically significant but increases slightly (to 0.48 standard deviations) the predictive power of baseline grade on those who received the inequality treatment (T1). Column 3 shows an interaction term of -0.10 standard deviations, significant at the 1% level. This suggest that the overall predictive power of baseline grade on students who received the role models intervention is lessen to 0.39 standard deviation.

Looking at students who scored below the median in their mock exam in column 4, there is an heterogeneous effect of inequality treatment. Test score increased by 0.02 standard deviations amongst this group from inequality treatment, this means that the inequality treatment coefficient for students below the median is slightly higher. Overall, there is an effect of 0.03 standard deviations but it is still non significant. This means that inequality treatment had a small but positive impact on students who performed below the median on the first mock exam.

In column 5, I included the interaction of role models treatment and students below the median in the baseline exam. The interaction value is -0.15 standard deviations and it is statistically significant at the 5% level. This coefficient offsets practically all the positive effect of the role model intervention, resulting in an improvement of only 0.01 standard deviations. This result corroborates the hypothesis that role models

intervention had more impact on the top of the distribution whereas students that scored below the median did not benefited from the intervention.

Table 4: Heterogeneity in treatment effect

	Dependent variable: standardized test score				
	(1)	(2)	(3)	(4)	(5)
Baseline grade	0.17*	0.44***	0.49***	0.46***	0.46***
	(0.098)	(0.017)	(0.013)	(0.011)	(0.011)
(T1) Inequality	- 0.01	- 0.00	0.02	0.01	0.01
	(0.034)	(0.056)	(0.055)	(0.049)	(0.039)
(T2) Role Models	0.11*	0.13***	0.21***	0.13***	0.16***
	(0.060)	(0.045)	(0.066)	(0.046)	(0.055)
Female	- 0.01	- 0.01	- 0.01	- 0.01	- 0.01
	(0.029)	(0.025)	(0.026)	(0.025)	(0.025)
Age	0.01	- 0.00	-0.00	- 0.00	- 0.00
	(0.030)	(0.029)	(0.029)	(0.029)	(0.029)
Below median		-1.02***	-1.02***	-1.03***	-0.97***
		(0.023)	(0.023)	(0.032)	(0.025)
T1*baseline		0.040			
		(0.032)			
T2*baseline			-0.10***		
			(0.034)		
T1*below median				0.022	
				(0.062)	
T2*below median					-0.15**
					(0.059)
Baseline grade^2	0.27***				
	(0.078)				
Baseline grade^3	- 0.00				
	(0.014)				
Constant	0.95**	1.33***	1.31***	1.32***	1.30***
	(0.356)	(0.334)	(0.337)	(0.334)	(0.327)
Observations	1267	1267	1267	1267	1267

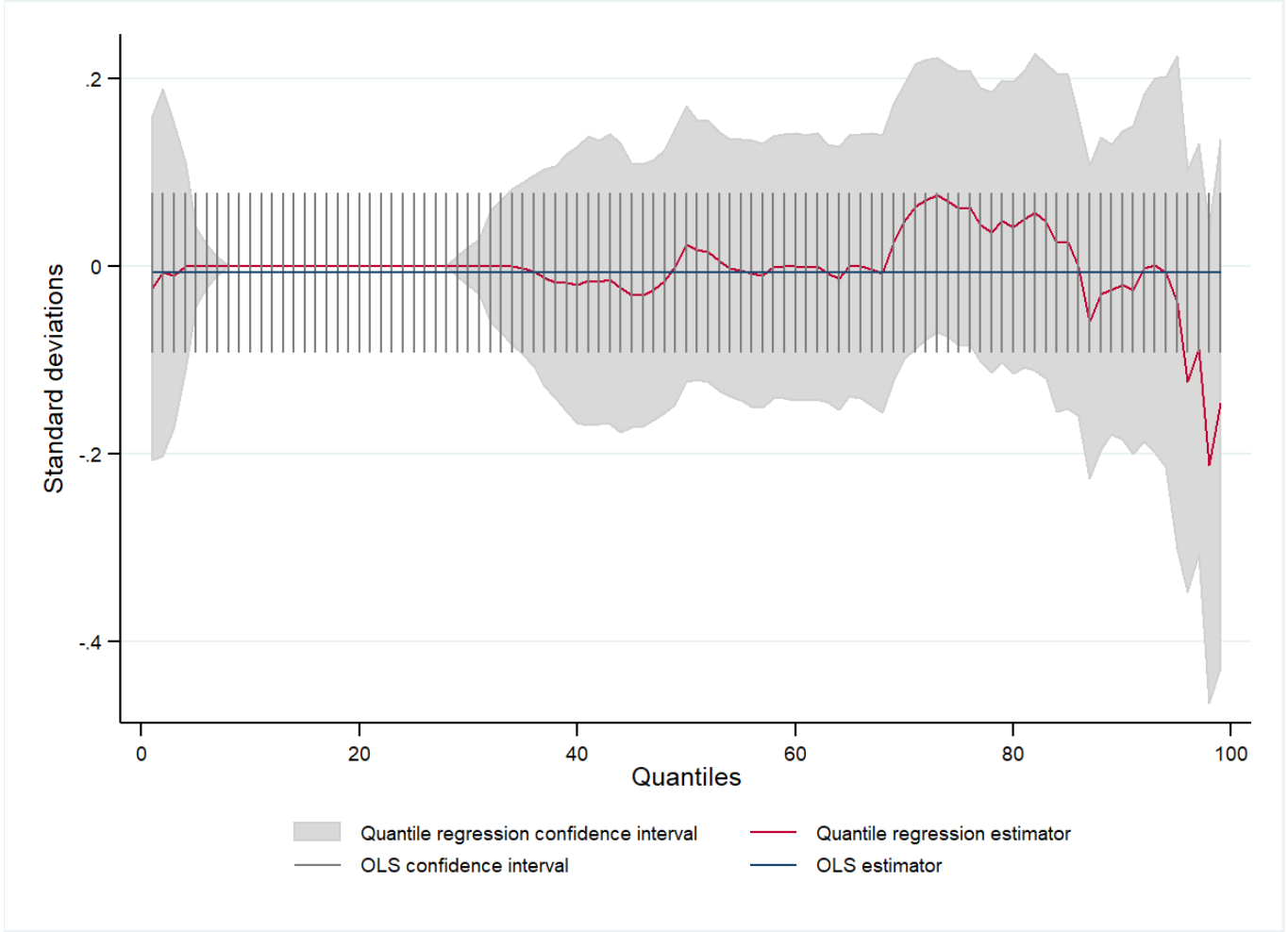
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Bootstrapped standard errors in parenthesis. Column 1 includes the variables grade^2 and grade^3 to account for a non-linear relationship with the outcome variable $Grade_{is1}$. T1*baseline (T2*baseline) refers to the interaction between the inequality (role models) treatment and the baseline test score. T1*below median (T2*below median) stands for the interaction between inequality (role models) treatment and an indicator variable equal to 1 if the baseline test score is below the median school score.

To further analyze the heterogeneous effects, I breakdown the treatment effect of both interventions by quantiles. Quantile analysis in figure 4 includes control variables but the results do not change significantly without them. I observe that, on one hand, inequality treatment effect appears very homogeneous until quantile 70th, the inequality treatment effect is practically null. However, for the top part of the distribution (above the 70th quantile) there is a decreasing treatment effect, reaching its lowest value in -0.20 standard deviations for the highest quantile. This negative impact is not statistically significant but its magnitude is important.

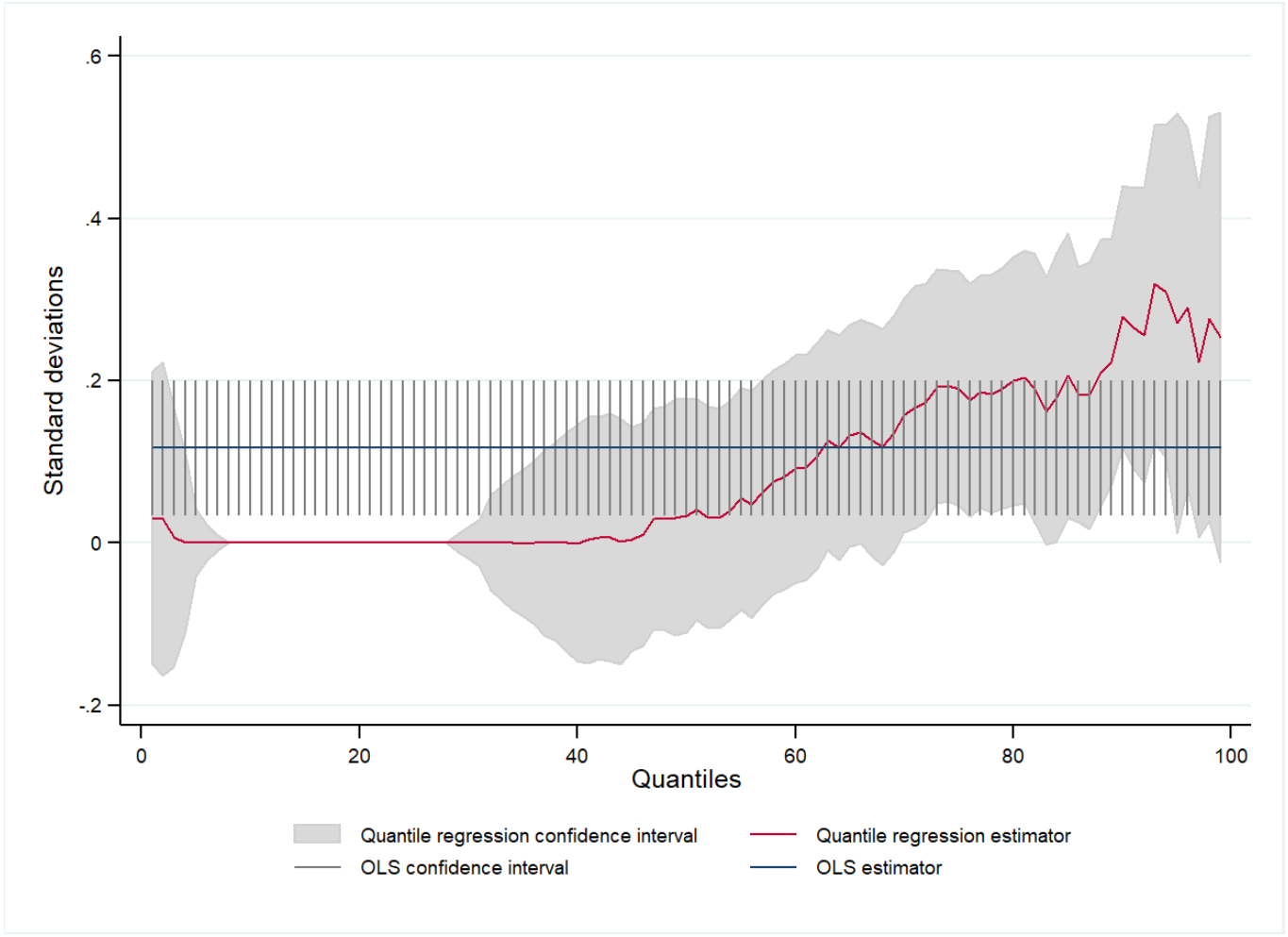
On the other hand, figure 5 shows that role models intervention has also a null treatment effect until the 40th quantile. From there on, the estimate coefficient - represented by the red line - starts increasing progressively, showing the existence of heterogeneous effects. This suggests that those at the top of the distribution are benefiting most from the role model treatment. The 95th percentile has an estimated coefficient of 0.33 standard deviation improvement of test scores. That is, students that outperformed in the baseline test benefited the most from the role models intervention but also were the most affected by the inequality intervention. Contrary, students at the bottom of the ability distribution in the baseline test were not affected by the inequality nor the role models intervention. As regards students in the middle of the distribution (50th quantile), there is a null effect of the inequality intervention but a positive effect of the role models treatment which improves their overall estimated test score.

Figure 4: Quantile treatment effect of inequality intervention (T1) on test score



Estimated coefficients (in red) for the average treatment effect of an inequality intervention on test performance. Black line refers to fixed effects estimates. Inequality treatment effect appears to be null for almost the whole distribution. However, a clear negative effect is observed at the very end of the distribution where a negative impact of inequality treatment reaches -0.20 standard deviations effect on academic attainment. 95% confidence intervals

Figure 5: Quantile treatment effect of role models intervention (T2) on test score



Estimated coefficients (in red) for the average treatment effect of a role model intervention on test performance. Black line refers to fixed effects estimates. Role models treatment effect increases significantly for those students above the the 80th quantile.This suggests it is the best students who benefit most from the role models treatment. 95% confidence intervals

The heterogeneity analysis suggests that the effects are most pronounced at the top of the distribution: the inequality treatment has a clear harmful impact on test score (≈ -0.20 standard deviations) and the role models treatment has an outstanding positive average treatment effect (≈ 0.33 standard deviations). There are a number of possible reasons that the literature has explored for these differences in average treatment effect.

Various field experiments involving financial rewards to improve the academic performance have shown that they may be detrimental for less-able students. According to Camerer and Hogarth (1999) the performance tied to a reward can result in a binding participation constraint for students at the bottom of the ability distribution. Similarly, Kremer, Michael R. et al (2009) conclude that merit aid scholarships may have a negative social outcome for students at the bottom of the ability distribution. Angrist and Lavy (2009) find that only those students in the upper part of the ability distribution respond to the rewards offered in their experiment. These results refer suggest than only high ability and motivated students are self selected into the rewards program.

The treatments in my experiment did not involved any kind of reward but the heterogeneous effect of the role model intervention may be also explained by non-cognitive abilities such as motivation. This literature presumes that high ability students have lower costs of effort and/or find high test scores more rewarding, so they will have higher test scores than low ability ones. Indeed, Segal, C (2008) claims that it is possi-

ble that higher scores on baseline test may be caused by higher test-taking motivation, associated with personality traits of students like conscientiousness. If this were the case, the role model intervention would have a bigger impact on high ability students because they have, a priori, more willingness to put mental effort in answering an exam irrespective of the treatment received.

Another possible explanation of heterogeneous treatment effects is provided by Paul Glewwe et al., (1998). They find that the effect of providing textbooks to randomly selected students in Kenya has an overall null effect on academic performance. However, there are heterogeneous effects and students in the top quintile of pre-treatment scores did observe a positive impact of 0.22 standard deviations on their academic performance after receiving the free textbooks. The authors argue that this positive effect may not be completely explained by the treatment itself but by a better academic performance explained by parents commitment to education. This conclusion suggests that the effect of the role models treatment may be biased upwards due to a problem of omitted variable. The treatment effect on test scores may be higher for better performance students because they are more incentivized by their parents to outperform on the following IDANIS mock test. This seems like a viable possibility in the context of elementary schools in Mexico city. Committed parents may enroll their children in preparation courses for the IDANIS test, allowing these children to improve their performance during the three weeks gap between the baseline and post treatment test.

Finally, recent psychological theories on inequality frames may account for the heterogeneous treatment effect of the inequality intervention. Lowery Brian S., and Wout Daryl A. (2010) comment on the psychological disengagement theory and its repercussions on academic outcomes. This theory suggest that, "members of some subordinate groups report self-esteem as high as, and sometimes higher than, that of their peers in dominant groups". For example, despite societal prejudices against their group and relatively poor outcomes in domains valued by society such as educations. So, in field experiments in the United States black students report self-esteem as high as, and sometimes higher than that of whites. (Gray-Little amd Hafdahl, 2000; Twenge and Crocker, 2002). The fact that members of subordinate groups do not tie their self-esteem to outcomes in domains in which their group fares poorly has been documented in the context of education. For example, Osborne (1995) finds that among Black students (a poorly performing group in the educational context) high school grades are weakly correlated with self-esteem. In contrast, white students' (the dominant group) grades are strongly correlated with their self-esteem.

Education literature has vastly proved that socioeconomic backgroup has an ubiquitous and well-establish prediction power on academic achievement (Fryer, 2017). If we assume this fact, students at the top of the academic performance distribution are also the most well-off. They are the dominant group. The psychological disengagement

theory then could explain why this dominant group seems more aware and affected by the subjective inequality intervention. Contrary, worst-off students, that is, those with worst test scores seem to completely untie themselves from their social status. This may be due to a similar effect of self-esteem on black students in the United States, provoking a null effect of the inequality treatment on the bottom part of the distribution. This explanation must be taken cautiously and should be tested using socioeconomic indicators to verify if there exists indeed a positive relationship between academic performance and dominant group for the particular context of this study.

7 Conclusions

Ensuring quality schooling and equality of opportunities for learning remain the main challenge for education policy makers. However, equal school opportunities seem a difficult task in a context of rising economic inequality within countries (Milanovic, 2013). Inequality creates beliefs that affect the perceived probability of success, self-confidence and change individual's attitudes. This is the reason why, in the education context, role models interventions have been suggested as an alternative to raise aspirations and relax the internal constraints of individuals (Rao and Walton, 2004).

In this field experiment in elementary schools in Mexico City, I showed that targeted education interventions can produce remarkable effects on behaviors related with effort and motivation. Among students completing elementary school, receiving a role models intervention increased their test score by 0.11 standard deviations. This effect is strongest for male students and children in a morning shift school. Also, I see heterogeneity, with upper ability students gaining the most from the role models intervention (up to 0.33 standard deviations improvement in test scores).

This study also provides insights on the effects of perceived inequality on academic outcomes. My results show that, among 11 year-old students, an intervention regarding the perceived social status and inequality has a negligible negative effect (-0.001) on academic performance. However, treatment effects of the inequality intervention differ

drastically as a function of baseline academic performance. Indeed, the heterogeneous effects analysis exhibits a negative impact of the treatment on students at the top of the baseline ability distribution. This effect begins clear from the 90th percentile and reaches a -0.20 standard deviations detrimental impact on students' test performance.

The magnitude of these results is important according to Fryer (2017) who conducts an exhaustive search of all randomized field experiments education. The author analyzes financial incentives interventions, no financial incentives and tutoring at high and low dosage. He notes that most effective kind of intervention for K-12 students are those related with high dosage of after-school tutoring. These interventions have positive impacts that reach up to 0.39 standard deviations improvement on school performance (Blachman et al., 2004). Although my findings are of smaller dimension (0.11 standard deviations) the comparison is important to assess how a low cost, one-off and brief exposure to role models can still have positive effects on education outcomes compared with larger, more expensive and complex programs.

Thus, this paper contributes to the literature about the pivotal role of non-cognitive skills for academic achievement (Almlund et al., 2011; Kautz et al., 2014). Firstly, my results provide an affirmative answer to the question of whether subjective inequality is relevant for academic attainment. Though its negative impact is clearer for upper ability students, a -0.20 standard deviations impact on standardized test score is very significant. Further research should test this hypothesis with a bigger sample to

diminish the statistical doubtfulness and corroborate the direction of the effect.

Secondly, my study shows how a role model intervention can temper the detrimental effects of subjective inequality and have a significant impact in concrete outcomes such as standardized test. This result provides evidence on how non-cognitive skills and academic outcomes can be influenced through childhood interventions. Indeed, it is encouraging to see that external signals such as role modeling seem to be able to loosen the internal constraints on young individuals. Although the role models intervention had a bigger impact on well-off students, these results offer hope for reducing persistent achievement gaps among groups who face complex structural challenges.

Thirdly, this work highlights a low-cost way of fostering motivation and effort on standardized test in the environment of the classroom. So, these results may contribute to the persistent debate about the effect of low-cost interventions relying on psychological theories on academic outcomes. (Yeager et al. (2018); Oreopoulos et al. (2018)).

Lastly, further work would hope to better understand potential mechanisms for how receiving the role models or the inequality intervention led to a bigger change in behaviour particularly for the most able student. Whether the treatments only impacted exam effort, or also led to changes in other areas of the students' lives is also important to understand. Additional work should also seek to understand the persistence of these effects.

References

Abadie, Alberto, Susan Athey, Guido W Imbens, and Jeffrey Wooldridge. 2017. "When Should You Adjust Standard Errors for Clustering?" National Bureau of Economic Research Working Paper 24003.

Acemoglu, Daron, and Joshua Angrist. 2000. "How Large Are Human-Capital Externalities? Evidence from Compulsory Schooling Laws." *NBER Macroeconomics Annual*, Volume 15: 9–59.

Akerlof, George, and Rachel E. Kranton. 2000. *Economics and Identity.* Vol. 115.

Alan, Sule, Seda Ertac, and Ipek Mumcu. 2018. "Gender Stereotypes in the Classroom and Effects on Achievement." *The Review of Economics and Statistics*, 100(5): 876–890.

Almlund, Mathilde, Angela Duckworth, James Heckman, and Tim Kautz. 2011. "Personality Psychology and Economics." *Handbook of the Economics of Education*, 4.

Appadurai, A., V. Rao, and M. Walton. 2004. *The Capacity to Aspire: Culture and the Terms of Recognition.* Stanford University Press.

Aronson, E., and S. Patnoe. 1997. *The jigsaw classroom: Building Cooperation in the Classroom.* Addison Wesley Longman.

Beaman, Lori, Esther Duflo, Rohini Pande, and Petia Topalova. 2012. "Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India." *Science*, 335(6068): 582–586.

Bernard, Tanguy, Stefan Dercon, Kate Orkin, and Alemayehu Seyoum Taffesse. 2014. "The Future in Mind: Aspirations and Forward-Looking Behaviour in Rural Ethiopia." Centre for the Study of African Economies, University of Oxford CSAE Working Paper Series 2014-16.

Bernard, Tanguy, Stefan Dercon, Kate Orkin, and Alemayehu Seyoum Taffesse. 2015. "Behavioral economics: Will video kill the radio star? Assessing the potential of targeted exposure to role models through video." *World Bank Economic Review*, 29: S226–S237.

Bertrand, Marianne, Eldar Shafir, and Sendhil Mullainathan. 2006. "Behavioral Economics and Marketing in Aid of Decision Making Among the Poor." Harvard University Department of Economics Scholarly Articles 2962609.

Bertrand, Marianne, Simeon Djankov, Rema Hanna, and Sendhil Mullainathan. 2007. "Obtaining a Driver's License in India: An Experimental Approach to Studying Corruption." *The Quarterly Journal of Economics*, 122(4): 1639–1676.

Blachman, Benita, Christopher Schatschneider, Jack Fletcher, David Francis, Sheila Clonan, Bennett Shaywitz, and Sally E. Shaywitz. 2004. "Effects of Intensive Reading Remediation for Second and Third Graders and a 1-Year Follow-Up." *Journal of Educational Psychology*, 96: 444–461.

Blackwell, Lisa S., Kali H. Trzesniewski, and Carol S. Dweck. 2007. "Implicit theories of intelligence predict achievement across an adolescent transition: a longitudinal study and an intervention." *Child Development*, 78 1: 246–63.

Burnette, Jeni, Ernest O'Boyle, Eric M Vanepps, Jeffrey Pollack, and Eli J Finkel. 2012. "Mind-Sets Matter: A Meta-Analytic Review of Implicit Theories and Self-Regulation." *Psychological Bulletin*, 139.

Bustos, Alfredo, and Gerardo Leyva. 2017. "Towards a More Realistic Estimate of the Income Distribution in Mexico." *Latin American Policy*, 8(1): 114–126.

Cameron, A., Jonah Gelbach, and Douglas Miller. 2008. "Bootstrap-Based Improvements for Inference with Clustered Errors." *The Review of Economics and Statistics*, 90(3): 414–427.

Campos, Raymundo M., and Eduardo M. Medina. 2018. "Identidad social y estereotipos por color de piel. Aspiraciones y desempeño en jóvenes mexicanos." *El Trimestre Económico*, 85: 53 – 79.

Card, David. 1999. "The causal effect of education on earnings." In *Handbook of Labor Economics*. Vol. 3 of *Handbook of Labor Economics*, , ed. O. Ashenfelter and D. Card, Chapter 30, 1801–1863. Elsevier.

Claro, Susana, David Paunesku, and Carol S. Dweck. 2016. "Growth mindset tempers the effects of poverty on academic achievement." *Proceedings of the National Academy of Sciences*, 113(31): 8664–8668.

Cohen, Geoffrey L., Julio Garcia, Valerie Purdie-Vaughns, Nancy Apfel, and Patricia Brzustoski. 2009. "Recursive Processes in Self-Affirmation: Intervening to Close the Minority Achievement Gap." *Science*, 324(5925): 400–403.

Dalton, Patricio S., Sayantan Ghosal, and Anandi Mani. 2016. "Poverty and Aspirations Failure." *The Economic Journal*, 126(590): 165–188.

Duckworth, Angela, Christopher Peterson, Michael D. Matthews, and Dennis R. Kelly. 2007. "Grit: Perseverance and Passion for Long-Term Goals." *Journal of Personality and Social Psychology*, 92: 1087–101.

Dweck, Carol S. 2006. *Mindset: The New Psychology of Success.* New York: Random House.

Eagly, Alice H., and Steven Karau. 2002. "Role Congruity Theory of Prejudice Toward Female Leaders." *Psychological Review*, 109: 573–98.

Eagly, Alice H., and Valerie J. Steffen. 1984. "Gender stereotypes stem from the distribution of women and men into social roles." *Journal of Personality and Social Psychology*, 46(4): 735–754.

Eble, Alex, and Feng Hu. 2017. "Stereotypes, Role Models and the Formation of Beliefs." Columbia University, Center for Development Economics and Policy CDEP-CGEG Working Paper.

Eccles, Jacquelynne S., Sarah Lord, and Carol Midgley. 1991. "What Are We Doing to Early Adolescents? The Impact of Educational Contexts on Early Adolescents." *American Journal of Education*, 99(4): 521–542.

Evans, David, and Anna Popova. 2015. "What really works to improve learning in developing countries? an analysis of divergent findings in systematic reviews." *Washington, D.C: World Bank Group.*

Fryer, Roland G. 2017. "Management and Student Achievement: Evidence from a Randomized Field Experiment." National Bureau of Economic Research Working Paper 23437.

Fuentes, Mario Luis. 2017. "Dos décadas de marginación 1990-2010. Un análisis longitudinal de Fernando Cortes y Delfino Vargas." *Economía UNAM*, N°14: 130–133.

Genicot, Garance, and Debraj Ray. 2014. "Aspirations and Inequality." National Bureau of Economic Research Working Paper 19976.

Gibbons, Charles E., Juan Carlos Suárez Serrato, and Michael B. Urbancic. 2018. "Broken or Fixed Effects?" NBER Working Paper No. 20342.

Glewwe, Paul, Michael Kremer, and Sylvie Moulin. 1998. "Textbooks and test scores: Evidence from a prospective evaluation in Kenya." The Field Experiments Website Working Paper 00255.

Good, Catherine, Joshua Aronson, and Michael Inzlicht. 2003. "Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat." *Journal of Applied Developmental Psychology*, 24(6): 645 – 662.

Goodman, E., Adler N. E. Daniels S. R. Morrison J. A. Slap G. B. Dolan L. M. 2003. "Impact of Objective and Subjective Social Status on Obesity in a Biracial Cohort of Adolescents." CESifo Group Munich Working Paper Series.

Gray-Little, Bernadette, and Adam Hafdahl. 2000. "Factors Influencing Racial Comparisons of Self-Esteem: A Quantitative Review." *Psychological Bulletin*, 126: 26–54.

Hoff, Karla, and Joseph E Stiglitz. 2010. "Equilibrium Fictions: A Cognitive Approach to Societal Rigidity." National Bureau of Economic Research Working Paper 15776.

Hoff, Karla, and Priyanka Pandey. 2014. "Making up people: The effect of identity on performance in a modernizing society." *Journal of Development Economics*, 106: p.118–131.

Huillery, Elise, and Nina Guyon. 2014. "Choix d'Orientation et Origine Sociale: Mesurer et Comprendre l'Autocensure Scolaire." Sciences Po 2441.

Kautz, Tim, James J. Heckman, Ron Diris, Bas ter Weel, and Lex Borghans. 2014. "Fostering and Measuring Skills: Improving Cognitive and Non-Cognitive Skills to Promote Lifetime Success." National Bureau of Economic Research Working Paper 20749.

Kremer, Michael, Edward Miguel, and Rebecca Thornton. 2009. "Incentives to Learn." *The Review of Economics and Statistics*, 91(3): 437–456.

Krueger, Alan B., and Diane M. Whitmore. 2001. "The Effect of Attending a Small Class in the Early Grades on College-Test Taking and Middle School Test Results: Evidence from Project STAR." *The Economic Journal*, 111(468): 1–28.

Kuhn, Andreas. 2015. "The Individual Perception of Wage Inequality: A Measurement Framework and Some Empirical Evidence." Institute of Labor Economics (IZA) Discussion Papers 9579.

Kuhn, Andreas. 2016. "The Subversive Nature of Inequality: Subjective Inequality Perceptions and Attitudes to Social Inequality." CESifo Group Munich Working Paper Series 6023.

Lakner, Christoph, and Branko Milanovic. 2015. "Global Income Distribution: From the Fall of the Berlin Wall to the Great Recession." *The World Bank Economic Review*, 30(2): 203–232.

Leuven, Edwin, Hessel Oosterbeek, and Bas van der Klaauw. 2010. "The effect of Financial Rewards on Rtudents' Achievement: Evidence from a Randomized Experiment." *Journal of the European Economic Association*, 8(6): 1243–1265.

Lowery, Brian, and Daryl Wout. 2010. "When Inequality Matters: The Effect of Inequality Frames on Academic Engagement." *Journal of Personality and Social Psychology*, 98: 956–66.

Lucas, Robert E. 1988. "On the mechanics of economic development." *Journal of Monetary Economics*, 22(1): 3–42.

Lybbert, Travis J, and Bruce Wydick. 2016. "Hope as Aspirations, Agency, and Pathways: Poverty Dynamics and Microfinance in Oaxaca, Mexico." National Bureau of Economic Research Working Paper 22661.

Mankiw, N. Gregory, David Romer, and David N. Weil. 1992. "A Contribution to the Empirics of Economic Growth." *The Quarterly Journal of Economics*, 107(2): 407–437.

Mingat, Alain; Jee Peng Tan. 1987. "The economic returns to investment in project-related training : some evidence from World Bank projects." The World Bank, Washington, D.C.". Discussion paper.

Morgenroth, Thekla, Michelle K. Ryan, and Kim Peters. 2015. "The motivational theory of role modeling: How role models influence role aspirants' goals." *Review of General Psychology*, 19(4): 465–483.

Nguyen, Trang. n.d.. "Information, Role Models and Perceived Returns to Education: Experimental Evidence from Madagascar." The World Bank Discussion Paper.

OECD. 2016. *PISA 2015 Results (Volume I).*

Oreopoulos, Philip, and Kjell G Salvanes. 2009. "How large are returns to schooling? Hint: Money isn't everything." National Bureau of Economic Research Working Paper 15339.

Oreopoulos, Philip, Richard Patterson, Uros Petronijevic, and Nolan Pope. 2018. "The Disappointing Impact of Encouraging Students to Study More." National Bureau of Economics Research Working Paper 25036.

Payne, Keith. 2018. *The broken ladder : how inequality affects the way we think, live, and die.* New York: Viking.

Pierre Bourdieu, Jean-Claude Passeron. 1977. *Reproduction in Education, Society and Culture.* London: Sage Publications.

Piff, Paul K, Michael W Kraus, and Dacher Keltner. 2017. *Unpacking the Inequality Paradox : The Psychological Roots of Inequality and Social Class.* . 1 ed., Elsevier.

Rao, Vijayendra, and Michael Walton. 2004. *Culture and Public Action.* Washington, DC: Stanford University Press.

Ray, Debraj. 2006. "Aspirations, poverty, and economic change." In *Understanding Poverty.* United Kingdom:Oxford University Press.

Rhew, Emily, Jody Piro, Pauline Goolkasian, and Patricia Cosentino. 2018. "The Effects of a Growth Mindset on Self-Efficacy and Motivation." *Cogent Education*, 5.

Riley, Emma. 2017. "Role models in movies: the impact of Queen of Katwe on students' educational attainment." Centre for the Study of African Economies, University of Oxford CSAE Working Paper Series 2017-13.

Romer, Paul M. 1989. "Human Capital And Growth: Theory and Evidence." National Bureau of Economic Research Working Paper 3173.

Roodman, David, James G. MacKinnon, Matthew D. Webb, and Morten Ã˜. Nielsen. 2018. "Fast And Wild: Bootstrap Inference In Stata Using Boottest." Economics Department, Queen's University Working Paper 1406.

Sirin, Selcuk. 2005. "Socioeconomic Status and Academic Achievement: A Meta-Analytic Review of Research." *Review of Educational Research*, 75.

Stout, Jane G., Nilanjana Dasgupta Matthew Hunsinger, and Melissa A. McManus. 2011. "STEMing the tide: using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM)." *Journal of Personality and Social Psychology*, 100(2): 255.

Thekla Morgenroth, Michelle K. Ryan, and Kim Peters. 2015. "The Motivational Theory of Role Modeling: How Role Models Influence Role Aspirants' Goals." *Review of General Psychology*, 4(19): 465–483.

Twenge, Jean, and Jennifer Crocker. 2002. "Race and Self-Esteem: Meta-Analyses Comparing Whites, Blacks, Hispanics, Asians, and American Indians and Comment on Gray-Little and Hafdahl (2000)." Psychological Bulletin Discussion paper 409.

Yeager, David, Carissa Romero, Dave Paunesku, Chris Hulleman, Barbara Schneider, Cintia Hinojosa, Hae Yeon Lee, Joseph O'Brien, Kate Flint, Alice Roberts, Jill Trott, Daniel Greene, Gregory Walton, and Carol S. Dweck. 2016. "Using Design Thinking to Improve Psychological Interventions: The Case of the Growth Mindset During the Transition to High School." *Journal of Educational Psychology*, 108: 374–391.

Yeager, David, Ronald Dahl, and Carol S. Dweck. 2017. "Why Interventions to Influence Adolescent Behavior Often Fail but Could Succeed." *Perspectives on Psychological Science*, 13.

Yeager, David S, Eric Bettinger, Sten Ludvigsen, Mari Rege, and Ingeborg F Solli. 2017. "Increasing Perseverance in Math : Evidence from a Field Experiment in Norway." , (2): 1–15.

The following map shows the geographical location of the elementary schools that I visited. There are only 12 markers because 8 schools had double shift.

Figure 6: Location of participant elementary schools

Map of Mexico city with pinned location of participant elementary schools. In total there are 19 schools in the sample. However, there are only 12 pins because some schools had two different shifts so they are considered separately.

Instrumento de diagnóstico para los alumnos de nuevo ingreso a secundaria (IDANIS)

Número de preguntas: 25

Tiempo límite: 25 minutos

Instrucciones:

Lee con cuidado cada pregunta y elige la opción correcta. Después, busca en tu HOJA DE RESPUESTAS el número de la pregunta que estés contestando y llena el espacio correspondiente a la opción que hayas elegido.

Puedes utilizar tu cuaderno para hacer cálculos o anotaciones pero verifica que TODAS las respuestas estén en tu hoja de respuestas.

0. Selecciona EN LA HOJA DE RESPUESTAS qué tan de acuerdo estás con las siguientes reflexiones:

   a. Existe gente que nace siendo buena para las matemáticas y personas que nacen sin esa habilidad.

Muy de acuerdo	De acuerdo	Un poco de acuerdo	Un poco en desacuerdo	En desacuerdo	Muy en desacuerdo
1	2	3	4	5	6

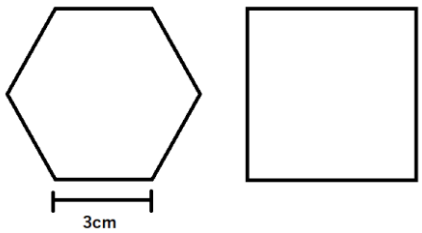
   b. Se pueden aprender nuevas cosas pero no se puede cambiar la inteligencia de una persona.

Muy de acuerdo	De acuerdo	Un poco de acuerdo	Un poco en desacuerdo	En desacuerdo	Muy en desacuerdo
1	2	3	4	5	6

1. Encuentra la opción que contenga el término que sigue en la sucesión presentada:
   3, 20, 18, 35, 33, 50, _____
   a) 46
   b) 48
   c) 67
   d) 42

2. Al término de tres meses. Juan cumplirá un año, ¿cuántos años y meses faltan para que cumpla dos años y medio?
   a) 1 año 3 meses
   b) 1 año 5 meses
   c) 1 año 7 meses
   d) 1 año 9 meses

3. Observa estas dos figuras. Ambas tienen el mismo perímetro ¿cuánto mide un lado del cuadrado?



   a) 4 cm
   b) 4.5 cm
   c) 5 cm
   d) 3.5 cm

4. Seis veces un número más nueve es igual a 105. ¿Cuál es ese número?
   a) 7
   b) 1
   c) 16
   d) 17

5. La maestra compró 72 lápices y repartió un lápiz a cada uno de sus alumnos. Si a las niñas les tocó la tercera parte de los lápices y a la maestra le sobraron 6, ¿cuántos niños hay en el grupo?
   a) 22
   b) 24
   c) 42
   d) 48

6. ¿A cuánto equivale el 9% de 750?
   a) 0.675
   b) 6.75
   c) 67.5
   d) 675

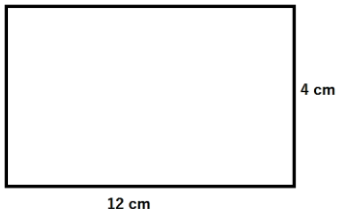
7. Los pueblos vecinos se _____ para vencer al enemigo.
   a) aliaron
   b) acercaron
   c) replegaron
   d) enfrentaron

8. Los perros de caza están _____ para atrapar a su presa.
   a) Habituados
   b) Entrenados
   c) Alimentados
   d) Descansados

9. ¿En cuál de las siguientes opciones se indica “una cuarta parte de un cuarto”?
   a) $\frac{1}{4} \times \frac{1}{4}$
   b) $\frac{1}{4} \times \frac{4}{4}$
   c) $\frac{4}{1} \times \frac{4}{4}$
   d) $\frac{4}{1} \times \frac{1}{4}$

10. ¿A cuántos kilogramos equivalen 10 toneladas?
    a) 1,000,000 kg
    b) 100,000 kg
    c) 10,000 kg
    d) 1,000 kg

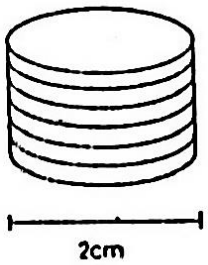
11. Si un borrego necesita $4m^2$ para pastar ¿Cuántos días puede estar un borrego en este terreno?



a) 8 días b) 10 días c) 12 días d) 14 días

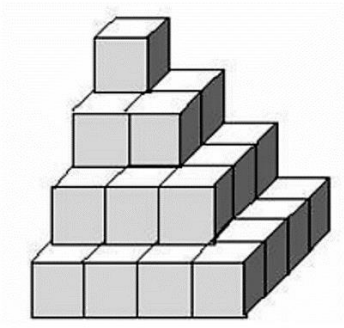
12. En el grupo de 4to grado hay 40 alumnos entre niños y niñas; y por cada niña hay tres niños. Si deciden formar equipos con dos niñas en cada uno ¿cuántos integrantes en total tendrá cada equipo?
    a) 5
    b) 8
    c) 10
    d) 12

13. ¿Cuál es el perímetro de todas las monedas?



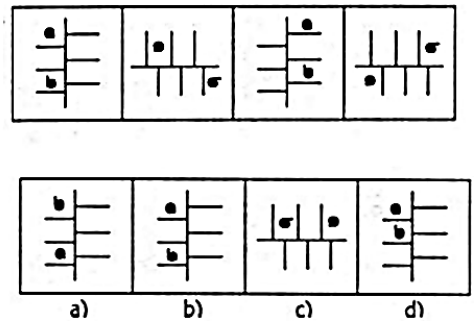
a) 12.16cm b) 37.6cm c) 24.68 cm d) 14.16 cm

14. Observa el siguiente dibujo, ¿cuántos cubos están totalmente ocultos?

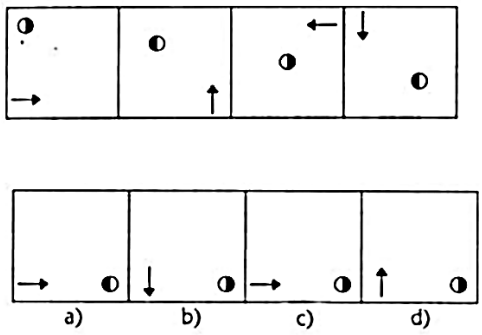


a) 8 b) 12 c) 14 d) 6

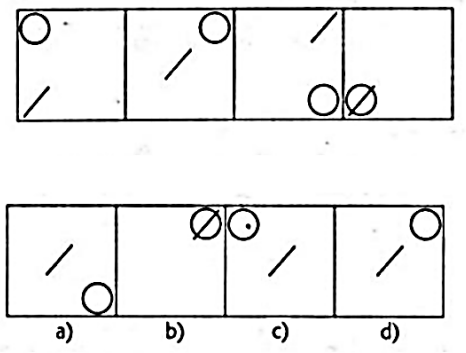
15. Analiza la siguiente serie y elige uno de los cuatro cuadros que contiene la figura que completa correctamente dicha serie



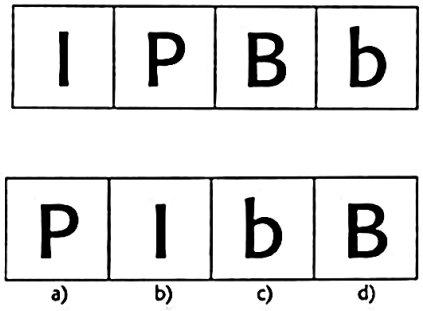
16. Elige el cuadro que completa la serie



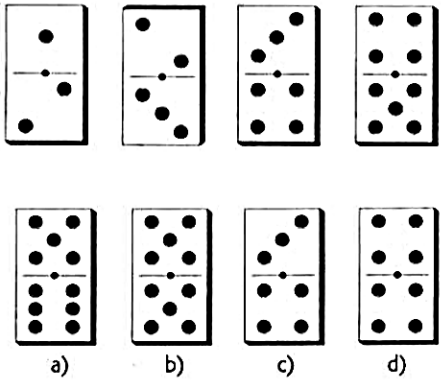
17. Elige el cuadro que completa la serie



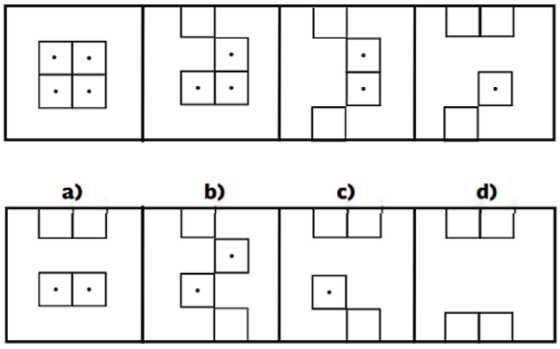
18. Elige el cuadro que completa la serie



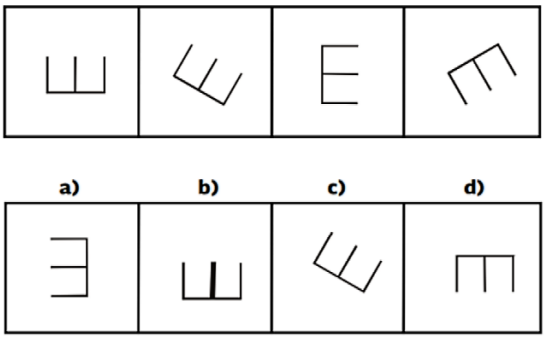
19. Elige el cuadro que completa la serie



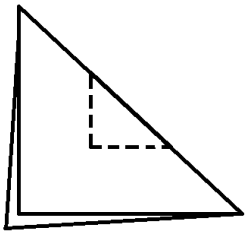
20. Elige el cuadro que completa la serie

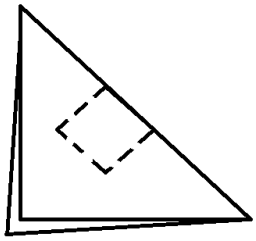


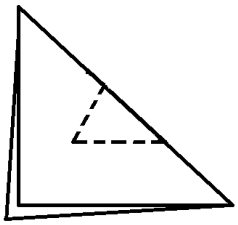
21. Elige el cuadro que completa la serie

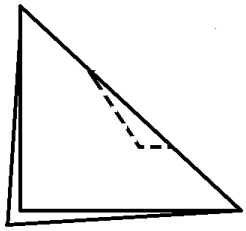


22. Ema va a hacer un corte en una hoja doblada. Quiere que al desdoblar la hoja quede un hueco cuadrado. ¿Cuál de los siguientes cortes debe de realizar?

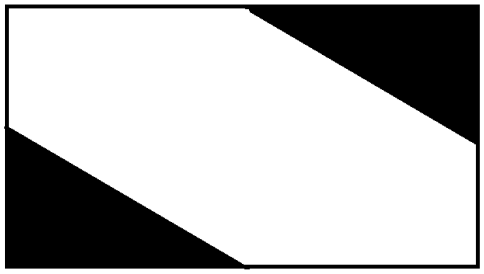
a) 

b) 

c) 

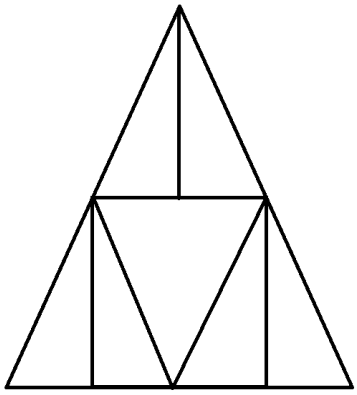
d) 

23. Observa con cuidado la siguiente figura, ¿qué fracción está sombreada?



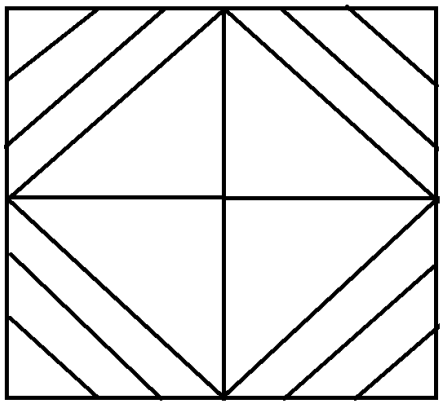
a) 2/8 b) 2/3 c) 2/4 d) 2/5

24. El total de triángulos que hay en la siguiente figura es:



a) 7 b) 8 c) 10 d) 12

25. Encuentra el total de triángulos que hay en la siguiente figura:



a) 16 b) 20 c) 18 d) 26

Examen 2

Instrumento de diagnóstico para los alumnos de nuevo ingreso a secundaria (IDANIS)

Número de preguntas: 25

Tiempo límite: 25 minutos

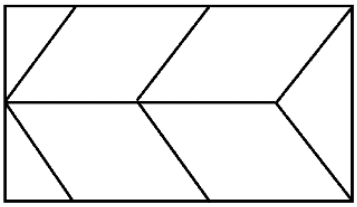
Instrucciones:

Lee con cuidado cada pregunta y elige la opción correcta. Después, busca en tu HOJA DE RESPUESTAS el número de la pregunta que estés contestando y llena el espacio correspondiente a la opción que hayas elegido.

Puedes utilizar tu cuaderno para hacer cálculos o anotaciones pero verifica que TODAS las respuestas estén en tu hoja de respuestas.

1. ¿Qué número multiplicado por 5 da el doble de 20?
    a. 10
    b. 8
    c. 5
    d. 4

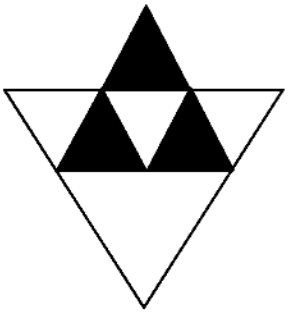
2. Encuentra el total de cuadriláteros en la siguiente figura:



    a. 7
    b. 8
    c. 10
    d. 11

3. Inés compró 30 chocolates para repartir entre sus amigas. Tenía pensado regalar 5 chocolates a cada una pero no asistieron todas, por lo cual logró darle a cada una 6 chocolates. ¿Cuántas amigas no asistieron?
    a. 1
    b. 2
    c. 3
    d. 4

4. Observa la siguiente figura e indica qué parte de esta figura está sombreada:



    a. 3/7
    b. 3/10
    c. 3/9
    d. 3/8

5. Cuenta la leyenda que Hércules se enfrentó a Hidra, un monstruo fabuloso que tenía siete cabezas y que, cada vez que le cortaban una de sus cabezas le crecían dos en su lugar. Hércules comenzó a cortarle cabezas pero ¿cuántas habría cortado si Hidra ya tenía 12 cabezas?
    a. 3
    b. 5
    c. 6
    d. 12

6. Si dispones de $60 pesos, ¿cuántas naranjas podrás comprar si las venden a 3 por $5 pesos?
    a. 12 naranjas
    b. 24 naranjas
    c. 36 naranjas
    d. 48 naranjas

7. Encuentra la opción que contenga el término que sigue en la sucesión presentada:

   128, 64, 32, 16, _____

   a. 2
   b. 4
   c. 6
   d. 8

8. Encuentra la opción que contenga el término que sigue en la sucesión presentada:

   95, 90, 85, 80, 75, 70, _____

   a. 55
   b. 65
   c. 75
   d. 60

9. Un profesor reparte 20 chocolates entre 5 alumnos, pero los tiene en bolsas de 2 chocolates. ¿Cuántas bolsas le tocan a cada alumno?

   a. 8
   b. 5
   c. 4
   d. 2

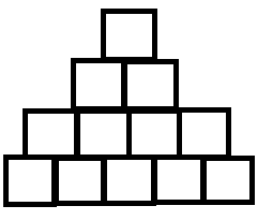
10. Juan y José, luego de haber tomado cada uno un refresco tienen la siguiente plática:

    - *Me quedan las 4/16 partes de mi refresco, dice Juan*
    - *A mi me quedan las 5/2 partes de mi refresco, dice José*

    ¿Quién tiene más gaseosa?

    a. Juan
    b. José
    c. Tienen lo mismo
    d. No se puede saber

11. La siguiente figura está formada por cuadrados de 1cm de lado. ¿Cuánto mide el perímetro de la figura?



    a. 17 cm
    b. 18 cm
    c. 20 cm
    d. 33 cm

12. Una bodega ha recibido 30 cajas con 40 huevos cada una. Si se rompieron 89 huevos y se venden 207 ¿cuántos huevos quedan?
    a. 1200
    b. 296
    c. 118
    d. 904

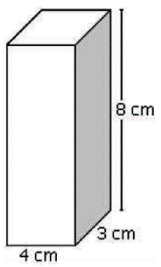
13. Una pecera con agua pesa 35 kg, si se le agregan 9 peces de 1/2 kg cada uno. ¿Cuánto pesará dicha pecera en total?
    a. 31.5 kg
    b. 42 kg
    c. 39.5 kg
    d. 38.5 kg

14. Belén estaba leyendo un libro cuando su mamá la llamó a comer. Si le dijo a su mamá que ya "llevaba leído" 1/3 del libro y le faltan 100 páginas para terminar de leerlo, ¿cuántas páginas tiene el libro?
    a. 600
    b. 450
    c. 300
    d. 150

15. Juan se levanta todos los días a las 6:30 A.M. para ir a la escuela. Tarda 15 min en bañarse, 10 minutos en vestirse y 30 minutos en desayunar y lavarse los dientes. ¿A qué hora sale Juan de su casa?
    a. 7:45 AM
    b. 7:25 AM
    c. 7:15 AM
    d. 7:00 AM

16. Los automóviles modernos son _____ por la potencia de sus máquinas.
    a. cómodos
    b. grandes
    c. seguros
    d. veloces

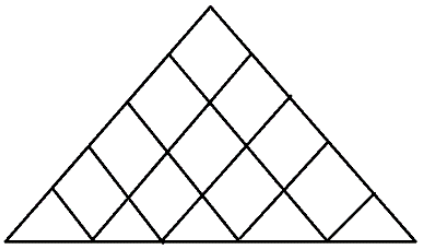
17. Observa el siguiente prisma y encuentra el área lateral (AL), área total (AT) y volumen (V)



    a. AL= 24cm2; AT=96cm2 y V= 136 cm3
    b. AL= 24cm2; AT=136cm2 y V= 96 cm3
    c. AL= 136cm2; AT=96cm2 y V= 24cm3
    d. AL=136cm2; AT=24cm2 y V= 96cm3

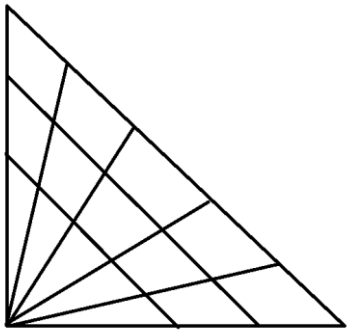
18. ¿Cuántos triángulos hay en la siguiente figura?

a. 16
b. 20
c. 12
d. 15



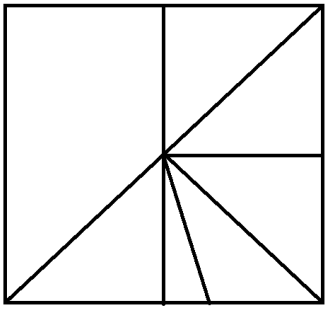
19. Indica el número de triángulos que hay en la siguiente figura:

a. 21
b. 42
c. 45
d. 60

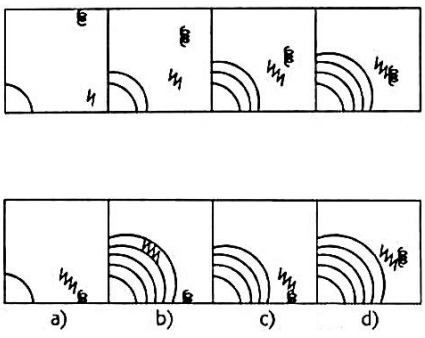


20. Encuentra el total de triángulos que hay en la siguiente figura:

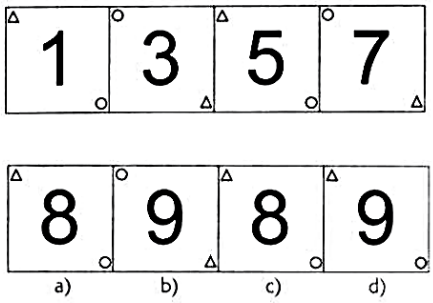
a. 10
b. 11
c. 12
d. 13



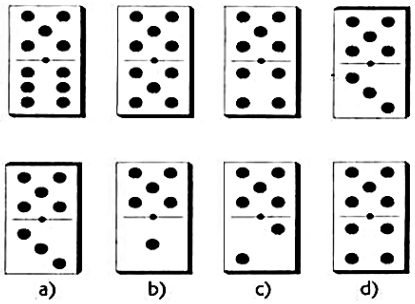
21. Analiza la siguiente serie y elige el cuadro que contiene la figura que completa correctamente dicha serie:



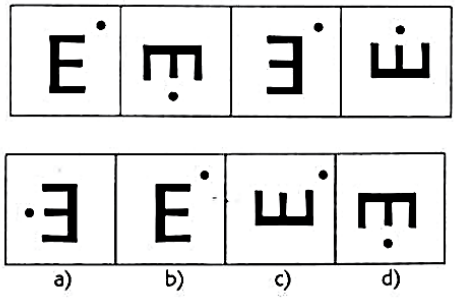
22. Analiza la siguiente serie y elige el cuadro que contiene la figura que completa correctamente dicha serie:



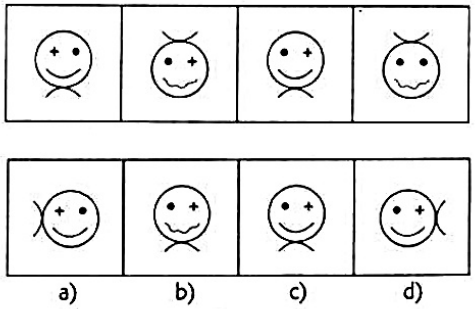
23. Analiza la siguiente serie y elige el cuadro que contiene la figura que completa correctamente dicha serie:



24. Analiza la siguiente serie y elige el cuadro que contiene la figura que completa correctamente dicha serie:



25. Analiza la siguiente serie y elige el cuadro que contiene la figura que completa correctamente dicha serie:



- Segunda parte -

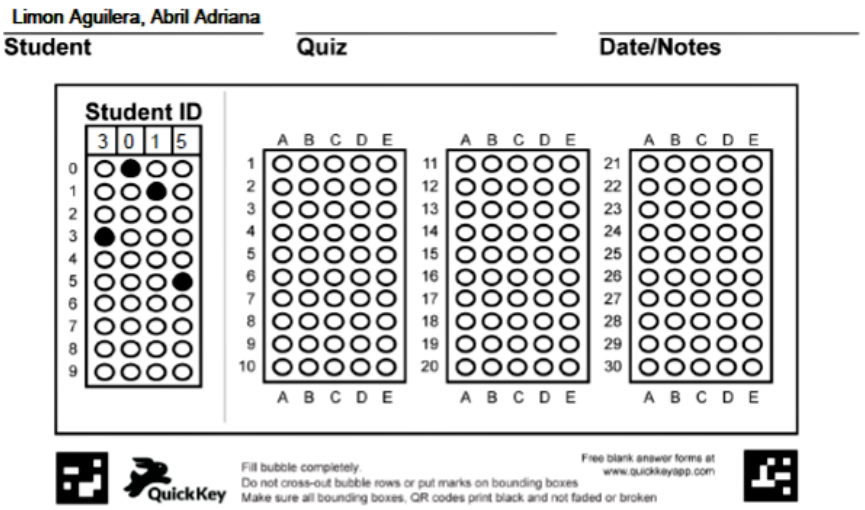
Reflexiona de nuevo sobre las siguientes situaciones:

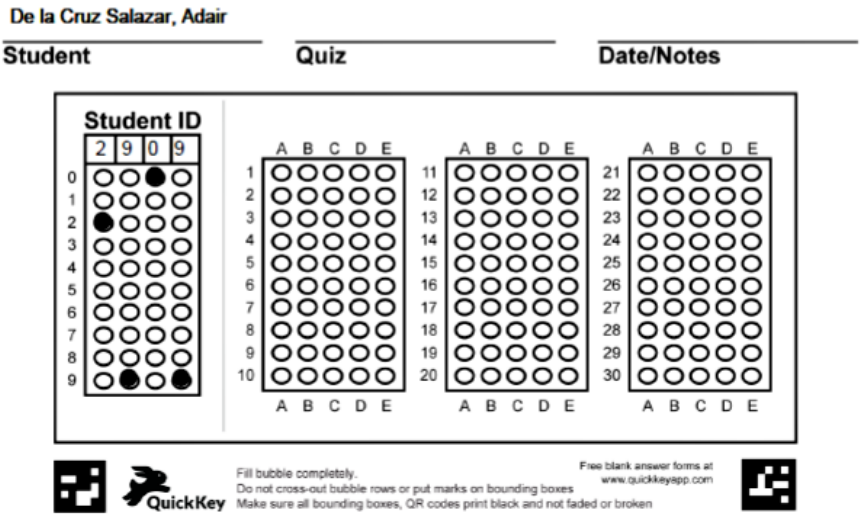
a. Imagina que los estudiantes de tu escuela con más recursos económicos y oportunidades se encuentran hasta arriba de esta escalera y hasta abajo los estudiantes con menores recursos y oportunidades. Coloca una “X” en la escalera de la derecha sobre el escalón que creas estar ubicado.

b. Imagina que la misma escalera representa todo el país. Hasta arriba se encuentran las familias de todo México más importantes y con más dinero. Hasta abajo están las familias mexicanas con mayores problemas de dinero. Ahora piensa en tu familia y coloca un “X” en la escalera de la izquierda sobre el escalón donde piensas está ubicada tu familia.

c. ¿Te preocupa tu posición en las escaleras? ¿Has sentido que las personas que te rodean tratan diferente a los niños que están hasta abajo de la escalera?

Figure 7: Example of pre-filled answer sheets used in both exams





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