The Role of Mindset in Education: a Large-Scale Field Experiment in Disadvantaged Schools

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Plan

1. Introduction
2. The program
3. Experimental Design
4. Data and empirical strategy
5. Results
6. Conclusions
Motivation

Why do students perform so differently?

- Important literature on *external* factors
  - School inputs: class size, teacher salary, teacher experience
  - Peer effects within the class, school, and neighborhood
  - Family: inherited intelligence, parental involvement

- More recent interest in *internal* factors, i.e. students’ psychology (or mindset)

- How adolescents think about their chance of success and returns to effort may be just as important for schoolwork and learning as external factors
Motivation

- The US and UK governments have launched programs to develop student character.

- The French blind spot? PISA 2012:
  - Self-esteem: France 62 / 65
  - Anxiety: France 62 / 65
  - Internal locus of control: France 58 / 65
  - Perseverance: France 63 / 65
  - Self-discipline: France 60 / 65

- Growth mindset (2018): 46% of French students think that intelligence can change, 60% in the US.
Motivation

Mindset issues may be more pronounced in disadvantaged students

▶ In France, students overestimate the influence of SES on future success in high school (Guyon and Huillery 2021)

▶ Low-SES students have a 0.15 SD lower academic self-esteem than their high-SES equally-achieving classmates

▶ The same patterns are found in 6 OECD countries using PISA 2018 (Barone et al. 2020)

▶ Behavioral poverty trap: low aspirations => low effort => low school outcomes
This paper

- Uses a large-scale field experiment to test a light-touch intervention in middle school to increase the perceived return to effort:
  - Internal locus of control
  - Growth mindset

- Research questions:
  - Is it possible to train character skills in adolescents?
  - Is it sufficient to induce changes in behavior and school outcomes?
Preview of the results

- We find positive and significant impacts on:
  - Students’ mindset and perceived return to effort
  - Behavior in class
  - GPA and aspirations

- These impacts are driven by girls and by well-behaved students

- Small effect sizes, but fantastic returns
Contributions to the literature

- Correlation between non-cognitive skills and educational or professional outcomes: Heckman et al. 2006, Almlund et al., 2011; Dohmen et al., 2011; Golsteyn et al., 2014

- Cocktails of actions including non-cognitive skills: Heckman et al. 2010 and 2013, Chetty et al. 2011, Durlak et al. 2011

- Only a few experimental papers on students’ mindset: Paunesku et al. 2015, Alan et al. 2018, Alan et al. 2019, Yeager et al. 2020
  - We provide rich and precise channels of causality
  - Longer term impacts on real-life educational outcomes
  - Ecological setting, large number of schools and facilitators
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The Program “Energie Jeunes”

► Objective: prevent school drop-out in disadvantaged schools by developing students’ motivation and engagement

► Consists of three 55-minute class interventions per year, from Grade 6 to Grade 9

► Led by the association’s volunteers and speakers from the professional world

► The interventions are built around videos, activities and personal stories
The Program “Energie Jeunes”
The Program “Energie Jeunes”

How does the program aims to develop motivation and engagement?

1. Internal versus external locus of control
   - Downplaying the importance of external constraints
   - Making the role of effort stand out

2. Growth versus fixed mindset
   - The brain is highly plastic and grows stronger when it experiences dedicated schoolwork
   - Failures are temporary and signal a learning opportunity

=> Increases the perceived return to effort
The Program “Energie Jeunes”

- Each year during the second session, students are asked to make a commitment that they record in an individual engagement journal.

- Examples of such commitment include: work more, be attentive in class, homework comes before video games, etc.

- During the third session, students assess whether they were able to honor their commitment.
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Experimental Design

Sampling strategy

- 97 middle schools from 7 academic districts
  - Eligibility: disadvantaged schools (80% Priority Education)
  - School staff is volunteer

- Sampled schools are in fact representative of Priority Education schools
  - 78% blue collar family (63% at the national level)
  - 49% receive need-based financial aid (25% at the national level)
  - 26% lower performance in maths at the Grade 9 national exam wrt national av.
Experimental Design

We randomized two cohorts within schools:

- In half of the schools, 2014 Grade 6 are treated for four years, while 2015 Grade 6 are not
- In the other half, 2015 Grade 6 are treated for four years, while 2014 Grade 6 are not
## Experimental Design

<table>
<thead>
<tr>
<th>Year</th>
<th>Grade</th>
<th>School A</th>
<th>School B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>6</td>
<td>Energie jeunes</td>
<td>Control</td>
</tr>
<tr>
<td>(2014/2015)</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd year</td>
<td>6</td>
<td>Control</td>
<td>Energie jeunes</td>
</tr>
<tr>
<td>(2015/2016)</td>
<td>7</td>
<td></td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Energie jeunes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3rd year</td>
<td>6</td>
<td>Control</td>
<td>Energie jeunes</td>
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<tr>
<td>(2016/2017)</td>
<td>7</td>
<td></td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Energie jeunes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th year</td>
<td>6</td>
<td></td>
<td>Energie jeunes</td>
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<tr>
<td>(2017/2018)</td>
<td>7</td>
<td></td>
<td>Control</td>
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<td></td>
<td>8</td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Energie jeunes</td>
<td></td>
</tr>
<tr>
<td>5th year</td>
<td>6</td>
<td></td>
<td>Energie jeunes</td>
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<tr>
<td>(2018/2019)</td>
<td>7</td>
<td></td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>8</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Control</td>
<td></td>
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</table>
Experimental Design

<table>
<thead>
<tr>
<th></th>
<th>Grade 6</th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Grade 9</th>
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</thead>
<tbody>
<tr>
<td>Full</td>
<td>24,142</td>
<td>23,095</td>
<td>24,349</td>
<td>24,532</td>
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<tr>
<td>Treatment</td>
<td>11,914</td>
<td>11,330</td>
<td>12,070</td>
<td>11,999</td>
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<tr>
<td>Control</td>
<td>12,228</td>
<td>11,765</td>
<td>12,279</td>
<td>12,533</td>
</tr>
</tbody>
</table>
Plan

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Data Sources

1. Administrative data from school registers (full sample)
   - GPA
   - School behavior: absences, lateness, sanctions, disciplinary actions
   - Socio-economic status, gender

2. Student survey (random sub-sample of seven students per class)

3. Teacher survey (same student sub-sample):
   - KIPP Character Report Card for each surveyed student
Outcomes of interest

1. Perceived return to effort
   - Growth mindset
     - Intelligence is something that can’t be changed (Claro et al 2016)
     - I prefer problems that I’ll learn a lot from (Li and Bates 2017)
     - Prob. of success if gifted but does not study hard / if study regularly (Guyon and Huillery 2020)
   - Locus of control
     - Prob. of success if from advantaged / disadvantaged neighborhood (idem)
     - Prob. of success if parents with / without college degree (idem)
Outcomes of interest

(2) Behavior

- Self-reported diligence
  - Orderliness (Goldberg et al. 1990)
  - Grit (Duckworth and Quinn 2009)
  - Schoolwork impulsivity (Tsukayama 2013)
  - Work discipline (Goldberg 2006)
  - Homework management (Xu 2013)
  - Time spent doing homework (the authors)
Outcomes of interest

(2) Behavior

- Teacher-reported character (Park et al. 2017)
  - Social character: peer conflicts and popularity
  - Intellectual character: participation in class, curiosity
  - Achievement character: grit, optimism, self-control

- School-reported behavior
  - Absences
  - Lateness
  - Sanctions (e.g. detention)
  - Disciplinary actions (e.g. expulsion)
Outcomes of interest

(3) Academic outcomes and life choices

- Aspirations
  - Educational aspirations: academic, technical or vocational high school
  - Career aspiration: preferred job $\Rightarrow$ hand-coded into low, medium, or high-skilled job

- GPA
### Balance checks

<table>
<thead>
<tr>
<th></th>
<th>G6 sample</th>
<th>G7 sample</th>
<th>G8 sample</th>
<th>G9 sample</th>
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<tbody>
<tr>
<td></td>
<td>C</td>
<td>Impact</td>
<td>C</td>
<td>Impact</td>
</tr>
<tr>
<td>Date of Birth</td>
<td>2003.30</td>
<td>-0.000</td>
<td>2003.29</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>[0.664]</td>
<td>(0.005)</td>
<td>[0.667]</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Female</td>
<td>0.489</td>
<td>0.004</td>
<td>0.492</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>[0.500]</td>
<td>(0.005)</td>
<td>[0.500]</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Was held back</td>
<td>0.185</td>
<td>-0.001</td>
<td>0.188</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>[0.389]</td>
<td>(0.004)</td>
<td>[0.391]</td>
<td>(0.004)</td>
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<tr>
<td>Financial aid</td>
<td>0.504</td>
<td>0.013</td>
<td>0.520</td>
<td>-0.028***</td>
</tr>
<tr>
<td></td>
<td>[0.500]</td>
<td>(0.008)</td>
<td>[0.500]</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Single parent family</td>
<td>0.178</td>
<td>-0.007</td>
<td>0.173</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>[0.382]</td>
<td>(0.005)</td>
<td>[0.378]</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Blue collar family</td>
<td>0.766</td>
<td>-0.013***</td>
<td>0.761</td>
<td>-0.009**</td>
</tr>
<tr>
<td></td>
<td>[0.424]</td>
<td>(0.005)</td>
<td>[0.426]</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Foreigner</td>
<td>0.125</td>
<td>0.003</td>
<td>0.134</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>[0.331]</td>
<td>(0.004)</td>
<td>[0.341]</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Top half baseline GPA</td>
<td>0.498</td>
<td>0.003</td>
<td>0.497</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>[0.500]</td>
<td>(0.006)</td>
<td>[0.500]</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Baseline GPA</td>
<td>13.176</td>
<td>0.020</td>
<td>13.310</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>[2.676]</td>
<td>(0.039)</td>
<td>[2.589]</td>
<td>(0.040)</td>
</tr>
<tr>
<td>Top half baseline behavior</td>
<td>0.525</td>
<td>-0.028***</td>
<td>0.516</td>
<td>-0.031***</td>
</tr>
<tr>
<td></td>
<td>[0.499]</td>
<td>(0.009)</td>
<td>[0.500]</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Baseline behavior (-)</td>
<td>-0.011</td>
<td>0.022*</td>
<td>-0.009</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>[0.637]</td>
<td>(0.012)</td>
<td>[0.614]</td>
<td>(0.013)</td>
</tr>
</tbody>
</table>

The table tests the differences between the treatment and the control group on outcomes not supposed to be affected by the EJ program. Under column \textit{C}, we provide the average in the control group, under \textit{Impact} the coefficient of the regression of the outcome and the EJ variable, controlled for school and cohort fixed effects. (-) indicates that the sub-indices scale was invested. Standard errors of the regressions, given under the impact coefficients, are robust to heteroskedasticity and clustered at the school*cohort level.

*10%, ** 5%, *** 1% significance level
Attrition

- Minimal attrition in the administrative data (0-4%)
- 6% to 21% attrition rates in the student survey sample
- 23% to 39% attrition rates in the teacher survey sample
- All balanced across T and C, and final samples are identical to original ones
Estimation strategy

- Intention-to-treat estimates

\[
Y_{iscj} = \alpha_j + \beta_j T_{sc} + \theta_s + \theta_c + \epsilon_{iscj}
\]

- Y: outcome of student i in school s, cohort c, grade j
- School and cohort fixed effects
- Standard errors clustered at the school*cohort level
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Results: impact on GPA by gender
Results: impact on GPA

by socioeconomic background

![Graph showing the impact of mindset on GPA by socioeconomic background across different grades.]
Results: impact on GPA

by baseline academic performance
Results: impact on GPA

by baseline school behavior
Summary of the impacts on GPA

- Positive and significant impact on GPA, +7% of a standard deviation
- Driven by girls (+9% sd) and well-behaved students (+13% sd)
- The impact increases over time +5%, +5%, +3% resp. in Grade 6, 7 and 8
  - Even boys and bad-behaved’ GPA improved in Grade 9
Summary of the impacts on GPA

- Positive and significant impact on GPA, +7% of a standard deviation
- Driven by girls (+9% sd) and well-behaved students (+13% sd)
- The impact increases over time: +5%, +5%, +3% resp. in Grade 6, 7 and 8
  - Even boys and bad-behaved’ GPA improved in Grade 9

=> Is the program worth the risk?
## Cost-effectiveness

<table>
<thead>
<tr>
<th>Intervention Description</th>
<th>Cost per Student</th>
<th>Impact (% sd)</th>
<th>Cost for a 1pp sd Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energie Jeunes (4 years)</td>
<td>60 EURO</td>
<td>7%</td>
<td>12 EURO</td>
</tr>
<tr>
<td>Energie Jeunes, including volunteer wage (4 years)</td>
<td>260 EURO</td>
<td>7%</td>
<td>52 EURO</td>
</tr>
<tr>
<td>50% class size reduction, French 2017 reform (DEPP report, 2019)</td>
<td>4,000 EURO</td>
<td>10%</td>
<td>400 EURO</td>
</tr>
<tr>
<td>50% class size reduction, international lit review (Bouguen et al. 2017)</td>
<td>4,000 EURO</td>
<td>30%</td>
<td>133 EURO</td>
</tr>
<tr>
<td>Boarding schools for disadvantaged stud. (2 years, maths) (Behaghel et al. 2013)</td>
<td>20,000 EURO</td>
<td>41%</td>
<td>488 EURO</td>
</tr>
</tbody>
</table>
Mechanisms

What happened in girls and well-behaved that did not happen in boys and bad-behaved?

▶ Changes in perceived return to effort?
▶ Changes in behavior?
  ▶ Self-reported
  ▶ Teacher-reported
  ▶ School-reported
▶ Changes in aspirations?
Perceived return to effort

by gender
Perceived return to effort

by baseline school behavior
Mechanisms

What happened in girls and well-behaved that did not happen in boys and bad-behaved?

▶ Changes in perceived return to effort: YES 4% sd overall, more pronounced in girls and well-behaved (×3 in girls, ×2 in well-behaved)

▶ Changes in behavior?
  ▶ Self-reported
  ▶ Teacher-reported
  ▶ School-reported

▶ Changes in aspirations?
Changes in behavior: self-reported diligence

by gender
Changes in behavior: self-reported diligence

by baseline school behavior
Mechanisms

What happened in girls and well-behaved that did not happen in boys and bad-behaved?

- Changes in perceived return to effort: YES 4% sd overall, more pronounced in girls and well-behaved ($\times$3 in girls, $\times$2 in well-behaved)

- Changes in behavior?
  - Self-reported: NO null effect overall, even negative in girls in Grade 7 (and girls’ self-perceived grit over middle school)
  - Teacher-reported
  - School-reported

- Changes in aspirations?
Changes in behavior: teacher-reported character by gender
Changes in behavior: teacher-reported character

by baseline school behavior
Mechanisms

What happened in girls and well-behaved that did not happen in boys and bad-behaved?

- Changes in perceived return to effort: YES 4% sd overall, more pronounced in girls and well-behaved ($\times 3$ in girls, $\times 2$ in well-behaved)

- Changes in behavior?
  - Self-reported: NO null effect overall, even negative in girls in Grade 7 (and girls’ self-perceived grit over middle school)
  - Teacher-reported: YES 4% sd overall, $\times 2$ in well-behaved (although the diff is not significant)

- School-reported:

- Changes in aspirations?
Changes in behavior: school-reported behavior by gender
Changes in behavior: school-reported behavior

by baseline school behavior
Mechanisms

What happened in girls and well-behaved that did not happen in boys and bad-behaved?

▶ Changes in perceived return to effort: YES 4% sd overall, more pronounced in girls and well-behaved (×3 in girls, ×2 in well-behaved)

▶ Changes in behavior?
  ▶ Self-reported: NO null effect overall, even negative in girls in Grade 7 (and girls’ self-perceived grit over middle school)
  ▶ Teacher-reported: YES 4% sd overall, ×2 in well-behaved (although the diff is not significant)
  ▶ School-reported: YES but only in Grade 9 when absences and sanctions deteriorate the most (more than double btw Grade 6 and Grade 9)

▶ Changes in aspirations?
### Changes in aspirations

<table>
<thead>
<tr>
<th></th>
<th>Obs.</th>
<th>Control</th>
<th>Impact</th>
<th>EJ</th>
<th>female</th>
<th>Ej* female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High skill</strong></td>
<td>5,379</td>
<td>0.284</td>
<td>-0.004</td>
<td>-0.019</td>
<td>-0.036**</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.451]</td>
<td>(0.010)</td>
<td>(0.016)</td>
<td>(0.018)</td>
<td>(0.024)</td>
</tr>
<tr>
<td><strong>Medium skill</strong></td>
<td>5,379</td>
<td>0.201</td>
<td>0.021***</td>
<td>0.017</td>
<td>0.091***</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.401]</td>
<td>(0.007)</td>
<td>(0.013)</td>
<td>(0.017)</td>
<td>(0.023)</td>
</tr>
<tr>
<td><strong>Low skill</strong></td>
<td>5,379</td>
<td>0.337</td>
<td>-0.023*</td>
<td>-0.005</td>
<td>-0.049**</td>
<td>-0.036</td>
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<tr>
<td></td>
<td></td>
<td>[0.473]</td>
<td>(0.012)</td>
<td>(0.015)</td>
<td>(0.019)</td>
<td>(0.026)</td>
</tr>
<tr>
<td><strong>No aspiration</strong></td>
<td>5,379</td>
<td>0.178</td>
<td>0.006</td>
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<td>-0.006</td>
<td>-0.002</td>
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<td>[0.383]</td>
<td>(0.009)</td>
<td>(0.013)</td>
<td>(0.015)</td>
<td>(0.022)</td>
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### Professional Aspirations

### Educational Aspirations

<table>
<thead>
<tr>
<th>Professional Aspirations</th>
<th>Obs.</th>
<th>Control</th>
<th>Impact</th>
<th>EJ</th>
<th>female</th>
<th>Ej* female</th>
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</thead>
<tbody>
<tr>
<td>Academic High School</td>
<td>5,504</td>
<td>0.684</td>
<td>0.019*</td>
<td>0.005</td>
<td>0.084***</td>
<td>0.028</td>
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<td></td>
<td></td>
<td>[0.465]</td>
<td>(0.011)</td>
<td>(0.016)</td>
<td>(0.019)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Technical High School</td>
<td>5,504</td>
<td>0.261</td>
<td>-0.011</td>
<td>0.010</td>
<td>-0.059***</td>
<td>-0.041*</td>
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<tr>
<td></td>
<td></td>
<td>[0.439]</td>
<td>(0.010)</td>
<td>(0.015)</td>
<td>(0.016)</td>
<td>(0.024)</td>
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<tr>
<td>Vocational High School</td>
<td>5,504</td>
<td>0.050</td>
<td>-0.010**</td>
<td>-0.011</td>
<td>-0.020**</td>
<td>0.002</td>
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<tr>
<td></td>
<td></td>
<td>[0.218]</td>
<td>(0.004)</td>
<td>(0.008)</td>
<td>(0.009)</td>
<td>(0.012)</td>
</tr>
</tbody>
</table>
## Changes in aspirations by baseline school behavior

<table>
<thead>
<tr>
<th></th>
<th>Full Non-missing Sample</th>
<th>Behavior heterogeneity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obs.</td>
<td>Control</td>
</tr>
<tr>
<td><strong>Professional Aspirations</strong></td>
<td></td>
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</tr>
<tr>
<td>High skill</td>
<td>3,984</td>
<td>0.293</td>
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<tr>
<td></td>
<td>[0.293]</td>
<td>(0.012)</td>
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</table>
Mechanisms

What happened in girls and well-behaved that did not happen in boys and bad-behaved?

- Changes in perceived return to effort: YES 4% sd overall, more pronounced in girls and well-behaved (×3 in girls, ×2 in well-behaved)

- Changes in behavior?
  - Self-reported: NO null effect overall, even negative in girls in Grade 7 (and girls’ self-perceived grit over middle school)
  - Teacher-reported: YES 4% sd overall, ×2 in well-behaved (although the diff is not significant)
  - School-reported: YES but for all and only in Grade 9 when absences and sanctions deteriorate the most (more than double btw Grade 6 and Grade 9)

- Changes in aspirations: YES, concerns mostly girls and well-behaved students (although diff are not significant)
Plan

1. Introduction
2. The program
3. Experimental Design
4. Data and empirical strategy
5. Results
6. Conclusions
Conclusions

- We find high returns on an intervention that works on students’ mindset
  - At least in France where baseline students’ mindset is particularly sad

- Shows the causal impact of psychology in the formation of human capital

- Students with better outcomes benefit more
  - Better at updating their beliefs
  - More prone to adjust their aspirations
  - Evidence of behavioral changes, but not always in line with benefits in GPA

- Methodological lesson: be careful with self-reported behavioral measures, reference points may change with treatment
Conclusions

We have to do more than that!

▶ Make boys and bad-behaved students more responsive
  ▶ School norms regarding work discipline and diligence?
  ▶ Intention-to-action gap?

▶ Teacher training on the growth mindset and locus of control
  ▶ Ongoing RCT for primary school teachers

▶ Parent training on growth mindset and locus of control?