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Policy Implications of Students' Dispositions Towards Learning

PISA results show that drive, motivation and confidence in oneself are essential if students are to fulfil their potential; but too many students lack some of these dispositions towards learning that would enable them to flourish. This chapter considers how the education policies of school systems and individual schools are associated with students' engagement with school, their drive and their self-beliefs.

PISA reveals that in most countries and economies, far too many students do not make the most of the learning opportunities available to them because they are not engaged with school and learning. That is most clearly evident in the fact that more than one in three students in OECD countries reported that they arrived late for school during the two weeks prior to the PISA assessment; and more than one in four students reported that they skipped classes or days of school during the same period.

This is not just a question of lost time; these students are also far more likely to show lower levels of student performance. On average across OECD countries, arriving late for school is associated with a 31-point lower score in mathematics, while skipping classes or days of school is associated with a 39-point lower score in mathematics – the equivalent of just under one full year of formal schooling. Learning demands engagement: unless students are physically present in class, they cannot learn; and unless parents, schools and governments commit to effective strategies to ensure that all students attend school regularly, and feel engaged while at school, public policies aimed at fighting social exclusion and promoting cohesive societies will be undermined.

It is interesting that attendance at and engagement with school does not just vary among students and schools, but also across countries. In particular, the high-performing East-Asian countries and economies, such as Hong Kong-China, Japan, Korea, Macao-China and Shanghai-China, have comparatively very low rates of students who reported that they arrived late for class or skipped classes or days of school. More generally, in countries with cultures based on the Confucian tradition, students, parents and educators value education and student achievement in school highly, and many observers believe that this cultural characteristic confers a large advantage on such countries. At the same time, the educational success of the countries with this tradition is relatively recent, and not all such countries show high levels of student performance. A Confucian heritage may be an asset, but it is no guarantee of success. The extent to which the educational aspirations of students and parents are the result of cultural values or determinants of these, and how such aspirations interact with education policies and practices is an important subject that merits further study. Whatever the case, it seems that if a country seeks better education performance, it is incumbent on political and social leaders to persuade the country's citizens to make the choices needed to show that they value education more than other areas of national interest.

PISA results also indicate that drive, motivation and confidence in oneself are essential if students are to fulfil their potential; but too many students lack the levels of perseverance, drive, motivation and confidence in their own abilities that would enable them to flourish. For example, across OECD countries, almost two in three students reported that they tend to "put off difficult problems", almost one in two reported that they tend to "give up easily when confronted with a problem", and only one in three reported "liking to solve complex problems".

Practice and hard work go a long way towards developing each student's potential, but students can only achieve at the highest levels when they believe that they are in control of their success and that they are capable of achieving at high levels. In Shangai-China, for example, students not only believe they are in control of their ability to succeed, but they are prepared to do what it takes to do so: for example 73% of students agreed or strongly agreed that they remain interested in the tasks that they start. The fact that students in some countries consistently believe that student achievement is mainly a product of hard work, rather than inherited intelligence, suggests that education and its social context can make a difference in instilling values that foster success in education.

Education systems and societies at large need to invest in ensuring that students enjoy learning, believe in their abilities and capacity to succeed, and also, crucially, have the stamina to face challenging problems and situations.

THE IMPACT OF SCHOOLS AND FAMILIES

Engagement with and at school

Students who are in schools where teacher-student relations and disciplinary climate are poor are more likely to have low levels of engagement with and at school. They are more likely to arrive late for school, skip classes or days of school, report a weak sense of belonging, and hold negative attitudes towards school. Establishing a positive school ethos, where teachers, students and administrative staff feel that they are members of a community and respect each other's roles and responsibilities, can help to ensure that all students are engaged with school. A lack of engagement – on the part of either teachers or students – can have adverse effects on the entire school community. Teachers and school principals need to be able to identify students who show signs of lack of engagement with school, and work with them individually before disengagement takes firm root.

Differences between schools and between countries in students' lack of punctuality and truancy signal that there are ways to engage students. Only when students find classes interesting and relevant, and have teachers who are willing, but also have the means, to engage their students, can schools maximise opportunities for student learning.

Drive and motivation

Schools can help students learn how to learn, nurture their willingness to solve problems, and build their capacity for hard work and persistence. These factors are as important as acquiring subject-specific competencies if students are to be able to succeed in a rapidly changing world. Teachers can help students to develop perseverance and motivation by supporting students in their efforts to meet high expectations and in showing greater degrees of commitment, and by encouraging students to regard mistakes and setbacks as learning opportunities.

PISA results reveal that teachers' practices can promote students' drive and willingness to engage with complex problems. Teachers' use of cognitive-activation strategies, such as giving students problems that require them to think for an extended time, presenting problems for which there is no immediately obvious way of arriving at a solution, and helping students to learn from the mistakes they have made, is associated with students' perseverance and openness to problem solving. Students whose teachers adopt such strategies are also more likely to favour mathematics as a field of study over other subjects or to see mathematics as more necessary to their careers than other subjects. Similarly, students who reported that their mathematics teachers use teacher-directed instruction and formative assessments also reported particularly high levels of perseverance, openness to problem solving, and willingness to pursue mathematics as a career or field of further study. Yet, the use of such strategies among teachers is not widespread: only 53% of students reported that their teachers "often"[1] present them with problems that require them to think for an extended time, and 47% reported that their teachers often present problems for which there is no immediately obvious way of arriving at a solution. Similarly, on average across OECD countries, only 17% of students reported that their teacher assigns projects that require at least one week to complete. Canada is more successful in this regard: 60% of students in Canada reported that their teachers often present problems for which there is no immediately obvious way of arriving at a solution, and 66% reported that their teachers "often" present them with problems that require them to think for an extended time. Education systems could and should do more to promote students' ability to work towards long-term goals.

Mathematics self-beliefs

Individuals' performance on a given task also depends on how capable of solving it they feel. As one would expect, PISA shows that students who are exposed to a variety of pure and applied mathematics problems feel more confident about solving a greater number of such problems than students who have little or only narrow exposure. Students who have developed wide and extensive knowledge of mathematical concepts and processes and who feel confident about their mathematics abilities can better assume the challenge of solving complex, real-life problems that they have not encountered before. Teachers can help their students develop these feelings by ensuring that they master mathematical concepts and processes, but also by challenging their students with a varied set of applied mathematics problems.

The role of social comparisons

PISA reveals that students' performance in mathematics is positively associated with their drive, motivation and mathematics-related self-beliefs. However, results also indicate that students' motivation and mathematics self-beliefs are closely related to the school students attend and to whether students perform better or less well than other students in their school. Students who attend schools where most other students perform better than they do reported lower levels of intrinsic and instrumental motivation to learn mathematics, mathematics self-concept and perseverance, and higher levels of mathematics anxiety, on average, than students who perform equally well but who attend schools with lower-achieving peers.

Teachers and parents can help all students develop their full potential by holding high expectations and celebrating each student's efforts and achievements, and rewarding each student who achieves specific learning goals. Korea, for example, reformed its grading practices so that assessments would not be used to rank students according to how well they did compared with other students, but rather to evaluate whether, and to what extent, individual students met the national curriculum standards developed for each subject.[2]

Parents' expectations for their child

Parents can also help their children develop high levels of engagement, drive, motivation and positive mathematics self-beliefs by engaging with their children at home, providing access to educational resources and, perhaps most

important, holding high expectations for their children's futures. Students whose parents expect that they will graduate from university display higher levels of perseverance and mathematics self-efficacy than students with the same socio-economic status and performance in mathematics and reading, but whose parents do not expect that they will earn a university degree. Parents who hold ambitious expectations for their children motivate and guide them in their learning; they create the conditions that promote academic excellence and the acquisition of skills.

Education systems can also promote motivation to learn by ensuring that all students are surrounded by excellence. PISA reveals that when education systems stream students into different schools based on ability, student motivation to learn and student performance suffers, on average. Only when education systems cultivate, foster and communicate the belief that all students can achieve at higher levels do students feel the drive and motivation that enables them to learn.

THE IMPACT OF A LEVEL PLAYING FIELD

PISA 2012 identifies two groups of students who are not only at particular risk of underachieving in mathematics but also of having low levels of engagement with school and negative dispositions towards mathematics: girls and socio-economically disadvantaged students.

Disadvantaged students are more likely than their advantaged peers to suffer from low levels of engagement, and lack of drive and motivation, and to hold negative self-beliefs. Disadvantaged students are also more likely to report skipping classes or days of school and arriving late for school, and are less likely to have a strong sense of belonging and hold positive attitudes towards school. For example, in OECD countries, while 85% of advantaged students agree or strongly agree with the statement "I feel like I belong at school", only 78% of disadvantaged students do. In some countries these differences are more pronounced. For example, in France, Korea and Lithuania, the difference between the proportion of advantaged students who agree or strongly agree with the statement and the proportion of disadvantaged students who do is larger than 15 percentage points.

Differences in mathematics achievement between advantaged and disadvantaged students explain a large share of the differences in students' propensity to arrive late or to believe, for example, that school is a waste of time. In fact, when comparing students who perform equally well in mathematics, there are few differences in drive, motivation and self-beliefs related to socio-economic status. Results from PISA show that disadvantaged students can succeed despite their socio-economic status by being engaged, motivated and holding strong beliefs in themselves and their abilities. Across OECD countries, 31% of students from disadvantaged backgrounds are resilient, meaning that they beat the odds against them and achieve beyond expectations. A key difference between disadvantaged students who are resilient and those who are not is that resilient students regularly attend school and have the kinds of dispositions and behaviours towards school and learning that are comparable to those observed among advantaged, high-achieving students.

That disadvantaged students tend to be less engaged in school may be because they have fewer resources at home through which they can benefit from their motivation to learn. Advantaged students might have an edge in how well they are able to translate their motivation into high levels of performance in school because these students have greater access to books, a quiet study area, extra tutoring, and after-school activities, to name just a few. Advantaged students also have better-educated parents who may feel more comfortable engaging with their children in ways that, even unconsciously, promote learning.

However, there are established strategies to aid disadvantaged students at school, including:

- promoting engagement with and at school, drive and positive self-beliefs. For example, disadvantaged students may be more likely to arrive late or skip classes or days of school because they need to help around the house or work to help support their families. They may also have less motivation and self-belief because they lack positive role models. These students would benefit disproportionately from conditional, incentive-based programmes aimed at promoting attendance at school (targeted policies), but also from teachers' efforts to create a culture that values effort, perseverance and motivation (policies inherently more universal in nature).
- developing targeted support mechanisms and strategies to ensure that disadvantaged students can fully benefit from their engagement, drive and motivation. PISA shows that many disadvantaged students, against all odds, are willing and ready to learn; but often they do not have all the tools that would enable them to capitalise on such positive dispositions. Strong partnerships among families, teachers and also local communities could ensure that socio-economic disadvantage does not prevent these students from flourishing.

While the demand for individuals with high-level mathematics skills is growing, because of the expansion of occupations in the so-called STEM fields (science, technology, engineering and mathematics), many economies are reporting shortages in the number of individuals with the solid mathematics foundations that are needed to enter such fields of study and work. PISA identifies large gender gaps in mathematics performance, but also related gender gaps in drive, motivation and self-beliefs. Girls underperform in mathematics, compared with boys, in 41 of the 65 countries and economies that participated in PISA 2012; in OECD countries, girls underperform boys by an average of 11 points. However, this gender gap between the average 15-year-old boy and girl masks even wider gaps among the *least* and *most able* students. In most countries, the *most able* girls lag behind the *most able* boys in mathematics performance. This underachievement, particularly among the most mathematically able students, together with gender disparities in mathematics self-beliefs, are of major concern among policy makers.

For many students, feelings of anxiety and lack of confidence in their own abilities are closely associated with mathematics as a subject. For example, across OECD countries, some 30% of students reported that they feel helpless when doing mathematics problems; 33% reported getting very tense when they have to do mathematics homework; and 43% believe that they are just not good in mathematics. By promoting mastery in mathematics, education systems can help students feel more confident in their skills and help them to feel less anxious about mathematics. It is noteworthy that many students, and girls in particular, feel anxious about mathematics and have low levels of confidence in their own abilities, irrespective of their performance in the subject. For example, even when they perform at the same level as boys, girls are more likely to report high levels of mathematics anxiety and to report low levels of confidence in their own mathematical skills and in their ability to solve particular mathematics problems.

Gender gaps in drive, motivation and self-beliefs are particularly worrying because, as this volume describes, these factors are essential if students are to achieve at the highest levels; and the relationship between drive, motivation and mathematics-related self-beliefs on the one hand, and mathematics performance on the other, is particularly strong at the top of the performance distribution. Unless girls believe that they can achieve at the highest levels, they will not be able to do so. Although boys show higher mean mathematics performance, differences within the genders are far greater than those between the genders. In addition, the size of the gender gap varies considerably across countries, suggesting that strengths and weaknesses in academic subjects are not inherent, but are acquired and often socially reinforced.

The results show that a substantial share of gender differences in mathematics performance can be explained by differences in boys' and girls' self-beliefs and motivation to learn mathematics. Once gender differences in motivation and self-beliefs are taken into account, the *most able* girls underachieve compared to the *most able* boys in only a small set of countries and by a much narrower margin. This does not mean that if girls' motivation and self-beliefs improved to match those of boys that they would perform equally well as boys. But given girls' lower levels of confidence in their own abilities, school systems, teachers and parents should try to find – or create – more effective ways of bolstering girls' beliefs in their own abilities in mathematics, both at school and at home.

The gender gap in mathematics performance has remained stable in most countries since 2003, as has the gender gap in mathematics self-beliefs. But changing students' dispositions may be inherently more difficult than, say, providing equal access to high-quality teachers and schools – two of the other factors that explain the poor performance of socio-economically disadvantaged students, and two areas where some countries have made significant progress over the past decade. In the short term, changing mindsets may require making mathematics more interesting to girls, identifying and eliminating gender stereotypes in textbooks, promoting female role models, and using learning materials that appeal to girls. Over the longer term, shrinking the gender gap in mathematics performance will require the concerted effort of parents, teachers and society as a whole to change the stereotyped notions of what boys and girls excel at, what they enjoy doing, and what they believe they can achieve.

Notes

1. This refers to the proportion of students who reported whether a series of statements related to the mathematics teacher who taught them their most recent mathematics class happened "often" or "always" or "almost always".

2. In December 2011, the Korean Ministry of Education, Science and Technology (MEST) announced the "Plans to Improve the Secondary School Academic Affairs Management" to meet the demands for creativity and character required in a global knowledge-based society. A key feature of the plan was a change in the assessment and in-class grading system within Korean schools, known as the Standard-Based Assessment. Details of the reform can be found in Box 2.1 Standard-Based Assessment, reforming marking schemes and practices in Korea in OECD (2012), *Grade Expectations: How Marks and Education Policies Shape Students' Ambitions*, PISA, OECD Publishing.

References

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