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**New PISA results on  
Creative Thinking: can  
students think outside the  
box?**

Programme for International Student Assessment



## New PISA results on Creative Thinking: can students think outside the box?

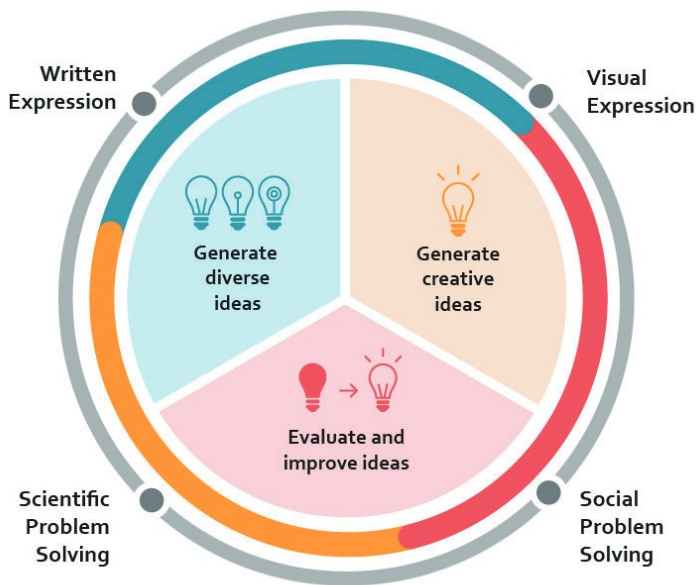
- Singapore scored significantly higher than all other participating countries/economies in creative thinking. Students in 11 other countries performed above the OECD average: Korea, Canada\*, Australia\*, New Zealand\*, Estonia, Finland, Denmark\*, Latvia\*, Belgium, Poland and Portugal, in order of performance.
- Education systems that scored highly in creative thinking almost always performed highly in mathematics, reading and science. However, about half of students who excelled in creative thinking did not excel in academic domains, on average across OECD countries.
- The results suggest that academic excellence is not a pre-requisite for excellence in creative thinking. However, a minimal level of proficiency in one domain complements proficiency in the other.
- Girls are considerably stronger creative thinkers than boys, and their better reading skills only plays a part in this. Girls have more positive beliefs about creativity in general and in their capacity to do creative work; and they feel more imaginative and open to perspective taking. Together with curiosity, openness to intellect and persistence, those are characteristics associated with stronger creative thinking.
- Socio-economically advantaged students outperformed their less advantaged peers, though the strength of the association between socio-economic status and performance is weaker in creative thinking than for mathematics, reading and science.

In its 2022 cycle, PISA measured 15-year-old students' creative thinking for the first time (OECD, 2024<sub>[1]</sub>). This was defined as the capacity to produce diverse and original ideas, as well as to evaluate and improve upon others' ideas. In today's world,

students need to be able to think creatively and adapt to new methods and perspectives to tackle emerging challenges. In the future, societies will increasingly depend on innovation and knowledge creation to address the issues they face.

### How PISA measures creative thinking?

PISA defines creative thinking as the ability to generate, evaluate and improve ideas to produce original and effective solutions, advance knowledge and create impactful expressions of imagination (OECD, 2023<sub>[1]</sub>). While related to the broader concept of creativity, creative thinking focuses specifically on the cognitive processes needed for creative work. This makes it a suitable construct for PISA, as it is a malleable skill that can be developed through practice and does not depend on societal validation of the outcomes.



The PISA definition of creative thinking aligns with the concept of “little-c” creativity, reflecting the types of creative thinking that 15-year-old students around the world can reasonably demonstrate in everyday contexts. It emphasises the importance of students learning to generate ideas productively, evaluate their relevance and novelty, and refine these ideas until a satisfactory outcome is achieved.

The PISA 2022 Creative Thinking test includes 32 open-ended, computer-based, human-rated tasks designed to measure three ideation processes: generating diverse ideas, generating creative ideas, and

evaluating and improving ideas. The test also aimed to measure different applications of creative thinking, given that the capacity to generate relevant and innovative ideas depends on knowledge and practice in specific domains. The tasks are thus situated in four domain contexts: written expression, visual expression, social problem solving, and scientific problem solving (OECD, 2022<sub>[2]</sub>). You can have a go at tasks from the PISA Creative Thinking test [here](#).

## Education systems that performed well in creative thinking generally performed well in the other PISA core domains, with some exceptions

Singapore, the best performing country in PISA 2022 mathematics, scored significantly higher than all other participating countries/economies in creative thinking (with a mean score of 41 points out of a total 60 points). Students in 11 other countries – Korea, Canada\*, Australia\*, New Zealand\*, Estonia, Finland, Denmark\*, Latvia\*, Belgium, Poland and Portugal, in descending order – also performed above the OECD average in creative thinking (33 points).

Performance in creative thinking was positively correlated with performance in the PISA core domains (OECD averages: 0.67 with mathematics, 0.66 with reading), but less strongly than reading, mathematics

and science were correlated with one another (all above 0.80 on average across OECD countries) (OECD, 2023<sub>[2]</sub>). In other words, good results in mathematics at the system level are more often accompanied by good results in science and reading, than they are by good results in creative thinking. For instance, Portugal, which performed around the OECD average in all three core domains, and Belgium and Estonia, which performed around the OECD average in reading, were above the OECD average in creative thinking. In the other direction, students in Czechia, Hong Kong (China)\*, Macao (China) and Chinese Taipei performed well above the OECD average in mathematics, reading and science, but were around or below the OECD average in creative thinking (Figure 1).

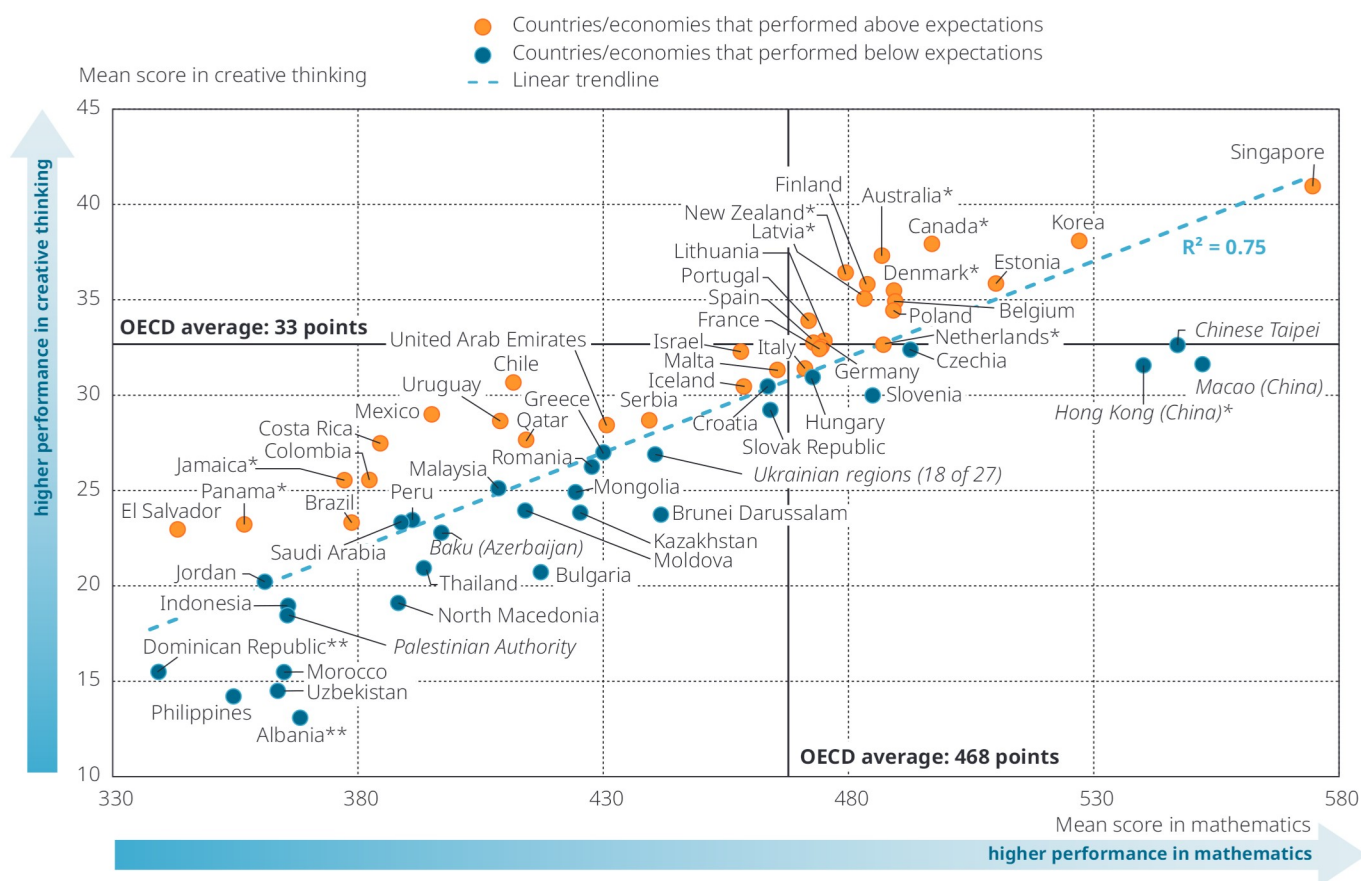
When measured in terms of relative performance (defined as the difference between actual and expected scores based on mathematics and reading

performance), Australia\*, Canada\*, Finland and New Zealand\* performed significantly above expectations in creative thinking. Many countries/economies with strong relative performance have implemented comprehensive policies to support students' creative thinking (OECD, 2023<sub>[2]</sub>).

On average across OECD countries, around half of students could think of original and diverse solutions for simple expressive tasks and familiar problems,

such as creating an interesting story idea or planning an awareness-raising campaign in school. However, around 1 in 5 students across OECD countries, and more than half of the students in 20 low-performing countries and economies, struggled with easier tasks like imagining a dialogue between two characters or suggesting appropriate ways to reduce city traffic. Very few of them were able to suggest original ideas in creative expression tasks.

**Figure 1. Mean creative thinking and mathematics performance**



**Notes:** Only the 64 countries and economies that implemented the creative thinking cognitive test are shown.

A student's relative performance in creative thinking is defined as the residual obtained upon a cubic polynomial regression of the student's performance in creative thinking over his or her performance in mathematics or reading. The regression is performed at an international level, pooling data from all countries and economies that participated in the creative thinking assessment.

**Source:** OECD, PISA 2022 Database, Tables III.B1.2.1. and III.B1.2.4.

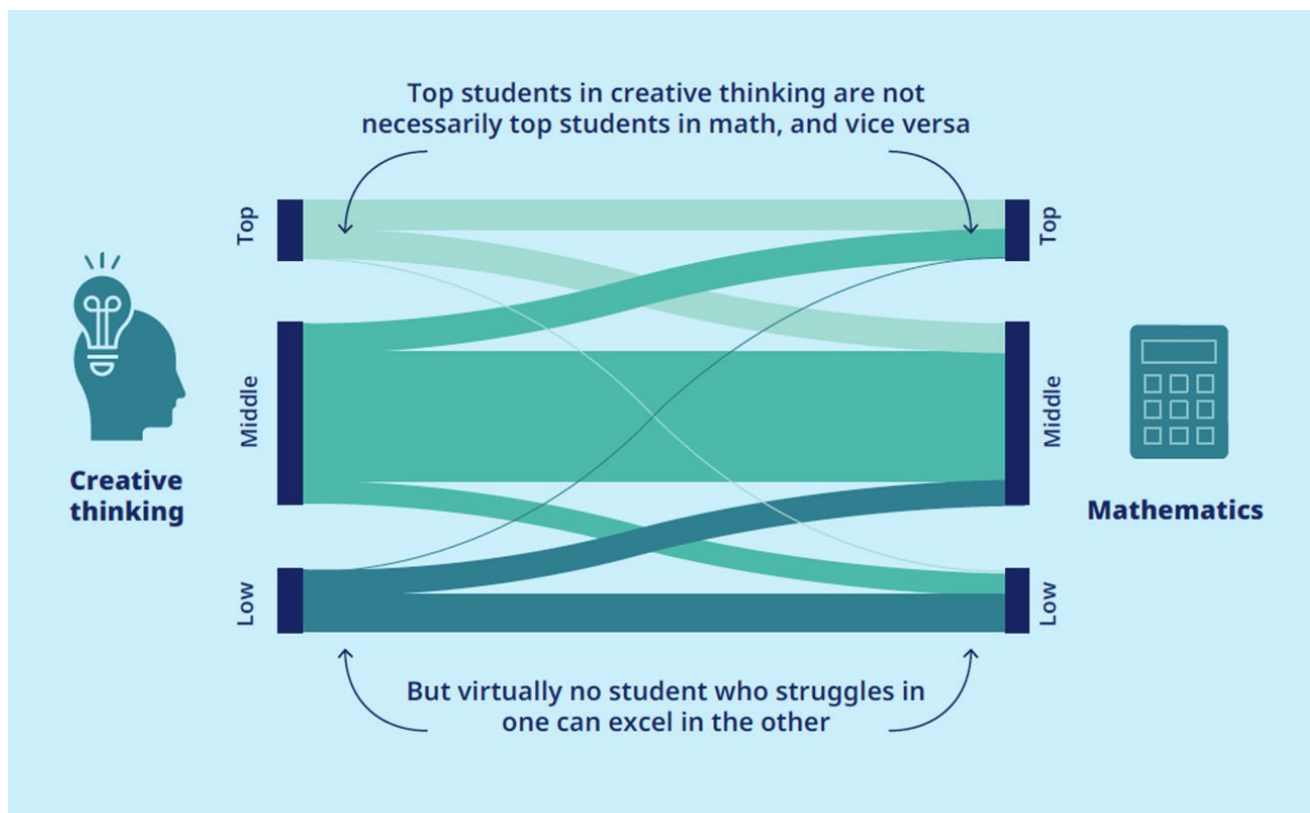
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## Academic excellence is not a pre-requisite for excellence in creative thinking, but minimal proficiency helps

Which students perform the best in the creative thinking test? Not always the top academic performers. Just about half of all students in the top quintile for mathematics performance were also in the top quintile for creative thinking. Among students scoring around the average in mathematics, there was an equal likelihood of high or low scores in creative thinking. However, very few students below the baseline proficiency in mathematics excelled in creative thinking. The same pattern was observed

when comparing students' results in reading and creative thinking.

The data suggest that while academic excellence is not a pre-requisite for excellence in creative thinking, there is a complementary relationship between creative thinking and academic performance to some extent – particularly at the upper and lower ends of the proficiency scales. This makes sense: without a minimum level of knowledge and experience in a given domain, it would be challenging to generate appropriate, diverse or original ideas. Amongst the 14 lowest-performing countries and economies in creative thinking, 12 had over 50% of students performing below a baseline level of proficiency in mathematics, reading and science.<sup>1</sup>



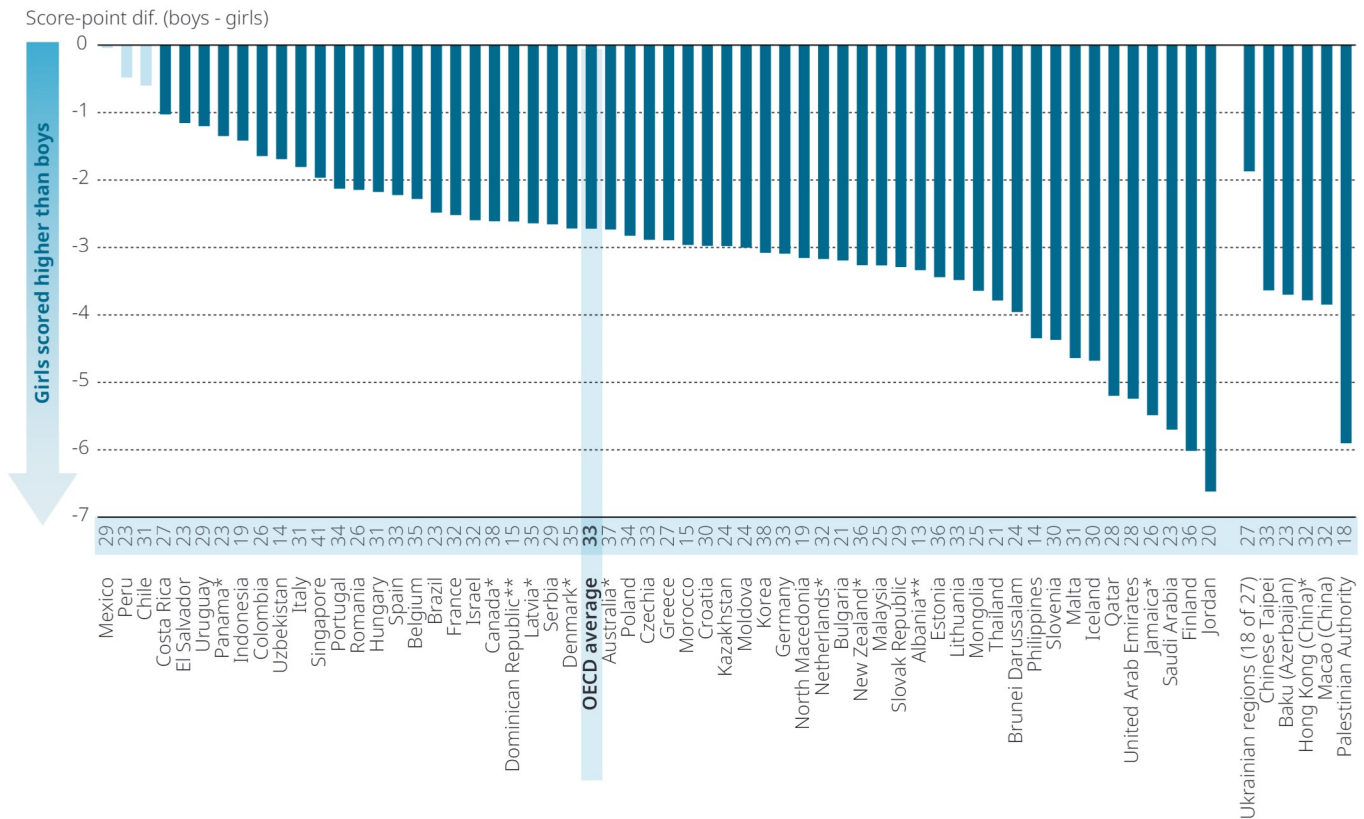
## Girls outperform boys in creative thinking in all types of tasks

In no country or economy do boys outperform girls in creative thinking, with girls scoring 3 points higher than boys on average across OECD countries (Figure 2). This is a large difference: girls achieve full credit in 5 percentage point more tasks than boys on average.

Girls particularly excel in written expression tasks and those requiring them to build on others' ideas. And this is not only a question of academic performance: this gender gap persists in all countries and economies, even after accounting for mathematics performance, and in around half of the countries and economies after accounting for reading performance.

## Figure 2. Gender gap in creative thinking performance

Score-point difference in creative thinking between boys and girls



**Notes:** The mean score in creative thinking for all students is shown next to the country/economy name.

Statistically significant score-point differences are shown in a darker tone (see Annex A3).

Countries and economies are ranked in descending order of the score-point difference related to gender (boys minus girls).

**Source:** OECD, PISA 2022 Database, Figure III.3.4.

StatLink <https://stat.link/Otjad>

Beyond academic performance, girls generally have more positive beliefs about creativity and their own ability to engage in creative work. They also display several attitudes and socio-emotional skills positively associated with creative thinking such as imagination, openness to art and experience and perspective taking (see two sections below).

### Socio-economically disadvantaged students struggled more

PISA 2022 results show that socio-economically advantaged students outperformed their peers in creative thinking, as they did in the core PISA assessment domains. Across OECD countries, the difference in creative thinking performance between students in the top quarter of the PISA index of

socio-economic and cultural status (ESCS) – or advantaged students – and students in the bottom quarter of the index – disadvantaged students – is very large at 9.5 score points. This represents a difference of over one proficiency level (see chapter 1 of PISA 2022 Vol. III). In Brunei Darussalam, Bulgaria, Hungary, Israel, Romania, the Slovak Republic and Peru, the performance gap exceeds 12 score points. However, the strength of the association between socio-economic status and performance is weaker in creative thinking than in the PISA assessments of mathematics, reading and science, on average across the OECD.

Why this gap? The challenging environment many of these students live in, as well as a curricular focus in under resourced schools that often sideline creative activities and practices, play a role. Further to that, analysing different tasks in the PISA creative

thinking test reveals that poor literacy skills may have largely prevented disadvantaged students from fully demonstrating their potential in creative thinking. Indeed, the socio-economic gap in performance is largest in written expression tasks and smallest in visual expression tasks, where writing and comprehension skills were less likely to influence outcomes. Disadvantaged students were also less likely to have a growth mindset about creativity and be confident in their creative potential, which are key assets discussed in the next section.

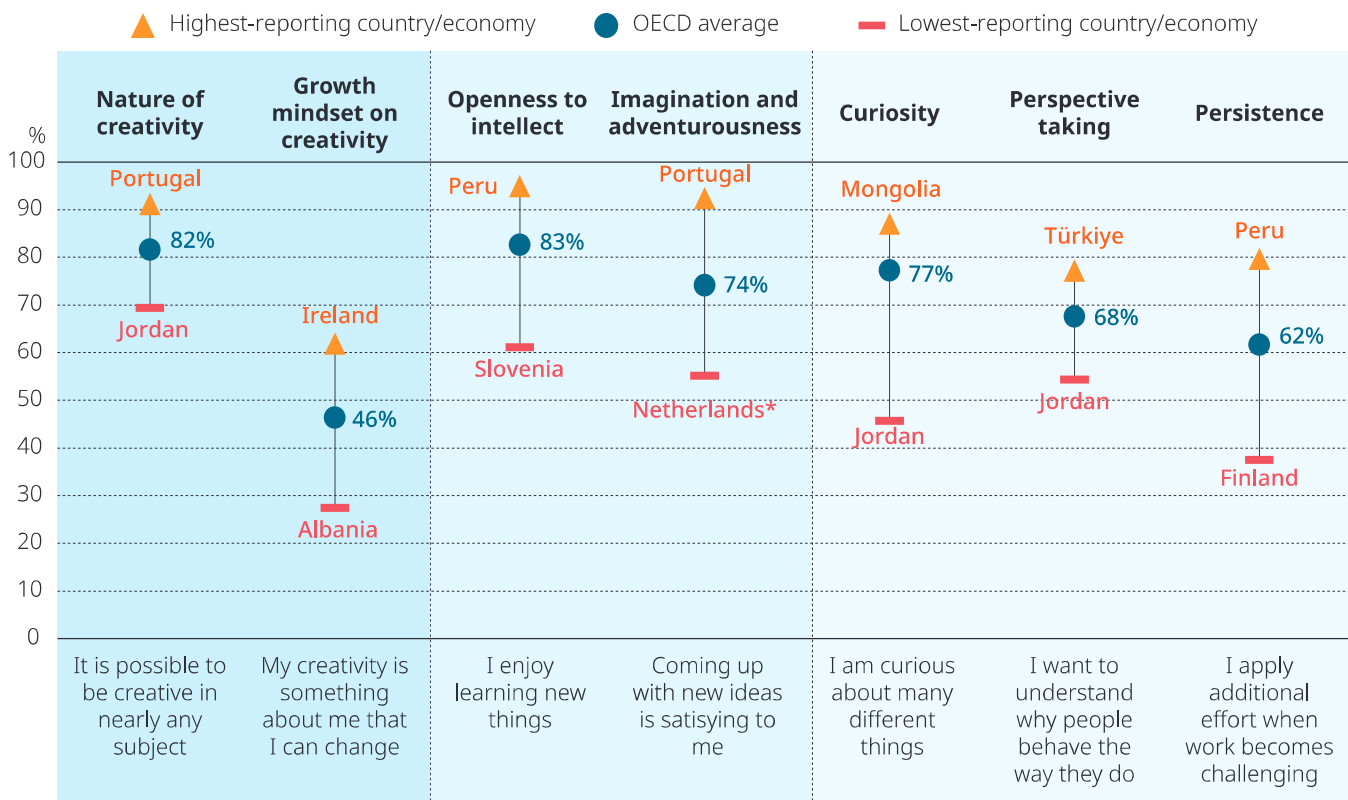
On average across OECD countries, around half of students believe that their creativity is a fixed trait that cannot be changed significantly. Put differently, only 46% students hold a growth mindset about creativity compared to 57% who hold a growth mindset about their intelligence, on average across the OECD. This suggests that many students consider creativity as an innate talent rather than a skill that can be developed through education, training or experience. Holding a growth mindset about creativity, along with higher levels of imagination and adventurousness, openness to intellect, curiosity, perspective taking and persistence, are all positively associated with better creative thinking performance (Figure 3).

## Beliefs, attitudes and social-emotional characteristics associated with creative thinking

What students think about creativity matters. Do they believe creativity is something they are born with?

**Figure 3. Beliefs, attitudes and social-emotional characteristics positively related with creative thinking performance**

Share of students who agreed or strongly agreed with the following statements



Source: OECD, PISA 2022 Database, Tables III.B1.5.1, III.B1.5.4, III.B1.5.11, III.B1.5.19, III.B1.5.23, III.B1.5.29 and III.B1.5.33.

StatLink <https://stat.link/o7qbg0>

Beyond domain readiness, creative work, and in particular creative work at school, requires engagement and goal orientation. Across OECD countries, nearly 83% of students reported enjoying learning new things, but only half reported loving to learn new things at school. Additionally, students were less confident in their ability to demonstrate creative thinking in specific school contexts compared to general situations: on average, only 62% of students felt confident they could come up with creative ideas for school projects.

## Schools and teachers can make a difference

PISA results show that certain pedagogies can enhance student performance in creative thinking (see chapter 3 of PISA 2022 Vol. III). Practices such

as valuing student creativity, giving enough time for students to come up with creative solutions on assignments, and practicing activities that encourage new ways to solve problems were associated with better performance in the creative thinking test, especially in certain types of tasks. For instance, students whose teachers value their creativity were 27% more likely to suggest original ways to improve others' ideas compared to those who felt their teachers did not value their creativity. This aligns with research suggesting that evaluating the appropriateness of ideas is a skill more easily developed in an educational context than generating original ideas. Students who participated regularly but moderately (about once a week) in school activities that encourage creative work also outperformed their peers who participated on a more infrequent basis in certain tasks, as well as those who participated in such activities every day.

### The bottom line

Equipping students with the creative thinking skills they will need throughout their life requires a comprehensive set of policies and changes in everyday schooling practices. Promoting the development of creative thinking consistently and effectively in education requires educators, curriculum developers and assessment designers to have a shared understanding of what creative thinking is, how students can develop creative thinking skills, and how their progress can be measured. Redefining curricula and learning progressions explicitly with these goals in mind can facilitate the development of creativity-supportive teaching and learning.

More concretely, high-performing systems in creative thinking have often implemented at least two of the following four approaches to support the development of creativity and creative thinking in education:

- Embedding creative thinking throughout the curriculum, explicitly and with clear guidelines;
- Supporting educators to recognise, develop and evaluate creative thinking by defining learning progression or rubrics;
- Creating opportunities in the curriculum for students to engage in creative and/or interdisciplinary work;
- Encouraging accountability through monitoring and evaluation.

Read the full PISA 2022 Volume III “Creative Minds, Creative Schools” for more details on student performance in creative thinking and examples of successful country policies, school initiatives and classroom practices (OECD, 2024<sub>[1]</sub>).



## Notes

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\* Caution is required when interpreting estimates because one or more PISA sampling standards were not met (see Reader's Guide, Annexes A2 and A4 of the PISA 2022 Vol. III report).

\*\* Caution is required when comparing estimates with other countries/economies as a strong linkage to the international PISA creative thinking scale could not be established (see Reader's Guide and Annex A4 of the PISA 2022 Vol. III report).

1. In decreasing share, the countries/economies with over 50% of students who performed below a baseline level (i.e. Level 2) in mathematics, reading and science and who also took the PISA 2022 Creative Thinking assessment are: Uzbekistan (71.4%), the Philippines (71.3%), Morocco (68.5%), the Dominican Republic\*\* (68.4%), the Palestinian Authority (63.5%), Jordan (62.9%), El Salvador (62.8%), Indonesia (59.0%), Albania\*\* (56.2%), North Macedonia (55.8%), Baku (Azerbaijan) (50.9%) and Panama\* (50.4%). These 12 countries and economies were amongst the 14 lowest performing countries in creative thinking.

## For more information

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### See:

OECD (2024), *PISA 2022 Results (Volume III): Creative Minds, Creative Schools*, PISA, OECD Publishing, Paris, <https://doi.org/10.1787/765ee8c2-en>. [1]

OECD (2023), "PISA 2022 Creative Thinking Framework", in *PISA 2022 Assessment and Analytical Framework*, OECD Publishing, Paris, <https://doi.org/10.1787/471ae22e-en>. [2]

OECD (2023), *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*, PISA, OECD Publishing, Paris, <https://doi.org/10.1787/53f23881-en>. [4]

OECD (2023), *Supporting Students to Think Creatively: What Education Policy Can Do*, [https://issuu.com/oecd.publishing/docs/supporting\\_students\\_to\\_think\\_creatively\\_web\\_1](https://issuu.com/oecd.publishing/docs/supporting_students_to_think_creatively_web_1) (accessed on 5 June 2024). [5]

OECD (2022), *Thinking Outside the Box: The PISA 2022 Creative Thinking Assessment*, <https://issuu.com/oecd.publishing/docs/thinking-outside-the-box> (accessed on 5 June 2024). [3]

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