Embargo: 12 November 2024 at 10.00 CET

IEA Releases Latest Results of the International Computer and Information Literacy Study, ICILS 2023

Eighth-grade students around the world are using Information and Computer Technology (ICT) more and more as the years progress, but digital literacy achievement scores have not been increasing to match.

In ICILS 2023, on average across participating education systems, **almost half of eighth-grade students reached at least Computer and Information Literacy (CIL) proficiency Level 2**—the level at which students demonstrate an understanding of computer use basics, and that may be considered a crucial learning threshold in the development of CIL.

Students not reaching a CIL proficiency level of 2 exhibit little more than rudimentary CIL skills. **These students also do not demonstrate the ability to make basic judgments about the credibility or reliability of digital information sources. In some countries nearly three quarters of students' CIL achievement was below Level 2.** Since the first cycle of ICILS in 2013, student CIL achievement has been decreasing across most participating countries.

> *'It is striking that, in a time of increased exposure to technology and digital information, students in lower-secondary school are actually demonstrating a decreasing ability to use computers in a way that is essential for effective and safe participation in society'*
> **Dirk Hastedt, Executive Director IEA**

Average student achievement levels in Computational Thinking (CT) were relatively higher, with **two-thirds of students attaining a CT proficiency level of 2 or better.** In ICILS, CT emphasizes the framing of solutions to real-world problems in a way that they can be executed by computers, and students working at CT Level 2 demonstrate the ability to engage with a range of structured computational problems.

ICILS is the only international large-scale assessment that focuses solely on digital literacy education and provides measures that can be used to monitor changes in students' digital literacy achievement over time.

On 12 November 2024, in an event hosted in Copenhagen in partnership with Aarhus University, results of the third cycle of IEA's International Computer and Information Literacy Study (ICILS 2023) were released. **ICILS 2023 collected high-quality data from more than 130,000 students and more than 60,000 teachers across 35 education systems internationally.**

ICILS measures student achievement in CIL and CT, and also collects extensive targeted data relating to the contextual factors associated with students' digital literacy learning in and outside of school. **ICILS supports countries to make informed decisions about how best to prepare students for life in an age of constantly evolving digital technologies.**

ICT use in education is growing, both inside and outside of the classroom.

On school days, 47% of students, on average, reported at least daily use of ICT devices **outside of school for schoolwork.** 33% of students, on average, reported at least daily use of ICT devices **at school for schoolwork**. On average, across country participants, most students were enrolled in schools where principals believed that teachers' willingness to use ICT in their teaching, the

effectiveness of teachers' use of ICT in their teaching, and students' digital literacy skills, either did not change or increased during the pandemic. Despite these facts, the tendency has been for students' achievement levels to stagnate since the last cycle of ICILS, in 2018.

These developments underline a troubling trend observed across previous ICILS cycles: **overall increases in students' familiarity with, and frequent use of, various digital platforms and services has not necessarily translated into more developed digital literacy skills.** More explicit teaching of digital skills is likely required to encourage development at a rate to match the growing digitalization of society.

> *'What we have seen in ICILS is, at best, no change internationally in students' digital literacy related skills between 2018 and 2023. This is arguably a more positive outcome than the achievement decreases reported for other learning areas in large-scale international assessments with data collection cycles spanning the pandemic. However, it does not represent the increase in digital literacy-related skills that many people had anticipated or at least hoped for. From this perspective, it is important to note that the skills that students apply when participating in digitally-supported remote learning across a range of subject areas, are not necessarily those that are fundamental to CIL and CT'*
> **Julian Fraillon, International Study Director, ICILS 2023**

Female students outperformed male students in CIL, continuing a trend from previous cycles.

Female students outperformed male students, on average, in CIL achievement. This pattern was evident across most participating educational systems. **Male students did not statistically significantly outperform female students, on average, in CIL in any participating country.**

In CT, the picture is more nuanced. Male students performed slightly better than female students, on average. This pattern was not consistent across the majority of countries with just six countries' male students achieving a statistically significantly higher level of achievement than female students. **Female students did not statistically significantly outperform male students, on average, in CT in any participating countries.**

The digital divide remains prominent.

International reports from previous ICILS cycles have shown how average achievement in CIL and CT differed by several student and family background measures, highlighting a digital divide associated with certain social inequalities.

Reducing this divide was reported in ICILS 2023 as one of the policy areas with the highest degree of emphasis across countries. However, the **findings did not indicate that the digital divide has decreased at the rate that one might expect given this intentional focus,** highlighting how difficult it can be to impact change in this area. Achievement levels are consistently higher, on average, for students from higher socioeconomic backgrounds, for students who speak the language of the test at home, and for students from families without an immigrant background. **Students from more disadvantaged social backgrounds are thus commonly more vulnerable as users of digital resources.**

> *'The ICILS data offer the potential to examine evidence of a digital divide within countries, not just in terms of infrastructure provision and access to ICT, but to probe differences in approaches to the teaching and learning of CIL and CT in schools. The ICILS student, teacher, and school-level data offer a resource to countries to inform the development of policies and practices to address this ongoing issue into the future'*
> **Julian Fraillon, International Study Director, ICILS 2023**

ICILS 2023 Key International Findings – Click for Infographics

CIL achievement has shown a tendency to decrease between the 2013 and 2023 cycles of ICILS.

- No countries that participated in ICILS 2013 and ICILS 2023 experienced an increase in average CIL achievement from one cycle to the next.
- Between ICILS 2018 and ICILS 2023, the majority of participating education systems that participated in both cycles did not record an increase in average CIL achievement. However, significant declines in average achievement were less common between ICILS 2018 and ICILS 2023, as they were over the 10-year period comparison.

On average across countries, a little more than half of all students are operating below proficiency Level 2 for CIL—a very basic level.

- On average, across countries, 24% of students are operating at a very low level of CIL proficiency—below Level 1, and 27% of students are working at a basic level—Level 1. Students at these two levels are not using computers autonomously and can only perform the most routine tasks on a computer under direct instruction.
- 34% of students, on average, are working at CIL proficiency Level 2. This is the level where students demonstrate an understanding of the basic use of computers, and this may be considered a crucial learning threshold in the development of CIL. The European Commission, for example, has set an EU target to reduce the proportion of eighth-grade students operating below this level to 15% by 2030.
- 14% of students, on average, fall within CIL proficiency level where they demonstrate effective independence, at Level 3. While 1% of students, on average, have achievement that falls within Level 4, a very high level of achievement in CIL.
- No country that participated in both the 2013 and 2023 cycles of ICILS recorded a statistically significant increase in the number of students operating at Level 2 or above.

Female students are outperforming male students across countries in CIL.

- This is a consistent finding across countries. Female students performed statistically significantly higher in 28 participating countries, and there were no participating countries where male students outperformed females in CIL achievement.
- Despite this, there is no difference between the general ICT self-efficacy of female and male students.

On average, across participating countries, two thirds of students are operating at proficiency Level 2 or higher for CT. These students can, at the very least, engage with real-world problems to plan and implement computer-based solutions.

- 37% of students, on average, are operating at Level 2 and are engaging in structured problem solving.
- 23% of students, on average, are working at Level 3. These students can plan and execute solutions to problems, make sense of data through simulations, and follow what is happening in a sequence of code without necessarily needing to see immediate output displayed.
- 6% of students, on average, are working at proficiency Level 4 and can formulate and structure elegant and efficient solutions to problems in a precise way.

Male students outperform female students in CT achievement on average.

- The difference is small. Male students outperformed female students in only six participating education systems, and there was no significant difference among other participants.

The digital divide remains a major factor in both CIL and CT achievement.

- Students from higher socioeconomic status groups demonstrate higher achievement levels, on average, in both CIL and CT across all participating countries.
- Students who have access to the use of a computer at home for schoolwork, and students who experienced less internet disruptions, recorded higher achievement, on average, in both CIL and CT in most participating countries.

Students' use of ICT devices on school days is most frequently for non-school related reasons.

- Students are extensive users of technology outside of school.
- 75% of students, on average, use ICT outside of school, on school days, for non-school related purposes.

Productivity software tools are used far more often in classrooms than more innovative digital resources.

- ICILS 2023 reported similar findings to previous ICILS cycles on the use of ICT resources in classrooms: students reported most frequent use of productivity software, such as word-processors, presentation software, and computer-based information sources.
- These are also the type of ICT tools most commonly reported as being available to teachers and students in schools.

Students report learning about internet-related topics more frequently outside of school than in school.

- A higher percentage of students, on average, think they are learning about issues like using the internet to find information and judging whether messages are scams, outside of school rather than at school.
- CIL and CT are generally well-represented in the curricula of participating education systems, but the teaching of CIL and CT is more commonly reported to be compulsory only at the secondary level, and there is typically less explicit expectation that skills in these areas be assessed compared to other learning areas.

School principals have a complex perspective on the possible threats and benefits of generative AI tools for students.

- An optional principal questionnaire on the topic of the use of generative AI tools in schools was administered in 12 countries.
- Most students had principals that were concerned that generative AI may encourage students to submit work that isn't their own, may confuse students with misleading information, or may cause students to become dependent on the tools rather than learning for themselves.
- More than half of students are in schools where their principals believe generative AI will improve their learning.
- Nearly two-thirds of students are in schools where their principals believe generative AI will help them develop a greater interest in learning.
- Most students are in schools where their principals feel that generative AI tools will make it easier for teachers to plan lessons and to create learning resources.

Notes for journalists

The 35 ICILS 2023 Participating Education Systems

Austria; Azerbaijan; Belgium, Flemish; Bosnia and Herzegovina; Chile; Chinese Taipei; Croatia; Cyprus; Czech Republic; Denmark; Finland; France; Germany; Germany (North Rhine-Westphalia)*; Greece; Hungary; Italy; Kazakhstan; Korea, Rep. of; Kosovo; Latvia; Luxembourg; Malta; Netherlands; Norway; Oman; Portugal; Romania; Serbia; Slovak Republic; Slovenia; Spain; Sweden; United States; and Uruguay.

**Benchmarking education system.*

CIL and CT

Computer and Information Literacy (CIL) refers to students' abilities to access, evaluate, and use digital information productively. In particular, ICILS emphasizes the higher-order thinking skills that students require to identify and share online information that is reliable and trustworthy.

Computational Thinking (CT) skills relate to students' capacities to conceptualize problems and formulate solutions in ways that might be implemented by a computer. Students are assessed on their ability to describe and solve problems through a visual coding environment, but knowledge of a coding language is not required for the ICILS assessments. CT assessment was an optional module of ICILS 2023 in which 24 education systems participated.

Proficiency Levels Explained

Distribution of students' CIL scores in ICILS 2023 was described across and below 4 levels:

Below Level 1: Undeveloped (407 scale points or below)

Level 1: Basic/Functional (above 407 to 492 scale points)

Level 2: Need support (above 492 to 576 scale points)

Level 3: Independence/Autonomy (above 576 to 661 scale points)

Level 4: Precision (above 661 scale points)

Distribution of students' CT scores was described across and below 4 levels:

Below Level 1: Basic interaction (330 scale points or below)

Level 1: Fundamental sequencing (above 330 to 440 scale points)

Level 2: Structured problem solving (above 440 to 550 scale points)

Level 3: Integrated problem solving (above 550 to 660 scale points)

Level 4: Systems thinking (above 660 scale points)

About the International Association of Educational Achievement (IEA)

The International Association for the Evaluation of Educational Achievement (IEA) is an independent, international cooperative of national research institutions and governmental research agencies. It conducts large-scale comparative studies of educational achievement and other aspects of education, with the aim of gaining in-depth understanding of the effects of policies and practices within and across systems of education.

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