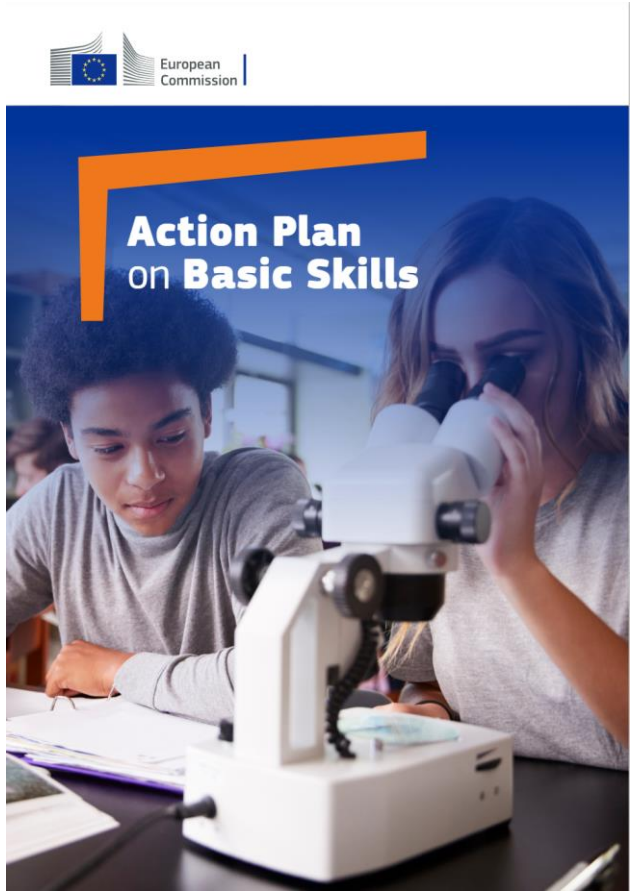
Study of the impact of digital infrastructure and ICT technologies on the organization and efficiency of the educational process in Kyiv schools

May, 2025

Digital skills are one of the 5 key competencies (Basic Skills) expected from EU citizens for lifelong learning



European Commission, March, 2025

1 Literacy

Understand, use, evaluate, and reflect orally and in writing, using visual, audio, and digital materials in a variety of disciplines and contexts

2 Mathematics

Reason mathematically, use and interpret mathematics to solve problems in real-world situations and make informed judgments and decisions based on data

3 Science

Understand scientific issues, think critically, explain scientific phenomena, conduct and evaluate research, and interpret scientific data and evidence

4 Digital skills

I confidently, critically and responsibly use digital technologies in my studies, work and social life, including information literacy, communication, media literacy, digital content creation, cybersecurity and digital well-being

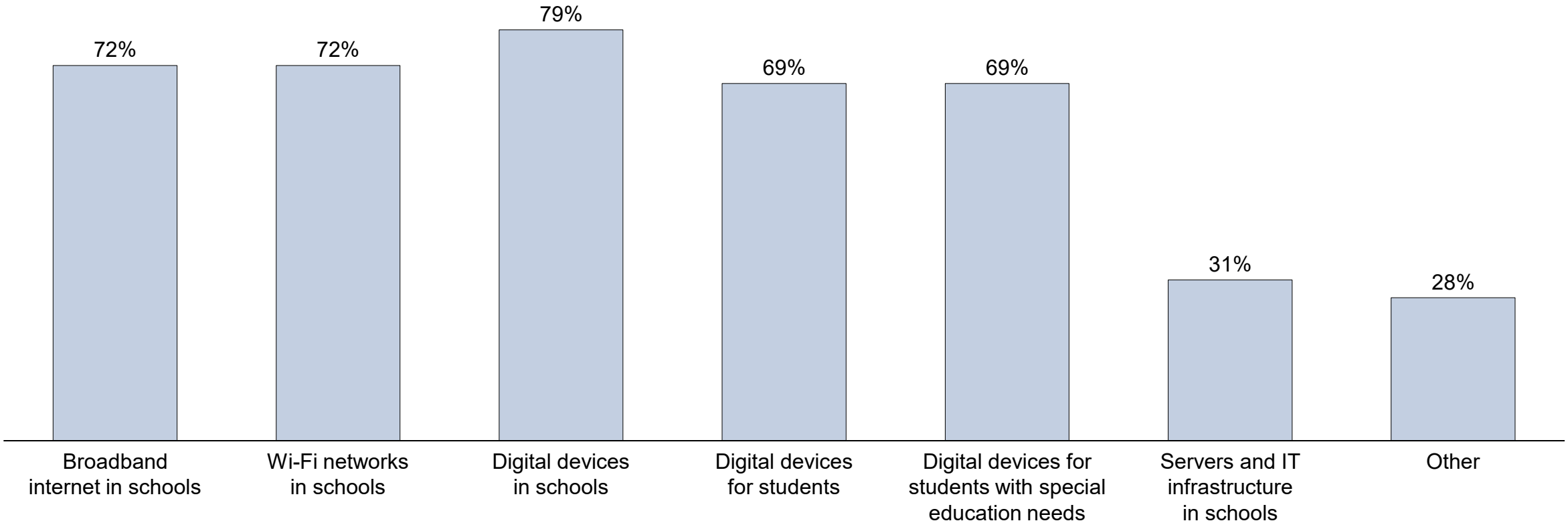
5 Citizenship

I participate responsibly and actively in public life and understand social, economic, legal, and political structures. I understand civic and democratic concepts, institutions and processes, such as democracy, media literacy, crisis preparedness, respect for others and freedom of expression

Sources: 1. https://education.ec.europa.eu/document/action-plan-on-basic-skills-graphic-version

70-80% of OECD countries invest in the development of digital infrastructure in schools

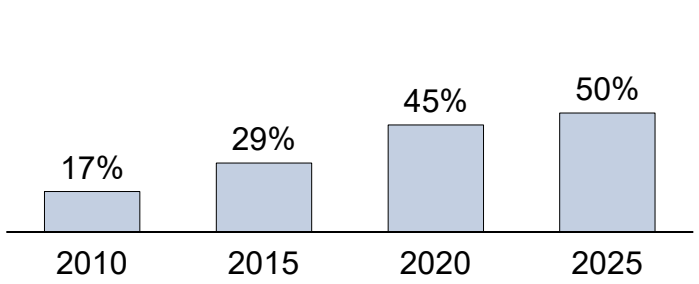
Over the past 5 years, has your government made significant investments in any of the following areas? (% of 29 OECD countries), 2024 survey



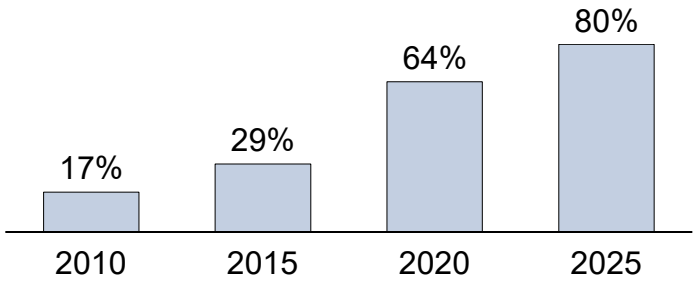
1. OECD Digital Education Outlook 2023, "Towards and Effective Digital Education Ecosystem", page 176

Over the past 10 years, ICT adoption in Ukraine has increased significantly ...

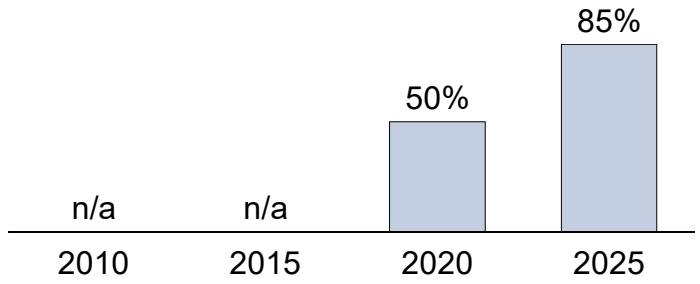
% of households in Ukraine with a broadband fixed-line Internet connection[1,2]



% of the population of Ukraine using broadband mobile Internet connection[2]

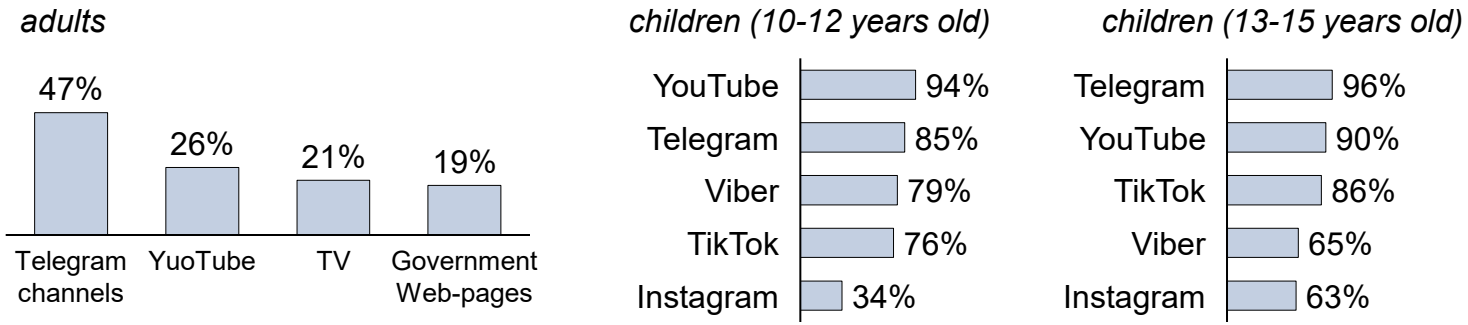


% of Ukrainian schools connected to high-speed (30+ Mbps) Internet[6,7]



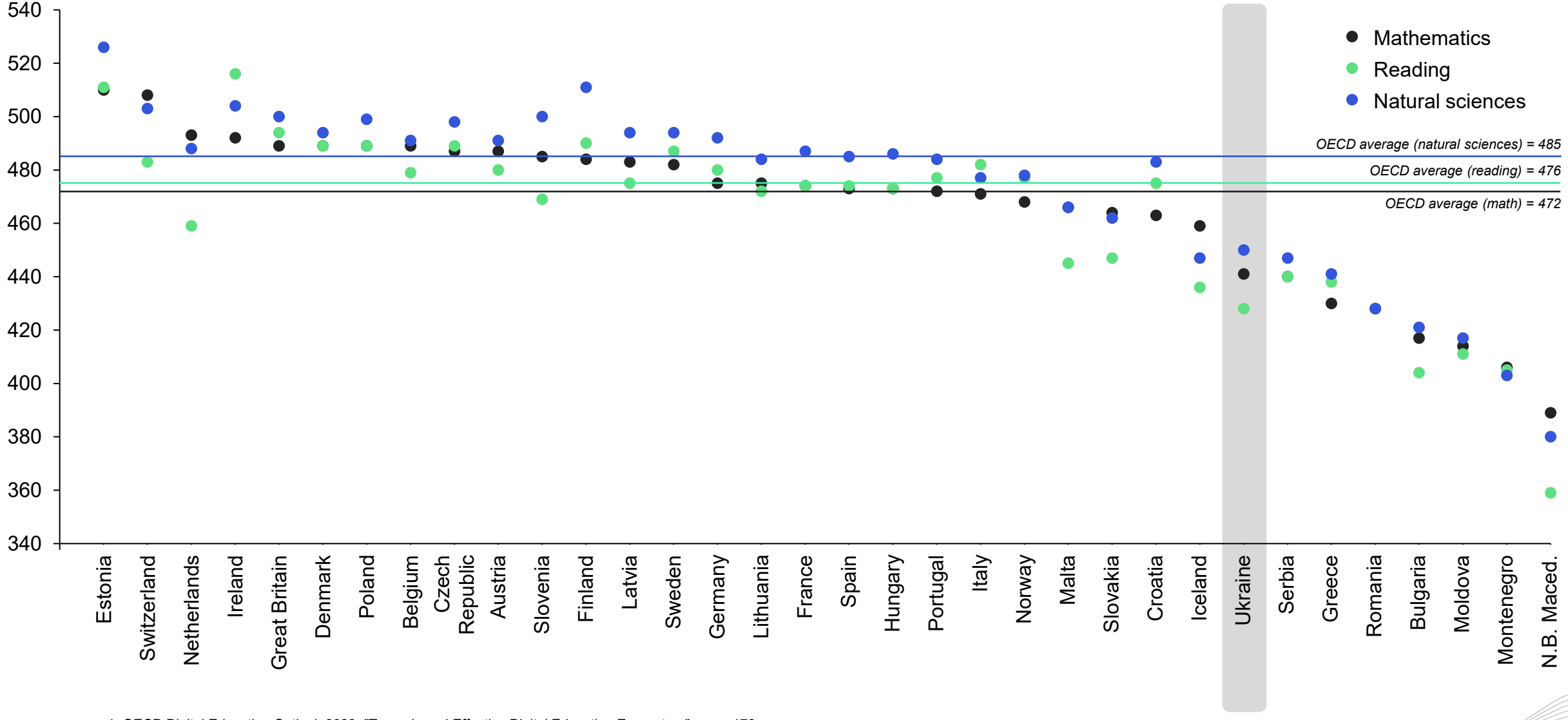
% of average fixed Internet speed, 2025, Mbps[3]

% of main sources of news and information, 2024[4,5]



Sources: 1. https://data.worldbank.org/indicator/IT.NET.BBND.P2; 2. https://thedigital.gov.ua/storage/uploads/files/%D0%90%D0%BD%D0%B0%D0%BB%D1%96%D1%82%D0%B8%D1%87%D0%BD%D1%96%20%D0%BC%D0%B0%D1%82%D0%B5%D1%80%D1%96%D0%B0%D0%BB%D0%B8.pdf#page=41.23; 3. Speedtest Global Index; 4. https://www.ukrinform.ua/rubric-society/3920830-osnovnimi-dzerelami-informacii-dla-bilsosti-ukrainciv-e-telegramkanali-ta-youtube.html; 5. https://mriemotadiemorazom.org/ukrainian-youth-today 6. https://nv.ua/ukr/opinion/nova-ukrajinska-shkola-chomu-ne-u-vsih-shkolah-ye-internet-novini-ukrajini-50173882.html ; 7. https://iea.gov.ua/diyalnist/naukovo-analitichna-diyalnist/osnovni-czyfry-osvity/

...however, Ukraine's results in PISA-2022 are among the lowest in Europe (reading - 30th position out of 34 countries)



1. OECD Digital Education Outlook 2023, "Towards and Effective Digital Education Ecosystem", page 176

Presence of ICT technologies in schools grows, but research emphasizes importance of high-quality integration of technology into the educational process

Learning outcomes	=	1 ICT		2 Educational process		
		ICT infrastructure and accessibility	+	Educational programs, methods, materials and digital skills of teachers	+	Attitudes towards learning and digital skills of students

OECD

Technology use at school and students' learning outcomes: exploring the relationship with new data from Germany

- Given technological developments and the growing demand for digital skills in the labor market, the **presence of ICT technologies in schools will increase.**
- However, more advanced educational technologies **will not automatically lead to better learning outcomes**, as the relationship between technology and learning is multifactorial
- Educational technology should be accompanied **by teacher training to the extent possible, which is necessary for the successful integration of technology into their daily activities** and to increase **students' confidence in their ability to** interact effectively with educational technology

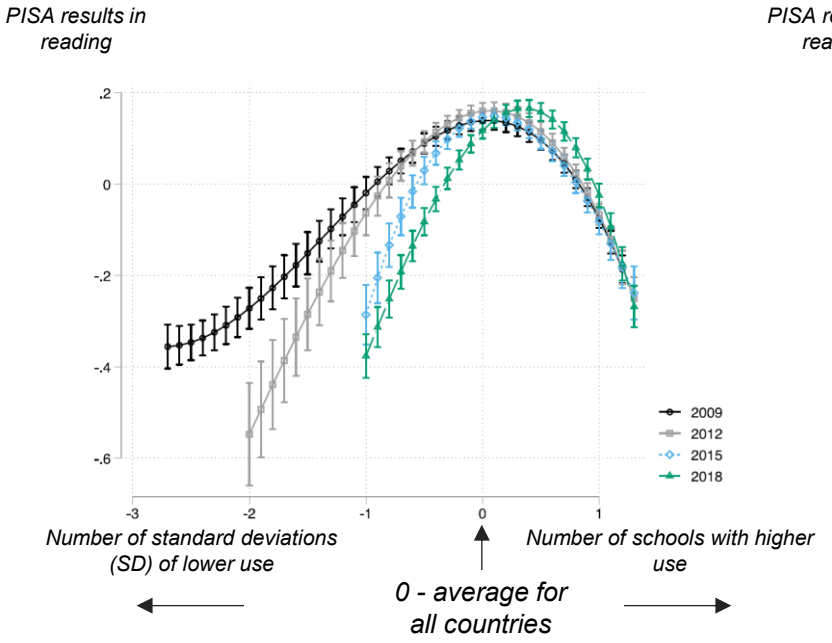
"Technology use in schools and student learning outcomes" (page 19), OECD, December 2024

Sources: 1. https://www.oecd.org/en/publications/technology-use-at-school-and-students-learning-outcomes_422db044-en.html

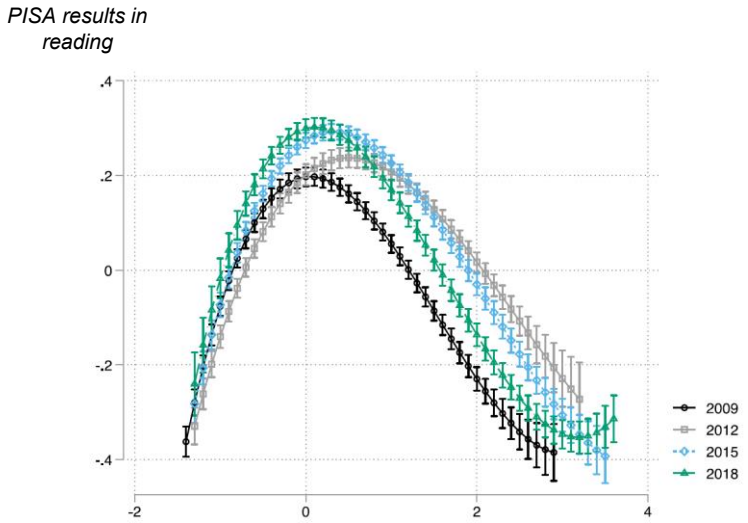
"U-shape“ – both insufficient and excessive use of digital technologies at home and at school negatively affects academic performance (PISA 2009, 2012, 2015, 2018)

Borgonovi F., Porkopek M., "The evolution of the association between ICT use and reading achievement in 28 countries", Computers and education Open 2 (2021)

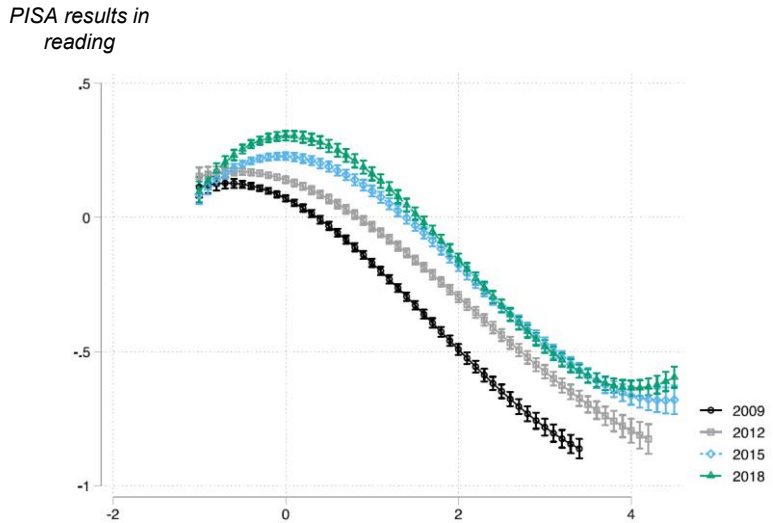
Using ICT for entertainment



Using ICT for learning at home



Use of ICT for learning at school



1. SD - standard deviation

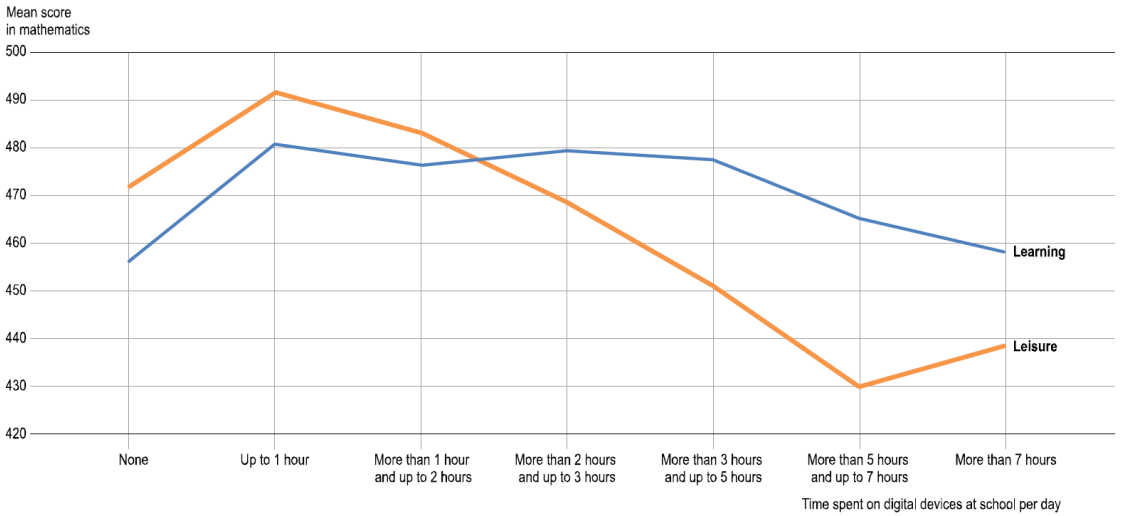
PISA 2022 data shows that moderate use of digital devices at school (up to 1 hour per day) has **a positive impact on students' educational achievements**[1]

PISA 2022

PISA 2022 data for all countries

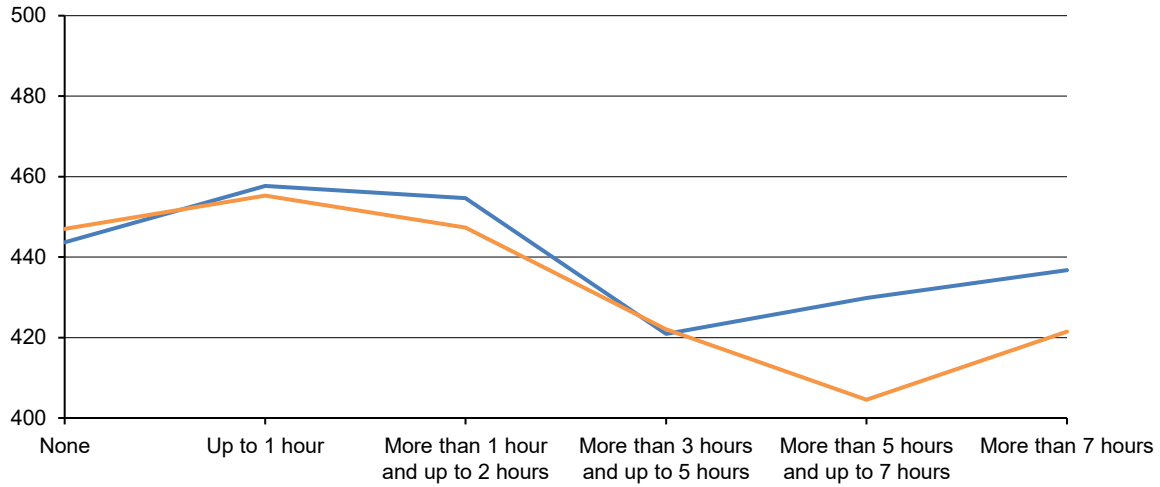
Figure II.5.14. Time spent on digital devices at school and mathematics performance

Based on students' reports; OECD average



Note: Differences between categories are all statistically significant (see Annex A3).Source: OECD, PISA 2022 Database, Annex B1, Chapter 5.

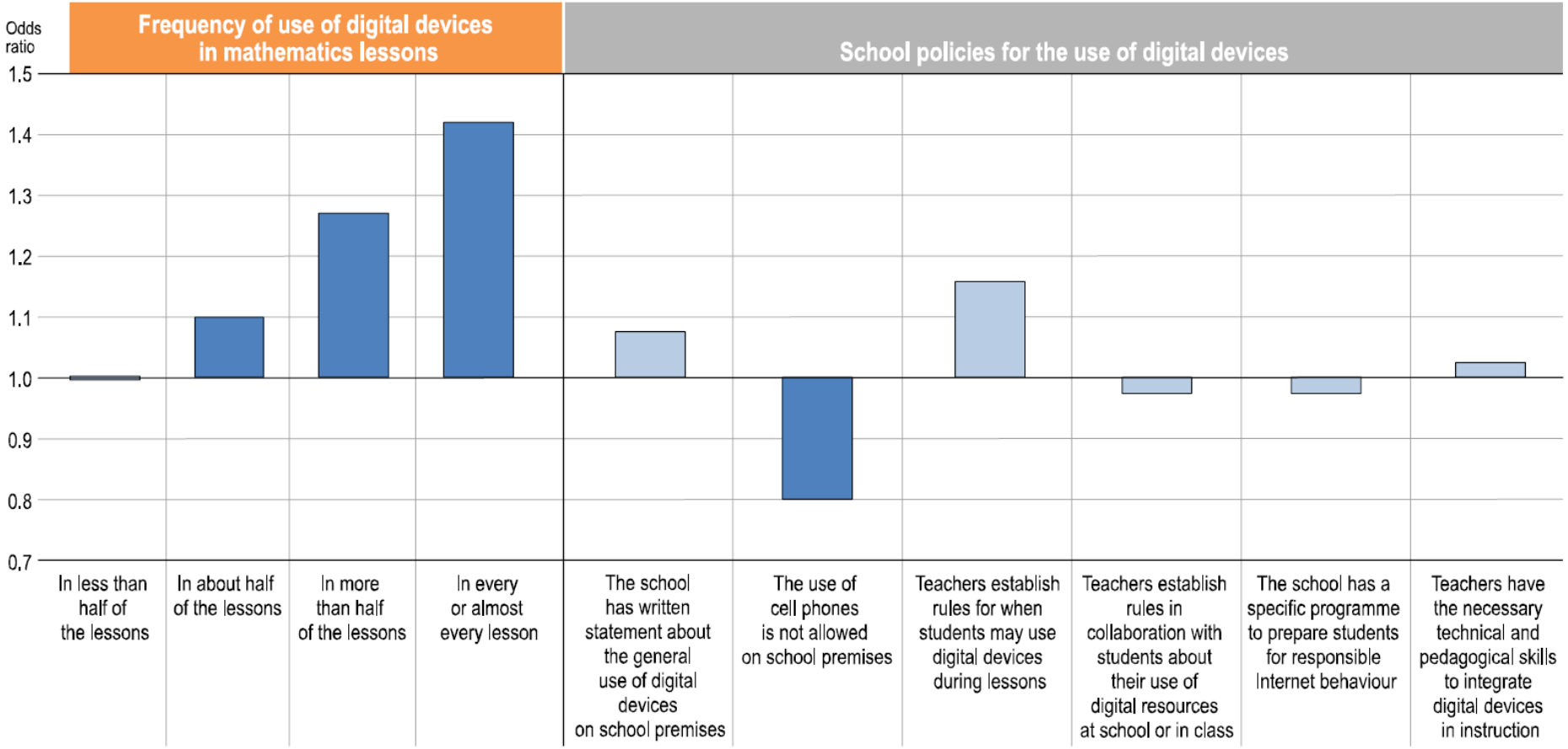
PISA 2022 data for Ukraine



1. PISA 2022 Volume II "Learning from and during disruption", page 196

When digital technologies are used during almost every class, students are 40% more distracted than when they are used during 50% or less classes

Change in the likelihood of students becoming distracted by using digital devices in mathematics lessons when students reported that they use their smartphone at school and school principals reported the school's policy on smartphone use; OECD average



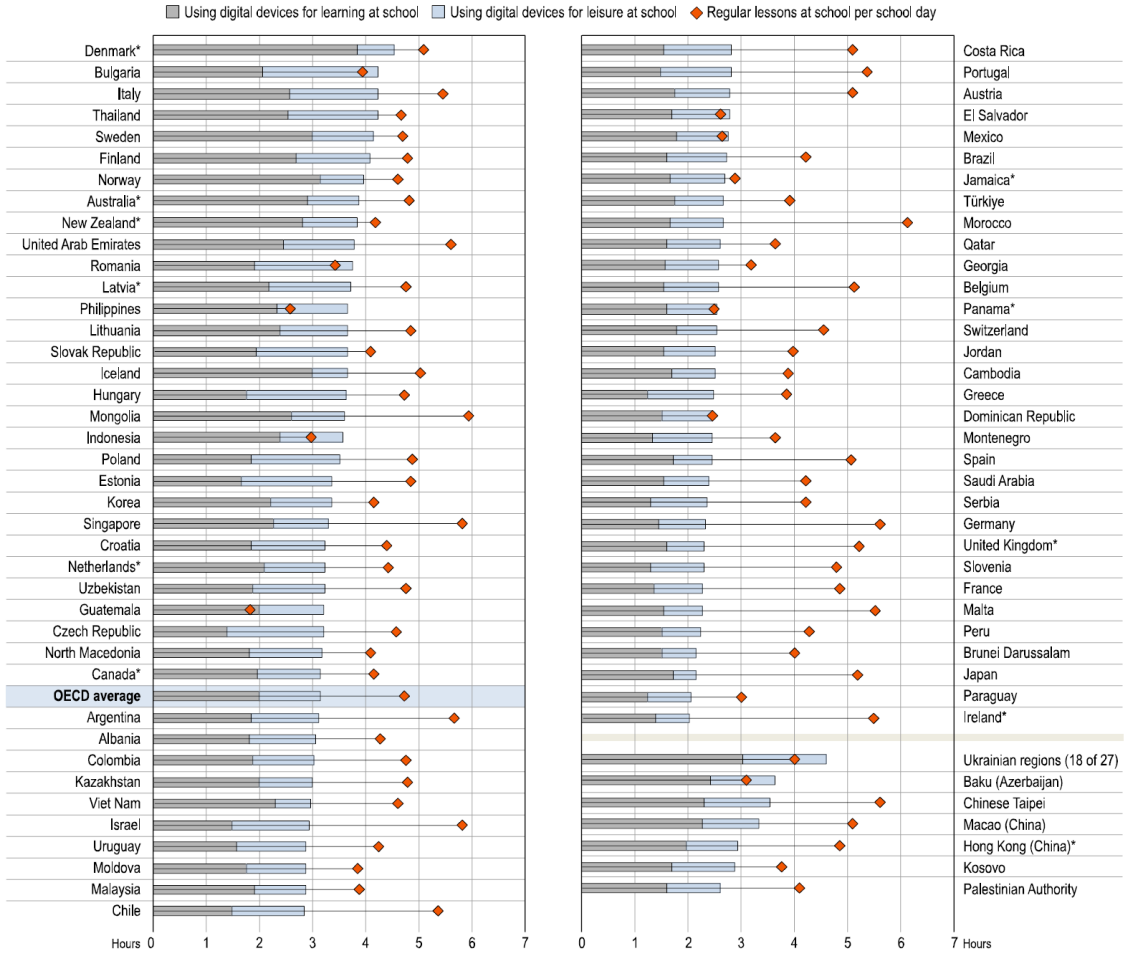
1. PISA 2022 Volume II "Learning from and during disruption", page 189

Ukraine ranks 1st in amount of time students spend on digital devices. Therefore, it is especially important to use this time effectively, using digital tools that have proven benefits for learning.

PISA 2022

Figure II.5.15. Time spent at school in regular lessons and on digital devices

Time spent per day by students (in hours)

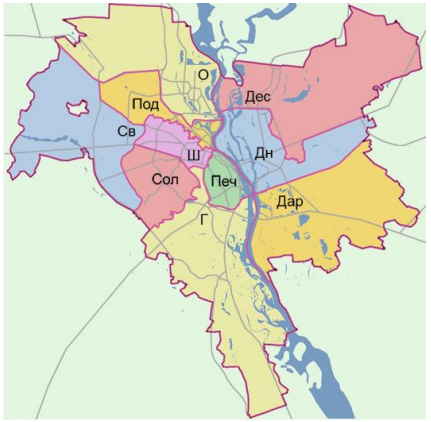


← Ukraine

1. PISA 2022 Volume II "Learning from and during disruption", page 196

civitta

March-May 2025: study of the effectiveness of digital technologies implementation in Kyiv schools using 3 methods



Online survey

- 17 schools
- 12 responses from school principals
- 108 responses from teachers
- 370 students

Detailed interviews with teachers on the use of digital tools

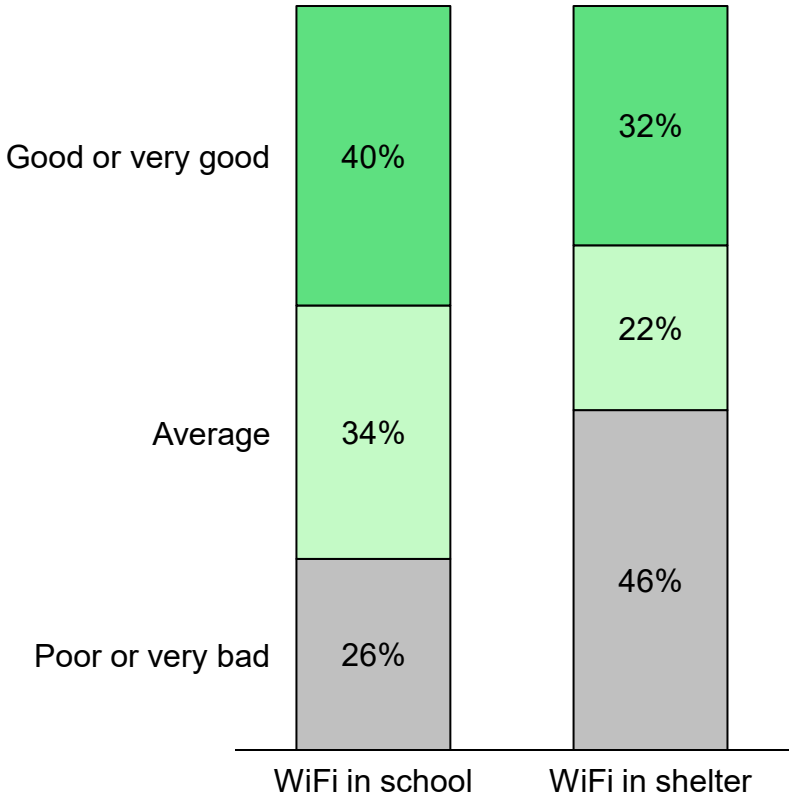
- 8 in-depth interviews in 4 schools

Analysis of student performance based on the data from the “Yedyna Shkola" IT system

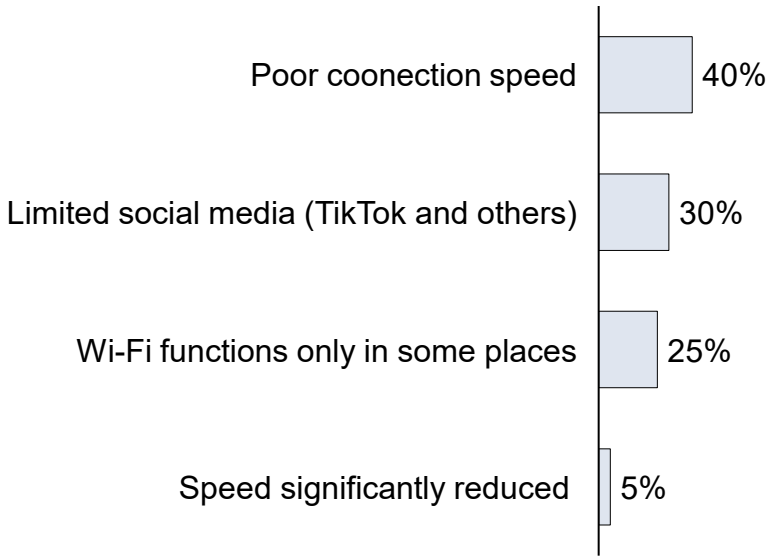
- Performance of 6th and 8th grade students (350 students in total) in 6 schools

Only 26% of Kyiv students consider the quality of the WiFi network in schools to be poor, almost half are dissatisfied with the quality of the network in shelters

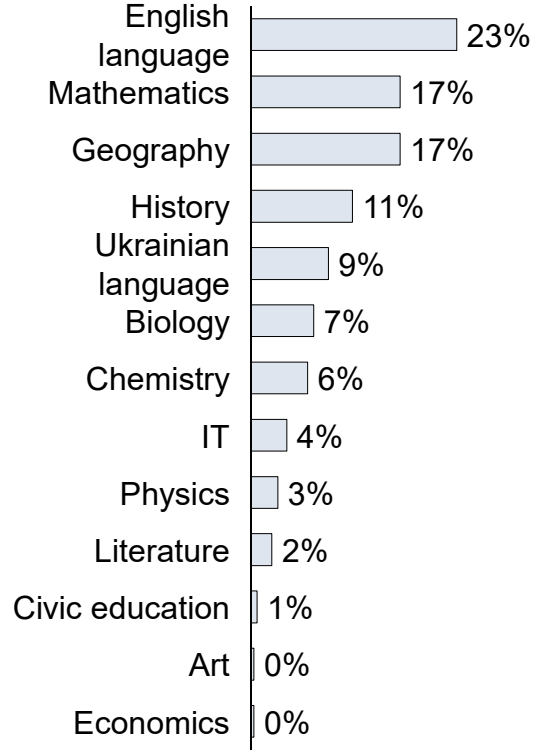
How would you rate the quality of the Wi-Fi network on a 5-point scale, students (370 respondents)



The main problems with Wi-Fi in schools, according to students (% of those who are dissatisfied with the quality of Wi-Fi)



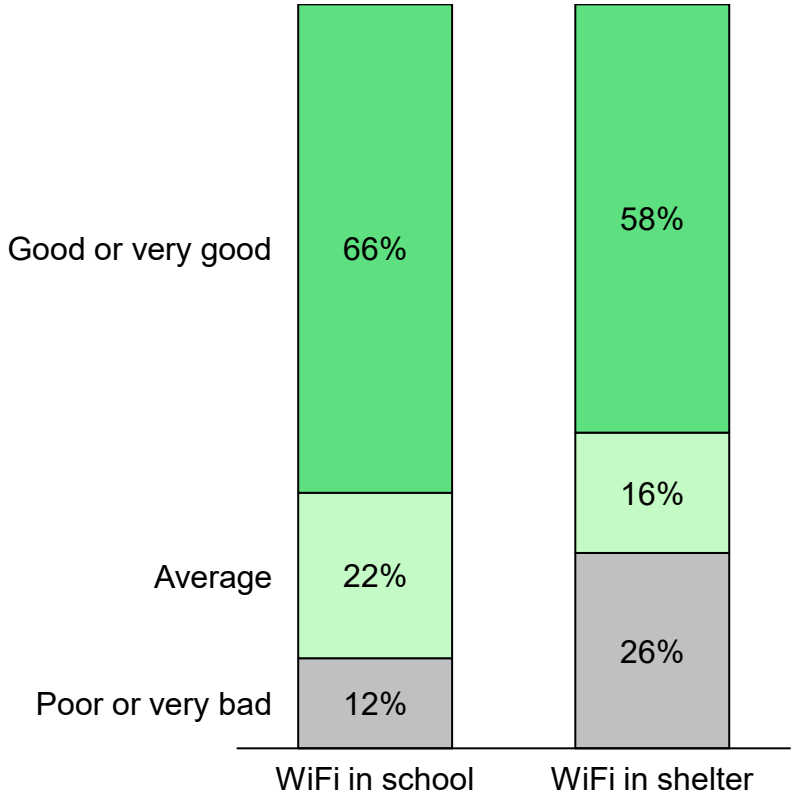
Classes where students use Wi-Fi most often



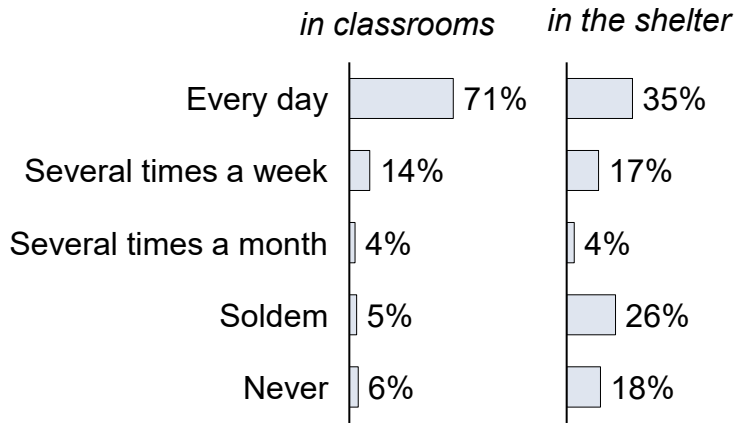
1. PISA 2022 Volume II "Learning from and during disruption", page 196

85% of teachers use ICT daily or several times a week, 55% consider the Internet speed to be sufficient. For teachers, the quality of Wi-Fi in the shelters is also a significant problem.

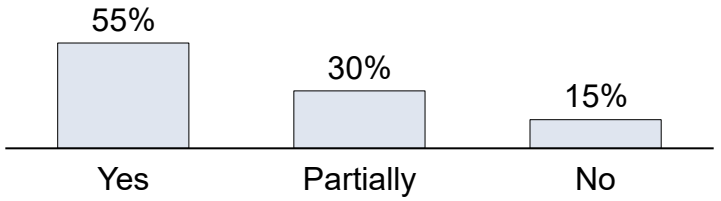
How would you rate the quality of the Wi-Fi network on a 5-point scale, teachers (99 respondents)



How often do you use Wi-Fi during class?



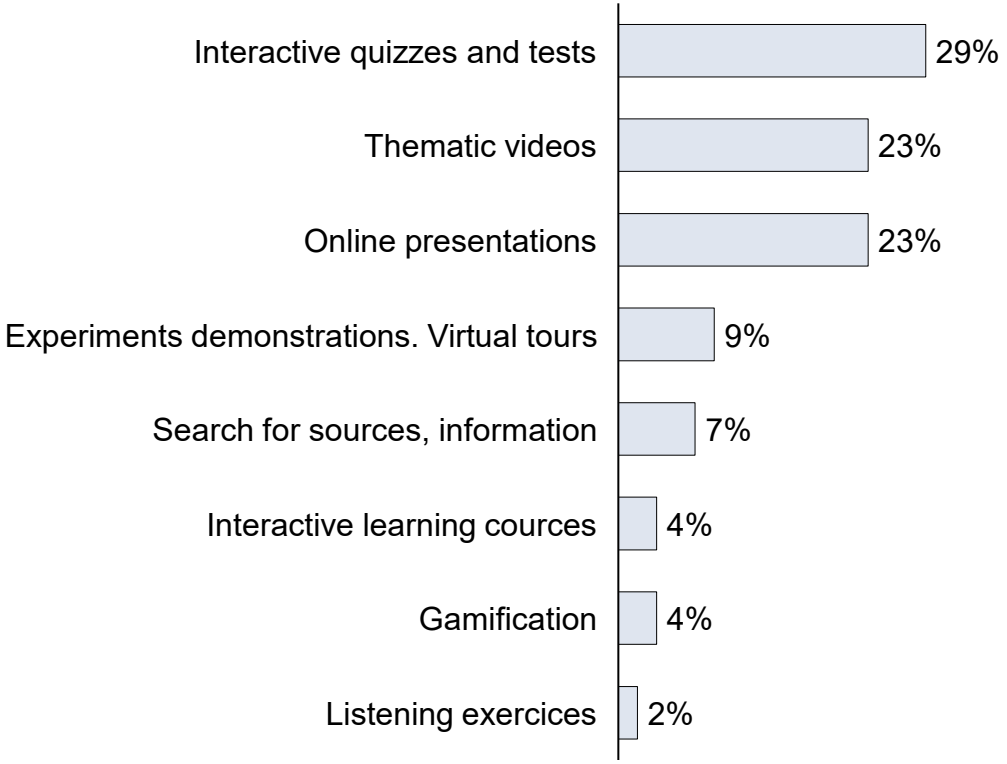
Is the Internet speed sufficient to use the digital resources you need?



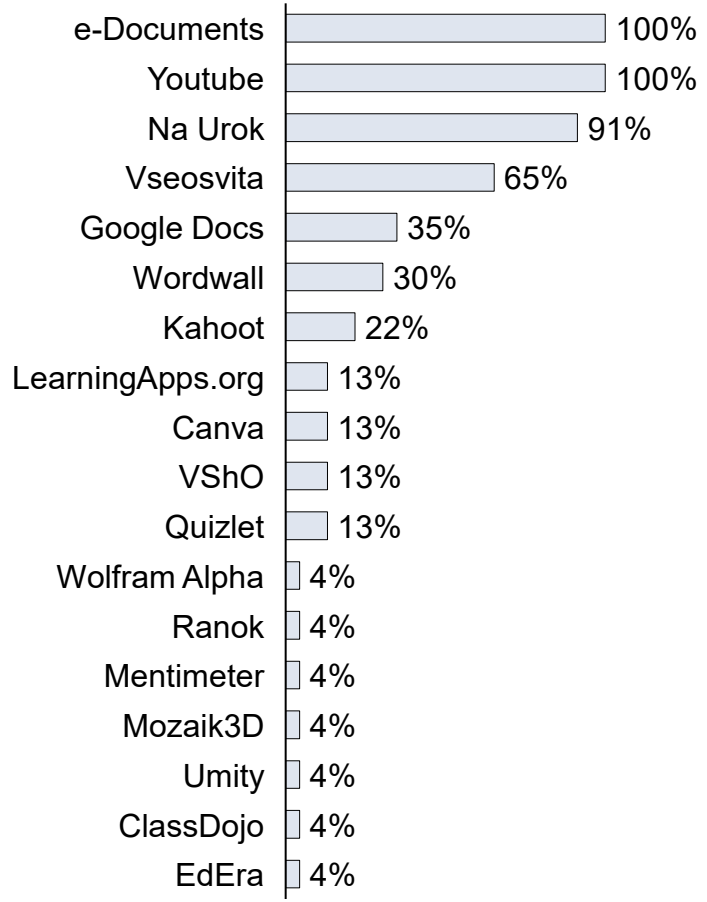
1. PISA 2022 Volume II "Learning from and during disruption", page 196

3 main methods (75% of teachers): interactive tests (Wordwall, Kahoot, Mentimeter, Quizlet), thematic videos (Youtube, VSE) and online presentations (Na Urok, Vseosvita, Google Docs, Canva). The main tool is an electronic journal

Teaching methods used by Kyiv teachers



Digital resources used by teachers in Kyiv

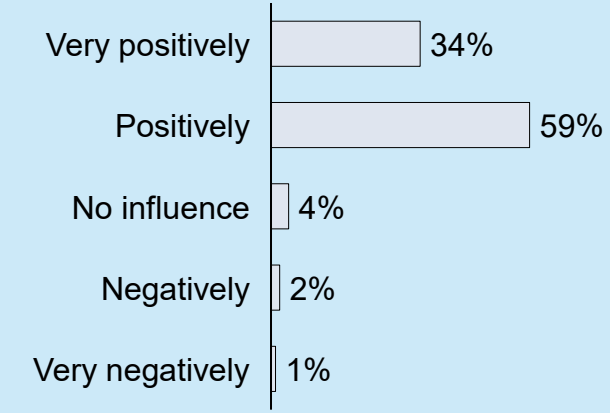


93% of teachers believe that Wi-Fi has a positive impact on their work, but 32% do not see a positive impact on students' academic performance. The main support that teachers need is a quality network throughout the school (including in the shelter), interactive whiteboards, free educational platforms and teaching materials

Teachers about themselves

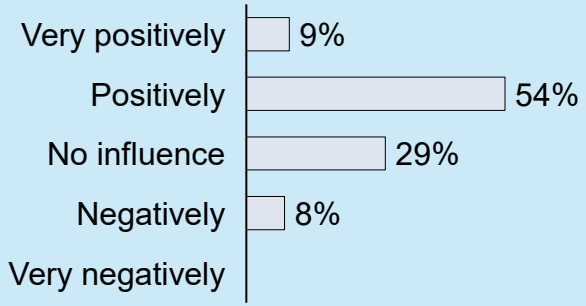
In your opinion, how does Wi-Fi affect your **effectiveness as a teacher**?

In your opinion, does the availability and quality of Wi-Fi affect **the work of teachers**?

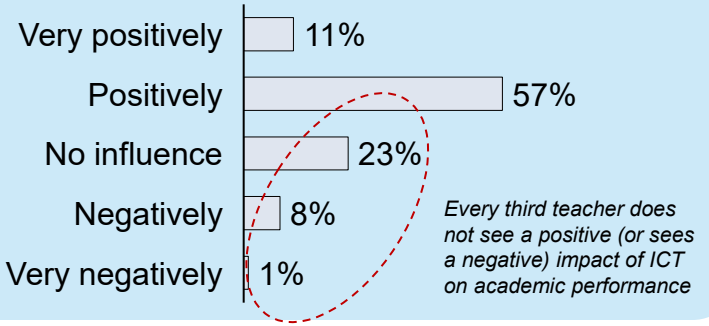


Teachers about students

In your opinion, does the availability and quality of Wi-Fi affect **students' motivation** to learn?



In your opinion, does the availability and quality of Wi-Fi affect **students' academic performance**?



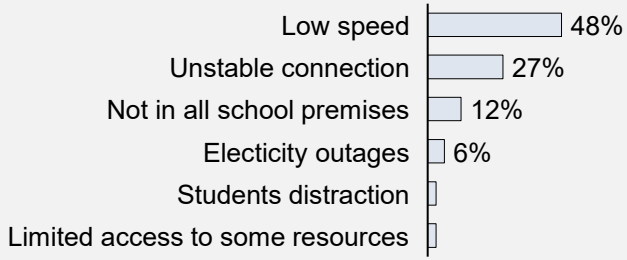
Teachers about support

Teachers' difficulties with Wi-Fi

There are no difficulties **66%**

There are some difficulties **33%**

Distribution of difficulties among those who face them

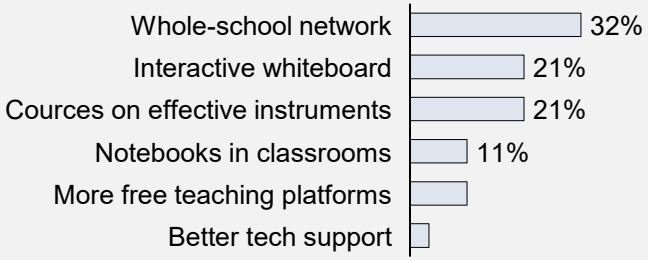


What support do teachers need

No support is needed **70%**

Support is needed **30%**

Distribution of support among those who need it



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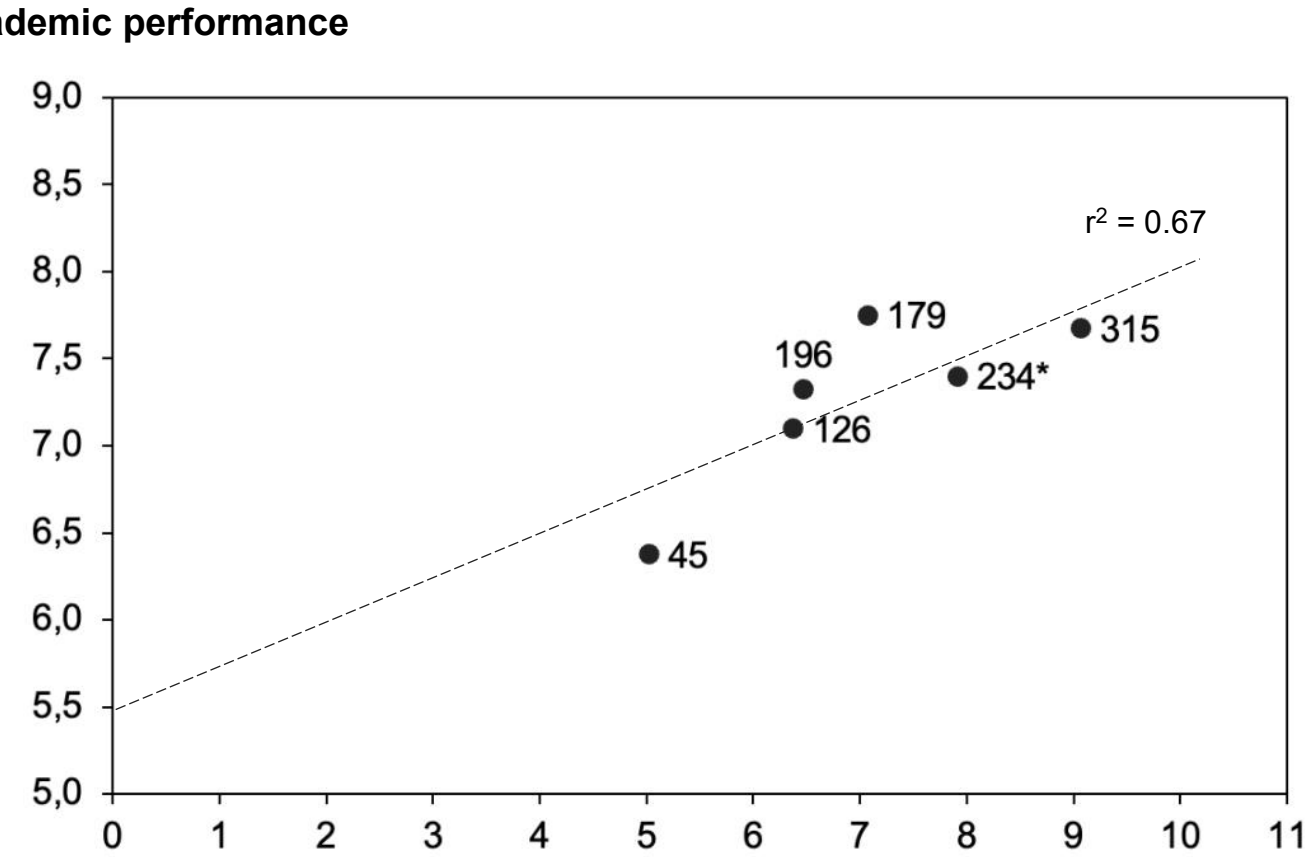
1. PISA 2022 Volume II "Learning from and during disruption", page 196

In Kyiv schools, the quality of the time spent on digital technologies is positively correlated ($r^2 = 0.67$) with students' academic performance



Quality index of digital technologies implementation =

0.3 * ICT infrastructure +

0.7 * Tools in the education process

Correlation between academic performance in schools and digital technologies implementation index

1. PISA 2022 Volume II "Learning from and during disruption", page 196

Kyiv should create a system for improving teachers' digital skills through ICT coordinators and teams with practical solutions. This is the model that works in countries that are leaders in student achievement.

TOP-12 countries according to PISA-2022 results

#	Country	PISA 2022 results			Development of teachers' digital skills
		Maths	Reading	Science	
1	Singapore	575	543	561	• 4 Levels of Practice benchmarks for teachers[1] • e-Pedagogy: Design lessons, Active learning, Assessment and Feedback • AI at National Institute of Education from 2022
2	Japan	536	516	547	• Time for ICT policy designates specific time for teachers' digital skills development[2] • Collaborative efforts with technology companies, ensuring teachers receive hands-on training aligned with the latest technological advances
3	Korea	527	515	528	• Community of practice (CoP) for teachers and Digital Labs[3] • EdTech SoftLAB, established in 2021, promotes school-industry partnerships • AI-embedded Digital Textbook - personalized education (2023 policy)
4	Estonia	510	511	526	• Teachers' digital competence framework, 18-21% of teachers participate in ICT-related professional development courses • Digital Key - 39-hour program to support subject teachers • Digital ABC - 26-hour train-the-trainer initiative, skills needed to support the professional development of their colleagues • Teachers (90% of the school) improve digital competencies in Digital Accelerator - 6 months[4]
5	Switzerland	508	483	503	• "Education and ICT" Department[5] , Schools IT Center (KITS Center) • Pedagogical and Technical ICT Support specialists (PICTS and TICTS)[6] in schools • Community of Practice (CoPs)[7]
6	Canada	497	507	515	• "Digital Technology and Innovations in the Changing World" course from 2023

1. "Technology in Education: a case study on Singapore", UNESCO, 2023; 2. UNICEF "Teachers' Digital Literacy in the East Asia and Pacific Region", 2024; 3. UNESCO, Digital Transformation of Education: The Case of South Korea, 2023; 4. https://www.educationestonia.org/digital-competence/; 5. https://blog.edu-ict.ch/fachstelle/; 6. https://ict-coach.ch/zh/digitalerwandel/; 7. https://blog.edu-ict.ch/communities-of-practice-zwei-weitere-cops-starten-nach-den-herbstferien/

Kyiv should create a system for improving teachers' digital skills through ICT coordinators and teams with practical solutions. This is the model that works in countries that are leaders in student achievement.

Top 12 countries according to PISA-2022 results

#	Country	PISA 2022 results			Development of teachers' digital skills
		Maths	Reading	Science	
7	Netherlands	493	459	488	• ICT-coordinators in schools • Reflection guide Digital literacy at the end of primary education[8]
8	Ireland	492	516	504	• Digital Strategy for Schools until 2027[9] • Digital Communities of Practice • Oide Digital Technologies Professional Learning Leaders
9	Belgium	489	479	491	• Reform of ICT teams in schools in 2023[10] • New model of team-based ICT coordination
10	Denmark	489	489	494	• The Knowledge Center for Digital Technology Understanding[11] • "UniLogin" is a single student and teacher login to more than 500 digital services (national and commercial) and about 1 million students and teachers use it every day
11	UK	489	494	500	• Connect the classroom is a government-funded program to improve internet speeds in schools. This is done by upgrading wifi access points and network switches.[12] • Digital and technology standards in schools[13] • "ICT coordinator" role in schools growing
12	Poland	489	489	499	• "Laboratory of the Future" National program[14] The obligation for schools to make these devices available to students came into force in the 2022-23 academic year. Schools can choose equipment from a catalog of 177 items, with support granted depending on the size of the schools • Digital education coordinator in each school from 2024[15] • Integrated Learning Platform https://zpe.gov.pl/

1. 8. https://www.onderwijsinspectie.nl/onderwerpen/peil-onderwijs/documenten/publicaties/2024/03/15/reflectiewijzer-digitale-geletterdheid-einde-basisonderwijs; 9. Digital Strategy for Schools Implementation Plan 2024; 10. https://www.vlaanderen.be/publicaties/digitale-transformatie-in-het-vlaamse-onderwijssysteem-hervorming-van-ict-teams-op-school; 11. https://tekforstaa.dk/skoler-og-gymnasier-udvikler-digital-teknologiforstaaelses-faglighed-med-videnscenter/; 12. https://www.gov.uk/guidance/connect-the-classroom ; 13. https://www.gov.uk/guidance/meeting-digital-and-technology-standards-in-schools-and-colleges ; 14. https://www.gov.pl/web/laboratoria ; 15. https://wydarzenia.interia.pl/tylko-w-interii/news-szkoly-czeka-cyfrowa-rewolucja-pierwsze-zmiany-juz-od-wrzesn,nId,7768607