



Audit Report no 18/18

Support for the Digitalisation in Education in the Czech Republic

The audit was included in the Audit Plan of the Supreme Audit Office (hereinafter also referred to as 'SAO') for 2018 under number 18/18. The audit was headed and the Audit Report drawn up by Mr. Adolf Beznoska, a SAO Member.

The audit aimed to review whether the measures and projects for developing the digitalisation in education in the Czech Republic make an effective contribution towards the strategic goals in this area.

Audited entities:

- Ministry of Education, Youth and Sports (MoEYS)
- C SYSTEM CZ a.s., Brno,
- itelligence, a.s., Brno,
- Rájec-Jestřebí Grammar School, a public benefit organisation (R-J Grammar School),
- Brno Secondary Technical School of Civil Engineering, a contributory organisation (Brno STSCE),
- Primary School at Kneslova 28, Brno, a contributory organisation (Brno PS),
- Primary School at Moskevská 2929, Kladno (Kladno PS).

The audit was conducted at the audited entities between August 2018 and March 2019.

The audit covered the period from January 2011 to December 2018 and, in case of related events, the period until the audit completion.

Note: The laws and regulations cited in this Audit Report apply as amended for the period under review.

At its ninth meeting held on 24 June 2019, *the SAO Board approved* by Resolution No. 10/IX/2019 the following wording of **the audit report**:

KEY FACTS

PROJECTS RELATED TO THE DIGITILISATION OF EDUCATION		
	NUMBER	AMOUNT
• OP 'EDUCATION FOR COMPETITIVENESS'	4 925	CZK 6 914 million¹
• OP 'RESEARCH, DEVELOPMENT, EDUCATION'	1 735	CZK 15 262 million²
• INTEGRATED REGIONAL OPERATIONAL PROGRAMME		

DEVELOPMENT OF DIGITILISATION IN EDUCATION HAS AN IMPACT ON

	PRIMARY SCHOOLS	SECONDARY SCHOOLS
NUMBER OF FOUNDERS ³	3 016	479
NUMBER OF SCHOOLS ³	4 213	1 311
NUMBER OF TEACHERS ⁴	77 573	45 270
NUMBER OF PUPILS ⁴	940 928	420 814

COMPUTER AVAILABILITY⁵

	PRIMARY SCHOOLS	SECONDARY SCHOOLS
TOTAL NUMBER OF COMPUTERS	152 109	111 103
AVERAGE NUMBER OF PUPILS PER COMPUTER	6.1	3.8

¹ Paid to beneficiaries.

² Total eligible expenditures.

³ Source: The MoEYS. The data is current as at 20. May 2019. As the law does not require private and religious schools to be included in the register, information on the number of founders may not be accurate.

⁴ Source: *The Education Statistical Yearbook - Performance Indicators*, school year 2018/2019.

⁵ Source: *School Governance Report R 13-01*, school year 2017/2018.

SUMMARY AND EVALUATION

The audit conducted by the SAO reviewed whether the measures and projects for developing the digitalisation in education make an effective contribution towards the digital education goals approved by the Government of the Czech Republic in November 2014 and defined in the *Digital Education Strategy until 2020* (hereinafter referred to as 'Strategy'). The SAO focused on the development of the digitalisation in education at primary and secondary schools. In order to evaluate the state of digitalisation, the SAO analysed the data contained in the *School Governance Report R 13-01* and conducted an online questionnaire survey, the results of which are provided in [Appendix 1](https://www.nku.cz/scripts/detail.php?id=10616) (<https://www.nku.cz/scripts/detail.php?id=10616>).

Even five years after the strategy was approved, the MoYES has not set a standard for pupils' digital competences determining the requirements for their education in information and communication technologies (ICT), nor has it ensured an adequate training and digital learning resources for teachers and has not set a technical standard for ICT equipment in schools.

Financing the development of the digitalisation in education at primary and secondary schools depends mainly on money from EU funds and school founders. From January 2011 to July 2018 alone, this area saw the implementation of 6,660 projects, which received CZK 22.176 billion from EU funds. The funds provided to schools from the state budget as part of the regional education funding system allow to a very limited extent financing the purchase, professional support and regular replacement of ICT. There is a real risk for schools not having sufficient funds for the digitalisation in education after the end of the current programming period.

This leads the SAO to believe that the MoEYS has failed to create the conditions necessary for long-term successful development of the digitalisation in education and for improving digital literacy. The MoEYS has not made systemic changes in education that would give both pupils and teachers the desired digital competences and clearly improve their digital literacy as envisaged in the Strategy and in the Government Plan: *Digital Czech Republic v. 2.0 - The Way to the Digital Economy*. Therefore, the MoEYS's measures and other projects concerning the digitalisation in education have failed to make an effective contribution towards the goals in this area.

The overall evaluation is based on the following facts:

1. The MoEYS stated in the Strategy in 2014 that it would introduce such conditions and processes in education by 2020 that will develop digital literacy and computational thinking⁶ of pupils and make an effective use of digital technologies to support teaching and learning activities. When adopting the Strategy, the MoEYS did not specify any implementation plan or budget. In order to achieve the goals and measures, the MoEYS defined 43 activities⁷ but did not state the planned costs or an estimate thereof. Nor did the Strategy specify the standard of ICT equipment at schools that the MoEYS considers appropriate in terms of the goals of the Strategy.

⁶ Thinking that solves problems by using computational methods. It develops the ability to analyse, synthesize, generalise and identify suitable strategies for solving problems and validate them in practice.

⁷ An overview of Strategy objectives, measures and activities is given in Annex 2.

The Strategy preparation and implementation suffered from a lack of staff. During the ongoing implementation of the Strategy, the MoEYS has modified the content of numerous activities and repeatedly extended the deadlines for their completion.

2. EU funds are the primary source for financing the measures and activities falling under the Strategy. It took the MoEYS two years after the Strategy adoption to prepare a plan of the calls to be used to support the projects, through which the Strategy should be implemented. Both systemic, individual and template projects are meant to be supported. However, the implementation of the systemic projects, which are key to the fulfilment of the Strategy and a prerequisite for effective use of funds at the level of projects implemented by individual schools, did not begin until three years after the Strategy adoption. The implementation of individual projects did not start prior to the end of the audit.

The required result of the template projects⁸ is ICT-assisted teaching. The funds allocated to these projects may also be used by schools to purchase ICT. The SAO reviewed a template project run by R-J Grammar School and did not find any breach of the subsidy terms.

The SAO audited the fulfilment of 18 activities falling under the Strategy. Of these activities, the MoEYS failed to complete, by the end of the audit, those activities that are key to implementing the Strategy. The MoEYS failed to define the required pupils' digital competences through a revision of the framework educational programmes (activities 2.2.1 and 2.3.1), to provide learning resources for both pupils and teachers (activities 2.2.2, 2.3.2, 3.2.1 and 6.4.1) and to create opportunities for teachers to engage in further training (activity 3.2.3). As the respective amendment is yet to be enacted by the Chamber of Deputies of the Parliament of the Czech Republic, the prepared *Standard for Teacher Digital Competences* (activity 3.1.2) has not been included in the Education Act⁹ to date.

3. Funds received from the state budget as part of the regional education funding system may only be used by schools to cover the costs of a non-investment nature set down in the Education Act. Part of the expenditure classified as '*other non-investment expenditure*', which schools may use for ICT, ranged from CZK 1,000 to CZK 1,136 per pupil annually in the period from 2013 to 2019. However, schools primarily used these funds to cover other mandatory costs. Although in 2019, according to the MoEYS's analyses, it would be necessary to increase *other non-investment expenditure* by CZK 500 per pupil for ICT acquisition and replacement, the MoEYS increased this expenditure merely by CZK 50 - 59 (depending on pupils' age). This means that the necessary increase did not occur. As a result, the amount and way of this funding severely restrict the ability of schools to purchase and renew ICT. In addition, the MoEYS did not allow schools to cover the cost of outsourced ICT services from funds received from the state budget as part of the regional education funding system even though up to 63% of schools outsourced the ICT support.

The SAO questionnaire survey suggests that the ICT equipment in schools depends on money from EU funds and from the founders. However, money from EU funds are not a predictable, stable and sustainable source, i.e. it cannot replace the financial resource needed for regular ICT renewal.

⁸ A template project means a project with simplified cost reporting in the form of unit costs.

⁹ Act 561/2004 Coll., on Pre-school, Primary, Secondary, Tertiary Professional and Other Education (Education Act).

4. In 2011-2012, the majority of schools received support for obtaining ICT equipment, which came from template projects funded from the operational programme *Education for Competitiveness*. However, this operational programme was not primarily intended to finance investment activities, and therefore the mandatory output of the projects included creating digital teaching materials for the creation and use of which ICT could be acquired. As a result, schools implemented 4,880 projects which received support in the amount of CZK 5.538 billion, creating over 1.8 million digital teaching materials. Many of these materials lacked quality, had duplicate content or were nothing more than the teacher's preparation for lessons.

The SAO audit of projects implemented by Brno PS and Brno STSCE, which in support received CZK 1.5 million and CZK 1.7 million respectively, did not find any breach of the subsidy terms. The schools purchased computers, data projectors and projection screens, and upgraded their school networks and Wi-Fi. Concurrently, they created 660 (Brno PS) and 788 (Brno STSCE) digital teaching materials that all teachers may use for teaching.

The MoEYS also used the operational programme *Education for Competitiveness* to support the education of teachers in effective ICT use and in ICT integration into teaching. Only a third of primary and secondary school teachers were trained as part of 45 projects which received CZK 1.376 billion in support. Thus, this support was not systemic.

The SAO audit of projects implemented by itelligence, a.s. and C SYSTEM CZ a.s. and by the partner schools of Kladno PS and R-J Grammar School did not find any breach of the subsidy terms. The beneficiaries received CZK 170 million in total and trained 3,061 persons and 43 ICT methodologists from 150 partner schools. They created 42 outputs, e.g. user manuals, didactic methods, tutorial sets, webinars, education applications and other methodological materials, but the SAO found the same texts and topics in some of the outputs.

5. An analysis of the data contained in the School Governance Report R 13-01 for the school year 2018/2019 and the SAO survey show that the main obstacles to the development of the digitalisation in education at primary and secondary schools are a lack of funds to replace, operate, extend, upgrade or support ICT, a difficulty to find resources for the purchase of new ICT, and the fact that the focus of calls does not correspond to school needs. On average, secondary schools in general have a statistically sufficient number of computers that are available to pupils (4 pupils per computer). On the other hand, there are, on average, 6.5 pupils per computer at primary schools¹⁰. The optimal ratio used by the MoEYS is 4:1. 80% of all computers available to students are older than three years. If the common practice of ICT renewal every 3 to 4 years is followed, there is a substantial risk that the state budget and the founders' budgets will be burdened heavily over the next two years. In Austria, there are 2.1 up to 5.4 pupils per computer (depending on the school type), of which approximately a half is older than four years old.

Only 6% of primary schools and 18% of secondary schools directly enable pupils to use their own ICT in the classes. 50% of primary schools and 64% of secondary schools leave it up to teachers to decide whether pupils can use their own devices in the classes. A similar situation exists in Austria where 6% of secondary schools and 15% of technical secondary schools support the BYOD trend, and where 67% of all secondary schools leave it up to teachers to decide. In Estonia, up to 50% of pupils use their own ICT in the classes.

¹⁰ The average number of pupils per computer is calculated only for those primary and secondary schools whose answers the SAO used in evaluating the questionnaire survey.

The SAO questionnaire specified four levels of school maturity in terms of the digitalisation in education. Only 3% of primary and secondary schools rated themselves as having achieved the digital education goals and successfully transformed their practices in order to actively use ICT in most parts of the education process. In 24% of primary and secondary schools, ICT is a standard component of selected parts of the education process, and these schools have achieved the majority of the digital education goals. The majority (68%) of primary and secondary schools stated in the survey that they were making use of ICT but still falling significantly short of the digital education goals. And the remaining 5% of primary and secondary schools are still formulating and identifying opportunities for ICT use to achieve the digital education goals.

Based on its findings, the SAO recommends the following to the MoEYS:

- Introduce the *Standard for Teacher Digital Competences*, which has been prepared by the National Institute for Education, into common practice, in particular by supporting the education of both current and future teachers in their efforts to use outputs of the systemic projects supported by *The Implementation of the Strategy of Digital Education I* call;
- Revise the framework educational programmes and incorporate the digital competences of primary and secondary school pupils proposed by the National Institute for Education;
- Define a standard for ICT for primary and secondary schools, in particular for hardware, general and special software, for digital educational materials, connectivity and qualified support of ICT;
- Modify the regional education funding system to give schools access to funds that will enable planned renewal, maintenance and support of ICT after the end of the 2014–2020 programme period.

The development of the digitalisation in education at primary and secondary schools – results of data analysis and questionnaire survey

Based on the data from the *School Governance Report R 13-01* for the school year 2018/2019 and on the questionnaire survey results, the SAO made the following findings at the primary and secondary schools (respondents):

1. Use of ICT

- If schools do not have an Internet connection throughout their premises, they have it at least in all classrooms and teacher offices.
- 97.53% of schools use mostly the Windows operating system in their computers and 72.85% of them have Windows 8 or higher.
- Virtual Desktop Infrastructure ('VDI') is used by 8.77% of schools; VDI is used by 22.86% of schools with the highest level of maturity; VDI use increases with a growing number of pupils, ranging from 5.6% at the smallest schools to 14.29% at the largest ones¹¹.

¹¹ The smallest school: 0–150 pupils, small school: 151–300 pupils, medium-sized school: 301–500 pupils, large school: 501–1,000 pupils, the largest school: 1,001–1,500 pupils.

- A system for communication with parents is used by 59.05% of schools; its use ranges from only 25.14% of the smallest schools to 74.86% of the remaining schools and increases with a growing number of pupils. Such systems are used by only 45.35% of municipal schools as opposed to 85.63% of private schools and 93.61% of regional schools, and by only 45.16% of primary schools as opposed to 93.22% of secondary schools.
- A learning management system ('LMS') is used by 23.27% of schools. LMS is used by only 11.89% of primary schools in contrast to 51.31% of secondary schools, and by 11.93% of municipal schools as opposed to 54.09% of regional schools. LMS use increases with the growing number of pupils, ranging from 7.51% of the smallest schools to 57.14% of the largest schools.
- At 84.11% of schools, the majority of teachers use ICT in the classes. This figure stands at 95.71% when it comes to schools with the highest level of maturity.
- ICT is often or too often used solely for teaching informatics (97.83% of schools), foreign languages (76.42% of schools) and natural sciences (67.43% of schools).
- Only 9.73% of schools directly encourage pupils to use their own devices in the classes (known as BYOD), with 53.76% of schools leaving it up to teachers to allow/prohibit such use. The BYOD trend is encouraged mostly by the largest schools (28.57%), private schools (31.14%), secondary schools (18.34%) and schools with the highest level of maturity as opposed to the smallest schools (7.24%), municipal schools (5.93%) and religious schools (6.82%).
- 86.07% of schools allow teachers to connect their own devices while 41.82% of schools give this opportunity to both teachers and pupils. Connecting their own devices is possible for both teachers and pupils at 78.57% of the largest schools as opposed to only 32.10% of the smallest schools, at 79.24% of regional schools and 73.65% of private schools as opposed to only 26.34% of municipal schools and at 79.82% of secondary schools in contrast to only 26.65% of primary schools.

2. ICT support and funding

- Schools usually outsource ICT support or assign it to a teacher for whom the task is not the main responsibility, or they use a combination of these methods. The largest schools and schools with the highest level of maturity assign ICT support to a qualified member of staff rather than to a teacher.
- 63.06% of schools finance ICT support mainly from the founder's contribution and 29.54% from the normative funding; the prevailing source of funding differs according to the founder, the type of school and the level of maturity, when those with the highest maturity use more contributions from normative funding.
- Schools finance the acquisition of ICT mainly through contributions from their founders and from EU funds; the source varies depending on the school type, the founder and the level of maturity. Private schools use tuition instead of founders' contributions while religious schools use mostly normative funding for purchasing ICT.
- From 2011 to 2018, 61.62% of schools participated in education digitalisation projects supported by EU funds; the level of participation was lower among the smallest schools (56.97%), the largest schools (50%), religious schools (52.27%) and private schools (47.30%).
- 66.31% of schools (but only 46.1% of private ones) use outputs generated in projects supported from the OP "Education for Competitiveness".

- The projects supported from the OP “Education for Competitiveness” are most commonly used by schools for ICT followed by study/educational materials and staff training.
- 9.64% of schools stated that every offer of digital outputs from projects supported from the OP “Education for Competitiveness” was of high quality and satisfied their needs, whereas 29.74% of schools are unable to evaluate such offers due to a lack of information.

3. Development of ICT (strategy)

- On average, 88.45% of schools have an ICT plan/strategy defining their priorities and problems. This figure stands at 79.78% of the smallest schools, 100% of the largest schools, 92.29% of schools with the highest level of maturity, 94.41% of regional schools but only at 85.03% of private schools.
- 51.2% of schools employ an ICT methodologist/coordinator as a separate position; this holds true for 70% of schools with the highest level of maturity as opposed to only 28.55% of the smallest schools. This position is most commonly held by an ICT support specialist and by a non-teaching member of staff at religious schools (36.36%) and at private schools (28.74%) respectively.
- 67.21% of schools remunerate their ICT methodologist/coordinator by using contributions from normative funding.

4. Development of ICT (obstacles)

- School directors state the following as the most common obstacles to the development of the digitalisation in education: a lack of funds to purchase new ICT and maintain and run existing ICT, the fact that calls from EU operational programmes focus solely on the purchase of new ICT and do not support the maintenance, operation, upgrade or extension of existing ICT or do not cover all school needs.
- Teachers state the following as the most common obstacles to a wider deployment of ICT in teaching: malfunctions/low reliability of ICT during lessons, insufficient time for lesson preparation with ICT and for further education, uncertainty how to operate ICT during lessons and insufficient quality and availability of ICT.

5. Availability and age of IT at the responders’

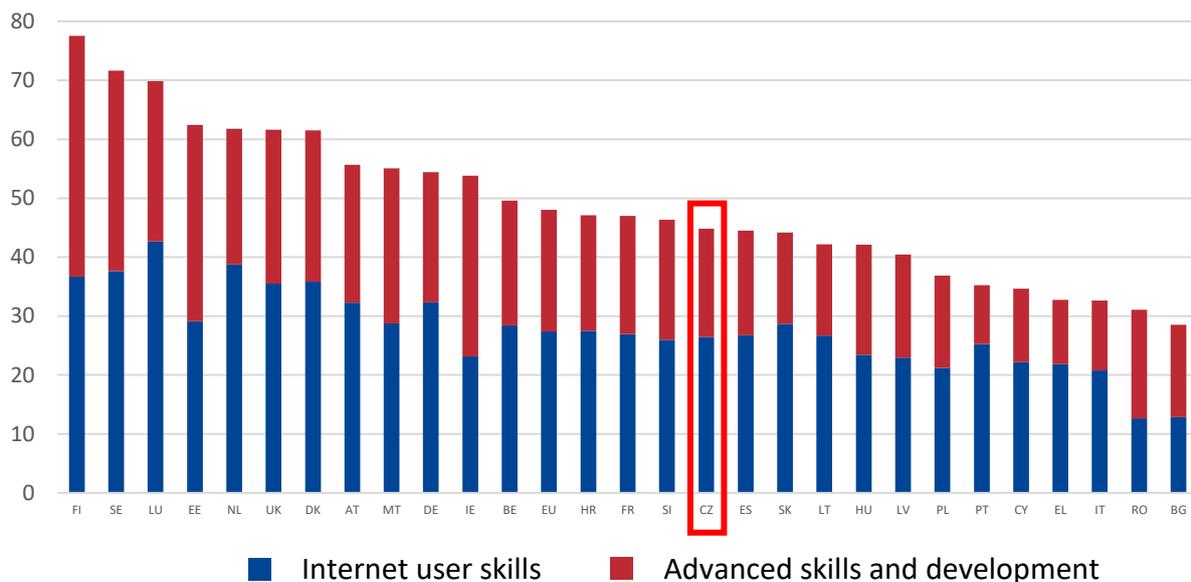
- On average, there are 5.3 pupils per computer at schools, 6.5 at primary schools and 4 at secondary schools. 19.77% of school computers are less than two years old, 73.53% are 3 to 9 years old and 6.70% are older than 10 years. 76.82% are desktops, 11.58% are laptops and 11.60% are other computers.

An overview of the results of the questionnaire survey conducted by the SAO is available in [Appendix 1](https://www.nku.cz/scripts/detail.php?id=10616) (<https://www.nku.cz/scripts/detail.php?id=10616>).

International comparison

Education, including digital education, is assessed in EU countries through international surveys or measured using indexes. The Digital Economy and Society Index (DESI)¹², which is published every year by the European Commission, measures the progress of EU countries towards a digital economy and society. Among other things, it assesses the level of Internet user skills and advanced skills and development of the population. The percentage of citizens in EU countries who achieved these skills in 2019 is shown in Chart 1. According to the DESI, in 2019 the Czech Republic ranked 16th in the EU in the area of digital skills.

Chart 1: Human capital according to the DESI 2019 index (in % of population)



Source: https://digital-agenda-data.eu/charts/desi-components#chart={%22indicator%22:%22desi_2_hc%22,%22breakdown-group%22:%22desi_2_hc%22,%22unit-measure%22:%22pc_desi_2_hc%22,%22time-period%22:%222019%22}.

Comparison of support for developing digitalization of education in selected countries

In order to identify and compare support for developing digitalization of education in specific countries, the SAO addressed Supreme Audit institutions in the Slovak, Austrian and Estonian Republics (SAIs) within the context of international cooperation¹³. Appendix 2 shows an overview of the responses of the addressed institutions in individual areas. A common feature of support for the digitization in education in selected countries is the anchoring of support for the development of digital education in a strategy or similar document. All countries focus on securing ICT and educational resources for schools and promoting digital knowledge and skills of pupils and teachers.

¹² Digital Economy and Society Index

¹³ International co-operation was carried out on Article 16 of Act No. 166/1993 Coll. on the Supreme Audit Office.

Audit in the field of digitalization of education by the Austrian SAI.

In addition to the required responses, the Austrian SAI provided a final audit report on ICT support used in public school education carried out between November 2016 and March 2017. Besides the ICT workload of teaching staff, ICT infrastructure of schools and digital literacy of pupils were also assessed. The evaluation period included school years 2011 / 2012 - 2015 / 2016. Selected pieces of information included in the final Audit Report are given in Appendix 2¹⁴. The Austrian SAI, among other things, recommended that the federal government and local governments, in agreement with municipalities, set up an ICT model for schools with central standards for ICT and centralized services and processes (e.g. ICT acquisition). In this model, competences and powers should be linked with the responsibility for funding. The Ministry of Education should also focus on supporting the pedagogical and didactic knowledge of teachers in the digital area. Digital literacy should be included as a compulsory expertise in the curriculum for training teachers.

Following the audit, the Austrian Federal Ministry of Education, Science and Research prepared a *Digitalization Action Plan* during 2018. Annex 3 shows selected pieces of information on its planned structure and focus.

¹⁴ Bericht des Rechnungshofes, IT-Betreuung an Schulen;
https://www.rechnungshof.gv.at/rh/home/home/IT_Betreuung_Schulen.pdf

International comparison of digitalisation development in education in selected EU countries

Support for digitalisation development in education in selected EU countries

The following table shows the key areas of digitalisation in education in each selected country. The information in the table was based on responses received from SAIs approached by the SAO.

Support for digitalisation in education in selected countries for the 2017/18 school year

Assessed area		Czech Republic	Estonia	Austria	Slovakia
Responsible body		The MoEYS and the National Institute for Further Education	The Ministry of Education and Research, and HITSA ¹⁵ and Foundation InnoVe ¹⁶	The Federal Ministry of Education, Science and Research	The Ministry of Education, Science, Research and Sport
Key documents		<i>The Europe 2020 strategy</i>			
		<i>The Digital Education Strategy up to 2020; The Digital Czech Republic 2.0, The Way to the Digital Economy</i>	<i>The Estonian Lifelong Learning Strategy 2020; Estonia 2020</i>	<i>The Action plan for digitalisation; the Digital Roadmap Strategy</i>	<i>The Concept of Computerising and Digitalisation in the School Sector with an Outlook to 2020; Digipedia 2020</i>
Target areas of support		<ul style="list-style-type: none"> - ICT infrastructure - Educational sources - Competences of teachers - Pupil literacy - Monitoring and evaluation of results achieved - Integration of digital technologies into teaching and into school life 	<ul style="list-style-type: none"> - ICT infrastructure - Educational sources - Competences of teachers - Pupil literacy - Monitoring and evaluation of results achieved - Creating educational opportunities for adults 	<ul style="list-style-type: none"> - ICT infrastructure and digital school administration - Educational sources - Competences of teachers - Pupil literacy 	<ul style="list-style-type: none"> - ICT infrastructure - Educational sources - Competences of teachers - Pupil literacy - Sectoral electronic services - Cooperation of entities at all levels
Primary sources of funding		EU funds	EU funds	Federal budget, and further budgets of the provinces and the municipalities	EU funds
Monitored areas	Digital literacy	PISA survey	<ul style="list-style-type: none"> - PISA survey - Questionnaire survey on satisfaction of pupils and teachers 	PISA survey	<ul style="list-style-type: none"> - Digital literacy of pupils in vocational training - Progress in digital literacy

¹⁵ The Information Technology Foundation for education; for details please visit: <https://www.hitsa.ee/>.

¹⁶ For details please visit: <https://www.innoVe.ee/en/>.

Assessed area		Czech Republic	Estonia	Austria	Slovakia
					achieved by teachers and teaching staff ¹⁷
	Equipment availability	Survey on ICT equipment ratio	TALIS survey (working and educational conditions); Absolute and ratio indicators	Survey on ICT equipment	Ratio indicators
Number of pupils per computer	ISCED 1	6.1	8.4 ¹⁸	6.8	Not accesible ¹⁹
	ISCED 2			3.6	
	ISCED 3	3.79		2.1 – 5,4 ²⁰	
Number of pupils	ISCED 1	575,699	89,615	348,456	440,582
	ISCED 2	350,409	39,036	340,601	
	ISCED 3	403,014	22,513	443,310	204,621

Note: ISCED 1 – First grade elementary schools; ISCED 2 – Second grade of elementary schools; ISCED 3 – Secondary schools.

Selected findings from the audit of the Austrian SAI in the field of digitalisation in education

The final audit report of the Austrian SAI on IT support at schools carried out in the period from November 2016 to March 2017 (Bericht des Rechnungshofes, IT – Betreuung an Schulen) states:

- ICT professional support at Austrian schools was supposed to be provided by teachers by law. The technical support for hardware and software was the responsibility of the school's founders who used their own staff or external experts for that. Neither the federation nor the local governments made a clear and uniform division and description of the tasks regarding ICT support. In this context, the Federal Ministry of Education, Science and Research is now implementing the *New IT Support* project. As a result, in the school year 2014/2015, professionally trained staff took over routine hardware and IT system support activities for several schools. By implementing this project, the Ministry has created an appropriate solution for ICT support. Thus, teachers were deprived of technical routine activities in favour of basic pedagogical tasks.
- In every state of the Austrian Republic (with the exception Vienna, which is the founder of all public compulsory schools), it was difficult to provide standardized ICT infrastructure and support for schools. This is mainly due to the high number of founders (municipalities).

¹⁷ Slovakia participated in the PISA survey, but it did not partake in an additional survey regarding the digital literacy.

¹⁸ According to a 2017 survey, 50% of pupils use their own devices (mostly smartphones) in the classes.

¹⁹ The Slovak annual statistics show the total number of computers (desktops, notebooks and tablets) at schools without specifying how many devices are available only to teachers and to both teachers and pupils. The calculated ratio of 2.62 devices per pupil thus does not take into account that not all devices are available to pupils.

²⁰ According to the *Digitalisation Action Plan* of the Federal Ministry of Education, Science and Research, pupils at two thirds of secondary schools use their own devices in the classes.

- During the school year 2015/2016, the number of pupils per computer ranged from 5.4 to 2.1 (depending on the type of school). This indicator decreased over the reviewed period, i.e. the number of computers increased. However, about half of the computers were over four years old.
- There is considerable qualitative and quantitative heterogeneity in ICT equipment at the schools throughout Austria. The Ministry issued recommendations for all types of schools regarding basic ICT equipment, which was the first step towards introducing the necessary standardization.
- By the end of 2016, the Ministry had not been able to integrate digital literacy into the curricula of schools for general education.

In the first half of 2018, the Austrian Federal Ministry for Education, Science and Research ("the Ministry") conducted a comprehensive evaluation of the educational system in the field of digitisation:

- 5.9% of New Secondary Schools, 6.4% of Academic Secondary Schools and 14.6% of Intermediate or Higher-Level Vocational Schools are so-called notebook classes in which students use their own electronic devices.
- at about two-thirds of New Secondary Schools, Academic Secondary Schools and Intermediate or Higher-Level Vocational Schools students use their own electronic devices when needed.
- 45.5% of New Secondary Schools, 50.6% of Academic Secondary Schools and 59.6% of Intermediate or Higher-Level Vocational Schools have WLAN in the whole school building;
- 65.6% of New Secondary Schools, 58.8% of Academic Secondary Schools and 50% of Intermediate or Higher-Level Vocational Schools have an educational concept for supporting use of digital technology in teaching.

During 2018, the Ministry drew up the *Digitalization Action Plan* to gradually incorporate the changes that result from the ongoing digitization into the entire Austrian education system. As a reason for creating this plan, the Ministry stated that for good and meaningful use of ICT at schools, it is first and foremost necessary to set up good educational practices. It also stated that digitization has enormous potential for the education system which needs strategic planning for the most effective use of identified opportunities. The forthcoming Action Plan was divided into three areas:

- (1) teaching and learning - including curriculum change, development and acquisition of digital teaching and learning tools;
- (2) vocational and further training for teachers – including internal increase of qualification at schools and the development and use of the new framework curriculum;
- (3) infrastructure and modern school management - including the construction of ICT infrastructure at schools, technical and organizational equipment by digital terminal and equipment, simplification of school management, and the "Digital School" service portal for massive support for digital teaching methods, digitization of school management and communication between all involved parties.

Since school year 2018/2019 the Ministry has introduced a new subject "*basic digital skills*" at schools that provides a wide range of digital skills ranging from safe and thoughtful use of

technology and digital media, through application-oriented software knowledge, to problem-solving, coding, and IT thinking. In connection with the improvement of the ICT infrastructure at schools, the Ministry implements programmes for broadband, network and Wi-Fi connections throughout the school building, digital boards and projectors, and sufficient equipment with mobile terminals according to defined standards.