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Education

Survey of Schools: ICT in Education

**BENCHMARKING ACCESS, USE AND ATTITUDES TO
TECHNOLOGY IN EUROPE'S SCHOOLS**

Executive Summary
February 2013

The Survey of Schools: ICT in Education was funded by the European Commission (Directorate General Information Society and Media) and undertaken by the Contractor: European Schoolnet and University of Liège under contract SMART 2010/0039. Project team: Roger Blamire, Patricia Wastiau, Caroline Kearney, Anja Balanskat (European Schoolnet); Valérie Quittre, Eva van de Gaer, Christian Monseur (University of Liège)

All materials produced in this survey, including the data set, are freely available and can be accessed at <https://ec.europa.eu/digital-agenda/en/pillar-6-enhancing-digital-literacy-skills-and-inclusion>.

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Conception:  EFMD Luxembourg

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Executive summary

Based on over 190,000 responses from students, teachers and head teachers collected and analysed during the school year 2011-12, the Survey of Schools: ICT in Education provides detailed, up-to-date and reliable benchmarking of Information and Communication Technologies in school level education across Europe, painting a picture of educational technology in schools: from infrastructure provision to use, confidence and attitudes.

The Survey was commissioned in 2011 by the European Commission (Directorate General Communications Networks, Content and Technology) to benchmark access, use and attitudes to ICT in schools in 31 countries (EU27, Croatia, Iceland, Norway and Turkey). The Survey is one of a series within the European Union's cross-sector benchmarking activities comparing national progress towards the Digital Agenda for Europe (DAE) and EU2020 goals. The Survey was conducted in partnership between European Schoolnet and the University of Liège (Service d'Approches Quantitatives des faits éducatifs, Department of Education).

It is the first Europe-wide exercise of this type for six years, following the eEurope 2002 and eEurope 2005 surveys. It is the first to be conducted online and the first to include students directly. Work on the survey took place between January 2011 and November 2012, with data collection in autumn 2011. The survey report and all related materials are freely available on the European Commission's Digital Agenda Scoreboard website¹. In four countries (Germany, Iceland, Netherlands and the United Kingdom) the response rate was insufficient, making reliable analysis of the data impossible; therefore the findings in this report are based on data from 27 countries.

HIGHLIGHTS AND RECOMMENDATIONS

1: ICT INFRASTRUCTURE AND USE

SURVEY FINDINGS

There are now between three and seven students per computer on average in the EU; laptops, tablets and net-books are becoming pervasive, but only in some countries. Interactive whiteboards are present in schools (over 100 students per interactive whiteboard), as well as data projectors. More than nine out of ten students are in schools with broadband, at most commonly between 2 and 30mbps on average in the EU. Most schools are connected at least at basic level (indicated by having, for example, a website, local area network, virtual learning environment). The *Survey* findings estimate that at EU level on average, between 25 and 35% of students at grades 4 and 8, and around 50% of students at grade 11, are in highly equipped schools, i.e. with high equipment level, fast broadband (10 mbps or more) and high connectedness. The percentages of such schools differ enormously between countries.

Even so, school heads and teachers consider that insufficient ICT equipment (especially interactive whiteboards and laptops) is the major obstacle to ICT use. Inhibitors like this are not the same across countries and these national differences are analysed in the main report and in more detail in the country profiles.

Around 50% of students at grades 8 and 11 in general education use a desktop or a laptop during lessons at school at least weekly, but around 20% of the students at the same grades never or almost never use a computer during lessons. Around 30% of students at grade 8 and 20% at grade 11 in general education use an interactive whiteboard at least weekly.

Interestingly, no overall relationship was found between high levels of infrastructure provision and student and teacher use, confidence and attitudes.

RECOMMENDATIONS FOR POLICY MAKERS

Central, local and institutional level. Policies and action at infrastructure level are still needed to enable the large majority of students, at all grades, to be in highly digitally equipped schools as defined above. These policies, putting the focus on providing laptops (or tablets, netbooks, etc.) and interactive whiteboards, would help to overcome what is still considered by practitioners as the major obstacle to ICT use. Such policies are a matter of urgency in some countries lagging far behind others. Infrastructure-related policies should be accompanied by complementary measures in other areas – and particularly in teacher professional development (see below) - for the use of this infrastructure to happen. Depending the level of autonomy given to schools, national, regional and local policy makers, or school heads, are in the first line to implement such policies; reaching consistency and cross fertilising efforts between actions implemented at each of these levels are important in bringing about successful change.

EU level. Supporting policies should take into account the very different levels and characteristics of infrastructure provision measured by the Survey depending on the country, developing diversified support actions suited to the most equipped education systems as well as the less equipped ones.

2: ICT BASED LEARNING ACTIVITIES AND CONFIDENCE IN DIGITAL COMPETENCE

SURVEY FINDINGS

Most teachers have been familiar with ICT for teaching and learning for some years but still use it first and foremost to prepare their teaching. Only a few use it – and still to a limited extent – to work with students during lessons, and even less frequently to *communicate with parents or to adjust the balance of students' work* between school and home in new ways. The overall frequency of use of different types of ICT-based activities in class reported by teachers is around several times a month on average at EU level.

On average at EU level, students report undertaking ICT-based activities between several times a month and never or almost never. Digital resources such as exercise software, online tests and quizzes, data-logging tools, computer simulations, etc. are still very rarely used by students during lessons. Students' ICT-based activities related to learning at home are more frequent compared to ICT activities at school. Such a finding underlines on the one hand the extent of informal or non-formal learning actually taking place out of school, and on the other hand students' interest in spontaneous self-directed learning.

The *Survey* findings provide evidence that teachers are confident in using ICT, positive about ICT's impact on students' learning, and organise more frequent ICT based activities than previously. They do it most when they are in schools with easy access to pervasive equipment, but also do it more often even when they are in schools with low equipment provision than teachers lacking confidence and not positive about ICT but in schools with high equipment provision and easy access.

Teacher participation in ICT training for teaching and learning (T&L) is rarely compulsory. At EU level, depending the grade, only around 25-30% of students are taught by teachers for whom ICT training is compulsory. This appears to contrast with teachers' appetite and interest in using ICT, as shown by the large majority of them who choose to develop their ICT-related skills in their own spare time. Interestingly, around 70% of students at all grades are taught by teachers who have engaged in personal learning about ICT in their own time. Although online resources and networks are widely available in Europe, they are a relatively new way for teachers to engage in professional development, and only a minority of these opportunities are used by schools.

It is not surprising that, across countries, teachers consider that they are more confident in their operational skills than in their use of social media. The more teachers are confident in using ICT, the more they participate in professional development and spend time on such training, and the more they report frequent ICT-based activities during lessons across all grades.

At EU level on average, students declare a fairly high level of confidence to use the internet safely and a lower one in their use of social media. Interestingly, students stating they have high access to and use of ICT at school AND at home also report higher confidence in their operational ICT skills, in their use of social media and in their ability to use the internet safely and responsibly, as well as more positive opinions about ICT's impact on their learning, compared to students reporting low access and use at school but high access and use at home.

Very large differences exist between countries in all the above areas.

RECOMMENDATIONS FOR POLICY MAKERS

Central and local level. *Increasing students' ICT-based activities during lessons, and as a consequence their digital competence, strongly needs to be boosted. Policies and actions to support a quantitative and qualitative increase in teacher professional development are probably the most efficient ways to obtain results in this area, especially given the interest shown by a large majority of teachers learning ICT in their own spare time. This support could usefully look at capacity building specifically in the area of new patterns of teacher professional development through online learning communities and other schemes closely integrated into teachers' daily practice (informal methods, blended learning, 'on the job' training, teacher and school networking on a local/regional basis, etc.), all training models not much used at present. These more recent professional development approaches could also more easily integrate teaching and learning scenarios and activities concretely showing teachers how ICT can be fully integrated to support efficient learning for all students. Policy makers should also dedicate attention to the creation and dissemination of good quality digital learning resources with the aim of increasing their use by teachers and students during lessons. Here again depending the division of responsibilities in each system, these action lines should be supported at central/national, regional and/or local level in a coherent way. In countries where an inspectorate exists, policy makers have to make sure that the efforts along the lines presented above are relayed and assessed by inspectors.*

Institutional level. *School heads should support the above policies and actions by adapting, when and where applicable, how professional development is organised at school level, replacing when appropriate external traditional training programmes by peer learning and sharing activities organised at school. They should support online teacher learning communities at school and/or school network levels. They should also allocate time for teachers to cooperate and reflect about new practices inspired by ICT based teaching and learning scenarios and activities, and to test, discuss - and adapt when possible - digital learning resources with a view to introduce them into mainstream teaching.*

EU level. *At EU level, policies along these lines could identify the conditions for the best use of such types of approaches and how to mainstream them, mostly from the point of view of the process-related aspects rather than the content ones. Funding large scale projects to produce evidence about what works concerning new models of teacher professional development (online learning communities, blended learning, etc.), and supporting high quality ICT-based scenarios and digital material – whether autonomous modules or a new type of 'textbook' – should (continue to) be high on the EU agenda. Make available tools to measure regularly progress in the adoption of ICT based activities in lessons at school, and teacher and students digital competence, as well.*

3: SCHOOL POLICIES, STRATEGIES, SUPPORT AND ATTITUDES

SURVEY FINDINGS

On average at EU level and across all grades, around 50% of students are in schools where formalised school policies – based on written statements – about using ICT in general, or specifically in subjects exist. Only 20% of students are in schools where over-arching formal policies covering ICT use in general, in T&L AND in subjects have been adopted. Around 35% of students are in schools where there are plans and measures to support collaboration between teachers AND time scheduled for them to share, evaluate or develop approaches and instructional material. Between 45% and 50% of students at grades 8 and 11 are in schools which have organised change management training programmes in the last three years.

The two most frequent incentives used to reward teachers for using ICT in T&L are additional ICT equipment for the class and additional training hours. ICT coordinators are frequently available in schools, full time in one case out of two, and usually providing pedagogical support.

The *Survey* finds that students, as well as teachers, have the highest frequency of ICT use and ICT learning based activities during lessons when they are in schools which combine policies about ICT integration in T&L generally speaking as well as in subject learning, incentives to reward teachers using ICT, as well as concrete support measures including teacher professional development and the provision of ICT coordinators.

A very large majority of school heads and teachers agrees about the relevance of ICT use in different learning activities, as well as concerning the positive impact of ICT use on students' motivation and achievement, and on transversal and higher order thinking skills. They are also close to unanimity about the fact that ICT use is essential to prepare students to live and work in the 21st century. An overwhelming majority of students is also positive about the impact of ICT on the classroom atmosphere and on different learning processes. These last two support measures appear to play a key role.

RECOMMENDATIONS FOR POLICY MAKERS

Central, local and institutional levels. *Depending the level of autonomy given to schools, national, regional and local policy makers, and school heads more importantly in decentralised systems, should combine – rather than choosing a single one – a set of actions from the following: defining and implementing specific policies about ICT integration in teaching and learning as well as in subjects, discussing on a regular basis this issue with teaching staff, implementing incentives to reward teaching staff using ICT in T&L, promoting collaboration among teachers about their ICT daily practice, and providing them with time for it. In addition, especially at institutional level, these policies should be systematically accompanied – or relayed when defined at a more central level – with concrete support measures for teachers' professional development and daily support in the classroom thanks to available ICT coordinators. In addition to clear and specific policies defined at central level particularly in systems where schools have limited autonomy, efforts are needed in all countries to reinforce policy and implementation capacity building at school level along the lines mentioned above.*

EU level. *EU level initiatives are needed to encourage and support Member States along these lines, supporting the development of tools to steer and monitor progress in a consistent and balanced way throughout Europe, and identifying the conditions for their streamlining through large scale pilot projects properly funded.*

In summary, the 'recipe' suggested by findings of the *Survey of Schools: ICT and education* could be termed the '5C approach':

- **Capacity building**, through sustained investment in teachers' professional development
- **Concrete support measures**, accompanying specific policies at school level
- **Combined policies and actions**, in different policy areas within a systemic approach
- **Country-specific support**, addressing large differences and degrees of ICT provision and implementation
- **Competence development**: these four actions directed at effectively and dramatically increasing young people's digital competence and the key competences described in the European framework.

KEY FINDINGS

This summary sets out some of the key findings from the survey together with some limited “Trends” data available from a similar study in 2006. Given the scale and complexity of the data and analysis provided by the survey, this can only be selective: readers seeking a more detailed picture should of course refer to the full report and supporting materials. This is especially so for those wanting to compare their country’s position with other countries, since the scope of this summary does not allow any significant or fair handed presentation of such data.

Information and communication technologies profoundly and irreversibly affect the ways of working, accessing knowledge, socialising, communicating, collaborating - and succeeding – in all areas of the professional, social, and personal life of European young people and citizens. The *Knowledge Society* makes infinite and extremely varied resources of information, knowledge and learning provision available at any place and any time. The possibilities allowing one to participate in social life taking place anywhere in the world are pervasive and engaging. Such daily and easy access to all these exciting opportunities radically changes the environment, habits and expectations of young generations. It also offers education systems new – and challenging – opportunities not to be missed.

This context imposes a radical challenge to the educational paradigm to engage students in their learning and prepare them for their future life and contribution to society. Education systems are expected to develop new competences in students and new ways of teaching these. Active, personalised and collaborative learning environments are to be designed and offered to students for them to engage in effective, efficient and rich learning paths, developing the knowledge and key competences needed by 21st century societies. ICT, properly integrated for the sake of learning, can substantially contribute to education systems’ success in facing this complex challenge. For this to happen, there are several key conditions to be met: students must have access to operational infrastructure in the classroom and make best use of it during lessons; teachers must have the right competences enabling them to use ICT to support engaging teaching and in-depth learning; suited pedagogical environments have to be designed for mainstream adoption while at the same time being adaptable to different contexts; good quality learning resources must be available and students’ assessment models must be updated and implemented. The *Survey in schools: ICT and education* examines these landscapes.

What is then the right mix of ingredients that is likely to support education systems to fully exploit the benefits arising from the numerous possible ICT based T&L opportunities and provide every student with a high quality learning experience?

1: POLICIES AND SUPPORT

Developing specific policies to use ICT in T&L and implementing concrete support measures at school level affect the frequency of students’ ICT based activities for learning in the classroom

The *Survey* finds that students, as well as teachers, have the highest frequency of ICT use and ICT learning based activities during lessons when they are in schools which have policies about ICT integration in T&L generally speaking as well as in subject learning, using incentives to reward teachers using ICT, implementing concrete support measures including teacher professional development and the provision of ICT coordinators. Interestingly, students in schools focusing mostly on concrete support measures show more frequent use of ICT during lessons compared to schools with policies but no concrete support measures. Rather than reflecting a higher efficacy of concrete support measures compared to policies, such an observation is more probably related to the fact that policies are still defined at central level in several education systems and have not necessarily been reported by school heads specifically at school level. Schools belonging to these two groups, i.e. having policies and/or concrete support measures, are defined by the *Survey as digitally supportive schools*.

On average across the EU countries covered by the *Survey*, between 25-30% of students are in digitally supportive schools developing policies as well as concrete support measures. This percentage goes up to between 40-50% of students (a little bit less in vocational education) when adding students in *digitally* supportive schools mostly focusing on concrete support measures. Differences between countries are very large: minimum 50% of students – and much more in a few countries at grade 4 – are in *digitally supportive schools* (at several grades) having policies and support measures in Czech Republic, Denmark, Norway, Slovenia, as well as in Bulgaria, Estonia, Ireland and Spain at grade 4; while only less than 10% of students are in such schools in Croatia (at grade 8), France (at grade 4) and Greece at grade 8 and 11.

The Survey findings support the idea that increasing students' – and teachers' - ICT use for T&L during lessons could be reached through actions at the whole school level. Increasing the number of digitally supportive schools is then an objective to be set in several countries, and very urgently in countries with very low percentages of such schools. Depending the level of autonomy given to schools, national, regional and local policy makers, and school heads more importantly in decentralised systems, would do well by developing actions among the following: defining and implementing specific policies about ICT integration in teaching and learning as well as in subjects, discussing on a regular basis about this issue with the teaching staff, implementing incentives to reward teaching staff using ICT in T&L, promoting collaboration among teachers about their ICT daily practice and providing them with time for it. Taking teacher professional development measures, not just through traditional participation to training programmes but also through teacher peer learning, as well as providing daily support in the classroom thanks to available ICT coordinators, can only efficiently complement the above mentioned actions. Rather than one type of policy or measure being the panacea to support ICT use in T&L at school level, the findings of the Survey demonstrate that it is a combination of several of the above mentioned policies and measures, articulated together in a systemic approach, that make the difference.

In all cases, efforts at school level have to be usefully supported by central/national, regional and local policies encouraging action along the lines mentioned above, in the best suited way according to the level of autonomy given to the schools. In addition to clear and specific policies defined at central level particularly in systems where schools have limited autonomy, efforts are needed in all countries to reinforce policy and implementation capacity building at school level, in favour of ICT use in T&L during lessons. All the stakeholders responsible for teacher initial education and in service training should dedicate efforts to reinforce and enlarge the provision they offer concerning ICT based pedagogy and innovative learning situations; school heads and teachers should think about ways to develop peer learning opportunities within their own school, provided all decision makers concerned at any level support the flexibility needed for this collaboration between teachers to take place within working time. EU level initiatives to encourage and support Member States along these lines, through peer learning activities, funding pilot projects and monitoring the development of tools in the above mentioned policy areas, are needed to steer and monitor the progress made in a consistent and balanced way throughout Europe.

2: TEACHERS' CONFIDENCE AND OPINIONS

Teachers' confidence and opinions about ICT use for T&L affect the frequency of students' ICT use for learning: boosting teacher professional development makes a difference, and appears to be a condition for an effective and efficient use of the available infrastructure.

Students' use of ICT for learning during lessons is related to teachers' confidence level in their own ICT competences, their opinion about the relevance of ICT use for T&L and their access to ICT at school. The *Survey* shows indeed that students have the highest frequency of ICT use during lessons when they are taught by teachers with high confidence in their own ICT operational as well as social media skills and ability to use the internet safely and responsibly, having positive opinions about ICT use for T&L, as well as facing low obstacles and having high access to ICT infrastructure at school. Such teachers are defined in the *Survey* as *digitally confident and supportive teachers*.

On average across the EU countries covered by the *Survey*, between 20-25% of students are taught by *digitally confident and supportive teachers* having high access to ICT and facing low obstacles to their use at school. Here again differences between countries are very large. Between 30-50% of students at grade 4 and/or grade 8 are taught by such teachers in Bulgaria, Estonia, Ireland, Portugal, Slovakia, Slovenia and Sweden; conversely, less than 10% of students at the same grades are taught by such teachers in Austria, Belgium, Cyprus, France, Finland, Greece and Luxembourg. In secondary general education, more

than 45% of students are taught by such teachers in Denmark, Luxembourg, Norway and Portugal; conversely, less than 10% of students are in this situation in Greece, Romania and Turkey. Interestingly, students taught by teachers confident in their own ICT competence and positive about ICT use in T&L, but facing low access and high obstacles to use it at school, report more frequent use of ICT during lessons compared to students taught by teachers having high access and facing few obstacles, but not being very much confident in their own digital competence nor positive about ICT use for T&L. These findings demonstrate that confident and supportive teachers are needed to effectively use ICT infrastructure and exploit its potential; it also shows that teachers are able to make the best use of poor ICT learning environments.

These findings pave the way for strongly recommending to policy makers at central/national, regional, local and school level - to massively invest in teacher professional development as a necessary accompaniment to investment in school ICT infrastructure, however modest. School heads would do well to develop combined efforts to reduce obstacles and provide high access to ICT use at school, investing at the same time in teacher professional development and regularly discussing with teaching staff about ICT use for T&L, an opportunity to be seized by teachers as well. Depending on the school context, obstacles to be reduced can relate to equipment (still), lack of competence and pedagogical models, unclear goals for using ICT or a lack of consensus about it. Regular discussions with teaching staff would not only help to increase consensus about ICT use for T&L at the whole school level, but also develop a starting point for teacher peer learning exchanges on the issue and new ways of 'on the job' teacher professional development. The overwhelmingly positive opinion of teachers about the value and impact of ICT on T&L reveals an opportunity not to be missed for teacher professional development to produce huge benefits and impact. In other words, convincing teachers and school heads about the relevance of using ICT for T&L no longer emerges as a priority, while equipping teaching staff with the digitally based teaching competences and experience they need for transforming positive opinions into effective and efficient practice in the classroom, certainly does.

Policies and actions defined at EU level to support quantitative and qualitative increase in teacher professional development could only reinforce what is needed for schools to play their full role and bring their contribution to 21st century education needs. This support could usefully look at capacity building specifically in the area of new patterns of teacher professional development through online learning communities and other schemes closely integrated into teacher daily practice ('on the job' training, teachers and schools networking on a local/regional basis, etc.). This action at EU level could identify the conditions for the best use of such types of scheme and their mainstreaming, mostly from the point of view of the process related aspects rather than the content ones. EU actions in supporting the production of grounded evidence about the scheme to be used according to the objectives to be reached would be of great help.

3: STUDENTS' USE OF ICT

Students' ICT use during lessons still lags far behind their use of ICT out of school, affecting their confidence in their digital competences.

A key finding of the *Survey* shows that, across countries surveyed, students are more confident in their digital competences when they have high access to/use of ICT at home AND at school compared to students having low access/use at school and high access/use at home, or low access/use at both places². Such higher confidence applies to students' operational ICT and social media skills, their ability to use the internet responsibly, and, to a slightly less extent, their ability to use the internet safely. These students are not just confident in their digital competences but also positive about the impact of using ICT in T&L. Such students, having high access/use to ICT at home AND at school, are defined in the *Survey* as *digitally confident and supportive students*. These findings underline how important it is to effectively develop ICT use during lessons at school for students to become more confident in their digital competence, regardless of the many opportunities some have to use ICT out of school, and even more fundamentally for those still lacking access to it at home.

Across the EU countries surveyed, on average between 30-35% of students are *digitally confident and supportive students*, i.e. have high access to ICT at home AND at school; the highest percentage of *digitally confident and supportive students* is systematically found in Denmark at all grades and Norway at grade 11. Across all the EU countries surveyed, the highest percentage of digitally confident and supportive students is observed at grade 11 in general education, suggesting a particular focus of policies at that education level. Nevertheless, around

² The cluster analysis implemented to analyse the present issue at stake doesn't identify a fourth group composed by students with high access/use at school and low access/use at home.

50% of students at grade 8 and 11 in vocational education still have high access/use at home, but low access/use at school; it decreases to 35% at grade 11 in general education. Even more alarming is that between 18-28% of students, depending on the grade, have low access to/use of ICT at home as well as at school.

These *Survey* findings strongly plead for policy makers at school, local, regional and central/national levels to continue to combine their efforts to increase the number of students to be considered as digitally confident and supportive. The *Survey* findings concerning digitally supportive school and digitally confident and supportive teacher underline how much a systemic approach is the key to success, provided teacher professional development benefit from a large part of the efforts invested. Such attention to teacher competence should be kept in mind when implementing any policy or action even focusing first and foremost on infrastructure, including those related to mobile devices and 1 to 1 schemes. Policy makers also have to dedicate specific attention to offer access/use to ICT at school specifically to students not having access/use at home. Here as well, the efforts do not have to concentrate only on equipment matters; they also have to address the issue of effectively using ICT during lessons, implementing policies that have already been mentioned above concerning ways to support the development of digitally supportive schools and digitally confident and supportive teachers.

European policies should support all the above-mentioned policies needed to boost the development of digitally supportive schools and digitally confident and supportive teachers and students, by monitoring progress in all Member States. Special attention should be dedicated to countries where the effective use of ICT in T&L still lags far behind education systems in other countries.

The challenge to reach balanced progress throughout all the EU countries is particularly key as the Survey findings reveal that education systems characterised by a high percentage of digitally supportive schools include a large percentage of digitally confident and supportive teachers or students as well, or the reverse. It suggests that systemic actions, developing specific policies to use ICT in T&L, incentives, teacher professional development programmes, concrete support measures, etc. in parallel are on the right track and bring improvement. It also pleads for the education systems still far behind, to implement such systemic approaches as a priority and to be supported in this direction.

The *Survey* also examines – as reported below – each of these areas in more detail, as well as a combination of elements within each area to understand how they interact to provide the best possible ICT setting for high quality teaching and learning.

CRITICAL FACTORS IN ICT IN EDUCATION

The *Survey* identifies and analyses a range of important **factors which influence how successfully ICT is deployed in school teaching and learning**. This part of our summary picks out some of the more striking findings.

ICT INFRASTRUCTURE: HOW WELL EQUIPPED ARE OUR SCHOOLS?

The benchmark for a **highly ‘digitally equipped school’** means that a school should have relatively high equipment levels, fast broadband (10mbps or more) and high ‘connectedness’ (e.g. having a website, email, a virtual learning environment and a local area network). According to the *Survey* findings, across the EU 37% of grade 4 students, 24% of grade 8 students, 55% of grade 11 general students and 50% of grade 11 vocational students attend such schools. There are great differences between countries in terms of percentages in high and low levels of such schools.

There are **between three and seven students per computer** on average in the EU; the older the student the lower the student to computer ratio in most countries. Laptops, tablets and netbooks are becoming pervasive but in some countries only; on average in the EU there are between eight and 16 students per laptop at grades 4 and 11 vocational respectively. There are on average over **100 students per interactive whiteboard** and **50 per data projector**. More than **9 out of ten students are in schools with broadband**, generally from 2 to 30mbps, on average in the EU. Most schools are ‘connected’ at a basic level, that is, having a website, email for students and

teachers or a virtual learning environment (VLE). One in four grade 4 students is in a school with a VLE, rising to almost two-thirds in vocational schools.

Trends

There are now around twice as many computers per 100 students in secondary schools as compared with 2006 - but the wide variations between countries reported in 2006 persist.

Laptops and interactive whiteboards are now extensively in place unlike in 2006. There is a trend towards smaller and portable computers, away from desktop computers in 2006 to laptops and personally owned devices such as mobile phones in 2011.

Broadband is now almost ubiquitous in schools, while in 2006 this was in place in less than three-quarters of schools.

The percentages of schools with websites, email for teachers and students, and a local area network have increased in all the levels of education surveyed.

The *Survey* findings concerning ICT infrastructure show that education systems are responsive to technological trends, for example implementing equipment policies reflecting recent trends in mobile devices - making laptops, netbooks, tablets, etc. pervasive – as well as equipping schools with interactive whiteboards and fast broadband; it seems that the priority is often to concentrate these efforts at first at secondary education level. Although the *Survey's* evidence points to progress as regards infrastructure, such policy efforts nevertheless still need to be increased if the majority of students, at all grades, are to be in highly *digitally supportive schools* as defined above. Policies to support better infrastructure are still needed, and as a matter of urgency in those countries lagging far behind others.

ICT IN SCHOOLS: HOW WELL IS IT USED?

There are **wide variations in the degree of use of the ICT equipment available**. Grade 11 vocational students are more than twice as likely as those at other grades to be in a school where teachers use ICT equipment in the majority of lessons. At other levels, one in five grade 8 students in the EU never or almost never use a computer, and one in two grade 8 and 11 students never use an interactive whiteboard, and one in four students is in a school where the teacher uses ICT in fewer than one in 20 lessons. On average in the EU more than half of secondary school students use desktop computers at least once a week, and one in three grade 8 students use an interactive whiteboard at least weekly. 28-46% of students say they use their own mobile phone for learning purposes in schools at least once a week. Whether sanctioned or not – and it increasingly is – students appear to be bringing their own technology into school, and using it for learning.

There is **no correlation at EU level between level of computer provision in schools and frequency of use by students**.

Trends

Almost all teachers at all grades have used ICT to prepare lessons and more than four out of five have used ICT in class in the past year, an increase since 2006. However, the percentages of teachers using ICT in more than 25% of lessons has not increased since 2006.

Percentages of teachers reporting resource-related or pedagogical obstacles to the use of ICT have declined, particularly amongst those stating that the benefits of ICT are unclear.

There is a debate on whether the major obstacle to ICT use is insufficient ICT equipment and technical support rather than pedagogical issues: in general, teachers are more concerned about pedagogical inhibitors than head teachers.

According to the *Survey* findings, the need for specific policies and actions substantially to increase ICT use in T&L during lessons is clear. The basic condition required for this to happen is the availability of operational equipment at the right place and time, in the classroom, where students' learning mostly takes place. However, mere provision of equipment is not a sufficient condition for its use, as we have seen previously when reporting students' higher frequency of ICT use when taught by *digitally confident and supportive* teachers, even in low ICT access conditions, compared to students' ICT use when taught by teachers who are neither confident nor supportive but have high access to equipment. For infrastructure to be effectively used, *digitally competent and supportive teachers* are needed. In other words, policies and actions substantially to increase ICT use in T&L are intrinsically a matter of teachers' professional development as well as discussion with teaching staff at whole school level about the relevance and goals of ICT use for T&L.

WHAT ARE TEACHERS' AND STUDENTS' EXPERIENCES IN ICT BASED LEARNING ACTIVITIES?

Across the EU, **around 75% of students at all grades are taught by experienced teachers with more than four years of using ICT at school.** Teachers with less than one year of ICT experience are extremely rare. Using ICT for teaching preparation is most common, with 30-45% of students being taught by teachers using ICT in this way every day or almost every day, or at least once a week.

Creating digital resources, and using the school website or virtual learning environment also takes place every or almost every day, or at least once a week, for teachers of around respectively 30% and 20% of students. But between 60% and 85% of students are taught by teachers who say they never or almost never communicate online with parents, assess students using ICT, evaluate digital resources, nor post homework for their students online.

Students' computer experience from home is greater than at school. Between 80% and 90% of students have more than four years of experience at home compared to 40-60% of students in this situation at school.

The **low use of digital resources and tools** is a concern. Digital textbooks and multimedia tools are the resources most frequently used. However, only 30% of students use them once a week or almost every day, but more than 50% of students at all grades never or almost never use such resources.

The *Survey* findings make the case for developing concrete policies and actions substantially to increase ICT based learning activities during lessons, exploiting the full potential of ICT to support students' in-depth learning and construction of knowledge through the use of simulation tools, learning/serious games, data-logging software, etc. Specific policies and actions should also be developed to exploit more fully the potential of ICT for communicating with students and parents, re-visiting student assessment practices, creating or evaluating quality digital learning resources, etc. Suitable professional development schemes, supporting teacher peer learning exchanges and cooperation with ICT-based learning experts, could certainly bring about an increase in ICT-based learning activities. Making easily and widely available to teachers examples of ICT-based learning activities and scenarios, validated by evidence as having a positive impact on learning, and flexible enough to be adapted to different school/class contexts, would also lead to progress. Policy makers at all levels should consider encouraging teacher professional development stakeholders (including those in initial teacher education) to develop and integrate such material in courses.

HOW CONFIDENT ARE TEACHERS AND STUDENTS IN ICT?

If we look at **teachers' professional development** across the EU, only about 25% of students at grade 8 and 11 and 30% at grade 4 are taught by teachers for whom ICT training is compulsory. Although ICT training forms part of initial teacher education in over half of EU countries, implementation varies according to the higher education institutions providing the training, and in a large portion of EU countries those institutions are free to adopt their own approach. Across the EU, around 70% of students at all grades are taught by teachers who have engaged in personal learning about ICT in their own time.

Across the EU, around 60% of students at grades 4 and 8 and around 45% at grade 11 (general and vocational education) are taught by teachers who have participated in equipment-specific training, while around 50% of students at grades 4 and 8 and around 40% at grades 11 (general and vocational education), are taught by teachers who have undertaken courses on the pedagogical use of ICT in the past two school years.

Teachers' confidence in using ICT can be as crucial as their technical competence, because confidence levels can have potential influence on the frequency with which teachers use ICT-based activities in the classroom. This is confirmed by the positive correlation found in the data of this survey between teachers' confidence in their operational use of ICT and their use of social media and the frequency with which they use ICT based activities across all grades; in other words the more confident teachers are, the more they use ICT based learning activities during lessons. Participation in professional development also has a positive effect on teachers' confidence in both their operational and social media skills.

In terms of **students' confidence in using ICT** (e.g. operational, social media): students across the EU in all grades have a higher mean score in their confidence to use the internet safely and a lower mean score in their confidence to use social media than in any other component of ICT competence.

Trends

Teachers' self-declared confidence levels in ICT skills such as word processing, using email, preparing a multimedia presentation and downloading and installing software have increased in most cases.

Policy makers should consider increasing suitable provision to meet the need and demand for training and professional development identified in the *Survey*, as shown by the large proportion of teachers spending their own free time learning about ICT and exploring its possibilities for teaching. New ways of training, supported by ICT and using online facilities, should be piloted and implemented, with support designed appropriately at central/national, regional, local, and school level. Support action at EU level would also be welcome, using the European territory as a large field for investigation to support testing and analysis of mainstreaming conditions of interesting schemes in this area.

WHAT ARE THE POLICIES AND STRATEGIES AT SCHOOL LEVEL?

Just over one in two students are in a school where the use of ICT for T&L is discussed between school leaders and teachers. Formalised school policies (written statements) about using ICT precisely in general or in subjects also exist to a similar extent and concern around 50% of the students at all grades. Holistic formalised school policies, covering ICT use in general AND precisely in T&L AND in subjects, are much rarer: only around 20% of students are in such schools. Higher percentages of students are in this situation in Denmark, Turkey, and Slovenia, while lower percentages are evident in Austria, Croatia, Italy and Greece. The picture is fairly similar throughout the grades.

Plans and measures to support collaboration among teachers exist in schools, but still to a limited extent, not concerning the large majority of students. Around 50% of students are in schools where there is a policy to promote cooperation among teachers or time scheduled for them to share, evaluate or develop instructional material and approaches. Around 35% of students are in schools having both, i.e. a policy and scheduled time. In Romania and Italy, the percentages are higher, contrary to Austria where such an approach is much less frequent. The picture does not differ very much between the grades.

Schools are adopting policies about responsible internet use and, to a lesser extent, the use of social networks for T&L. A majority of students (60%) are in schools where there is a policy about the responsible use of the internet; a large minority of students (40%) are in schools where a policy about safe internet use exists. Around 30% of students are in schools which have both. Slovakia, Croatia and Austria have the highest percentages of students going to schools which have both.

The two most frequent incentives used to reward teachers for using ICT in T&L are additional ICT equipment for the class and additional training hours for the teachers; the more grades increase, the more frequently they are used. Between 30%-45% of students are in schools implementing one or the other, and between 20%-25% have both. Competitions and prizes, as well as financial incentives are less frequent, except in the Eastern countries. Reduction of teaching hours is almost never used as an incentive.

ICT coordinators are frequently found in schools: between 65%-80% of students (slightly less at grade 4) are in schools with a designated ICT coordinator, full time in only one case out of two (even less at grades 4 and 8), rewarded in one case in two, and providing pedagogical support in three cases out of four.

These policies, strategies and support measures are developed in a context in which a large majority of both school heads and teachers are **positive about ICT use** – for retrieving information, doing exercises and practice, and learning in an autonomous and collaborative way – **and its impact**: on motivation, achievement, transversal skills and higher order thinking skills. Both school heads and teachers strongly agree about ICT's use in T&L being essential for students in the 21st century. A large majority of students at all grades share these positive views about the use and impact of ICT on T&L.

WHAT'S THE BOTTOM LINE?

Where does all this data and analysis take us? What are the lines of action for everyone involved? The *Survey* picks out some areas where those concerned – especially policy-makers at national, regional and school levels – should consider further steps.

In general terms, the *Survey* findings make the case for **strengthening public action** at institutional, local, regional, national and European levels, to boost ICT use at school so as to reduce the gap between ICT use in and out of school – a gap identified many years ago but still persistent in 2012 - and give greater opportunities to about 30% of 16-year-old students lacking adequate home access to ICT to experience it at school. Findings of this *Survey* plead to orientate such public action preferably towards **building capacity for ICT pedagogical expertise** at school level. It also suggests investigating in more detail why digital learning resources are not used more, and ways to improve the situation, by increasing public/private partnerships with publishers, developing teachers' online communities for content creation and open content products, etc.

Evidence shows also that increasing **professional development opportunities for teachers** is efficient way of boosting ICT use in teaching and learning, since it helps build highly confident and supportive teachers. This seems only sensible given that teachers' opinions about the impact of using ICT for learning purposes are already very positive and about 80% of students are in schools where the school head also shares such positive views. Countries might be wise to ensure that ICT training – consistently specified and applied – is made a compulsory component of all initial teacher education programmes

Despite having access and positive attitudes towards implementing ICT in teaching and learning, teachers often find this difficult and require **support – not only technical but also pedagogical**. Increasing the training provided by school staff and others to teachers of all disciplines should therefore be encouraged, including subject-specific training on learning applications. Online professional collaboration between teachers can also lead to effective changes in their practice, and a deeper awareness of their own professional development needs. Although online resources and networks are widely available in Europe, they are a relatively new way for teachers to engage in professional development, and only a minority are exploiting their benefits. There is a need therefore to further promote such online platforms and the opportunities they can afford to the European teaching community.

The *Survey* results point to a number of policy actions at all levels of the system to ensure optimal use of increasingly tight financial resources. The availability of the dataset should facilitate further valuable research work at national and European level, as well as at school level.

All materials produced in this survey, including 31 country profiles, the questionnaires, tables and the data set, are freely available at <https://ec.europa.eu/digital-agenda/en/pillar-6-enhancing-digital-literacy-skills-and-inclusion>.

