

INNOVATIVE TOOLS IN THE CLASSROOM: IMPLICATIONS FOR LEARNING STYLES AND GENDER



Briefing Papers, published monthly, aim to present the findings of the *Survey of Schools: ICT in Education* on a specific topic, relating them to the results of European Schoolnet's projects.

Survey of Schools: ICT in Education provides detailed, up-to-date and reliable benchmarking on ICT in school education across Europe, painting a picture of the use of technology for learning in schools; from the provision of infrastructure to teachers' and students' use, confidence, and attitudes.

Based on over 190,000 responses from students at grade 4, 8, and 11, in general and vocational education, from their teachers and head teachers, in schools randomly selected in around 30 European countries, the *Survey* questionnaires were administered online and answers analysed during the school year 2011-12.

The *Survey*, commissioned by the European Commission (Directorate General Communications Networks, Content and Technology), was conducted in a partnership between European Schoolnet and the University of Liège (the Service d'Approches Quantitatives des faits éducatifs, Department of Education).

The *Survey* and all the *Briefing Papers* are available here: www.eun.org/observatory/surveyofschools

The next *Briefing Paper* will be published in May 2014.

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European Schoolnet is the network of 30 European Ministries of Education, based in Brussels. As a not-for-profit organisation, we aim to bring innovation in teaching and learning to our key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners.

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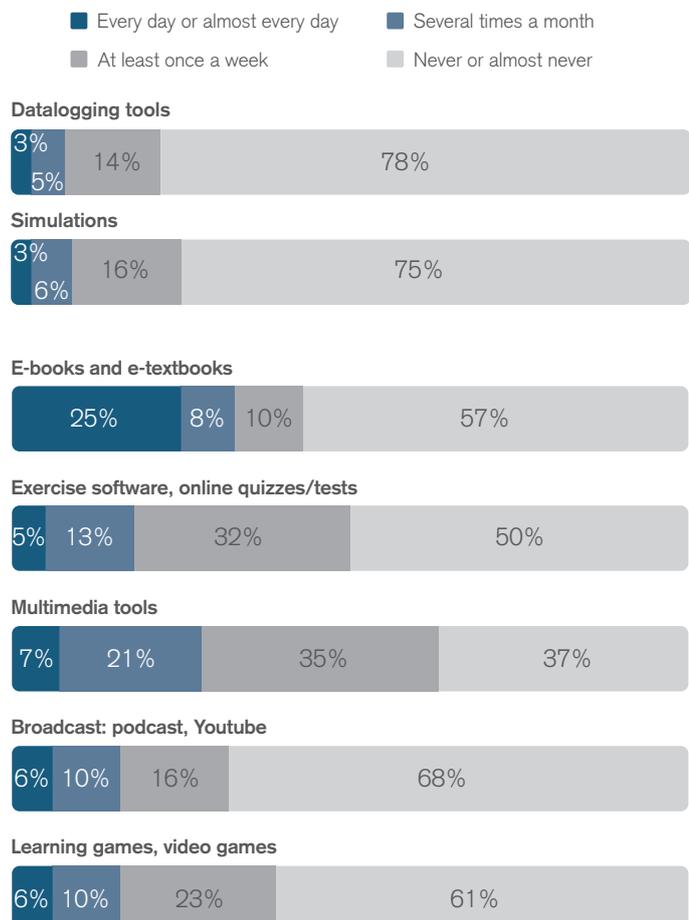
To which extent do students use innovative tools and resources in the classroom?

From exercise software to data loggers, from computer simulations to e-textbooks, ICT is providing education practitioners with more and more opportunities to use innovative tools and resources with their classes. However, results from the *Survey of Schools: ICT in Education* suggest that such potential is not being sufficiently exploited.

In the *Survey*, students were asked how often they used a number of tools and resources in the classroom, using a 4-level scale ranging from 'never or almost never' to 'every day or almost every day'. As figure 1 shows, between 50% and 78% of students at grade 8 never use computer simulations; data-logging tools; digital books and textbooks; exercise software, online quizzes and tests; multimedia production tools; broadcasting tools; or digital learning games and video games. Such percentages become even higher at grade 11, both in general and vocational education (figure not shown). The most frequently used tools at all grades are digital books and textbooks and multimedia tools, i.e. PowerPoint presentations and audiovisual materials. In contrast, simulations and data-logging tools are very rarely used, with 73% to 80% of students at all grades never using them.

The *Survey's* students' questionnaire does not allow to differentiate the use of tools and resources by subject. However, one can infer that simulations and data-logging tools are particular to science classes. As the *Special Focus* of this issue is dedicated to Scientix and science teachers, this briefing will thus concentrate on the analysis of the relationship between teaching and learning style and using simulations and data-logging tools.

FIG. 1: Percentage of students using resources and tools during lessons at grade 8 (EU level, 2011-12)



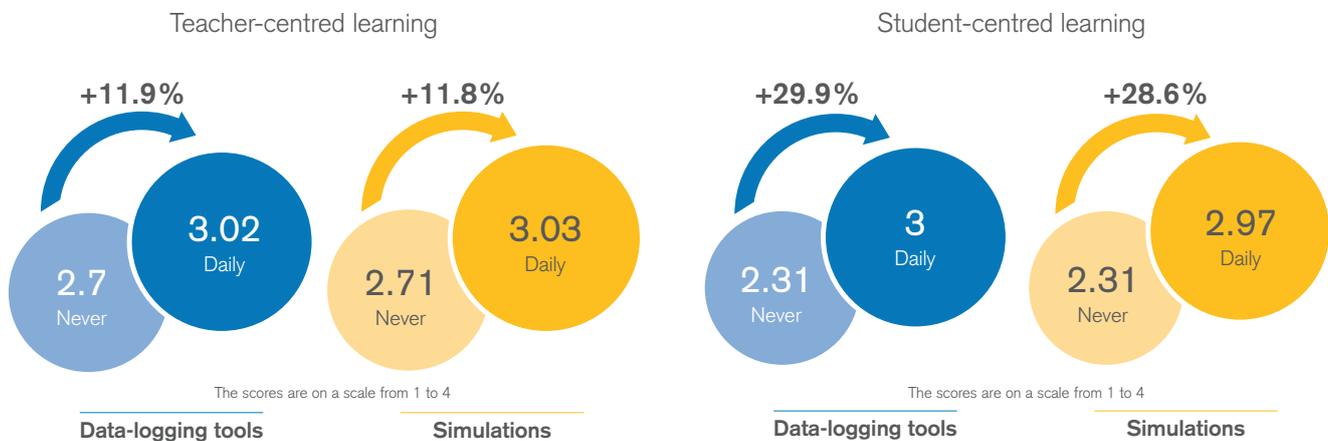
What is the relationship between the frequency of use of simulations and data-logging tools and the teaching and learning style?

Although only about 3% of students at grade 8 use simulations and data-logging tools daily or almost daily, results from the *Survey* indicate that teaching and learning styles are related to such practices. In figure 2, for each type of tool, two subsets of students at grade 8 are observed: those who use the respective tool never or almost never, and those who use it every day or almost every day. This allows to compare the extent of teacher-centred and student-centred learning styles.

More precisely:

In the *Survey's* questionnaires, students were asked how often they were engaged in a list of six activities, with or without ICT, ranging from listening to teacher presentations or explanations to working in small groups. Students could measure the frequency of engagement in such activities using a scale ranging from 'never or almost never' to 'every day or almost every day'. On the basis of this information, a factor analysis yielded a score representing 'teacher-centred activities' and a score from 1 to 4 representing 'student-centred activities'. This also takes into consideration that the two types of learning styles are not mutually exclusive and usually coexist.

FIG. 2: Relationship between use of tools and the teaching and learning style at grade 8 (EU level, 2011-12)



It is interesting to note that scores for both teacher-centred and student-centred learning style are higher when data-logging tools and simulations are used on a daily basis. However, the extent of the increase is quite different. When the two types of tools are used every day or almost every day, the score for teacher-centred learning style is, for both, almost 12% higher than when they are never used. This gap becomes strikingly higher when it comes to the score indicating the student-centred learning style: students who use data-logging tools and simulations on a daily basis are associated with a student-centred learning style score that is, respectively, 29.9% and 28.6% higher than students who never use these tools. This trend is confirmed, and even reinforced, at grade 11 in general education, when the daily use of data-logging tools and simulations leads to a respective increase of 32.3% and 33.5% in the score attributed to the student-centred learning style (figure not shown).

An analysis of the relationship between the use of all the tools presented in figure 1, and not included in the figures above, and the learning style also suggests that using exercise software and multimedia tools daily is associated to a significant boost in the student-centred learning style score, with an increase of 36.3% and 28.6% respectively at grade 8, and 32.6% and 33.5% respectively at grade 11 in general education. In sum, these findings only confirm that the use of ICT based tools in the classroom and the learning style that places students at the centre of the learning process are closely associated.

More precisely:

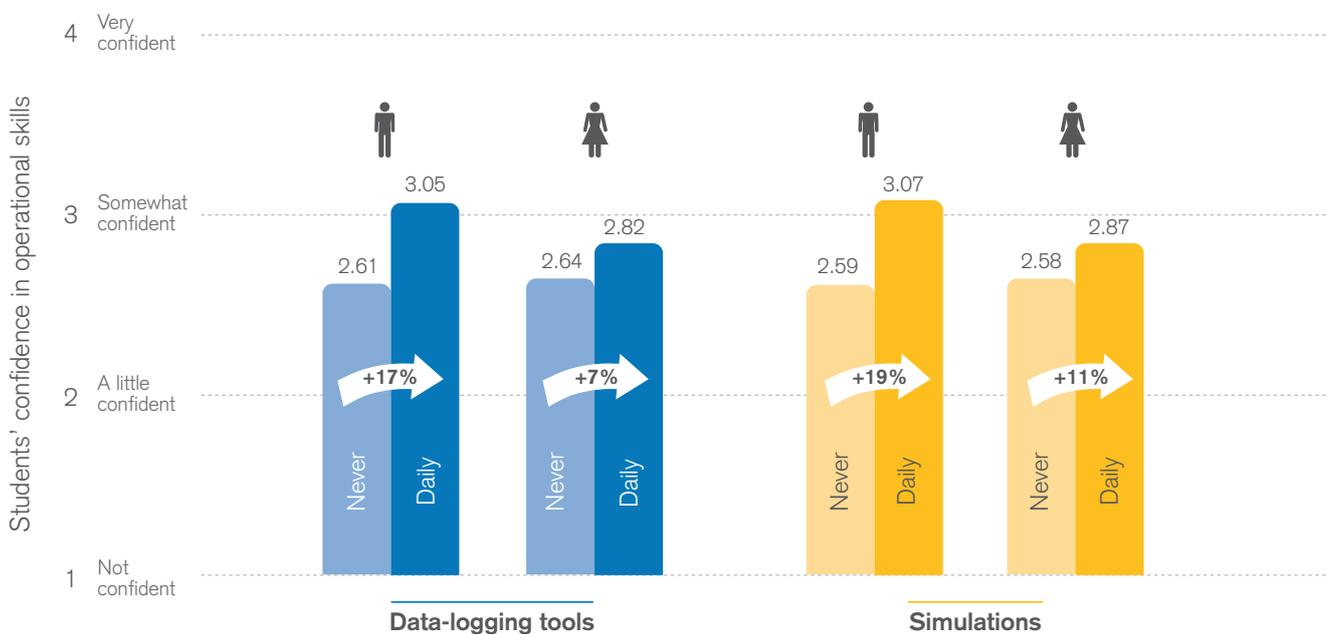
In the *Survey*, the following definitions are adopted: 'student-centred learning is a learning model that places the student at the centre of the learning process, i.e. students are active participants in their learning; they learn at their own pace and use their own strategies; learning is more individualised than standardised. Conversely, teacher-centred learning is characterised by the transmission of information from a knowledge expert (the teacher) to a relatively passive recipient (student/learner) or consumer.'

What is the relationship between the use of tools and resources and students' confidence in their operational skills? Are there any differences by gender?

As figure 3 shows, students who use data-logging tools and simulations on a daily basis show higher levels of confidence in their operational skills, as measured on a scale ranging from 'Not confident' to 'Very confident'. However, the differences among genders, in both absolute and relative terms, are quite striking. Girls seem to express lower levels of confidence in their operational skills under all circumstances, even though the difference between boys and girls in the case where tools are never used is extremely small. This gap significantly increases in the scenario of daily use of resources: not only do boys report relatively higher levels of

confidence, but in their case the increase in the confidence score is almost double. Switching from the scenario of no use of data-logging tools to their daily use, the score indicating students' confidence in their operational skills increases by 17% for boys and only 7% for girls. Likewise, in the case of simulations, the increase amounts to 19% for boys and only 11% for girls. The picture at grade 11 is quite similar to grade 8, with boys expressing higher confidence levels than girls. However, the confidence scores at grade 11 in general education are higher than at grade 8, and the increase in the gap between genders in the two scenarios is not as large.

FIG. 3: Relationship between use of tools and confidence in operational skills at grade 8, by gender (EU level, 2011-12)



Conclusions

Obviously, a number of other factors are not captured in the analysis above that can affect the teaching and learning styles, as well as students' confidence in their operational skills. However, the results presented in this *Briefing Paper* provide us with some important confirmations and suggestions for policy.

Firstly, it is evident that the use of innovative tools and resources during classes is still too limited. Although PowerPoint presentations, e-books and e-textbooks and exercise software are increasingly being used by students during class at least once a month, other tools such as data-loggers and simulations, which are vital to make science learning interactive and engaging for students, are still very rarely used during lessons. This *Briefing Paper* showed that there are important differences in terms of teaching and learning styles when such instruments are regularly used in the classroom, with daily or almost daily use being associated with a learning style centred on the needs and abilities of students. Finally, gender disparities are certainly present: boys and girls are not benefitting equally from the enhanced use of innovative tools and teaching methods. This finding clearly calls for gender-sensitive policies and strategies aimed at ensuring that girls also take advantage of the benefits of a more student-centred approach. This is especially true for a subject like science, given the chronic shortage of women choosing science education and careers.

Project Focus: Scientix, the community for science education in Europe

The Project Focus page links the main findings from the *Survey of Schools: ICT in Education* analysed in each issue of the *Briefing Papers* with one specific project coordinated by European Schoolnet.

As this issue explores innovative tools in the classroom, particularly in terms of learning styles and gender implications, we asked Dr. Agueda Gras-Velazquez, European Schoolnet's Science Programme Manager and project manager of Scientix, to explain how Scientix is contributing to the aforementioned issues.

Scientix (www.scientix.eu) promotes and supports Europe-wide collaboration among STEM (science, technology, engineering and maths) teachers, education researchers, policymakers, and other STEM education professionals.

Q1: How is Scientix contributing to mainstream the use of innovative tools and resources in the classroom?

Year after year, hundreds of science education projects are funded, but apart from the persons directly involved in these projects (teachers, project managers, etc.), not many people hear about the results, especially when the projects are over. During the first 3 years, Scientix collected information from more than 200



projects, and over 1,000 teaching and learning materials developed by national or European STEM projects. By collecting and re-disseminating these materials, we ensure that the knowledge and results of the projects reach out to a larger audience.

Q2: How is Scientix trying to attract more girls into science education and careers?

Scientix is supporting projects and initiatives which encourage a more gender-neutral education, and encourage both girls and boys to go into STEM degrees and careers. For example, in 2012 the European Commission launched the campaign 'Science it's a girl thing!' to encourage girls aged 13-18 to study science. 'Science: it's a girl thing!' is based upon the active participation of women scientists acting as role models for young girls. Up to now, more than 100 STEM professionals have contributed to the campaign through various activities: participation in events and workshops

with teenagers; video portraits; chats on the Facebook page to talk to girls about their careers and passion for science; photos of their professional and private life for the 'Instant Science' photo album. Through a partnership with Scientix, the campaign is now addressing teachers as well. To this end, a brochure to promote gender equality in the classroom is under preparation, and will be finalised with the support of science teachers and science education/gender experts. More activities for teachers on gender will be organised in collaboration with 'Science: it's girl thing!' over the course of 2014.

Q3: How can different stakeholders become involved in Scientix?

The main stakeholders of Scientix are teachers, researchers and project managers in STEM education, and policymakers. Each of these groups can benefit from Scientix activities and events.

Teachers:

- Browse through the Scientix resource repository and find inspiration for their classes
- Get involved in European STEM education projects
- Participate in the national and European workshops and professional development courses
- Join the 2nd Scientix Conference, 24 - 26 October 2014 in Brussels
- Participate in online training, webinars, or communities of practice

Researchers / project managers:

- Add their projects in the portal and browse through the project reports library
- Find teachers or schools to collaborate with in the Scientix public profiles directory
- Participate in the Scientix networking events for STEM education projects
- Co-organise an event with Scientix, increasing their project's dissemination and participants
- Present their project at the Scientix Conference

Policymakers:

- Get information about national strategies on STEM education
- Keep up-to-date with developments in STEM education research and practice via the Scientix observatory
- Get in touch with the STEM education community at the Scientix Conference



[scientix_eu](https://twitter.com/scientix_eu)



[Group: Science Teachers in Europe](https://www.facebook.com/scientix_eu)



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