

School technology through the eyes of its users

Report of a roundtable discussion on learning with information and communications technology, in schools and at home - between 29 students age 17-20, representatives of OECD governments, and local public and private partners in Aix en Provence.

Report received from Donald Hirsch, rapporteur general.
A final version will be published with the papers for the roundtable

The short history of information and communication technology in schools has been filled with promise and disappointment.

Over the past decade, the world has been waking up to the enormous potential of computers to transform education. The first reaction of the education world to the information technology revolution was to worry that students would lack “computer skills” necessary for adult life, and to focus on instruction in computer literacy. The second reaction was to realise that information technology could in fact be a powerful tool in the service of mainstream education itself. At best, it might transform teaching and learning in ways that empower students to become self-directed learners, with teachers playing a new yet still essential role in facilitating this process. From the late 1990s the possibilities expanded still further when the mass availability of the internet made it possible to access a wealth of knowledge instantly, and to communicate in new ways. IT became ICT.

Yet some ten years after the OECD and others started pointing to the huge opportunities that computers bring to education, schools do not seem to be realising the full potential of ICT. Most teachers, it would appear, lack sufficient training or a real understanding of what technology can deliver. Physical resources remain unequally distributed, both in schools and, to an even greater extent, in students’ homes. Software is of at best uneven quality. The internet is a jungle for which most students lack adequate maps. The result is that while some students are using ICT in wonderful new ways, most are not using technology to transform the way that they learn – whether because they lack sufficient access, know-how or motivation.

But how exactly are schools then using the vast resources now being spent on their ICT (an estimated \$16 billion and rising), and what are the obstacles to better usage? Whom better to ask than the students themselves? Those who have passed through secondary school during the 1990s have first-hand experience of the developing use of ICT in the classroom. Unlike their teachers, they have always taken for granted that computers are part of life and part of education. Many have the imagination and vision to see what could be done, and the fresh perspective of the young to observe critically what has been and is being done. In a number of classrooms today, it is students rather than teachers who understand most about the technologies being used. This combination of circumstances offers a unique opportunity to ask the “user as expert” to help evaluate a topic of central importance to the future of OECD education systems.

That is why the OECD brought together 29 students from most of its member countries to discuss with policy makers their perceptions of the use of ICT for learning in schools and at home. This roundtable, held in Aix-en-Provence in December 2000, was the culmination of a year-long set of email contacts in which the students exchanged their experiences and views, producing a detailed report on the use of educational software and the internet at school and at home, and on the “digital divide” between the “haves” and the “have nots”¹. At the roundtable, these views were presented and discussed by the students, with the participation of government officials from across the OECD, and with the public national authorities and their private partners as well as local and regional authorities in the Provence region.

The roundtable was undoubtedly a successful learning experience for all concerned, but most particularly it demonstrated what system providers and administrators could learn from users. (As such it was a highly innovative experiment by the OECD’s Centre for Educational Research and Innovation: it showed that users can not only be represented, but can become the driving force, in such a discussion.) The students confirmed many existing impressions about positive and negative aspects of ICT usage, but also brought a host of new perspectives. Most importantly they showed how, behind simplified impressions such as the view that teachers are inadequately trained in ICT skills, lie a complex set of relationships and practices that need to be worked on if things are to improve. Nor did they present a homogeneous picture: their views and experiences coincided on many aspects, but differed starkly on others.

This report of the conference picks out some of the salient lessons that came out of the roundtable discussion and the students’ own year-long deliberations. The project yielded a wide range of insights about what encourages and hinders the best use of technology in schools. These can be grouped as follows:

- First, it is *people*, and the way they develop relationships with each other and with computers, rather than the flow of electrons within the computers, that determine whether technology is used well. Much of the discussion focused on relationships between students and teachers, and among students themselves.
- Second, there is great potential for *teaching and learning methods* to be changed fundamentally by ICT. But the students did not think that this had yet happened, with computers mainly being used to do old things better rather than something fundamentally new. The students wanted to move things forward, but insofar as they had revolutionary ideas about education, they were Mensheviks rather than Bolsheviks: the consensus was for gradual change, taking care to develop teacher and learner roles in ways that would work, rather than overthrowing all that had come before.
- Third, the *places* or context in which learning occurs – whether in the classroom, the computer lab, at home or in the community – affect profoundly the process of learning with computers. Students had found, as much through the development of practice as from any conscious policy, that certain types of

¹ This Background Report, report, *Student Views on Learning with Information and Communication Technology*, can be obtained from <<http://bert.ed.s.udel.edu/oecd/roundtables/roundtablesframe.html>>

computer-based learning thrive at home, and other types at school, and that habits have developed accordingly.

- Fourth, local *cultures* must be linked strongly into the use of computer-based resources. Although it had not been a major part of their brief, many students put a strong emphasis on resisting the domination of monocultures and monopolies in the light of globalisation: most particularly, they wanted to be slaves neither to the English language, nor to the American culture, still less to a company with a dominant market position, such as Microsoft.

- Fifth, the way in which *technologies* themselves are developed and accessed continues to be of prime importance, even though in the four ways listed above the problem cannot be seen as purely technological. Even as technological competence continues to advance, so do expectations of them, and there is a lag insofar as the technologies often do not work for students as they had hoped. Sometimes this is also linked to a resourcing lag. These consumers, as for any product, will not be impressed by the design of educational technology, however imaginative, if it does not work as advertised.

(i) ICT and people: a complex web of relationships

“The potential for using teaching and learning will not be realised unless teachers are well trained and retrained in the uses of information technologies.”

This opinion is not new. In fact, it was stated by a senior OECD official in a conference in 1991. The importance of well-trained teachers was still seen as central by the students and national delegates at Aix. Our teachers must know what they are doing, said the students. They must understand the software they are using. Too often things go wrong in class because there is insufficient understanding or preparation by the teacher.

Yet making things work well was seen as a far more complex matter than simply ensuring that teachers are well-trained in the use of computers.

The teachers themselves require more than just a competence in ICT. They also need a vision of how it can be used as a teaching tool. In the analogy of learning to drive a car, said one national delegate, “Even teachers who have learned how to drive may not know how to read a map”: they may lack a sense of direction, or strategy. “We have realised”, said another, “that the key relationship is between the content of the software and the competence of those who are using it”.

The students did not expect that their teachers could go off on courses and come back as computer experts who could show them exactly how to use software and internet resources. They recognised that teachers are under many pressures to learn new things, and that often the person in a class who knew the most about a particular piece of technology was not the teacher but one of the students. This is not necessarily an indictment of the teacher, but is an inevitable result of the fact that knowledge of the

working of a particular computer process tends to be proportional to the amount of time one has had to practice using it.

To this extent, learning about technology was bound to be a joint experience between teachers and students, with the teacher playing less the role of “master” than of “team member”. This also ties in with the teacher becoming a facilitator who helps give students access to knowledge via the technology, rather than being the direct source of knowledge and instruction.

Yet some students warned about taking this change in relationships too far. Weaker students needed guidance and motivation, which cannot necessarily be provided by a computer. Students at the roundtable challenged the assumption that, because young people feel happy with computers, all of them would be automatically be motivated by computer-based learning.

Here, the perspectives of young people growing up in the computerised world turned out to differ considerably from that of many adults observing them. The adults see students who feel comfortable with a mouse, a keyboard and a screen, and perhaps conclude too readily that they have the capacity and motivation to learn through ICT. The young people themselves, however, note big differences between different kinds of computer use. A student who spends time on the Playstation at home may be no more enthusiastic about using educational software than a comic-book fan is about reading novels. The tendency of personal computers with office-type software to be concentrated in the homes of more educated parents, and for less advantaged families to buy games consoles, can help accentuate cultural divides.

Thus the teacher may be faced, within a single classroom, with a combination of students who are extremely knowledgeable in ICT and those who need close instruction in how to use it for learning purposes. A logical response, it would seem, is to use the former to help teach the latter. This further possible development of classroom relationships was treated with caution by many of the students. They feared a lack of willingness on both sides. Among weaker students because they did not like admitting that they had to be helped by their peers (although it was suggested that this was more likely for boys than girls); among stronger ones because they may not see the benefit of spending time teaching others which might otherwise be used to progress themselves. Moreover the students who are strong in ICT skills may not always be the best pedagogues. All these considerations made it clear that any pairing of stronger and weaker students would need to be carefully designed. Ideally it should be voluntary for both sides. Students may need incentives to be “teaching assistants”, for example getting some form of academic credit. And it should not be automatically assumed that they could take on the role of teacher without some form of guidance themselves.

So the relationship between teachers and technology, between teachers and students and among students themselves all need to be carefully developed within schools. Less was discussed about relationships outside school, although they were clearly important. The students at the roundtable all used computers at home as well as at school. Here, their position seemed to be largely autonomous, since they tended to know more about technology issues than their parents, and some even took the lead in purchasing the required equipment. But practical issues, such as the way family

members divided time on shared computers, could be significant for individuals. So could resourcing issues, such as how often equipment was updated. Thus parents can also play a significant role in the new set of relationships that set the context for learning with technology

(ii) ICT, teaching and learning: a quiet revolution?

Closely related to the new human relationships that technology can bring to education is its potential to transform teaching and learning itself. Computers allow students to acquire knowledge in many new ways. An early vision of this change was that students would simply become more autonomous: they would interact with software rather than rely on the teacher for instruction. In practice, the impact of technology seems more complex. On the one hand, the importance of the teacher is being re-emphasised. On the other, the potential for using communication with others outside the classroom is being explored as a learning tool.

The students who met in Aix felt strongly that educational software in the classroom had been most useful when it was used as an auxiliary teaching tool. CD-ROMs provided good ways of allowing students to work on topics at their own pace, of putting information at their disposal more easily than requiring them to carry round a pile of books, and of “bringing a subject to life” for students through multi-media simulations. But these functions complemented existing teaching practices, helping to deliver the existing curriculum, rather than changing it.

In principle, learning through the internet is more transformational than that. It allows the student to become both a researcher and a knowledge producer – by finding out information from a wide range of resources, and potentially communicating it to others. But the internet is newer in classrooms than CD-ROMs, and students found that it is not on the whole being used in a very sophisticated way. It became evident in the roundtable discussions that there was a dual difficulty: on the one hand a gap in understanding by teachers and students of how to use the internet well, and on the other a structure of classroom learning that did not help to close that gap.

The understanding gap arises from the fact that, while the internet offers huge potential for learning, it is not designed for educational use (indeed it is not “designed” at all). Using it well therefore requires particular skills, for example how to search for information and, just as important, how to discriminate between good and bad information. Neither teachers nor students necessarily have these skills, or strategies to acquire them. Educational portals can, to some extent, help, and a strong conclusion of the roundtable was that these should be strengthened.

However, portals do not resolve a basic paradox of internet use in schools. This is that the internet’s potential to transform learning lies precisely in its ability to turn students into investigators and knowledge workers, rather than mere recipients of pre-digested information that can be put onto a CD-ROM. Yet if they are not directed towards useful information, they may not succeed in accessing relevant knowledge. The ideal solution is to improve their investigatory skills. But the students in Aix warned against expecting too much of their peers – especially of weaker students. It is better to start with modest ambitions.

Even modest ambitions, though, are often being frustrated by the way in which classroom (or, more usually, computer room) learning on the Internet is structured. Even assuming that connections work properly, when a large number of students are on-line the download speed can be problematically slow. When this is combined with the limited length of a lesson, and the inexperience of students and teachers, by the time they start to find what they are looking for it can be time to log out. This raises a basic challenge to the standard secondary school instructional module of one teacher and 20-30 students in a 40-50 minute time period. Such a situation seems singularly ill-designed to develop internet usage. In particular, an internet-based project may require longer blocks of time than the present school timetable allows.

While such considerations can pose fundamental challenges to the design of schooling, some smaller, more practical issues are more straightforwardly resolved. One which was pointed out by the students is that the common design of computer rooms with students facing outwards towards the wall is not a good model for collaborative learning, or for interaction with the teacher. The students advocated a layout with computer users facing inwards towards a teacher in the centre as much more desirable.

How much is the internet being used as a communications tool in which students become co-workers in the knowledge industry? Some of the national delegates expressed disappointment that they did not hear more about collaborative projects across schools and countries. That may have been a function of the particular experiences of the students present; but it would at least appear that such activity has not become part of the routine of education. (Here is an example of the different perspective one gets from ordinary students than from public policy experts: the latter tend to focus on cutting-edge but not necessarily typical projects; the students are more concerned with everyday experiences.) The students did see merit in publishing information on the internet for other students' benefit, and some had done so. However, they warned that such activity needs to be carefully managed, since it could be hard to judge whether the information in a project presented by a student on the other side of the world was in any way reliable. Again, it was the mediation of teachers that could help guide such efforts. Publishing a student project with teacher notes/comments, suggested one of the students, could be a helpful way forward.

Thus the roundtable heard a mixture of caution about how quickly teaching and learning could change as a result of technology, and optimism that it could make many new things possible. Students, teachers and educational systems are slowly learning what does and does not work². As new tools become more familiar, they will permit an evolutionary change towards new models for tomorrow's schools³, rather than overturning established practices simply because different technologies are available.

(iii) ICT and places: it is not the same everywhere

“The place in which learning occurs gives it meaning.”

² See detailed lists in background report, *ibid*

³ Reference to Schooling for Tomorrow document: “Trends and Scenarios” CERI/CD(2000)4

This observation from a delegate at the roundtable helped explain some sharp distinctions that were made by students about the difference between learning in different contexts.

In particular, they made two types of distinction. The first was between learning that was supervised and unsupervised. The second was between on the one hand learning about the use of technology and on the other hand the use of technology in learning.

The most important difference between the ways in which ICT is used for learning in school and in the home is that in the former case it is generally supervised and in the latter case not. This difference was closely associated with the dominance of CD-ROMs and other educational software with particular curriculum purposes within school, and the growing significance of the internet outside it.

Those students who used the internet as a research tool liked to use it mainly at home where they had the flexibility in the use of time to pursue their enquiries at their own pace. They liked the internet more than CD-ROMs for this purpose largely because it was possible to find out particular information, going into a subject in greater depth, than with learning packages which only contained a limited amount of information. Conversely, they considered such packages wholly appropriate when placed in the context of a specific lesson where a teacher was trying to develop a specific theme in a planned manner.

But even within school, they regarded efforts to improve computer skills very differently from the use of computers as auxiliary tools in, say, social studies courses. In the case of the latter, students were more tolerant of a relatively traditional overall approach to teaching, with ICT tools used as an add-on to help bring across or access information more effectively. It was in the more technology-oriented lessons in computer labs that they had the highest expectations for new approaches – aiming to help students to use computers to learn in new ways.

The delegate who made the link between place and meaning was worried that the cultural milieu of many students' homes made it difficult for fruitful learning to occur there. This is one way in which the "digital divide" between more and less privileged groups is reinforced. It also reinforces the case for specific efforts to develop the skills and attitudes of students towards ICT within schools. It was suggested, further, that other milieux outside schools and homes, such as resource centres in libraries, may need to be developed more actively as places of learning.

(iv) ICT and cultures: resisting monocultures – but how effectively?

The discussion at the roundtable which probably produced the most emotion and the least consensus – and was also the least expected – concerned the domination of Microsoft and its Windows operating system. It should be emphasised that the following is a summary of the independently expressed views of students, and other roundtable participants where indicated, rather than the viewpoint of the OECD.

The students were instinctively against domination by Microsoft for two reasons of principle. One was cultural: most came from non-English-speaking countries who did not like the idea of American hegemony, and many of the students were also uneasy

about the idea of a commercial monopoly making big profits from schools and others. (Many national delegates shared both kinds of unease.) The other was practical: Windows may not be an appropriate platform for every computer function, and at least the option of other platforms was seen as being desirable. Several students saw Linux as an attractive alternative on both counts: its codes are distributed free, and is thought to be a strong and stable platform for some advanced computer functions. (They probably also identified more readily with the young Finnish student who developed Linux than with Mr Gates...)

However, there were also strong practical reasons for Windows continuing to be used for most processes in schools. It is easier to use than some of the more advanced systems. Its domination in the world beyond school means that familiarity with it is in practice often a prerequisite in the labour market. This creates a dilemma. On the one hand, schools may not like to be in the position of reinforcing the monopoly by ensuring that it is the only computer environment that the next generation of adults know. On the other, any individual school that tried to start to break the cycle may be creating a severe disadvantage for its own students. There are limits to how far schools can change the world.

In the circumstances, a compromise view was that schools should not discard Windows, but should look for ways of using other systems alongside it. In the discussion it emerged that this is a strategy most appropriate for helping the most able and interested students to use computers in advanced ways, rather than introducing an alternative standard to be mastered by everybody.

Linked to the cultural dominance of Microsoft (though discussed in less depth) was a wider unease about the domination of the English language and an American cultural context in software. Students felt that considerable priority should be given to ensuring that materials are developed with a local cultural flavour, although they accepted that this could sometimes be expensive. One delegate asked in the discussion whether there were a few key CD-ROMs that could be used in schools. In general, this quest was thought to be a misguided one, since there is no international desire to standardise the curriculum. The fact that the most commonly mentioned materials – encyclopedias on CD-ROM – are reference rather than purely educational works, seemed to underline this point.

At the same time, there was optimism about the potential of computers to start to bridge cultural divides. Even linguistic differences were reduced, one student pointed out, now that there are online dictionaries that could translate everything. More broadly, immediate access to current information from around the world made it easier to understand the cultures of others. Thus many participants at the roundtable were quite comfortable with the idea of some learning taking place in the context of cultures and languages other than one's own, as long as these were not unduly neglected as a result.

(v) The technology: is it adequate, and does it work?

The computer and the modem are on their way to becoming as integral a part of the furniture of the classroom as the desk and the chair. But they are by no means yet

taken for granted. Both the supply of equipment and its correct functioning continue big issues, and ones that students regard as important.

The availability of equipment is not the only aspect of the “digital divide”. It is not a sufficient condition for intelligent use of technology, which also depends on attitudes and know-how. But it is certainly a necessary condition, which is not always fully met. Variable availability of computers in the home is perhaps the biggest source of inequality, but schools by no means have adequate equipment either. It was clear from the students’ views that their expectations are, understandably, high relative to what they may have been some years ago – and indeed higher in some countries represented compared to others. While one country was still talking about the importance of having a computer in every school, students from elsewhere defined problems in terms of several people having to share a computer, of insufficiently fast internet connections or of poorly operating local networks. There was a widely-held feeling that hardware and software do not always function as they should. As students understand better what ICT *could* do, their impatience with limited facilities grows.

One type of improvement advocated strongly at the roundtable was to work towards access to the computer outside class for all students, not just those lucky enough to have equipment at home. One method was by keeping school computer rooms open after school and into the evenings. There are serious practical difficulties in doing so, most notably in terms of security. But these could be overcome with sufficient investment, in security equipment or out-of-hours supervision. Since such investment could be a key means of tackling the digital divide, students felt it was worth making.

Private companies have for some time played an important role in helping provide extra ICT resource needed in schools, either as part of their corporate citizenship role, or because they have an interest in getting young people to use their products. While students were concerned to ensure that pure commercial interests did not dominate, they clearly welcomed the involvement of business in such ways. They not only recognised the close relationship between the development of ICT use in schools and the world of work outside, but in some cases felt that this was the driving force. According to one student, those who did well in ICT did not necessarily perform better academically at school, but they acquired skills that gave them a big advantage on the labour market.

In developing this partnership, the private companies represented at the roundtable were interested in doing more than just donate money for schools to buy computers. They understood that this was not a magic solution which would ensure that technology was well used in the schools. One participant described the partnership between schools, universities, public authorities private companies as being much wider:

“A partnership exists when there is a sharing of risks, a sharing of competence and a strategic sharing of information.”

By this, he meant that schools and others need to work together to ensure that the software and the hardware perform as they should. Information technology is a knowledge-based industry in which the interaction between producers and users is a vital engine of development. It is not a matter of designing a package in a laboratory,

producing it in a factory and using it in a classroom. Feedback from users needs to become part of the design process. The need to strengthen this process was well illustrated by students' stories about the cases in which ICT did not work properly.

Conclusion: which priorities?

Opening the roundtable, Counsellor Jarl Bengtsson of CERI expressed the underlying objective that students should say what from their point of view the priorities of ICT development in schools should be. Their list may overlap with that of their governments, but the relative importance attached to different priorities may well not be the same. The discussion that followed was an open one, and no formal set of recommendations were arrived at. However, the following were, in brief, five of the more specific things that students would like to see, and which could make learning with technology more fruitful. They are by no means an exhaustive list of the ideas and hopes that came out of this roundtable.

- ***Better teacher preparation.*** Students agreed with the general view that teacher training was essential. But they put a particular emphasis on *time* rather than just expertise. It may be that in some cases what is needed is an extra hour a week to experiment with the technology outside class, and to prepare a lesson, rather than to go on more courses. Understanding computers takes time, which teachers lack. Releasing more of it for preparation is not cheap, but is a priority that students support.

- ***Longer lessons.*** Time was also a constraint within the classroom. In some countries, secondary students typically have a repeated daily lesson pattern of seven or eight subjects. An alternative in this case would be to do only half the subjects each day, and to have longer lessons. This applies particularly to computer classes, but as computer use becomes more common throughout the curriculum, there is a case for applying it across disciplines. A common counter-argument is that it is hard to retain students' attention for more than a certain time. But technology may be starting to change the rhythm of learning – particularly in the use of the internet, where there may be a ten or fifteen minute “start-up” period of getting to where one wants, before truly productive work begins.

- ***More computers, with faster connections.*** These seem rather obvious demands, and perhaps technology will always breed resource-hungry users who are never satisfied. But what the students made clear is the absolute imperative of ensuring that resources and their capacities passed a certain threshold appropriate for the use being made of them. If students are having to do individual projects on a computer, it is no good having six of them crowding round waiting to use a single machine. If a project is to be done using the internet, a certain minimum connection speed will be needed to complete it in the required time.

- ***Wider availability of computers outside school hours.*** The students who came to the roundtable were supposed to be “typical”, with the proviso that they should have experience of using computers for learning at school and at home. It became clear in discussion, however, that this latter condition immediately set them apart from many of their peers. They did not believe that access to computers in lesson time was in any way an adequate substitute for being able to work with technology in one's own time.

Hence the priority they gave to opening up school computer labs to those who lacked home access.

- ***The pursuit of pluralism in the information age.*** Computers had helped give these 29 students a common language and a comparable set of experiences, which had stimulated a lively discussion during the course of 2000 culminating in the roundtable in Aix-en-Provence. They came from many cultural and linguistic backgrounds, yet communicated fluently in English and French, using on the whole Windows-based programmes to exchange ideas about experiences of learning that were familiar across countries. Yet they retained a fierce desire not all to become the same, but to preserve local cultural difference. They had no magic solution for doing so, except to resist the domination of any one set of computer tools or a single curriculum defined by software content. These views, like many of the others expressed in Aix, have implications for education that go well beyond the development of ICT. They pose some serious challenges to OECD education systems, as seen from the perspective of their users.