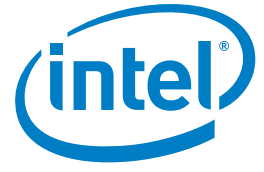


## CASE STUDY

Intel® Atom™ Processor  
Education



# Lessons for ICT in Education

## Charles University and Intel support initiative to demonstrate and evaluate use cases for ICT in the classroom

Founded 1348, Charles University in Prague is one of the world's oldest universities. It frequently ranks highly among global league tables, validating its reputation as a leading center of learning both within the Czech Republic and internationally. Its Faculty of Education has about 4,200 students, training as teachers and for other pedagogical roles for all types and levels of education. As information and communication technologies (ICT) become more prevalent in both the workplace and the classroom, the Faculty wanted to investigate the link between ICT and improved learning in more detail.



“Measuring the impact of newly-deployed technology can be difficult – but it is essential to justify often hefty investments in PCs, connectivity, digital content and other equipment. Our aim was to identify and validate a selection of valuable use cases of modern IT in the classroom, particularly for grades six to nine.”

*Dr. Nataša Mazáčová (PhD), Faculty of Education, Charles University*

### Challenges

- **Equip learners for the future.** Support pupils in the development of core ICT skills in preparation for a digital future
- **Demonstrate best practices.** Put various ICT use cases to the test in a real classroom environment to identify what works best
- **Validate ICT use.** Implement effective and simple-to-execute methodologies for evaluating the impact of ICT on learning

### Solutions

- **A collaborative model.** Intel joined experts in hardware, software and educational content to create the Education21\* initiative
- **Include the community.** Teachers, school boards and parents were all encouraged to support and participate in the project
- **Pilot project.** Six Czech schools were chosen to run pilots of the new Education21 model during the 2009-2013 academic years

### Impact

- **Multiple uses.** Trialing the model in different subject lessons across the schools showed the effectiveness of ICT in supporting a number of learning activities
- **In-depth reporting.** Teachers submit regular video footage and diary reports for qualitative and quantitative analysis by Charles University pedagogical experts
- **Setting an example.** Regular updates to national media have shared project success and encouraged other schools to investigate using ICT in the classroom

### Getting IT Right with Education

The Faculty of Education set out to analyze the ways in which schools in the Czech Republic were using ICT to enhance the quality of education. Besides identifying best practices and common use cases, the Faculty wanted to develop and demonstrate effective methodologies for measuring the positive impact of technology on learning processes and outcomes.

## Leading university deploys and validates ICT learning model featuring Intel technology

Dr Nataša Mazáčová (PhD) from the Faculty of Education explains: "Many schools and higher education establishments are considering the use of ICT in the classroom now, but it's often hard for them to know how best to use it. Measuring the impact of newly-deployed technology can be difficult as well, but it is essential to justify often hefty investments in PCs, connectivity, digital content and other equipment. Our aim was to identify and validate a selection of valuable use cases of modern IT in the classroom, particularly for grades six to nine."

### Education21: A New Model

The project the university initiated to meet these objectives was called Vzdělání21 (Education21). It was launched in collaboration with ICT and education experts including HP, Microsoft, Avmedia and Fraus. As part of its commitment to create economic and social opportunities for all by improving the quality of education systems, Intel also formed part of the team.

A holistic model for educational transformation, based on the use of high-quality digital content and a 1:1 computing model, Education21 encompassed six primary schools. The classes involved were for children aged 11 to 12, with 65 teachers and 275 students participating. Each classroom was equipped with a Wi-Fi network and electronic whiteboard. Teachers were provided with HP ProBook\* 6560b notebook PCs, and students with Intel® Atom™ processor-powered HPMini\* 5103 netbooks, through which they could access interactive tools and documents including PDF\* files, photos, videos and online tests. Interactive textbooks were also supplied.

Participation in the project depended on three stakeholder groups – parents, teachers and the school authority. Parents had to approve the placement of their child within a digital class and to support funding of their child's laptop. The teachers had to agree to integrate

interactive technologies into their lessons. Finally, the school authority needed to agree to set up the digital classes and provide teachers and students with adequate support.

### ICT in Practice

The pilot phase of the project saw ICT being used for a variety of activities during the academic year 2010-2011. As part of the Education21 project, the Charles University Faculty of Education plans to create an online database of the most effective use cases to encourage greater collaboration and idea-sharing among teachers across the country. These include:

- Task analysis
- Multimedia learning materials
- Individualized learning
- Teacher control
- Real-time instruction, assessment and feedback

### Task Analysis

The teacher can use his or her own PC to control what appears on students' screens and ensure they understand the task at hand. For example, if explaining a particular element of an image or graph, the teacher highlights the relevant section, drawing students' attention to the key details without complicated verbal directions. In mathematics or language classes, the teacher can highlight specific groups of numbers or words to ensure students can follow along as they explain how to arrive at the right answer to an equation or piece of textual analysis.

### Multimedia Learning Materials

By equipping each student with a laptop PC, schools give students the opportunity to benefit from a richer learning experience, even when they are not in the classroom. This means video and other multimedia content can be a useful resource for homework tasks. It is particularly useful in teaching foreign languages, where students can see

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and hear native speakers of the target language. Physics classes have also benefited significantly from the ability to show students complex experiments which may not be possible in the classroom.

### Individualized Learning

Access to a wider library of engaging educational content and the ability to interact on a one-to-one basis with the teacher make it much easier for students to work at their own pace when using a laptop. Those who work faster or want to delve deeper into a topic can access additional content, while others may prefer to spend more time on the core exercises. An education experience tailored to the needs and interests of the individual student is more likely to encourage perseverance and motivate students to do well.

Students can integrate digital elements into their learning to a greater or lesser extent, depending on their own preferences, allowing those who prefer to work from traditional text books to do so where appropriate.

The ability to allocate tasks to different individuals or groups within a single class also means that teachers can give each student one-to-one attention without creating dead time for the rest of the class. While focusing on a task with one student, either on their PC or using the interactive white board, the teacher can assign work to the rest of the class to ensure all students make the most of class time. While tasks may not always be appropriate to the use of a laptop, students can carry out even more traditional activities such as essay writing electronically, giving them the opportunity to practice core word processing skills.

The team from Charles University believes this ability to empower each student to work at their own pace and level of knowledge is a key benefit of the Education21 initiative.

### Teacher Control

When using ICT in the classroom for the first time, many teachers fear children will be distracted by their devices and spend time surfing the Internet instead of focusing on class work. To ensure students concentrate on their assigned activities, teachers can take control of each child's PC screen, turning the screen black and sending a message such as "silence please" or "please look forward."

Using Smart Sync\* software, the teacher can see what a child is working on at any time, quickly identifying those who need extra help or are ready to move onto another task.

### Real-time Instruction, Assessment and Feedback

Besides making learning more exciting for the student, ICT in the classroom can help the teacher better monitor progress and provide more informed, timely guidance and feedback. For example, the teacher can highlight details in a text on their own screen, which then appears on the same text on students' devices, to help draw attention to important information.

Teachers can also use the Smart Notebook\* software that comes as part of the Education21 package to create practice and self-test exercises for pupils. Applets – readily-available online or created by the teacher – can enable students to practice a particular aspect of the course. This may include algebra calculations in mathematics class or grammar exercises in language lessons. Students access an applet from their own device and the teacher can review their progress and provide feedback and help in real time. Within one class, different students can use different applets, depending on their level of ability.

Once students have practiced their new skills, the teacher can also issue each individual a self-test exercise. Students use their own laptops to perform the tests at their own pace while teachers

can view and mark their completed tests immediately to assess their readiness to move on in the syllabus.

Some classes have trialed applets and self-test exercises, but the Charles University team has identified opportunities for further improvements in this area. In particular, it plans to create a system for teachers to share exercises and tests to minimize the time-consuming process of creating new applets for each class.

## Tracking Performance

### Regular Reporting

Each of the six schools involved in the pilot nominated a teacher to act as Education21 project coordinator. This teacher holds responsibility for liaising with their colleagues to ensure that every individual participating in the project submits at least two hours of camcorder video footage each quarter demonstrating the use of IT in their classes. Each school submits an average of eight hours of footage per quarter, covering subjects including mathematics, languages, geography, physics and chemistry.

A specialist from the Charles University team also attends some classes to observe them in real life. This specialist then collects the footage from all schools, along with their notes taken on-site, to review and evaluate the use cases and effectiveness of the ICT resources.

Other reporting activities support the qualitative evaluation enabled through direct observation of classes and video footage. For example, teachers submit diaries recording details such as:

- **How many minutes students use ICT during each lesson.** Generally, this does not exceed 20 minutes, although time spent with the devices varies by teacher and subject. Children are also encouraged to continue developing their handwriting skills
- **How much time teachers spend on lesson preparation.** Teachers who have just begun to teach using computers

spend more time on lesson preparation than before, but become more efficient over time. All educators agree that while they have responsibility for efficient preparation, it is also important to have high-quality training for working with ICT

- **Which interactive materials have proved most popular.** Students like the electronic textbooks - mainly for scientific subjects such as chemistry, mathematics, and physics. The textbooks contain audio recordings, videos and links to the Internet. The interactive whiteboard is also very popular, and teachers welcome the opportunity to check and supervise all pupils' work and progress from their own devices
- **How students evaluate IT-enabled teaching.** Pupils agree that learning in an interactive way is fun, with many saying they would prefer to replace traditional printed textbooks with their netbooks. According to their parents, students have improved their approach to homework too. They are more motivated, more computer literate and very conscientious in looking after their devices
- **Any common technical problems.** Ensuring adequate connectivity was one of the key challenges from the pilot, so learnings are shared with other schools wishing to use the 1:1 computing model. An important point is to ensure on-site employees are able to provide basic technical support to supplement that provided by Intel, HP, Microsoft and other specialists. Many teachers have commented on the lack of problems with the hardware involved in the project, noting that the devices are truly child-proof
- **How teachers work with parents to support the project.** The advantage of the project is that parents are engaged from the outset and can choose whether their child is placed in a traditional or digital class. They attend regular meetings to stay abreast of the project and can contribute financially to the purchase of their child's netbook. A recent survey showed that over 50 percent of parents think their children know more about computers than they themselves do, so they appreciate the proper training provided in the classroom around the safe use of computers and the Internet

## Qualitative Surveys

A survey was conducted across 32 students from three schools to evaluate initial responses to the introduction of ICT to lessons. The questions focused on identifying pupils' attitudes to working with ICT and their overall satisfaction with digital teaching. The feedback was generally positive, with students identifying benefits such as being able to work more closely with the teacher, greater engagement in class thanks to the interactive whiteboard and dynamic content, and easy-to-use devices. They also appreciated being able to use their laptops for homework outside of class and that having the device meant not needing to carry around so many weighty textbooks.

Teachers were also questioned on their experiences, with most noting a significant and sustained boost in student engagement and motivation in the classes using ICT. Some could even point to an increase in students' speed of learning, with an improvement in average grades of about 0.5 points. Digital learning was found applicable to almost every subject including Czech language, physics, geography, natural history, mathematics and health education, with use cases varying to align with the demands of each subject.

The surveys also generated useful input from teachers and students on how issues could be overcome and ICT-based learning could be improved. Some pupils suggested that slightly larger laptops with easier-to-read screens would be beneficial, and that the interactive whiteboard - a popular feature - should be used more often. Teachers emphasized the importance of the role of parents in ensuring students made full use of their ICT resources when studying at home. They also indicated that preparing for ICT lessons can be more time-consuming, especially for teachers who are not very tech-savvy, so sharing best practices and tips among the teaching community is important.

## Outcomes and Next Steps

The team from Charles University publishes its findings on the project regularly through the national media and

## Spotlight on Charles University

Charles University is one of the world's top universities, frequently appearing near the top of international university rankings. It is the only Czech institution of higher education to be placed in the published list of 500 universities.

More than 650 years old, the university has 17 faculties, three university institutes, six centers for further educational, scientific, research, development and other activities or for providing information services, and five university-wide special facilities. It has more than 7,500 employees and over 51,000 students.

television and interest in its progress has been strong at a national level. More schools are starting to investigate the potential uses of IT in their own classes – whether a full 1:1 computing model, or simply the introduction of a few digital nests across campus to provide students with access to online resources. Throughout this expansion of the project, Charles University will continue to play an integral role in providing methodological consultancy and project coordination as well as evangelizing the advantages and importance of ICT in education at the national and international levels.

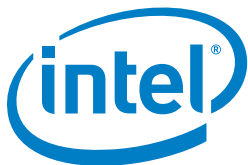
The pilot schools are also starting to look beyond their own initiatives to share ideas and best practices with each other. Discussions highlight the fact that IT may be more appropriate to some classes than others. For example, no schools have incorporated it into music or health

education lessons. For those subjects that do use IT, use cases are often common across the board, with Czech language classes tending to use electronic textbooks while geography classes may be more likely to use online maps and video. Mathematics and science lessons make heavy use of activity kits provided through the Smart Classroom Suite\*, which include activities and tests.

“Despite these differing use cases and experiences, all schools agree that ICT’s ability to encourage both independent learning and interactive group projects has helped increase motivation, engagement and understanding among students,” concludes Mazáčová. “However, pilot participants also agreed that the teacher still has a critical role to play, now acting as role models and enthusiasts for using IT as well as continuing to provide their students with academic and

pastoral support. Encouraging teachers, especially those used to more traditional classroom environments, to embrace new technologies was identified as a challenge by all participating schools. However, with practice and the support of more tech-savvy colleagues, the schools all reported that even these teachers are now eager to take advantage of the digital classroom.”

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