



## Case Study

Turkey

1:1 eLearning

Intel World Ahead Program

**“Students who have their own laptops have more interest in their studies compared to when there were no computers at the school.”**

Ümran Aktürk

Teacher

Evliya Celebi Primary School

# Transforming Education with 1:1 eLearning in Turkey

## Executive Summary

A public-private collaboration involving 1:1 eLearning at four Turkish primary schools is showing the power of innovative technologies and comprehensive approaches to improve the education of young children.

The project is sponsored by the e-Government Research and Development Center (EDMER) of Turkey's Middle East Technical University (METU), with support from the Intel World Ahead Program, SMART Technologies, and other contributors. In an ongoing project begun in April 2007, the EDMER team created a 1:1 eLearning environment for 70 fourth- and fifth-grade students at a public primary school in Ankara. Guided by teachers who received training through the Intel® Teach Program, students used:

- Intel-powered classmate PCs
- SMART Board™ interactive whiteboards and SynchronEyes™ classroom management software from SMART Technologies
- Wireless networks
- Localized curriculum resources

A second phase extended the project to 16 additional classrooms at three more schools for three months. Altogether, the project encompassed 1,165 students and 26 teachers in 18 fourth- and fifth- grade classrooms. Classmate PCs for both schools were donated by Intel through the ICT for Education program.

Assessments conducted by education and technology professionals indicate promising results. Students and teachers are more engaged and excited. Test scores are rising, and students are developing the skills needed for success in today's global economy. Parents are eager to see the program continued and expanded.

The EDMER project shows the value of 1:1 eLearning for young children and provides practical lessons to guide future efforts. The project highlights the importance of comprehensive approaches that combine child-friendly mobile learning devices with wireless Internet access, locally relevant content, and teachers who are skilled at using technology to enhance teaching and learning.

## 1:1 eLearning and Pupil-centric Pedagogy

Governments, educators, parents, and students increasingly recognize the importance of technology in preparing students for the 21st century. Not only are computers part of nearly all skilled jobs, but PCs and the Internet are crucial in opening the door to educational opportunities. Used effectively, computers can motivate students to learn, and make lessons more relevant to their daily lives. Whatever the subject matter, technology can enable students to access educational resources and participate in the global community.

Consensus has emerged about 1:1 eLearning as the optimal environment for achieving the benefits of technology in education. In an effective 1:1 eLearning environment, technology tools and connectivity are deeply integrated into the classroom experience, rather than confined in a PC lab or limited to a few PCs at the back of the classroom. The computer moves with the student instead of the student moving to the computer.

Figure 1 depicts the evolution from basic ICT (stage 1) toward 1:1 eLearning (stage 4).

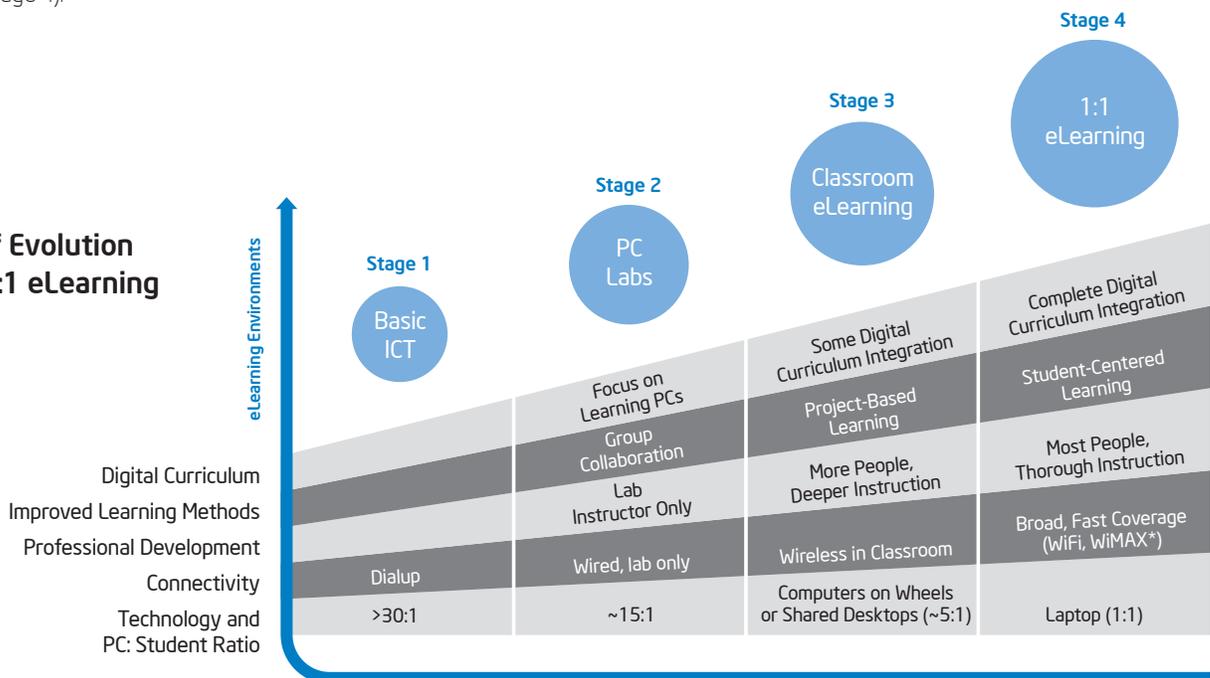
### Intel World Ahead Program

The World Ahead Program is Intel's global initiative to bring the benefits of the digital world to the next billion people. Taking a comprehensive, long-term approach, Intel collaborates with local and global leaders to improve citizens' lives through:

- Access to highly capable PCs
- High-speed connectivity
- Effective teaching and learning
- Locally relevant content

Intel is investing \$1 billion over five years on efforts to increase opportunity for people worldwide to develop 21st century skills and participate in the global economy.

**Figure 1.**  
**Stages of Evolution**  
**Toward 1:1 eLearning**



Source: Intel Corporation

- As schools advance along the eLearning continuum, they *move from* using slower networks, a small number of stationary computers, and training and curriculum that focus on basic technology skills.
- They *move toward* an educational environment in which every student has a personal, mobile learning device; high-speed wireless networks provide ubiquitous, continuous access to the Internet; teachers add impact to whole-group lessons through tools such as SMART Board interactive whiteboards; and teachers are skilled at using digital content to enhance teaching and learning.

With each successive stage, students have more mobile, personal access to technology during more of the day. When resources do not allow for one laptop for each student throughout the day, the classroom eLearning model (stage 3) uses mobile carts with laptops (also known as computers on wheels). Carts move from classroom to classroom, introducing students and teachers to the advantages of mobility and greater individual access to technology.

When accompanied by appropriate content and teacher training, 1:1 eLearning supports a deeper shift from lecture-driven, instructor-centric instruction to a student-centric, project-based environment. Teachers present pupil-focused lessons that better meet students' individual needs and learning styles. Students are better able to learn at their own pace. They can repeat material to reinforce learning, or delve into additional material to enrich their educational experience. They use technology to master 21st century skills such as critical thinking, problem solving, research, communication, and collaboration.

## Turkey's Strategic Goals

As Turkey strives to join the European Union (EU), the country has made it a priority to improve education and show that its 70 million citizens will be a strategic asset to the EU. Primary and secondary school educators are increasingly focused on preparing students for success in a fast-changing, technology-driven global economy.

As part of these efforts, Turkey has established basic ICT and Internet connectivity in its schools, and is moving along the eLearning continuum toward classroom eLearning and 1:1 eLearning environments. By advancing toward 1:1 eLearning, the Turkish Ministry of National Education (MoNE) aims to help Turkey achieve important national and educational goals such as:

- Establishing an information society and knowledge economy
- Creating a competitive society by using 21st century skills to improve Turkey to the level of fully mature markets
- Evolving from "knowledge acquisition" to "knowledge creation"
- Reducing the digital divide
- Providing equal educational opportunities to schools located in different geographic and socioeconomic conditions
- Supporting connection and networking between schools in Turkey and other countries
- Improving students' grades and graduation rates
- Increasing teachers' motivation and productivity
- Increasing administrative efficiencies, with resulting cost savings

**Table 1. Turkey's 1:1 eLearning Project Objectives**

Project Objectives	Description
Online content and professional development	Prepare teachers to integrate technology in their teaching through educational online content. Give staff time to learn about technology integration.
Innovative technologies	Provide high-quality education to more students at a lower cost by increasing computer awareness and teaching students how to use new technologies.
Student-centric problem solving and collaboration	Improve student access to information by using new technologies and Internet connectivity to foster student-centered problem solving, collaborative projects, and independent research.
Ubiquitous access	Provide equal educational opportunities by empowering students and teachers to utilize technology when and where they need to.
1:1 eLearning environment	Increase student-centered learning and achievement through laptops dedicated to students in their classrooms.
Student motivation	Increase students' performance, motivation, and engagement, as reflected in their grades.

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“Investing in education is investing in the future of Turkey. Our target is to connect every classroom to the Internet and help our students obtain a 21st century learning skill set by utilizing ICT.”

Dr. Hüseyin Çelik  
Minister of National Education  
Turkey

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### EDMER Project Objectives

In alignment with MoNE’s vision, EDMER initiated a project to demonstrate the feasibility of 1:1 eLearning and showcase the role of innovative education technologies in primary schools. EDMER collaborated with a range of public institutions and private sector organizations, including MoNE, the Intel World Ahead Program, SMART Technologies, Turkish Telekom, Microsoft, Sebit, and the METU Education Faculty.

EDMER established six objectives for the 1:1 eLearning project (Table 1).

### Classmate PCs: Built for Learning

The classmate PC reference design was developed at Intel’s Platform Definition Center to serve as an affordable, education-focused personal learning device for children in emerging nations.

These practical devices are colorful, fun, lightweight, and child-sized, and their rugged design includes a waterproof keyboard and an easy-to-carry handle. Yet classmate PCs provide “real PC” capabilities, including built-in wireless networking connectivity and the performance to run educational software and other mainstream applications.

Classmate PCs also include integrated educational capabilities to help teachers enhance the classroom experience.

## Phase 1: Evliya Celebi Primary School

Phase 1 of the EDMER eLearning project began in April 2007 and continues today. Working with its public and private collaborators, the EDMER team created a 1:1 eLearning environment for one fourth-grade class and one fifth-grade class at Evliya Celebi Primary School, a public school in Ankara.

- Each student was given access to a classmate PC—a new category of personal computers developed by Intel to facilitate teacher-guided, student-centered learning. PCs were donated by Intel through the ICT for Education program.
- The two classrooms were also outfitted with SMART Board interactive whiteboards and SynchronEyes classroom management software from SMART Technologies.
- A high-speed wireless network was established.
- Teachers received training from the Intel® Teach Program, as well as ongoing support in curriculum development and methods for using technology to enhance teaching and learning.
- Teachers accessed interactive, multimedia content from MoNE, Turkish software developers such as Sebit, and Intel’s skool™ eLearning materials.

While students used classmate PCs, teachers needed more powerful mobile computers to help them develop lesson plans, research curriculum resources, and collaborate with colleagues. Each teacher in the program received an Intel® Core™2 Duo-based laptop that they used for developing lessons and accessing information. They incorporated the technologies and content into some of their mathematics, social sciences, and English lessons.

From their laptops, teachers used SynchronEyes from SMART Technologies to monitor and manage the activities of the classmate PCs, such as administering exams and enabling chats with and between students. Teachers used SMART Board interactive whiteboards to introduce topics and teach whole-group lessons. Students used their classmate PCs to conduct research, participate in interactive lessons, and collaborate on group projects. Students consolidated their understanding by using the interactive whiteboard to share what they learned with their teacher and peers.

### Technology Environment: A Closer Look

Turkey's 1:1 eLearning project implemented a three-layer architecture, as shown in Figure 2.

- Physical layer. The physical layer is the hardware for the overall system. It consists of the school server on which the applications run, as well as the routers, switches, and network devices for wireless access for local area networks and for wide-area network technologies such as WiMAX.\*
- Application layer. Applications include the learning management software and education content database to store course content and support collaboration among students and teachers.
- Classroom layer. This is the top domain of the architecture. Each student has a classmate PC, and the classroom is equipped with a SMART Board™ interactive whiteboard and projector. Each teacher has a laptop computer based on Intel Core 2 Duo technology with classroom software that enables them to manage students' classmate PCs.

#### Specific technologies used to implement the architecture include:

- Intel® processor-based classmate PCs
- Instructor laptops with the Intel Core 2 Duo processor
- SMART Board interactive whiteboards, classroom management software, and two projectors provided by SMART Technologies
- WiMAX and ADSL connection infrastructures, including cable infrastructure, ADSL modems, and wireless access points
- Intel-provided skool content for the Ministry of National Education
- Vitamin\* content for education provided by Sebit
- A low-cost server that allowed the school to cache related content from the Ministry of National Education and other servers

### Phase 1 Results

To evaluate the pilot's impact during Phase 1, professors from Turkey's Anadolu University conducted baseline assessments of qualitative and quantitative metrics. Assessment was performed six months after the 1:1 eLearning environment was initiated, and used:

Personal interviews with school administrators, teachers, students, and parents

- Quantitative surveys
- Classroom and other observation
- Student tests

Results of the evaluation were exciting and positive. Teachers quickly noticed differences in student learning. "Students who have their own laptops have more interest in their studies compared to when there was no computer at the school," said Ms. Ümran Aktürk, who teaches at Evliya Celebi Primary School.

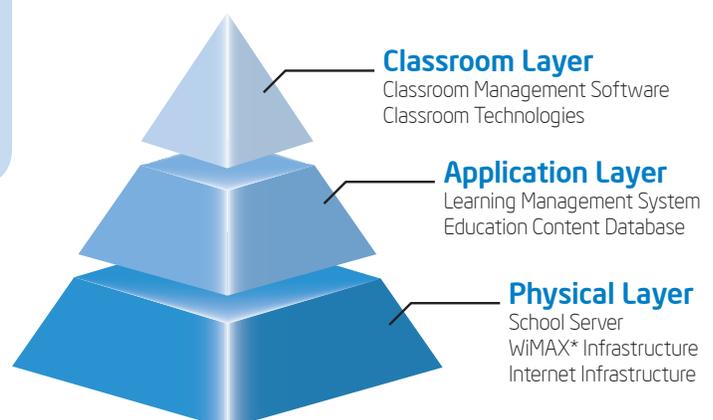
Students, teachers, and school administrators were pleased with the benefits of the 1:1 eLearning model. The model created a positive synergy among the school's staff. Students and teachers were enthusiastic, finding that the project environment made teaching and learning easier. On sample tests, the pilot classes scored higher than comparable classes in subjects where technologies were used. These observations are similar to those reported by Silvernail and Lane of the University of Southern Maine (see references).

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**Figure 2.**  
**1:1 eLearning Architecture**



During the evaluation, observers noted:

- 15 percent savings in teaching time from teachers using existing content in the classmate PC or projecting content on the SMART Board interactive whiteboard rather than sketching out problems on the blackboard
- An increase in students' attention from 18 minutes in traditional teaching methods to 28 minutes in the eLearning environment
- A 35 percent increase in the education content given to students in the same time period due to use of the SMART Board interactive whiteboard

In addition to these tangible findings, observers identified:

- Increases in students' interest in their courses
- Increases in teachers' interest and motivation
- Higher attendance rates compared to traditional classes, perhaps as a result of teachers using techniques such as three-dimensional animations and simulations to present lessons
- New self-development opportunities for teachers
- Increases in exam performance, although they could not be quantified in the limited timeframe

Table 2 correlates the team's observations with the six program objectives.

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**"I am impressed with all these technologies. I was afraid at the beginning that students' technology skills would not be enough and this would be one of those technology integration projects that would not last long. But, after seeing their performance with the laptops, I thought that this is the project that really can help students learn science and other subjects more easily. It helps us, too."**

Science Teacher

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**Table 2. 1:1 eLearning Project Objectives**

<b>Project Objectives</b>	<b>Observations</b>
Online content and professional development	To fulfill the needs of today's learners, it is necessary to improve curriculum and provide digital content and teacher training. This is what the project aimed for and achieved. The collaborative environment, instructor-centric training, and ongoing support gave teachers the skills and encouragement they needed to successfully adapt classroom eLearning materials and integrate technology into their teaching.
New technologies	The evaluation and almost all observations showed that students easily learned how to use technology in their education. As students became familiar with the technologies, they became more skilled and flexible at using new educational materials.
Student-centric problem solving and collaboration	eLearning experiences induced students to become more independent, self-directed learners. The eLearning environment, including the curriculum, digital content, and teacher training aspects, increased students' problem-solving, collaboration, and research skills.
Ubiquitous access	The project provided students and teachers with the ability to access the Internet and use interactive content. The 1:1 eLearning practices promoted equal educational opportunities and gave all children in the project the chance to bridge the digital divide.
1:1 eLearning environment	As the student-to-computer ratio decreased, the positive impacts of the 1:1 eLearning model in creating a student-centered environment were realized.
Student motivation	Student motivation and performance increased.

## Phase 2: Three Months, Three Additional Schools

In Phase 2 of the EDMER project, the team built on its success by extending the pilot to three additional public primary schools in the Ankara area:

- Burak Reis İlköğretim Okulu in Sincan Ankara
- Necmi Sahin İlköğretim Okulu in Batıkent Ankara
- Beynam Emine Erisen İlköğretim Okulu in the Bala village outside Ankara

The Phase 2 project was conducted from April to June 2008. Sixteen fourth- and fifth-grade classrooms at the three schools were equipped with a 1:1 eLearning environment like that used at Evliya Celebi. Teachers who had not previously attended training provided by the Intel Teach Program were given training prior to the project. Including Evliya Celebi, Phase 2 encompassed a total of 1,165 students and 26 teachers in 18 classrooms.



Academic researchers affiliated with GLOKAL assessed the effectiveness, efficiency, and appeal of the project at all four schools.<sup>1</sup> Evaluation methods included both short-answer and essay-style surveys as well as individual interviews and focus group discussions.

The assessment team found that teachers used the technologies extensively to conduct research, develop lesson plans, present lessons, share multimedia resources, and administer tests. Students used their classmate PCs to find information, take notes, create papers and presentations, take tests, analyze and manage information, collaborate, and communicate. The project increased the quality of teaching and created a positive impression of the participating schools.

### Among specific findings:

- Teachers reported that they improved their technology skills and gained experience with 1:1 computing and project-based learning. They felt the project gave them an opportunity to improve their motivation and job satisfaction.
- 87 percent of teachers indicated that the project helped their students develop 21st century skills such as teamwork, independent thinking, problem solving, public speaking, and writing. Teachers also said their students understood the lessons better, increased their technology skills, were more interested in their lessons, and were more motivated to complete their assignments.
- 89 percent of students said the project helped them learn better and develop a more in-depth understanding of the content.
- All teachers stressed that the project should continue, and over 75 percent noted their desire to have students take the classmate PCs home. Teachers expressed confidence that if the required infrastructure and training were available, the project would scale successfully to other schools throughout Turkey.
- Parents appreciated the program and its benefits for their children. Ninety percent of parents said the project had a positive effect on their children's motivation and learning, particularly regarding 21st century skills. The same percentage would like to see all students involved in the project and see the project extended through the conclusion of primary education. Many parents would like students to be able to bring their classmate PCs home.

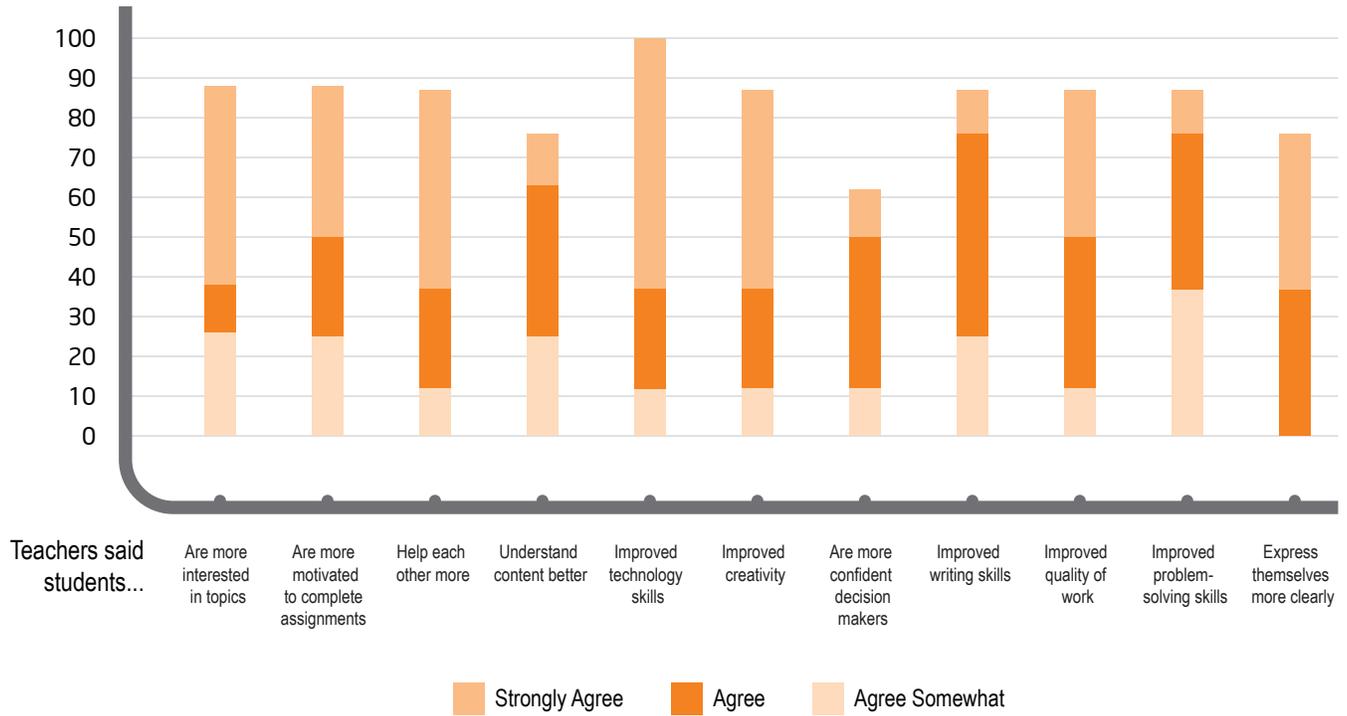
### About SMART Technologies

SMART Technologies invented the touch-sensitive SMART Board™ interactive whiteboard in 1991. It was just the first of many innovative, easy-to-use products that have earned SMART worldwide recognition and made it the undisputed global leader in the interactive whiteboard product category. Its strategic alliance with Intel Corporation and strong commitment to research and development has accelerated SMART's growing line of technology solutions. Thanks to their simplicity and powerful ability to connect people, SMART products have transformed learning for more than 20 million students around the world.

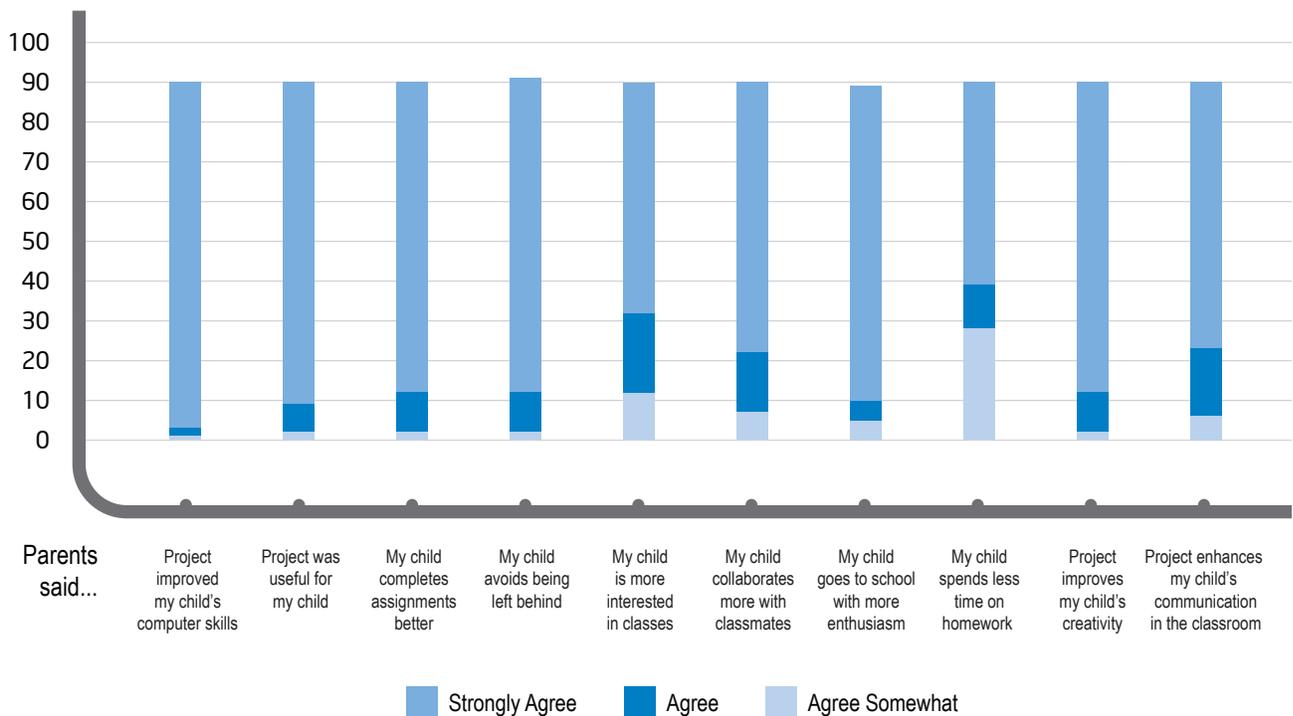
For more information about SMART Technologies, visit [www.smarttech.com](http://www.smarttech.com).

1. Cengiz Hakan Aydin, Business Case: The 1:1 eLearning POC Project Pilot Implementation in Turkey, Ankara, 2008.

**Figure 3.**  
**Teachers' Perceptions of the Project's Impact on Students<sup>2</sup>**



**Figure 4.**  
**Parents' Perceptions of the Project's Impact on Their Children<sup>2</sup>**



2. Cengiz Hakan Aydin, Business Case: The 1:1 eLearning POC Project Pilot Implementation in Turkey, Ankara, 2008.

The assessment identified ways to help teachers use technology even more successfully to enhance learning:

- Conduct a front-end analysis to identify teachers who are more open to change, familiar with technology, and experienced at student-centered, project-based learning
- Ensure that teacher training provides concrete (prescriptive) models that offer hands-on activities and include step-by-step directions about how to use technology in the classroom
- Provide teachers with ongoing support about 1:1 eLearning and educational technologies
- Encourage and train teachers to use Web 2.0 tools and strategies. This can build success by enhancing student learning and helping teachers share the products or experiences they develop with the other teachers

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## Advancing Turkey's Future

Turkey's 15 million students will graduate into a world where jobs increasingly require not just facts, but the ability to research and evaluate information, create and share new knowledge, and use technology to perform a wide range of tasks. The EDMER project is a significant step in Turkey's preparation for this new environment. The project demonstrates the value of the 1:1 eLearning model, and shows that children are ready to learn, expand, and grow using technology. When students are provided with classmate PCs and ubiquitous access to the Internet, they hold the keys to their own learning. They can access interactive educational content and build on it as they imagine, question, research, study, communicate, and collaborate.

Equally important, the EDMER project highlights the vital role teachers play in successful technology adoption. Teachers in the project received not only technologies, but also appropriate training, modeling, and support. They had access to compelling, locally relevant digital content, and help in becoming more skilled and confident about incorporating the new resources into their lessons. These elements, along with the technologies, inspired teachers and students to new levels of enthusiasm and effectiveness.

Turkey's leaders aim to continue the nation's evolution to the third and fourth stages of eLearning. As they move forward, they aim to build on the best practices of the EDMER project:

- Embrace comprehensive approaches that emphasize teacher training, curriculum development, and digital content
- Provide technologies that are well-suited for children's and teachers' needs
- Combine the experiences and resources of the public and private sectors, including committed organizations such as Intel World Ahead

## One Teacher's Story

"I have gone through a big change. In the previous system, a teacher-centered dispersion was being done, but now it is totally student-centered. I am only explaining to the children what they are supposed to be doing—presenting the subject. After presenting them with the main theme of the subject, the students start working completely on a research basis. [They are asking questions like:] 'Teacher, is this possible? Can this be true?' I am walking among them only as a guide and showing them directions. Later, the children use their classmate [PCs] and organize this on a table. They summarize it, and create a presentation out of it, and then they teach the lesson themselves. The subjects are retained in their minds much better. I am getting feedback like, 'We will never forget this, Teacher,' and 'This will never be forgotten.'"

"Children listen to their friends more carefully than when they had only me to talk to them. They are more attentive. [For one project,] we invited parents to our classroom, and students began presenting their presentations one by one at the SMART Board™ interactive whiteboards. Some mothers had tears in their eyes, because they saw their children not as students but in the position of teachers who teach a lesson to the class or as a person who disperses information. I chose each presentation from different subjects, and that made them excited about having their turn to perform. Above all, my silent children became more active."

"It is very good to use the technology, because we are on a mission to create scientists—this is our goal. Technology is moving this way and we are moving together with it."

Sevgi Kalkan  
Teacher, Burak Reis Elementary School

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**"At the end of the semester, we did not want to go to holiday. We are very happy with our computers. Our teacher told us that next year we would not be able to use these computers. But how will we learn? We want to use computers and also to take them home."**

Fifth-Grade Student

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## Creating the World Ahead through Education in Turkey

In addition to the EDMER 1:1 eLearning project, Intel has collaborated with Turkish leaders on a variety of programs to accelerate the benefits of technology in education.

- **Intel Teach Program.** Since 2003, more than 108,000 teachers in Turkey have learned how to effectively integrate technology into their classroom curriculum. Intel will train an additional 500,000 Turkish teachers by 2011.
- **skool.com.** Interactive content from Intel's online eLearning resource ([meb.skool.gov.tr](http://meb.skool.gov.tr)) offers Turkish language math and science lessons for students.
- **ICT for Education program.** Through this program, Intel is donating 100,000 PCs to improve teaching and learning in emerging market countries. In Turkey, Intel is donating 8,000 computers to initiate effective 1:1 eLearning at schools where students and teachers have lacked technology access. Microsoft Corporation has generously donated software for this program.
- **PC donation program.** Through a public-private partnership donation program, approximately 220,000 PCs have been donated for school labs.
- **Teachers' laptop project.** Intel helped architect a program that enabled more than 100,000 teachers to purchase a highly capable laptop computer. Vakifbank offered affordable installment plans without the need for a guarantor, and Turkish PC manufacturers configured solutions that met the Ministry of Education's recommendations.
- **My First PC initiative.** Intel, Microsoft, and Turk Telecom worked with the Ministry of Education to provide 75,000 families with a technology package that included a low-cost computer with Microsoft software, free ADSL Internet connections, parental control software, and after-sales support. The campaign has helped raise awareness of technology's role in education and increased computer literacy across the country.

What is your vision of the world ahead? See how the Intel World Ahead Program can help you design programs that use technology to improve education and achieve other policy objectives. Talk to your Intel representative, or visit us on the Web at: [www.intel.com/worldahead/](http://www.intel.com/worldahead/)

### Acknowledgements

The project team thanks the Turkish Ministry of National Education for providing the real-world laboratory of schools, teachers, and classrooms in which to apply the 1:1 eLearning model.

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