



White Paper
COW
Education

Embracing 21st Century Learning

Intel partners with AED, The Jordan Ministry of Education, USAID, and others to help develop Jordanian students' 21st century skills with Computers on Wheels pilot

Eager to drive its competitiveness on an international level, the Jordanian government wants to transform the way in which students develop essential 21st century skills. To address this challenge, Jordan established the Education Reform for the Knowledge Economy (ERfKE) initiative. To support ERfKE, the U.S. Agency for International Development (USAID) created the ERfKE Support Project (ESP) that is being implemented by the Academy for Educational Development (AED). As part of ESP's mandate, AED, in partnership with the Ministry of Education and private companies, is piloting different approaches to solving a variety of educational challenges.

The approaches include providing students and teachers with access to effective information and communications technology (ICT) resources, and delivering effective professional development to teachers that enables successful integration of ICT into teaching and learning.

AED partnered with Intel for the Computers-on-Wheels (COW) pilot. This project uses mobile computer carts from Earthwalk Communications and Intel® technology-based laptop PCs to provide students and teachers in four pilot schools with ICT resources that can be used in their classrooms. Teams of teachers at the schools have been trained in project-based learning and in using the COW carts and the internet in the educational process.

The Challenge

- **Provide teachers and students** with regular access to technology resources to enhance educational experiences and develop key 21st century skills
- **Develop Jordanian students' skills**, necessary to compete in today's global economy
- **Build teachers' skills** with successful ICT integration into the classroom

The Solution

- **COW Pilot Project:** Intel and USAID provided funding to sponsor development of pilot project, designed and implemented by the Academy for Educational Development (AED) as part of Jordanian government's ERfKE initiative
- **Four pilot schools equipped** with one COW cart from Earthwalk Communications, containing 16 Intel technology-based laptop PCs
- **Teachers' professional development** provided by ESP and the Ministry. Teachers trained in cart use and management, enhanced ICT skills, and project-based learning methods incorporating technology. Some teachers also participated in the Intel® Teach program, where they learned how to successfully incorporate technology into teaching methods

Assessing the Situation

As advances in technology and communications are making the global market more accessible, competition within and among nations is becoming more intense. For a country to effectively participate in this new worldwide economy, it is increasingly essential for its workforce to have the skills necessary to take advantage of the latest technology. The Middle East is a prime example of a region that is making a success of seizing new opportunities in high tech business, and Jordan's national government is implementing a series of bold initiatives to ensure it remains at the forefront.

The Jordanian Ministry of Education initiated a nationwide educational reform programme. This included the World Bank-funded Education Reform for the Knowledge Economy (ERfKE) program, designed to enhance learning through the use of ICT, the modernisation of curricula, the expansion of early childhood education and the delivery of eLearning. In early 2004, USAID initiated a major programme to support the Ministry's education reform initiatives. One part of USAID's programme is to work with the Ministry and other partners to pilot different approaches to using ICT in education and to improve teachers' professional development. AED, the non-governmental organisation contracted with USAID to implement its ERfKE Support Project, partnered with Intel to help carry out the COW pilot project.

Prior to ERfKE, most Jordanian students had little, if any, access to computers and the internet. Large schools may have had a single computer lab, but typically building and cost considerations prevented the development of many more. Often, relatively few desktop PCs are shared by all students and teachers in a school, resulting in as little as five minutes of access per user each week. In collaboration with AED and USAID, Intel helped refine AED's strategy for using mobile computer carts to enable teachers to use ICT in their classrooms. One goal of this pilot is that it may become a model for using ICT to enhance education for the whole region.

The COW initiative includes two boys' schools and

two girls' schools of between 600-800 students each, representing a cross-section of Jordan's student population. AED and Intel worked with local equipment provider Earthwalk to develop their mobile solution. Earthwalk carts provided students with regular access to WiFi-enabled Intel® technology-based laptop PCs to facilitate study. Each cart holds 16 laptop PCs, and is wheeled into classrooms when needed. This allows many classes to benefit from their use, and also eliminates the need for extra classroom space for dedicated computer labs. Students make use of the notebook PCs during lessons to research projects, access e-learning content and work on collaborative activities. The carts also have a battery bay where spare batteries are charged while the laptops are being used. This means there is always a fully-charged battery available so that the laptops can be used throughout the day without interruption.

Delivering the Solution

To help prepare students for the modern work environment, the pilot schools carry out learning projects within the context of their courses to further develop their ICT skills. For example, in maths classes, pupils manage imaginary company accounts, while in other subjects teachers encourage pupils to share their projects with each other as Microsoft PowerPoint* presentations and reports. The pupils also use eLearning programs, developed by the Ministry of Education as part of ERfKE. Programs such as eMath* (for students grades 1-12), and I Love Physics* (for students in the final two years of the science curriculum) are used, which enable students to revise concepts learned in class and prepare for final exams. AED contracted CADER, a Jordanian training organisation, to provide teachers with professional development training and support to implement project-based learning in their classrooms as part of the COW Project. Teams of 15 to 25 teachers from each participating school were trained and given an essential introduction to how to use and manage the carts in learning projects and how to use the classroom control software. This foundation is enabling these first teachers to pass on the skills learnt to colleagues at their respective schools. All staff are therefore

empowered to drive students' development of key 21st century skills like collaboration, problem solving and the use of technology through the COW carts and Intel technology-based laptop PCs.

In addition, some teachers received teacher training through the Intel® Teach program, which has provided support for 30,000 teachers throughout Jordan. In parallel with the training provided to teachers, some students in each school will be given the chance to develop their skills further by becoming Student Support Technicians (SSTs). AED designed the SST programme to help schools and the Ministry provide cost effective and technically sound support, while also giving some students a chance to expand their ICT skills. The SST pilot, which is partly sponsored by Microsoft, will be initiated during the second phase of the COW pilot.

Challenges Faced and Lessons Learned

The first phase of the COW pilot revealed a variety of challenges, with some important lessons to be learned for future phases of the project. The key learnings are organised into three key areas: technology/infrastructure, pedagogy/training, and management/support.

Infrastructure and Technology

Many schools in Jordan are in multi-story buildings without elevators. This means that the mobile carts can only be used on one floor, potentially limiting their usefulness. This challenge has been addressed by the schools by re-organising class schedules so that most of the classes that need access to computer technologies are on the same floor as where the COW is used. Connectivity and internet access also posed a challenge as the WiFi radios initially used on the COWs produced a weak signal that was often insufficient to reach all laptops in the classroom. AED and Earthwalk collaborated to install a WiFi signal-boosting device to correct this problem.

Additionally, none of the classrooms in the COW schools have access to the internet, limiting the usefulness of the programme. In the second phase, AED and the Ministry will experiment with using

power line Ethernet as an affordable means of distributing internet in classrooms.

Many schools in Jordan have 40 to 50 students in classrooms designed for 30, and use chair desks – the combination of which presents challenges to the Ministry's overall education reform program and to the goal of using computers in classrooms, as with the COW pilot, to facilitate teamwork and student-centered learning. Over time, as resources become available, smaller class sizes, different furniture and classroom arrangements that encourage greater interaction would support broad efforts to improve education and enable the integration of computers into classroom teaching. The use of COWs helps achieve this.

At the start of the project the decision was taken to use smaller, less robust laptops, so that more mobile carts could be purchased. As a result, it was often awkward for a number of students to work in teams with a single laptop, as the screens were small. A lack of initial training on using the laptop also caused some problems – many students found the screens too dim and glary until they were shown how to adjust the brightness controls. Since the pilot, larger laptops have become more affordable and have been deployed as standard equipment.

As part of the pilot, Earthwalk provided classroom control software that enables teachers to control what students see on their screens. This proved critical to effective information sharing and integration of the computers in routine teaching and learning. The combination of wireless networking and the classroom control software allows students to work across teams, and teachers to keep their class better focused on work and on achieving important learning outcomes.

Pedagogy and Training

Before the COWs were delivered, AED and the Ministry organised training sessions for a core group of teachers and the principal from each school. This provided an essential introduction to the use of the systems, enabling teams to learn

essential skills and share ideas about integrating the technology into their teaching programmes. Another important lesson from the pilot is that training and change management must extend beyond the classroom. Teachers in Jordan are regularly evaluated by supervisors that carry out classroom observations and provide feedback. Some teachers involved in the COW programme reported that supervisors observing team learning and projects would admonish them for not using appropriate methods. To avoid this, some teachers told their students to use the conventional lecture approach when supervisors were in the room. Learning from this challenge, in future phases AED and the Ministry will organise special training activities with supervisors, principals and other Ministry officials so that the skills of the supervisors will be strengthened.

Management and Support

When the pilot began, AED staff worked with each school to create School Technology Committees comprised of the Principal, two to four teachers, two students and two community members. These committees were set up to help the school make decisions about how to manage the COW, allocate the use of this resource, ensure security for the equipment and cover the cost of consumables. Early results show that the active involvement of the committees is essential in achieving optimum results in using the technology to improve teaching and learning.

Positive Results

The COW pilot has revealed important insights into a way to help the Ministry integrate ICT into the Jordanian school system that shows potential for improving teaching and learning. In addition, the project demonstrated just how powerful technology can be as a tool to enhance learning when it is implemented correctly and integrated within a teacher professional development programme.

Since the introduction of the COWs in combination with ongoing teacher professional development focusing on using technology as part of project-based learning, teachers at some of the pilot

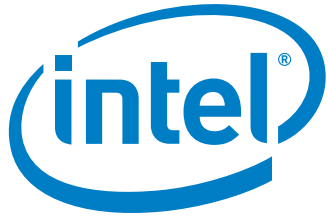
schools have reported an improvement in student performance. "In the past I was disappointed with students' attitudes, all the burden was on me as the teacher – there was no discussion and no interaction," explains Manal Abu Samen, IT and Management Teacher at Balqa School for Girls. "With the new methodologies of teaching, the students contribute more and I can see the results of my work in theirs." After just one year using the COWs, staff from Balqa School for Girls report an improvement in student grades. These teachers emphasised that the combination of the COW with new teaching methods and a new capacity for student-centred learning was critical to this improvement.

Teachers in the pilot schools now have more choice in the way they can conduct lessons, using online content and eLearning programmes within their classrooms. In combination and when appropriate, this enables teachers to consolidate and expand students' understanding of complex topics. These teachers now act as learning facilitators, giving pupils more control over their education and encouraging them to use their own initiative.

Students using computers in their classrooms have the flexibility to work either individually or in groups depending on the task in hand. Using technology as a tool that is integrated within classroom learning has instilled enthusiasm in the children to take advantage of the exciting new resources and new approaches to learning.

The COW pilot has provided an important model of how ICT can be integrated into education. AED, Intel and USAID will continue to monitor and assess the impact of this usage model to assist the Jordanian Ministry of Education in implementing policies that will drive continuous improvement in the school system.

At the start of the 2006/07 school year, AED and the Ministry will carry out a formal assessment of the pilot as the next phase begins. The goal is to refine the model so that, under the right conditions, it could be replicated across Jordan and throughout the region.



For more information, please visit
intel.com/go/education.

Copyright © 2006 Intel Corporation. All rights reserved.
Intel, the Intel logo, Intel. Leap ahead. are trademarks or
registered trademarks of Intel Corporation or its subsidiaries
in the United States and other countries.

This document is for informational purposes only. INTEL
MAKES NO WARRANTIES, EXPRESS OR IMPLIED, IN THIS
DOCUMENT.

*Other names and brands may be claimed as the property
of others.

0107/KW/RLC/XX/PDF

XXXXXX-001EN