ONE-TO-ONE E-LEARNING TRANSFORMATION IN EDUCATION: A CASE STUDY IN TURKEY

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Abstract
This paper summarizes one of the proof of concept projects of e-Government Research and Development Center, METU (EDMER), Turkey, on 1o1 e-Learning. The project aims to show the feasibility of 1o1 learning by a small application in one of the primary schools in Turkey. The POC project is realized by EDMER stake holders and supported by Ministry of National Education, Turkey.

Keywords:

e-Learning, 1o1 e- Learning, education Technologies, Proof-of-Concept Projects

1. Introduction

As an accession country to EU, Turkey set its national strategy to fulfil the gap between mature markets and emerging markets by growing number of well educated people. In the light of its national strategy Turkey has completed the second phase of Digital Education, which are establishing computer labs to each school and connecting them to internet, providing integral training programs to the teachers, supplying needful technologies such as overhead projector to the schools and ready to move next phases to reach the ultimate goal of 1o1 Learning.

The primary focus of this POC (Proof of Concept) project is to support transformation in Education and accelerate the momentum of Turkey in reaching the ideal education environment through presenting the trends which are the Value Proposition of 'Classroom e-Learning' & 'One-to-One e-Learning' Technologies and stimulating a 1-to-1 e-Learning environment to showcase the 21st Century learning and teaching experience.

Figure 1 depicts the four phases of e-learning environments according to 5 different criteria. As one moves from 'Basic ICT' to '1:1 e-Learning', it can be observed that importance of 'Digital Curriculum' and 'Improved Learning Methods' increases greatly. In a similar way, the ICT tools and connectivity alternatives are presented in the classroom as opposed to being offered in the PC labs.

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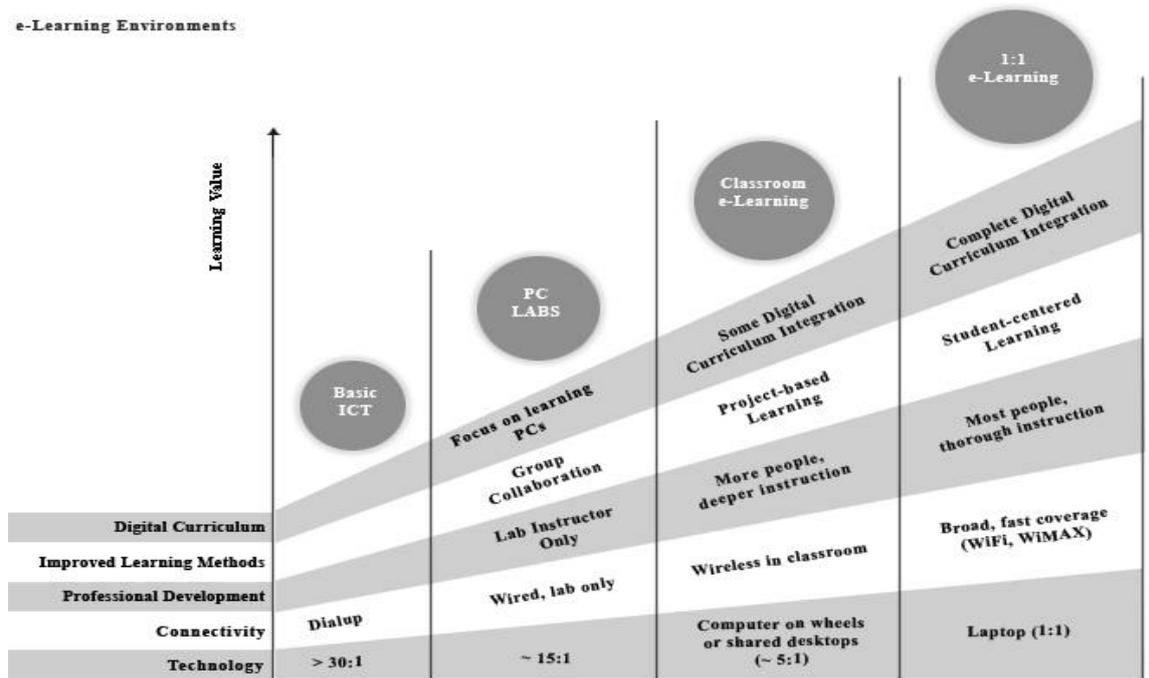
Figure 1: e-Learning Models

This project has been initiated by e-Government Research and Development Centre (EDMER), METU at the beginning of 2007 as one of its proof-of-Concept (POC) projects and the first phase is completed on January 2007. The second phase is planned to be started in January 2008. This paper summarizes the details and results of first phase of 1o1 e-Learning project.

2. Project Definition

2.1 Definition

The Project aimed to show benefits of the transformation of education system and one-to-one computing, which requires digital curriculum and content engages, hi-tech components, challenges, and promotes learning anywhere, by implementing '1:1 e-learning' model on the pilot schools as we can see from *Figure 1* above. It is designed as two phased project.

In the first phase of the PoC project the Classmate PCs has been used in rural area like school where students see/use pc first time in their life. This phase includes, setting up a learning environment where each student was able to access to their classmate PCs (a new category of PCs designed to facilitate teacher-guided, student-centered learning), to experience the benefits of 1-to-1 e-Learning with WiMAX/ADSL connectivity using skooolTM e-Learning and local ISV's (SEBIT) content coupled with Education Initiative Programs (such as Intel Teach) while teachers were using laptops, smart boards and projectors in delivering their courses.

The project has aimed to trigger the transition from 2nd phase (Computerization of Labs) to 3rd (Classroom e-Learning) and 4th Phase (One-to-One e-Learning) (see *Figure 1*).

2.2 Objectives

Objectives, with their definition and description are ordered in the following table.

Table-1: Objectives

#	Definition	Description
1	Online content	Prepare teachers to be integrated with technology in their teaching through educational online contents. Provide %30 of the day towards time for staff to learn about technology integration.
2	New Technologies	Creating computer awareness and teaching how to use new technologies to students by providing high-quality education to more students at a lower cost.
3	Student-Centric problem solving and collaboration	Improving student access to information by providing students with new technologies and internet connectivity to foster student-centered problem solving, collaborative projects, and independent researches.
4	Ubiquitous Access	Provide greater access to equal educational opportunities through 'ubiquitous access' to technology (at anytime from anywhere).
5	1o1 learning environment in classroom	Accelerate and increase student centered learning and achievement through the usage of laptops dedicated to each of them in their classrooms.
6	Student Motivation	Increasing students' performance, motivation, engagement and which is reflected to their grades.

2.3. Partners

This PoC has been initiated by EDMER with joint efforts of following project stakeholders where each of them is local and international leading companies in their business areas and related government organizations as well. Partners are: MoNE (Ministry of National Education), Intel Corporation, Turkish Telekom, Microsoft, SEBIT, Smart Technologies, METU Education Faculty.

2.4 Expected Results

The expected results of POC were:
- Contribution in forming the Information Society and Knowledge Economy by using the most valuable asset of Turkey – manpower – through modern education methods.
- Support in creation of a competitive society by using 21st century skills so that to improve Turkey to the level of mature markets.
- Evolution from 'Knowledge Acquisition' to 'Knowledge Creation'; Gaining 21st Century Skills;
- Reducing 'Digital Divide'.
- Providing equal educational opportunities to schools situated in different geographic and socio economic conditions.
- Supporting connection and networking among schools in Turkey and other countries.
- Improving grades and graduation rates of the students.
- Increasing teachers' motivations and marginal productivity.
- Increasing administrative efficiencies (Cost Savings).

3. The Approach

3.1 POC Concept

A POC project is the one including a small scale implementation of a brand new concept for the country. The concept may not be original for the world but it should be original for the environment where it is going to be implemented. After the POC project is completed, it is finalized with a feasibility report including the approaches for scaling up the project thru the country as well as its costs and benefits. By another terms, a POC study can be interpreted as a feasibility study supported

by an application. 1o1 e-Learning project is one of EDMER POC projects to show the feasibility of the usage state-of-the-art education technologies in primary schools.
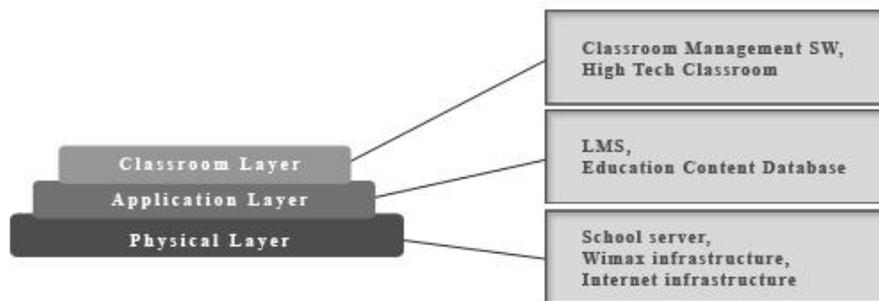
3.2 The Model

Figure 2: 1o1 learning model

1o1 learning model is a three tired model involving three layers as it depicted in *Figure 2*:

Physical Layer: This is the hardware layer of the overall system. It includes the hardware required for the applications to run on. The hardware consisted of school server, routers and switches and network devices for wireless access for local area and wide area (wimax).

Application Layer: In this layer, the learning management software and education content data base is maintained to provide collaboration among the students as well as course content.

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, projector and a teacher computer including classroom software to manage the student computers.

Classmate PCs provide teachers with an integrated educational feature set that facilitates classroom and content management, and support teacher-student and teacher-parent collaboration. Integrating classmate PCs, the teacher laptop and wireless network in the classroom allowed the connection of students with the teacher and with a much larger set of digital content and software from the teacher PC. With this environment, student could have collaborated, exchange information and work with e-Learning materials. The teacher control program allowed the teachers effectively manage the activities of the student PCs like performing exams, sharing the results with the classroom and ensuring students stay focused on the activities the teacher is leading. The low-cost server allowed the school to caching the related content from the Ministry of National Education main server and other servers.

3.3 Infrastructure

- WiMAX and ADSL connection infrastructures; Cable Infrastructure, ADSL Modem, and Wireless Access Points. 4 instructor notebooks and cash server as EDMER's fixed assets.
- 'Skoool' content (provided by Intel) for Ministry of National Education;
- 'Vitamin' content for education (provided by SEBIT);
- 60 Classmate PCs powered by Intel Corp. (Notebooks developed for K12 Students by Intel)
- 2 smart boards and 2 projectors provided by Smart Technologies;

4. Project Implementation

4.1 Execution of Project

The project was implemented in two different classes (fourth and fifth grade classes), and each of the classes contained 35 students. Some of the mathematics, social sciences and English lessons have been delivered by the usage of resources such as Classmate PCs, smart boards, and wireless network infrastructure. Teachers quickly noticed the differences on the student learning when applied the usage model that the project delivered. 'Students having their own laptops have put more interest in their studies as compared to when there was no computer at the school' said Ms. Umran Akturk, who teaches at Evliya Celebi School. Sample tests showed that the pilot classes scoring higher than comparable classes on the related areas of the curriculum. Both students and the teachers were enthusiastic as they all found that the environment in the project has made teaching and learning quite easy. Students, teachers and school administration were all pleased with the benefits of the usage model that was tested in the school which was created nice synergy among all the staff of the school.

4.2 Evaluation

The evaluation process was done with baseline assessments of qualitative and quantitative metrics. Assesment tools included are; personal interviews of school administrators, teachers, students and parents; quantitative surveys; classrom or other observation and student tests.
The observations and corresponding objectives are given in *Table-1* below:

<div align="center">Table-2: Objectives vs. Observations</div>

Observation#	Definition	Related Objectives
1	**Online Content**	1,6
2	**New Technologies**	3
3	**Student-Centric problem solving and collaboration**	2,6
4	**Ubiquitous Access**	4
5	**1o1 learning environment in classroom**	5
6	**Student Motivation**	6

Furthermore, all of our observations are very similar to the result of a similar study which is realized by University of Southern Maine [7].

4.2.1 The Costs

The project required about 30 person-month efforts to be completed in 6 month time. Since, the cost of infrastructure varies among different brands; the money figures were not given.

4.2.2 The Benefits

<div align="center">Table-3: Tangible and Intangible Benefits</div>

Tangible Benefits	Intangible Benefits
• **15% savings in teaching time due to using already existing contents in notebook rather than sketching to the blackboard,** • **Attention of students increased from 18 min in**	• **Increase in interest of the students to the courses,** • **Increase in interest and motivation of the teachers to the courses,** • **High attendance rate compared to traditional**

traditional teaching methods to 28 min. in digital education, • **35% increase in the education content given to the students in the same period.**	classes due to interesting topics (3D animations, simulations etc) covered during class, • **Provided an opportunity to the teachers for self development,** • **Increase in the exam performance though it could not be quantified in limited timeframe in a statistical way.**

The tangible and intangible benefits we observed were given in Table-3 above. However, it should be noted that our sample size is too small.

5. Conclusion and future work

Fast-paced, multi-tasking generation that has grown up with multimedia, video games, mobile phones and the internet has changed the way the students capture and process the information. This has changed the requirements of equipping them with the 21st century skills needed for academic excellence and success in the global workforce. The pressure is on for primary and secondary school educators to keep up with technology-enabled world. Technology is now capable of delivering enriched educational environments and students are ready to learn in their way, anytime or anywhere. We are coming to the point at which one-to-one learning is inevitable however managing a one-to-one initiative is a comprehensive undertaking.

In 1o1 Learning POC in Turkey, we have witnessed great change in Evliya Celebi School, from students point of view it was "Unbelievable" or "Vow" type of change whereas from teachers point of view it was "Yes, this is technology!" type of change. What ever they call it, it was inevitable change taking place in Turkey where 21st Century Learning experienced. This POC was an important milestone in educational transformation and first step to 3rd and 4th phase of Digital education. The second phase of the PoC Project will include computer on wheels model for use in 'Classroom e-Learning', matching an urban area school with a rural area school creating a virtual classroom, distance learning concept, and community generated content experience in Turkey.

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