



# Model Schools Network Program

## Technology In Schools: Final Report

### POLICY Recommendations

This report is the second of four final reports each highlighting important thematic outcomes of the USAID-funded, AMIDEAST-administered Model Schools Network (MSN) Program. This report presents findings from extensive evaluation of capacity-building interventions

supporting education technology in MSN schools. This evidence has framed key policy recommendations which are presented below. These recommendations are premised upon the statement that the integration of education technology in the curriculum and instruction within Palestinian schools is most effective when the following conditions exist:

- 1 All public schools are provided with Internet connectivity and the necessary technology infrastructure to support the effective use of new media and digital technologies in curriculum and instruction and professional development.
- 2 Internationally accepted standards for the integration of education technology, such as those established by the International Society for Technology in Education are reviewed and considered in the MoEHE's broader approach toward integrating educational technology in schools.
- 3 Pre-service and in-service teacher education prepares teachers to use education technology to enhance learner-centered, authentic forms of student performance activities, emphasizing collaborative problem-solving and project-based approaches to assessment.
- 4 Principals and school staff make broader use of education technology to communicate more effectively and efficiently with teachers, students and parents through the use of e-mail, a school website, Facebook or other appropriate platforms.
- 5 The MoEHE works in tandem with the District Offices and school principals to establish new guidelines and procedures in class scheduling that encourage multidisciplinary use of the computer lab.
- 6 The MoEHE reviews the Palestinian curriculum by grade and subject in order to create optional, supplemental content and guidelines for integration of education technology in the classroom using learner-centered strategies.
- 7 The MoEHE provides teachers access to portable computers for use inside classrooms and at home.
- 8 The MoEHE develops a strategy regarding the maintenance of all technology, particularly hardware that is mobile and virus-prone. Users must be equipped with strategies to minimize the debilitating aspects of computer viruses.

# Background and Research Approach

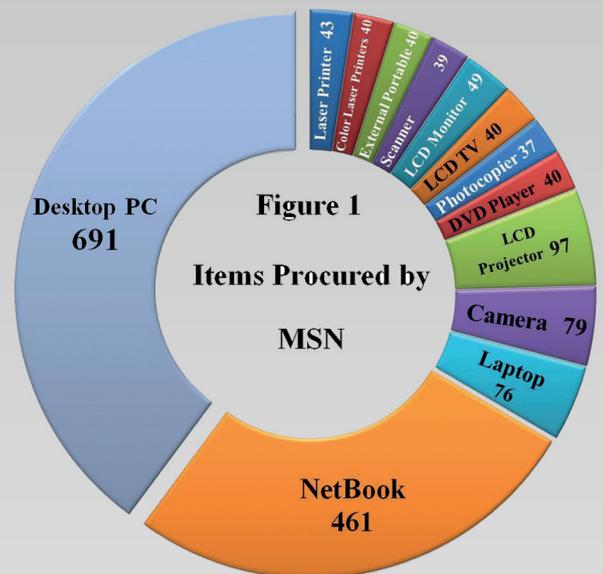
The MSN Program's Education Technology Strategy (ETS) is premised on using appropriate technology tools that connect classrooms and teachers to the wider world, enable professional networking among teachers and improve learning outcomes for Palestinian students. The MSN

approach has involved piloting a selection of technology in tandem with other program components. A set of basic minimum standards for educational technology use and support which lead to improved learning, has resulted from this approach. The approach focuses on providing ample training time and follow-up for teachers and administrators to demonstrate understanding. It ensures teachers and administrators are proficient in the use of technology as a way to guarantee sustainability.

Four core initiatives comprise the ETS: 1) one netbook/one teacher - each math, science, English and technology teacher in the MSN program was issued a netbook to support the teaching and learning of subject matter content, and school computer labs were upgraded; 2) school connectivity was provided including Internet access in all classrooms; 3) provision of teacher professional development supporting ICT in education occurred at all schools; 4) a Virtual Learning Environment (VLE) using a Moodle-based platform was created for communication and collaborative work.

The MSN Assessment Team, which included technical input and data gathering from the MoEHE's Assessment and Evaluation Department, designed a mixed-methods

approach for its research. Quantitative data collection consisted of surveys, while qualitative methods included focus groups, in-depth interviews and narrative comments from classroom observations. A pre-intervention study took place at the start of the MSN program to establish baseline data and was followed by a post-intervention study at the program's conclusion. Furthermore, ten schools outside the MSN network were selected by the MoEHE for inclusion in the pre- and post- study to provide a more robust basis for determining whether changes were the result of MSN's interventions or other factors at the 40 MSN schools<sup>1</sup>. Table 1 shows the sample sizes for the groups comprising the survey research. In addition, AMIDEAST/MSN's internal Monitoring and Evaluation Department conducted 67 interviews with principals, teachers and students in ten public schools participating in the MSN Program. In addition, MSN administered 448 surveys of all teachers in order to assess the impact of netbooks in the classroom. This data was triangulated and integrated with the pre- and post- study.



**Table 1 Sample Sizes of Research groups**

	MSN Schools		Control Schools	
	Pre	Post	Pre	Post
Teachers	521	655	146	104
Principals	57	40	13	10
Parents	918	1603	180	364
Students, grades 4-5	147	726	111	96
Students, grades 6-9	739	1799	275	314

The sample of principals in the pre-study indicated a subsample of deputy principals: 17 from the MSN schools and 3 from the control schools.

1. The comparability of the ten control schools to the 40 MSN schools was confirmed through an ANOVA analysis comparing the means of key variables.

## KEY FINDINGS

### Computers and Connectivity in Schools

MSN renovated 29 school computer labs and provided all new equipment for 38 schools. MSN also provided 461 netbooks to math, science, technology and English teachers, as well as principals and some supervisors. The point of introducing netbooks to teachers was to enable the teachers to practice technology integration to support instruction in their respective subjects. Teachers were expected to draw on content and resources available to them on the Internet, as well as to encourage collaborative learning using netbooks among their students and colleagues. The netbooks were also supplied as a tool to support their MSN in-service professional development.

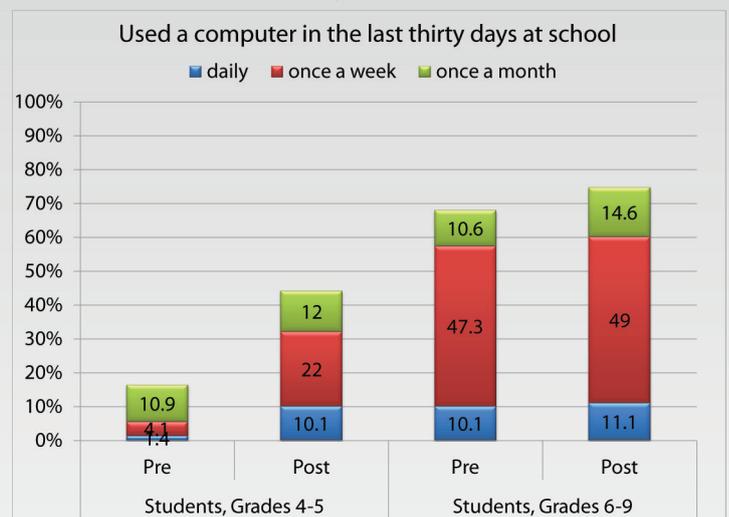
**Procurement of computers and the provision of Internet connectivity has made a dramatic improvement to the IT infrastructure of MSN schools.** The MSN experience demonstrated the introduction of netbooks was relatively easy. Although skill levels varied considerably among teachers, many required little to no computer training in use of the netbooks. Schools reported more requests for advanced training and increased access to the Internet following netbook distribution and Internet provision. Based on reporting by principals, all of the MSN schools had Internet connectivity, while the control schools reported just 20%. This disparity is highlighted by the fact that there is virtually no difference in the availability of computers or the Internet in students' homes. Eighty percent of students from both MSN and control schools reported having a computer at home, with 50 percent having Internet access.

**Students' use of educational technology in MSN schools increased impressively with the addition of refurbished or new computer labs and the provision of Internet at school.** Figure 2 highlights the frequency of student computer use over time.

Until more households can be connected to the Internet, schools with Internet connectivity are the most accessible and affordable source of educational technology for Palestinian students. This point was reinforced by a student who observed that "During free time some students who don't have Internet at home use the computer lab to browse the Internet to write reports."

**MSN's provision of computers and Internet connectivity among its network of schools noticeably improved teachers' capacity to access and incorporate teaching resources into the curriculum and instruction.**

Figure 2



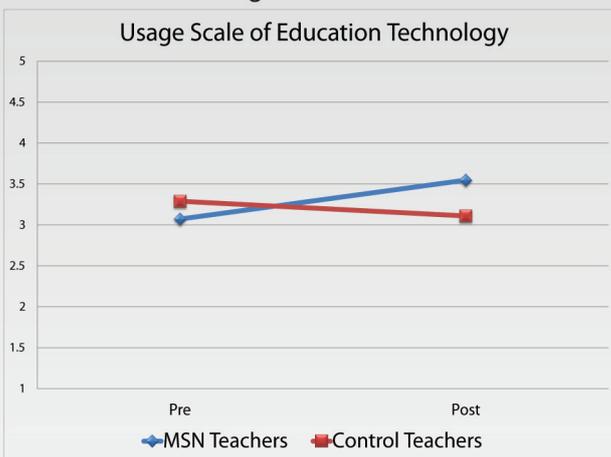
A principal commented on the added value of connectivity at his school: "Computers (both laptops and desktops) are considered the most important. Students never thought that they would be able to do fun stuff in class, like watching a video on educational material. Not all of the students have computers and Internet at home, so this gives them a chance to see new things."

The survey for teachers and principals included a Usage Scale of Education Technology comprised of seven question based on a 5-point Likert frequency scale (1 = never, 5 = always). The questions asked teachers and principals to indicate how often they used a computer at home or in school to:

- Gather information from the Internet for planning lessons
- Access model lesson plans from the Internet
- Access best practices for teaching from the Internet
- Participate in professional development activities/courses via the Internet
- Download software from the Internet to use in class
- Give multimedia presentations in class

Figure 3 shows the results of the Usage Scale of Education Technology. The results indicate that MSN teachers, compared to their control school peers, increased their use of computers and software for school and related educational purposes. An analysis of the discrete questions comprising the Usage Scale revealed that among the most dramatic changes for MSN teachers was their enhanced capacity to access resources from the Internet for use in class, as well as their improved opportunities to participate in online professional development. The results also indicate that teachers appear better able to create instructional materials and give multimedia presentations in class<sup>2</sup>.

Figure 3



## CONNECTIVITY IN SCHOOLS: A National Model

MSN's approach to connectivity in schools was to design a national model that was affordable, would easily scale to hundreds more schools, and could be centrally monitored and maintained for quality assurance. A local area network was installed at each school to allow Internet via wifi access in all classrooms and administrative areas. AMIDEAST created a broadband WiFi, virtual private network (VPN) at each of the 40 schools with the following key features:

- 3 Mbps upload/download speed with a maximum capacity of 20 Mbps within the VPN.
- Ability to use high-bandwidth technologies between schools (e.g. video conferencing).
- Symmetrical connections so that students and teachers can create content at all locations.

### The MoEHE's central network monitoring and management system allows:

- Access to a "dashboard" showing in near-real time the status of all connected sites.
- Filtering and blocking inappropriate sites and setting Internet bandwidth allocation rules for each school
- Links to other MoEHE online resources and internal content .

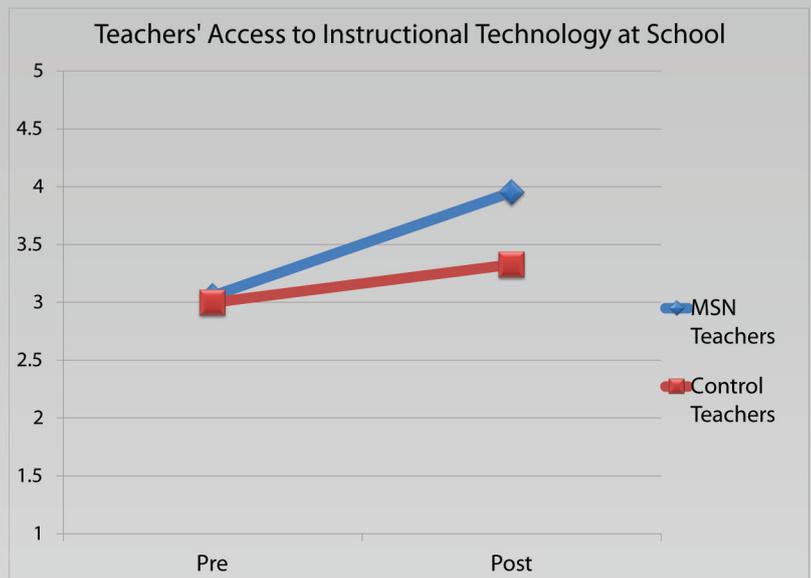
Internet service has been continuous since November 2011 and a local Internet service provider (Coolnet), will continue providing all 40 schools with Internet until September 2014. The average student body of each school is 432 students, therefore, annual per pupil costs are approximately 26 NIS.

Furthermore, the frequency of netbook use in classrooms was correlated to three factors: 1) the background of the teacher, particularly educational attainment; 2) prior home computer ownership; and 3) access to the Internet at home. These factors influenced teachers' frequency of netbook use in their classrooms. The most frequent use came from individuals when all three of these factors occur. The two most common types of netbook usage involved classroom related tasks, such as lesson preparation and using the netbook in tandem with an LCD projector to teach a unit or lesson.

2. Statistical evidence from a t-test of variance shows that the differences between the pre-post means of the Usage Variable are statistically significant, providing further evidence of MSN's likely influence:  $t(614.01) = -7.67, P = .000$ .

The MSN survey created a second composite variable to measure the availability of and access to instructional technology for teachers at their schools. This included computers, printers, software and Internet access, including sufficient training and support to fully utilize the available technology resources. As shown in Figure 4, MSN teachers exhibited improvement in this domain compared to their counterparts in the control schools. Results for principals regarding the same variable mirrored those of teachers, but with even larger gains in satisfaction over the pre-post period<sup>3</sup>.

Figure 4

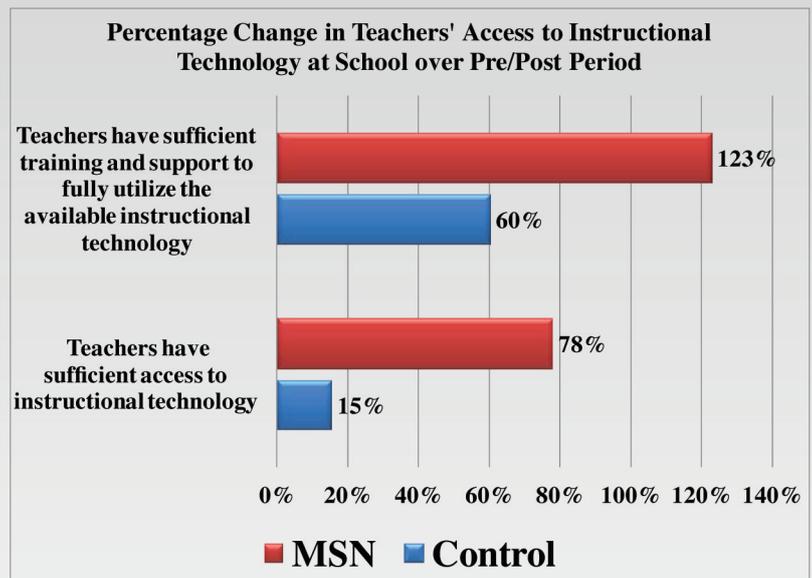


The impact of MSN's procurement strategy is further illustrated in Figure 5, which shows the dramatic increase in the number of MSN teachers who believe they have both sufficient access to education technology and sufficient training and support to use it. On the other hand, though MSN teachers' assessment of technology training markedly improved, still less than half the teachers feel they have sufficient training and support in this regard.

### Teacher Professional Development and the Virtual Learning Environment

The MSN model blended face-to-face learning experiences with synchronous and asynchronous activities and assignments on the MSN Virtual Learning Environment (VLE). The VLE is a Moodle-based platform used for assessment, communication, content sharing, collaborative work, and reflection. An important aim of the VLE was to create virtual communities of practice within each discipline. Two of sixteen professional development modules for math, science and English teachers specifically addressed the integration of technology in the classroom, while the IT teachers participated in specialized skills sessions, such as designing and

Figure 5



maintaining a school's presence using Moodle and managing the VLE. The results of these efforts are apparent in a variety of data.

**The provision of Internet connectivity at MSN schools greatly facilitated teachers' capacity to access online resources and integrate them into their teaching.** Overall, MSN teachers reported nearly a 20% increase in their participation in online professional development (PD) activities. The percentage reporting frequent online PD participation doubled. Over the same period, teachers in the control schools reported nearly stagnant rates of participation in online PD activities. The total number of VLE logins by teachers and trainers in both public and private schools during the PD program exceeded 600,000, and the total number of posts to the VLE approached 70,000. This level of activity reflects the blended nature of the PD program.

3. The differences in the means from pre-post for the MSN teachers and principals are statistically significant Teachers:  $t(1052.40) = -17.25, P = .000$ ; principals:  $t(74.35) = -8.23, P = .000$

**Increased Internet connectivity and use of technology provided the foundation for a more collaborative community of learning among students and teachers.** An English teacher from Hebron remarked, *“The students have started to bring us PowerPoint presentations that they have produced. We take them, edit them and improve them and then show them to the class as the work of the student. This has encouraged the students to use technology more.”* Another teacher also alluded to how educational technology is bringing the students’ homes into the larger community of learning: *“I learned that by using technology students will try to imitate me and they go home and try to do things that we did in the classroom, and do an online search. If they struggle, they get their parents involved, and that is an overall learning experience for all of us.”*

**Teachers are eager to integrate instructional technology into their teaching practices and MSN’s evaluation provided examples of how technology in schools improves learning.** For example, comments by some teachers illustrate that they believe that using a netbook, an LCD projector and a well-equipped computer lab allows a teacher to provide good conditions for student learning: *“I noticed when the students see the videos they understand the material in a different way. We use technology to motivate the students to try harder”.* Students found the classes using technology more exciting. The link between encouraging student motivation and higher student achievement should not be underestimated. A Ramallah principal’s feedback also highlighted how teachers’ use of computers minimized individual differences, encouraged group work, enhanced research skills and made students think beyond the prescribed textbook.

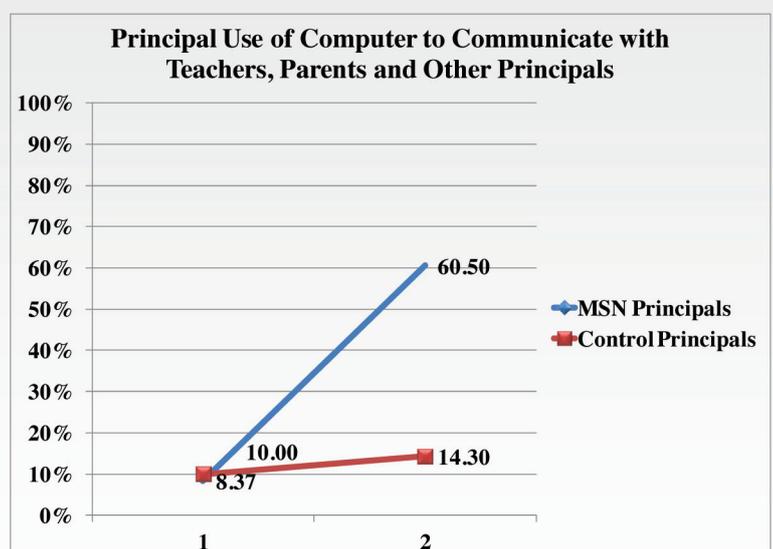
Subject teachers actively integrated technology into their instruction. One student remarked, *“In math class, we learned about the Pythagorean Theorem. [The math teacher] made the lesson not just lecture, lecture, lecture, but engaged us so that we were all involved. We came to the computer lab and researched it on the Internet.”* Furthermore, comments received from teachers in focus groups and interviews reinforce the perception that MSN’s interventions in instructional technology have contributed to improving teachers’ professional self-esteem. *“I enjoy using technology as I discover new things that enhance my knowledge. Now I’m using the computer to access scientific websites that help me in delivering my lesson to my student. And on the personal level I have new information as well.”*

**Principal responses also demonstrated the benefits of the integration of technology and training in their schools.** Ninety-four percent of the public school principals felt they had learned how to utilize the VLE upon completion of their Leadership Diploma Program. Furthermore, Figure 6 illustrates how the introduction of information technology and Internet connectivity in schools dramatically influenced their online communication with teachers, parents, as well as with fellow principals. The implications of this change point to the expanded leadership capacity of principals to foster not only improved communications among teachers, staff and district supervisors, but also their enhanced capacity to strengthen home-school connections and community outreach.

**Teachers’ level of satisfaction with the professional development provided by MSN in the use of computers and related instructional technology increased.** The post-intervention survey indicated an 18% increase in teachers’ satisfaction with their capacity to use IT, as developed under the MSN professional development program.

*One teacher noted, “We took another IT course but it was short and brief. The MSN training was longer and it covered various issues. The use of technology during the training was for a longer period than any other previous training so it enhanced our skills more.”*

Figure 6



# CHALLENGES

## to Integrating Technology in Schools

The quantitative and qualitative evidence presented above point to an overall positive impact regarding the value and relevance of instructional technology to teaching and learning in MSN schools. However, the findings also highlight important challenges and reflect the global debate of how to most effectively integrate technology in schools.

**It is unclear if instructional technology at MSN schools improved teachers' capacity to use technology in learner-centered ways.** For

example, teacher and student interviews and focus groups frequently describe how teachers use technology and new media (i.e., netbooks, LDC projectors, PowerPoint slides, and YouTube videos) to "show" students content, but do not necessarily describe what students actually do to demonstrate they understand the ideas or concepts being taught. One student observed: "The teachers want to show us lessons in color and sound, and using the computer does just that." A teacher made a similar comment: "We used to use transparencies, but the new LCDs are with color and project things differently and get the students' attention better." In short, it is unclear how much teachers' use of technology goes beyond being a more interesting teacher-centered method of delivering the curriculum content. Teachers would seem to benefit from more guidance and curriculum materials that support how to use education technology in the classroom or computer lab.

The ambiguity about the effect of technology on student classroom learning is telling when a student complements her teacher's use of technology to help her to "remember" rather than understand content and ideas: "[Teachers] are trying to advance by taking us to the computer lab and that is certainly good and definite progress. [But] it's the teacher that makes the lesson interesting; if she does it in an interesting way, we remember better."

**Palestinian classroom practices also pose challenges to the introduction of technology.** Teachers' assessment approaches do not readily take into account the assessment of students using technology, such as when students conduct research projects using the internet, use a computer lab for other subject classes or conduct group work in class. These types of activities are often not assigned a grade or given suitable weight for a student's effort and learning. Furthermore, teachers and principals sometimes acknowledged that pressure to prepare students for tests undermines their capacity to integrate technology in ways to support learner-centered curriculum and instruction.



**Another factor is the chronic problem of overcrowded classrooms that continue to hamper effective teaching and learning even in schools with newly equipped computer labs.** "We have 25 computers, but we have some classes that have up to 47 students. It is difficult to get the students' attention when there are so many of them in a classroom."

**Ensuring netbooks and computer labs remained virus-free was a major challenge during the MSN Program.** The netbooks were frequently infected with viruses, particularly from the use of flash drives, underscoring the need for continuous antivirus protection or alternative solutions, as well as effective technical support. Although teachers were trained in how to mitigate computer viruses on their netbooks, frequent misuse reduced the efficiency and functionality of the machines.

**Furthermore, teachers and administrators had only a rudimentary understanding of basic computer use for educational purposes, and required significant training and supervised contact with their netbooks in order to use them most effectively.** This finding, which is confirmed in other MoEHE studies,



highlights a clear imperative to provide sufficient and ongoing training when introducing education technology. On the other hand, simply having access to the technology inspired further learning and interest in more advanced training.

In sum, schools around the world face the constant challenge of how to effectively integrate rapidly changing forms of new media and digital technologies in education. These challenges are especially difficult in the education systems of low resource countries, such as Palestine. What the MSN research findings show, however, is that easy access to Internet connectivity and mobile technology, such as netbooks in classrooms, combined with teacher professional development, can be a powerful catalyst for practical change in Palestine's public schools.