Report for

# OECD/CERI
# Programme on ICT and the Quality of Learning
# Case Studies of Organisational Change

by the

## U.S.A. Exemplary Technology-Supported Schooling Case Studies Project

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# Executive Summary

This is a summary of the six case studies conducted in the United States for the OCED/CERI "Case Studies of Organisational Change."

## Site Selection

Six criteria were established for selecting the sites as follows: (1) a majority of teachers at the public school are engaged in a school-wide reform or school improvement; (2) a majority of teachers are engaged in an innovative, technology-supported pedagogical practice; (3) the school is committed to meeting high content standards in core subjects; (4) the students are drawn from diverse backgrounds including a number of low income students; (5) the reform effort and the innovative technology-supported teaching practices appear to be sustainable and transferable; and (6) there is compelling evidence that the reform effort and the innovative technology-supported teaching practices have resulted in educationally significant outcomes or gains for the students involved.

An extensive procedure of solicitation of nominations from numerous experts and organizations was followed to obtain candidate school sites. When it appeared that any school met the selection criteria reasonably well, we attempted to interview a school administrator and one or two teachers to obtain more details. We supplemented this with information from school, district, and State Web sites. Final selection of the sites was done with our advisory board and representatives of our sponsoring organization, OERI of the U. S. Department of Education.

## Overview of the Schools

The six schools are listed in Table 1 with basic school information. There are two elementary schools, three middle schools, and one senior high school. One middle school is quite large with over 1,3000 students and the senior high is small with only 240 students. Otherwise, the schools tend to be somewhat average or typical in size. Walnut Grove and Future High are magnet schools and only about 5 years old. The remaining schools are older, more established schools. Two schools are in sizable urban areas, three are in suburban communities, and the high school is in a small town.

Table 1. Schools in study and their basic information.

| School Name** | Grades Served | Enrollment | Size of Place | Percent Minority | Percent Poverty* |
|---|---|---|---|---|---|
| **Walnut Grove** | K-5 | 768 | Urban | 60 | 60 |
| **Harland** | K-6 | 618 | Suburban | 25 | 7 |
| **Mountain** | 6-8 | 1,338 | Suburban | 12 | 7 |
| **Pine City** | 6-8 | 800 | Suburban | 65 | 75 |
| **Future High** | 11-12 | 240 | Small town | 46 | Not available |

| Joshua | 7-8 | 500 | Urban | 95 | 80 |
|---|---|---|---|---|---|

*Poverty indicator was percent of students eligible for free or reduced cost lunch.
** All names of schools and individuals in this report are pseudonyms.

There is considerable variation in the racial diversity and family poverty of the schools. Two schools have relatively little diversity and poverty: Harland and Mountain. Three schools have 60% racial minority or greater and very high poverty levels. The remaining school, Future High, has nearly 50% minority and students come from diverse income backgrounds. However, the school does not have a lunch program and a large share of the students are employed in jobs themselves.

## *Overview of the Reforms*

This table summarizes in a phrase for each school the investigated school reform and gives the share of teachers participating in the reform.

| School | Reform | % of Teachers Participating | Students per Computer |
|---|---|---|---|
| **Walnut Grove** | Project learning using wireless laptops | 100 | 5 |
| **Harland** | Basic school powered by technology | 100 | 1 |
| **Mountain** | Technology to support standards-based achievement | 80+ | 4 |
| **Pine City** | Thin clients supporting academic performance | 100 | 2 |
| **Future High** | High-Tech preparation for a High-Tech World | 100 | 1 |
| **Joshua** | Inquiry-based instruction to improve student achievement. | 75 | 2 (in targeted classrooms) |

It also gives the students per instructional computer in the school. In every instance all of the teachers were participating in the reform activity, which involved the use of ICT for instructional improvement. Of course, the degree of teacher participation varied across teachers, and in Mountain a technology specialist said that 20% of the teachers did not have a heavy, regular involvement in the ICT activities, which is why the table shows only 80% of the teachers participating. Two of the schools had a student-computer ratio of four to five, which is approximately the national average. Two of the schools, Harland and Future High, had a computer for every student, i.e., a ratio of one, and Pine City had nearly as high a computer density with a ratio of two.

The school-wide reform of the first school, Walnut Grove, was "project-based learning using wireless laptop computers." This strategy was supported by an intensive 45-hour

technology-based professional development in which 38 of 40 teachers had participated. The reform program included a variety of software packages and learning activities for the teachers and students to use.

Harland called itself a "basic school powered by technology." This approach was derived from their attempts over a decade to adapt the Boyer Basic School philosophy, which emphasizes a learning community with a coherent curriculum. The teachers with the help of technology specialists developed a variety of strategies for pursuing this philosophy using technology. Among their strategies are a computing unit for every student, a video conferencing center and a full range of assistive technologies. A number of the reform activities appeared to have been initiated by the teachers.

Mountain Middle, a large suburban school has a reform program that can best be described as "technology to support standards-based achievement." For some time its school district leadership has pioneered an approach to promote improvements in achievement using technology in a variety of ways. Some of their innovations include a new teacher-support role called "Student Achievement Specialist" and innovation groups called Vanguard Teams.

Another suburban middle school, Pine City, emphasizes student achievement but takes a much different approach with technology. Their reform effort is summarized as "thin client computing supporting students' academic performance." "Thin clients" refers to the computer stations which have very little independent capability (either hardware or software) apart from the local network to which they are connected. This ICT strategy has made it possible for them to attain a very high computer density and quality maintenance with centralized control.

Joshua is a grades seven and eight junior high in a district that has promoted and inquiry-based style of teaching supported by ICT. Teachers prepare for a year before receciving an advnaced technology classroom. During this time they learn the applications as well as a style of instruction the district refers to as inquiry-based. This approach emphasizes the students working to locate information on the Internet, make sense of it through a higher-level task, and create a product that demonstrates what they have learned.

The high school, Future High, was established about five years ago to give students "High-Tech preparation for a High-Tech world." They think of themselves as a high-tech "start-up" company where the students are learning to fill technically demanding jobs, but unlike a vocational school, their education is not seen as ending, and in fact almost all of the students go on to college. A number of radical improvements have been implemented and their school has become known as a showcase to which visitors come from all over the world.

## *Conclusions Regarding Hypotheses*

Overall the findings related to the main hypotheses yielded quite similar conclusions across the cases. Given the diversity of the cases and the variety of researchers involved, this uniformity is especially impressive. There were six different researchers participating in the site visits, although one of two lead researchers led the team at each site to provide continuity.

| School | H1 - ICT as Strong Catalyst? | H2 - Traditional Diffusion? | H3 - Staff Competence Key? | H4 - ICT Not Widening Digital Divide? | H5 - ICT leads to higher Standards? | Future Sustain-ability? |
|---|---|---|---|---|---|---|
| Walnut Grove | N | N | Y/N | Y | Y | Y |
| Harland | N | Y | Y | Y | Y | ? |
| Mountain | N | N | Y | ? | Y | Y |
| Pine City | N | N | Y | Y | Y | Y |
| Future High | N | N | Y/N | Y | Y | Y |
| Joshua | N | Y/N | Y/N | Y | Y | Y |

The general response to each hypothesis is summarized in the following table. For instance in the H1 (hypothesis 1) column, an 'N' in each cell means that the hypothesis was not confirmed for any of the cases. A 'Y' indicates that the hypothesis was confirmed. A "rival hypothesis" was given for some hypothesis, and some hypotheses were expressed as negative statements. Given this semantic variation and the ambiguity of some of the propositions, some attention is given here as to how each hypothesis was interpreted.

# Hypothesis 1: ICT as a "Strong Catalyst"

At every site one or more administrators and/or teachers volunteered their opinion that the technology (ICT) was subsidiary to their educational mission. This idea was expressed in many different ways but underlying this discourse was a conviction that the technology itself was not an end or a goal but a means toward improving instruction and related processes. Another way of saying this is that the technology was merely a resource. Even technology coordinators and other specialists who spend all of their time on technology matters shared these same perspectives. One could argue that an institution like Future High is an exception to this pattern because "high-tech" gave the school an identity. Their mission is to prepare students for a "high-tech" world with the help of "high-tech" tools. Yet even at Future High the teachers insisted their goal was to create an environment were the students could optimally learn the full range of abilities needed in today's changing society. The abilities that they focused upon were skills in problem solving, inquiry, analysis and communication, not computing. Therefore the researchers concluded that ICT did not function as a strong catalyst driving the educational reforms observed.

# Hypothesis 2: Traditional Diffusion Pattern

Roger's diffusion model states that cumulative adoption of an innovation follows an S-shaped curve where the rate of adoption accelerates mid-way through the spread of the innovation. Furthermore, he also proposes that people that are connected to information flows relevant to the

innovation and people that have a propensity for trying out new things are more likely to adopt an innovation early in its spread. It was noted that people who are younger and have more education tend to have a greater propensity to change or experiment with new ways. This Rogerian model is generally called the traditional diffusion model.

The preponderance of evidence from all but one of the cases is not consistent with this traditional diffusion model. The most salient factor accounting for this discrepancy derived from a top-down reform plan. Two of the schools were established for the express purpose of fulfilling a reform model, so staff were recruited on the basis of their prior experience with, or their interest in learning, the innovation. In several other schools the teachers were all given educational training sessions at about the same time. In Harland and Mountain schools the teacher participation was to some extent optional, thus a traditional diffusion pattern could have emerged. In fact, Harland offered evidence that teachers with home computers or prior experience with computers in the classroom were more likely to adopt the new practices early in the process. Such a pattern appears to have been rather weak at Mountain. Instead the school administrators implemented a strong program of professional development and in other ways established a "culture" in which everyone collaborated in moving toward a "shared vision."

# Hypothesis 3: Staff Competence

This hypothesis is that successful implementation depends mostly upon "staff competence in the integration of ICT into instruction and learning." The rival hypothesis is that ICT infrastructure and "student ICT competence" account for success. Two of our cases, Walnut Grove and Future High, offered evidence that supports both the main hypothesis and the rival hypothesis. And even though the remaining cases offered a preponderance of evidence in favor of the main hypothesis, overall the findings suggest that the most successful implementation of such ICT-supported reforms would have all three elements: staff competence, student ICT competence, and infrastructure.

# Hypothesis 4: ICT Not Widening Digital Divide

This digital divide hypothesis is that the ICT reform will not worsen academic gaps between the rich and poor students. The rival hypothesis is that it will worsen the gaps. Often times ICT is introduced into instruction with the explicit purpose to reduce the such digital divides. In such cases about the only way that a widened gap can occur is if the divide remains outside school, especially in the home. Also, if students are differentially tracked such that poor students get less or less effective ICT access, then the results of ICT could widen the gap. Especially problematic would be instances where poor (both low-income and low ability or performing) students are exposed to a lower level of computer instruction and higher students are given more higher-level instruction with ICT.

Most of the evidence supported the hypothesis that the reform would not widen the main digital divide. Walnut Grove provided evidence that the minority gains in the State standardized scores were higher than the non-minority students, which means the gap was closing not widening. Harland has an ICT program for deaf students that is explicitly aimed at avoiding such gaps. It was noted that the vast majority of students at Harland and Mountain had computers at home,

which helps to supplement in-school efforts to minimize any digital gaps. The teachers at Future High made a very important point that a culture or climate of learning (for all) is the most potent force in the school toward helping the disadvantaged student to maximize his or her learning and hence minimize digital divides.

# Hypothesis 5: ICT leads to Higher Standards

The question here is whether or not ICT implementations result in higher teacher-implemented academic standards or expectations. It is unlikely that administrators promoting such implementations would admit any evidence for the rival or negative hypothesis. However, negative evidence might come from reports that teachers or students thought they were wasting time due to difficulties learning ICT or due to the poor quality of ICT-based resources. In fact, teachers and technology coordinators at several schools commented how students and teachers are given guidance in discriminating between poor-value and high-value software and Web-based resources. Others noted that the reform, such as project-based learning, actually contributed to greater collaboration and professionalism among teachers, which added to the improvements in academic performance due to the ICT-based reform itself. Evidence contrary to this hypothesis was negligible.

## *The Future and Sustainability*

The staff members in every site we visited expect to continue their instructional reform activities in the future. However, concerns and reservations were heard in some instances from future uncertainties such as funding, turnover, leadership, and changes in State policy. Most opinions were very optimistic about the future, in part because the schools had been selected on the basis of their exemplary performance in the past. The site selection process gave us schools that had addressed their systemic challenges directly and met with considerable success.

The systemic factors that appear in our cases to have been most critical to the success of the schools in the past were shared vision, strong leadership shared with the teachers, both private and public sector partnerships, professional development that is both institutionalized and extensive, quality technical and instructional support, a cultural climate supportive of the reforms, and a commitment to taking advantage of relevant advances in technology. More personal factors that seemed to have been very important to their success include excitement from observing results from the new teaching methods, charismatic leaders, and external recognition for being exemplary. All five of the schools benefited from having these systemic factors, at least to some extent. The more personal factors were not observed in every site. A combination of limited institutionalization of these success factors and uncertainties in the environment make the future difficult to predict.

Factors that were identified as contributing to the vulnerability of the reform programs include uncertainty in future funding, staff turnover, uncertainty in district and State policies, and staff "burnout" due to the intensiveness of the innovation and time demands. With the exception of Harland, every school in our study had established one or more business partnerships, and Harland was attempting to establish such a partnership. Several of the schools enjoyed strong political and financial support from their Parent Teacher Associations. Perhaps most vulnerable

in the future is Pine City because it is in the 4th year of a 5-year, 5-million dollar award, which had been critical for improving and maintaining their technology and professional development programs.

The future of the new schools (Walnut Grove and Future High) appear to be the most sustainable because technology-supported instruction was part of their original charter. Not only did that give them a sustained vision, but is has helped them create a critical culture where students as well as staff understand that innovation and excellence in learning are expected of them. It may also reduce high staff turnover problems and continue to perpetuate a reputation of being exemplary.

One interesting trend found in these cases was the move toward wireless laptop networks. The two elementary schools, Walnut Grove and Harland, had such systems already installed. And Mountain is moving in this direction for the future. The other middle school, Pine City, has a thin-client model that to some extent provides an alternative to the wireless model as the low-cost of student stations gives students unusually high access potential. Further research on the wireless model seems warranted on the basis of our current findings.

Another area that deserves further attention from both researchers and policy makers is the role of State standards and assessment. Staff and teachers in several of our schools mentioned this as a problem area with implications for their future. Teachers at Walnut Grove felt that the State standards emphasized lower level competencies such as memorization of facts, which tended to undermine their attempts to teach higher level competencies using project-based learning. If the State standards are given even greater emphasis without modifications, this could undermine their own reform programs. Mountain has dealt with this dilemma by pioneering their own (district-wide) versions of the standards. Furthermore, they are in the future giving more emphasis to "backward planning," which means that teachers will be helped to use the standards more effectively in diagnosing student weaknesses and in otherwise improving their instruction. The school principal at Pine City noted how difficult it made their attempts at instructional improvement when the State assessments were poorly aligned with their standards. Given the current trends in Federal and State educational policy to increase "high stakes testing," these trends, without reform of State standards and assessment, could have a significant inhibiting effect on the innovative instructional reform efforts of these pioneering schools.