

New Tech High School
Case Report from the
U.S.A. Exemplary Technology-Supported Schooling Case Studies Project

New Tech High School: A Little School with Big Results

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For further information on the *U.S.A. Exemplary Technology-Supported Schooling Case Studies Project*, including additional case reports and papers with cross-case analysis, go to <http://www.education.umn.edu/edutech/exemplary>

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<p>International Association for the Evaluation of Educational Achievement</p>  <p>IEA's <i>Second International study of Technology in Education</i> (SITES) consists of three modules. SITES Module 2 (M2) is an international qualitative study of innovative pedagogical practices that use information and communication technology (ICT).</p> <p>The final project report and cases from participating countries can be found at http://www.sitesm2.org/</p>	<p>Organisation For Economic Co-Operation and Development</p>  <p>The OECD case studies project, <i>ICT and the Quality of Learning</i>, is a major international initiative organised by the Center for Educational Research and Innovation (CERI) within its work on Schooling for Tomorrow. This initiative is concerned with the profound implications that ICT has for education and learning and involves many of the 30 OECD member countries.</p> <p>The final project report and cases from participating countries can be accessed at http://iol3.uibk.ac.at/ICTandSchooling/caseStudies/</p>
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New Tech High School: A Little School with Big Results

Case Overview

New Tech High is five years old with just over 200 students in grades 11-12. It is located in a small town and approximately thirty-five percent of the students are minority. The underlying philosophy of the instructional program is to educate students in capabilities most essential to the 21st century, especially problem-solving, project construction, knowledge management, and teamwork.

Students spend a major part of every day using computers, as most of their assignments are projects requiring educational technology applications. Instructors install most of their assignments and course materials on the computer system and students access these and turn in their work by computer. As this type of teaching and learning environment requires considerable hardware and software, their level of access is more typical of a high-performance organization than a typical school. The construction of the school building is also modeled after such organizations in that the classrooms have glass rather than solid walls and the students work at desk areas that resemble office more so than school furniture.

The teachers as a whole view themselves as a team addressing the innovations and issues that a dramatic restructuring of the curriculum and instructional activities implies. Most classes are interdisciplinary and team-taught, and students' work often requires they serve as a team member on a project.

While students are given a great deal of responsibility and expected to monitor their own learning, assessment and accountability systems are integral to the program.

In keeping with its "school to career" focus, all of the students are required to complete an internship and to take four community college classes during their two years at the school. Nearly ninety-five percent of the students attend college within two years of graduation. New Tech High has established a reputation for innovation and high productivity with frequent visitors from all over the world.

Implementation Context

History of the Innovation

The "Tech Prep" movement appeared to have an indirect effect on the district leaders who helped to develop what would eventually become New Tech High School (NTHS). "Tech Prep," or vocational-technical education preparation, originated as a movement in U.S. education in the early nineties that advocated an important school-to-work transition strategy, helping all students make the connection between school and employment and any required post-secondary education. In 1992, the school district, working with the local business community, discussed

the need to create a school that would help to meet the technology workforce needs in the area. As a district administrator described those discussions, “they [business leaders] were telling me that they needed entry-level workers who knew what it meant to work on a team, who knew what it meant to take responsibility for their own work, who knew what it meant to improve their skills so they could grow with the companies.” Career preparation and college preparation became the twin goals of schooling at NTHS.

The school is targeted at students with “average” grades because district administrators believed that such a student in their system was under-served by its other large, comprehensive high schools. The district administrators who founded NTHS were deliberate in making it small, so they could address the needs of these students and create an environment that would duplicate an authentic work environment. In addition to providing a new model of schooling to address workforce needs, district administrators viewed NTHS as one way to help alleviate overcrowding at the district's two comprehensive high schools. The building, formerly a women's health club and elementary school, was completely renovated to resemble a high-tech work environment.

In line with the model of a high-tech start-up company, district administrators envisioned that project-based learning activities would be best suited to help students at NTHS prepare for the work world. Immersion in the authentic world of work would be facilitated by the requirement for all seniors to work in an internship. The influence of the “Tech Prep” movement that led to the idea of NTHS was also infused with a college preparatory emphasis, as students were required to take four community college courses in addition to fulfilling all the district requirements for graduation.

Under the direction of the district board of trustees, the school was established on the condition that its funding would not siphon additional resources from other district programs and that the funding level per pupil would be the same as the district's other high schools. In order to meet these conditions and create a high tech environment, fundraising for the new school became a major thrust for the school's originators.

School Culture, Professional Community

The mission statement at New Tech declares that the school was founded in 1996 “to prepare students to excel in an information-based, technologically advanced society.” From its inception, the school staff has seen educational technology as an essential resource in creating technologically savvy students who are prepared for college and the work world. The school incorporates technology into every aspect of its curriculum, activities, and culture. Every teacher and every student uses technology for instructional purposes in support of project-based learning activities.

The culture at New Tech High reflects that of a small, innovative business that must matrix staff in order to complete complex projects. During our visit, the “director” (principal) of New Tech used the metaphor of a “high tech start-up” to describe the school, indicating that he believes the staff must run the school like a small, cutting edge, start-up company and provide a similar experience for students in their class assignments.

The director's involvement in leading and supporting innovation at New Tech has been positively received and he appears to be universally admired and respected by staff and students alike. Although he maintains regular contact with teachers, he gives them a great deal of freedom. He is committed to seeing project-based learning prepare New Tech students for university work as well as a career of work.

Because the school is small, the entire staff can operate as a team and more rapidly adopt innovative curriculum projects, or instruction and assessment practices. Using a school Intranet, the director and his staff keep track of each other's schedules and communicate with each other through email. They use an agenda database to prepare for weekly meetings, at which the staff discusses issues, make decisions, selects students of the month, and identifies any students about whom they have concerns. Together they collaborate and deliberate on how to manage the school. For the past two years, the entire teaching staff has collaborated in a large schoolwide project. Six of the nine teachers regularly team-teach together in a shared classroom.

Technology, Technology Support Structure

The school has a robust technology infrastructure with approximately 250 computers, which all use a Windows-based operating system. There are four different kinds of computers of various ages and capabilities, but all are faster than 166 MHz. The newest are dedicated to the multimedia design classroom. All the computers are on the network, allowing access to the Internet and to the school's servers, where class information and databases are stored. The network is also linked to two large capacity printers. Ten laptops are available for students to check out overnight. Equipment is regularly replaced and recycled (with funding from the New Tech High Foundation).

With a 1:1 student-computer ratio, ICT access at New Tech High School is universal. Further, ninety-nine percent of New Tech High students have computers with Internet access at home. The staff has access to student, course, and school information through *Lotus Notes* software. Students also have email accounts and can access a course database to retrieve syllabi, assignments, rubrics, and other instructional resources. Parents can access student data via the Internet.

The standard software used at New Tech is *Microsoft Office* on an *NT* operating system. In addition, Web browser and authoring tools, *Filemaker Pro*, and *Lotus Notes* are used. In the New Media class, students use a variety of software (*Adobe PageMaker*, *Photoshop*) to create business cards, stamps, posters, letterheads, Web pages, and other integrated multimedia projects. The software is standard across the school (i.e., all teachers use the same word processor) but not all computers have the same software loaded on them. For example, the Adobe image-processing software is mainly on the fastest computers used in the New Media classroom. In the tech management class that the network administrator teaches, students are asked to research and report on software, which provides the school with helpful information about new software.

At least two classrooms were outfitted with the *Tegrity* system, which provides on-demand video lectures on the Web using software and a digital camera to capture the teacher's presentation. All classrooms had video projectors from which one presentation computer's screen could be displayed.

Technical support is a full-time job for the network administrator at this small school. With 250 computers to support, she gets help from students in her Tech Management class in maintaining all computers and the network. The district also has an IT manager and some support staff. She can also hire consultants, if additional help is needed.

Teachers spoke favorably of the technical and instructional support they received. They are given resources to take professional development courses, but most training in the use of ICT is informal.

Context Beyond the School

The surrounding business and civic community actively support New Tech High School. Businesses have contributed greatly to the creation and continuation of the school, through donations of money, time, and technology as well as by opening their offices to students for the school's required internship. In 1999, the New Tech High Foundation was established to fund and support the school. The Foundation provides business management services to the staff, funds the annual refreshment and replacement of equipment (distributing used equipment to other schools in the district), and oversees the effort to market New Tech classes to other schools in the nation.

New Tech High School has received a number of state awards and national recognition, including being the first high school to receive recognition in California's Digital High School Initiative and being named as an U.S. Department of Education Demonstration site. It has also received funding from the Bill and Melinda Gates Foundation to replicate its curricula and culture in a number of schools in northern California.

Improvement in Teaching & Learning

Curricular and Assessment Aspects of the Improvement

All nine teachers design project-based learning activities, which require students to work collaboratively and find solutions to problems they encounter, using curricula mandated by the district and the California standards. For these projects students demonstrate competency and proficiency in real-world skills through a variety of assessment measures including project presentations, daily journal writing, and some paper and pencil tests. Through collaboration, students are challenged to provide creative solutions to problems they would face in the work place.

The courses at New Tech are largely interdisciplinary and team-taught. Pairs of colleagues teach interdisciplinary math and science, English literature and history, and government and

economics classes. A computer applications course, New Media (a graphic design course), and some advanced computer classes in networking and technology management are offered.

Within these courses, the curriculum is organized by the school's learning outcomes, which address the skills and competencies students must have to graduate. These "Expected Schoolwide Learning Results" (ESLRs) specify a performance goal for each competency area, the subject areas covered, the content standard, and sample assignments in those subject areas that might fulfill the standards. The learning outcomes cover the following areas:

- Technology Literacy
- Citizenship and Ethics
- Critical Thinking
- Career Preparation
- Collaboration
- Written Communication
- Oral Communication
- Curricular Literacy

Each outcome, or ESLR, lays out the various components of the work in a rubric and correlates clearly articulated criteria to a score or level of competence. The ESLRs influence how the students approach their learning tasks. As a teacher prepares students to begin their projects, the ESLRs provide detail about what will be expected of them and how their products will be assessed. Students also use the rubrics to assess themselves and their peers. All the learning outcomes must be demonstrated and documented through the completion of an electronic portfolio, which is evaluated by teachers and a review panel from the community.

Assessment goals at New Tech High incorporate knowledge gained as well as demonstration of understanding through performance tasks. Assessment is ongoing and continuous, as it would be in the work world. The school's director explained that the assessment practices and technology present supported students acting independently and collaboratively:

It's organized around creating independent learning environments so well-detailed in the rubric that a student can go off and work on that on their own, or they can go work on that with another student. And I think that the technology allows them, just as I worked from my workstation last night, to communicate at night in their project teams, and schedule themselves, and who's doing this and who's doing that.

Although technology plays a central role in supporting school reform and project-based learning at New Tech, teacher respondents, in general, described technology's role within project-based learning as a tool or resource rather than a catalyst. One teacher described the utility of technology for research purposes, "...they can browse 12, 13 Web sites to answer one question in a space of 15 minutes. Whereas we would need a library the size of [the whole town] and hours and hours of time for them to generate that much research in such a short window. So to me it's an invaluable tool . . ." (Teacher Focus Group).

Another teacher highlighted technology's role as a lever, "I guess when you look at the broader projects that happen in all of our courses, I think those could happen in another setting with less technology, but I think the presence of technology makes us more efficient, and makes our students more efficient learners . . ." (Teacher Focus Group).

Technology at New Tech High School has also expanded access to assessment information and enhanced assessment. The use of electronic portfolios has provided a repository of the student's work that is accessible to teachers, students, and their parents. Having access to on-line portfolios has also enabled teachers to assess student work more holistically and comprehensively. Instead of focusing only on one aspect of a student product, teachers can consider several dimensions of a student's work. As one teacher explained, comparing assessment at New Tech with their experience at another school stated, "we focus more on quality rather than quantity. So if I had a student produce a document or a piece of work, I can get multiple observations off of that, that I can then enter into my grade book, was it done on time, does it demonstrate collaboration, does it demonstrate content literacy. Because student data on attendance, discipline, and grades is distributed to all on *Lotus Notes*, teachers can notice patterns and pass on information quickly and efficiently.

Parents can access their child's grades and assignments through Web pages. A parent who happens to work on the staff at New Tech stated, "Our kids get their homework off of Lotus. They can never say I didn't know I had it, because it's posted there. And our kids' parents get their grades daily off of Lotus, at home. So they can't ever say, I didn't know my child was doing so poorly, because it's there."

Teacher Practices and Outcomes

New Tech High School teachers interact with each other and their students in many different kinds of activities within the interdisciplinary project-based learning model. Six of the school's nine teachers are paired together to teach integrated courses. With team-teaching, teachers share the load of creating curricula and organizing class activities, and students have more time to explore a topic in depth. According to the school director, team-teaching took over gradually, beginning in the American Studies (social science and literature) class. The benefits for both students and teachers provided solid evidence for the staff to argue to team-teach Scientific Studies (science and math) and Political Studies (government and economics).

Teachers at New Tech occupy multiple roles in project-based learning classrooms. One prominent role is that of instructional designer, who plans activities and organizes resources for a variety of student learning needs. Teachers constantly design and create instructional materials to accommodate a variety of learning styles. One teacher, describing a software tool (*Tegrity*) that provides digital web video on demand, explained during the focus group,

I think it meets a variety of learning styles and I couldn't do that in the traditional classroom, but it's wonderful. I have kids, you know, begging me, 'Hey Smith, we need you to put that *Tegrity* lesson up' because they go home and they can access these materials from home. It helps them access the material to decode their textbook to get through the lessons and it's a wonderful, wonderful tool.

Teachers also act as team coordinators, given the frequency with which student teams are required by the curricula. In this role, teachers create opportunities for peer interaction and support between students of mixed achievement levels. Students at New Tech are required to provide written and oral assessment to their project team members. Teachers at New Tech assess a student's ability to collaborate with his or her peers. A New Tech High School student described how receiving a collaboration grade provided incentive to fulfill his responsibility as a team member:

. . . we have a collaboration grade [from teachers] and the students give out our own collaboration grade. . . . In my old school, you know, I only had projects in my History class and they were group projects and I hated group projects. I absolutely hated them because I was always stuck doing all of the work. . . . [Here] you can fire somebody for not doing their work and so you know everybody is going to put in equally, you know what they did. And if they did not [and were not] caught by the teacher, then we can give them a bad collaboration grade. (Student Focus Group)

Teachers at New Tech also function as “facilitators,” providing assistance, advice, suggestions, or questions that enabled students to determine how to complete a particular task. We observed teachers in this role in the Political Studies class. Students had to create a web site that described their role in the current economy. The teachers posed questions to individual students to help them search for career employment opportunities, salary and benefits information, and housing information that could be used on their web site. One of the teachers described his own role in helping students, and that of technology:

The technology here allows them to be aggressive in terms of getting the information and digesting information. And I want to facilitate that process and technology certainly allows me to facilitate that process. But I don't want to be asked for answers and technology allows that. (Teacher Focus Group)

The philosophy and the predominant pedagogy in the school results in a much greater deal of autonomy for the students. Without bells denoting the end of classes, required hall passes, an open campus, and work time where the students are managing their time, teachers have to take a different approach to classroom management. They can't use indicators that work in traditional teaching, such as how quiet it is or if students are in their seats, to determine if students are “on task.” Both in a staff meeting we observed and in site documents, the principal and staff framed this as an issue of needing to trust students. In addition, the staff sets up clear expectations for assignments via their assessment practices and establishes mechanisms for students' accountability to their groups.

The teachers are often exploring and learning new programs or equipment to use in their classrooms. They reported that by and large, they are self-taught technology users and continue to rely on themselves, or one another, to get up to speed on new technology.

To be successful at New Tech High, and meet the demands for new pedagogy, classroom management, and technology, requires a particular type of teacher. The first teachers were all from outside of the district, which perhaps contributed to implementing a different model of schooling, and increased the likelihood that they were risk takers. The principal described the teachers and staff as one of the top three critical factors for the school's success.

I think we were prepared and this type of school is timely, but it still was lucky....We've been able to attract people [who are] talented in a variety of ways: risk taking, resilient, creative, innovative, hard working. You know, just futurist types of people. They are before their time.

Student Practices and Outcomes

Students at New Tech High work on interdisciplinary project-based learning activities both individually and in teams. Students must consult and use course syllabi, assignments, assessment rubrics, and other learning resources teachers post on-line.

During a Political Studies class session we observed, the two-hour class commenced with some general announcements and a short period for students to check their email. Then the teacher gave the students an option of studying the new material that day by either reading the book, coming to the front to a small group where he delivered a mini-lecture, or reviewing the same lecture he prepared and stored using the *Tegrity* system. Later in the period, the students worked in groups, discussing their assignment and accessing a relevant Internet-based database. The next day, the students collaborated on the information and design of the web page they were to make to illustrate their collective and individual work.

In most classes, students are assigned to project teams with specific roles to fulfill. Team members work together, using evaluation rubrics, to create products and complete projects that address a real-world concern. Projects typically encompass integrated subject area content (e.g., math and science; history and literature; economics and government). In addition to focusing on high standards and specific learning outcomes for all students, teachers and students place a high premium on collaboration; team members are required to assess themselves and their peers on how well they work with team members. Collaboration is viewed as an essential workplace skill that every New Tech student must cultivate and develop before graduating.

As self-learners and team members, New Tech High students engage in independent and collaborative problem-solving activities that they initiate and eventually resolve. One teacher described how problem solving at New Tech High prepared students for the real world of work: "That's how the real world operates. Employees are given problems, tasks that they need to solve, they need to work with somebody, maybe it indicates in our case, where the teachers were coordinators, were facilitators, were coaches, what tools, what knowledge do you need to solve." this problem. So I think that we are preparing these kids for the real world that's out there (Teacher Focus Group) Another teacher described student as independent learners: "They search for answers, instead of us giving them the answers or where they can find the answer. They really come up with questions that are relevant, and the problems that need to be solved. . . ."

Students at New Tech develop personal management skills from their involvement in project-based activities. According to one parent, "One thing I've heard teachers talk about is how this school forces students to take responsibility for their own learning, makes them learn time management skills, it [also] brings up their communication capabilities, their social and their personal skills . . ." A student stated that "in order to be here, you need to try. I mean do your homework; you need to get that done. You need to take time; don't be a procrastinator here, you

can't do that . . .”

Teachers and parents also identified increased technology skills as one of the outcomes of participation in project-based learning at New Tech High School. Students reported using computers on a daily basis to store and access files, to word process reports, email group members, make Web pages or other products to present their projects. They also used them to review class lectures and assignment requirements stored on the school intranet, capture data and graph results in the science/math class, and search CD-ROMs or the Internet for information. They liked that they had computers in schools to start their work and they used their computers at home to continue with it.

All students have individual email accounts and access to *Lotus Notes*, which allows them to create databases and store their class work in an electronic portfolio. Students are required to take one year of multimedia design and pass computer applications competencies in Microsoft Office (Word, Excel, Access, and PowerPoint) before graduation. The skills acquired in these classes allow New Tech High students to create multimedia presentations for their other classes. Effective oral communication skills are an important learning outcome (ESLR) pursued at New Tech High.

The school's stated mission is to “prepare students to excel in an information-based, technologically advanced society.” Schooling at New Tech High has resulted in a wide range of student outcomes. New Tech High students graduate with career skills that will serve them well in the work world. A former New Tech student remarked how he used to be “totally nervous, when I had to go in for an interview. But after talking . . . [and] doing all the projects, all the oral presentations and all that, it's so much easier now . . .” Another student described how he felt his internship job was preparing him for work as a network manager who handles both hardware and software implementation. New Tech High graduates also are prepared to pursue post-secondary studies. According to the school counselor, ninety-five percent of New Tech students go on to a community college, four-year university, or a technical college. Parents recognize the value of their students' taking college courses while studying at New Tech High. One parent remarked, “I think that the transfer from high school into college has been so much better because it isn't like hitting this wall all of a sudden; [instead] they're just progressing on . . .”

Lessons for the future

Noteworthy Outcomes

The school produces many noteworthy student achievement outcomes. In addition to meeting the district requirements for graduation, all the students must complete NTHS standards in community service, an internship, four community college courses, and a software applications and multimedia design course. Over 90% of students go on to attend post-secondary schooling.

It appears that because students are accorded respect, given a great deal of autonomy, and are also provided with opportunities to work collaboratively with others on a number of project teams, it has cultivated in them a desire to take responsibility as a contributing team member. There are many anecdotes about students who transferred in not liking high school and with no

record of previous high achievement who have “turned around” at New Tech High. As one teacher a teacher from a focus group said about how NTHS shapes student performance:

And one of the things that I noticed with last year’s juniors, and again this year, is kids that are just finally free to be who they are. Some of them decide to sort of say “This is the year I’m going to break out of that reputation I’ve had since kindergarten of being a slacker.” Because [the town] in this general geographic area is pretty stable, so a lot of them have been going to school with the same kids since they were five or eight years old. And they come here and they have a choice for who they want to be....I can’t think of a day that goes by at the school when I don’t say, if only for that kid I’m glad this school exists.

Added Value from Technology

The technology at New Tech High facilitates staff and student collaboration; information sharing and communication are critical to the team-teaching and the collaborative design of students’ project work. Because the projects are information and product oriented, the Internet and the tool software are very useful resources for students as they do their work. Teachers and students mentioned the ways technology contributes to their efficiency, adds convenience, and increases their access to data, its processing and knowledge communication all as added value the technology provides. At the same time, staff members acknowledge technology’s contribution to their success, they underscore the school’s small size, and its emphasis on communication and respect as critical to creating the important base to which technology adds value.

Key Implementation Factors

The reform of project-based learning appears to be sustainable because of the structure and organization of New Tech High. The teaching staff and students have bought into the goals of and instructional philosophy behind project-based learning. Because New Tech is unique in that region as a high school focused on career preparation, it is likely that students’ demand for their model of schooling will help to sustain their work. New Tech has also intentionally organized itself to be a small, personalized learning community that targets what it believes is a traditionally underserved population in their school system: the average student. Maintaining a small school environment is a key to their future sustainability. As one teacher noted, “my concern is if they [were to] double us in size, the whole model will collapse . . .” (Teacher Focus Group). District administrators were deliberate in making New Tech High small from the beginning so as to allow them to address the needs of these students and create an environment that would duplicate an authentic work environment.

One of the ways New Tech has addressed the sustainability of its model is to find outside funding resources. The New Tech Foundation has paved the way to support New Tech in maintaining its technology infrastructure and its unique learning environment. The foundation was established in 1999 “as a vehicle to fund, support and to insure continued development of the New Technology High School in Napa as a national model; and thereby, have a significant positive impact on national educational reform.” The foundation provides business management services to the staff, and funds the annual refreshment of technology/equipment and the grants for faculty and program innovations. To do so, the foundation establishes and manages

partnerships with local companies and other charitable entities.

Finally, the innovation developed at New Tech was greatly affected by the presence of a charismatic leader. The director's involvement in leading and supporting innovation at New Tech has brought positive results. He is universally admired and respected by staff and students. He is committed to seeing project-based learning prepare New Tech students for university work as well as a career of work. He is willing to fight battles with the school district in order to keep New Tech High on the cutting edge of school reform. As a result, the school is able to vary from some local practices or policies; for example, pending special negotiations with the teachers' union, the New Tech High teachers may receive merit pay. There is no guarantee that a capable replacement would materialize if this Director were to leave. Replicating charismatic leaders is not a predictable venture. The presence or absence of a gifted school leader needed for such an ambitious reform effort constitutes a major constraint in transferring the New Tech model to another setting.

Challenges

Several teachers noted that a number of teachers had left New Tech due to burnout. In the first couple of years of the school the New Tech High School staff needed to invest enormous amounts of time in developing curricula that was suited for its mission. At that time there were few transferable models of project-based learning in schools. The pressure and stress of constant innovation took its toll and in its fourth year New Tech retained only one teacher, the Director, and the Administrative Assistant from the founding members of the staff.

The school director faced the challenge of doing fundraising and building relationships with the community. Maintaining a modern technology infrastructure at New Tech required a constant infusion of funds. These fundraising efforts required the director to be off site a great deal in the first few years of the school's existence.

For schools that deliver innovative programs, complying with national or state practices or policies can be a challenge. Implementing project-based learning on a broad scale would be a challenge, given the need to develop some consensus on the range and scope of the implementation with a large number of players. Implementing this kind of innovation is more feasible only on a small scale, where national and state policies allow freedom to establish a school program that differs so greatly from the normal secondary school model.