



21st Century Learning in Schools ? A Case Study of New Technology High School in Napa, CA

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We have known for years what kids need to know and be able to do in the 21st Century. Starting with the SCANS report, "What Work Requires of Schools", in 1991, it was clear that 21st Century Learning was to be built on a foundation of basic knowledge, but went well beyond basics to include a significant set of 21st Century Skills.

SCANS anticipated the profound changes coming in the 1990s, including globalization and the increased role of technology in work and life. It was the first significant report that argued that kids would need to be smarter and also better communicators, collaborators, and performers for the workplace and society of the future.

SCANS said that future workplace know-how requires thinking skills, personal qualities (responsibility, self-management), project management, interpersonal skills (teamwork, leadership), information skills, systems skills, and technology utilization skills.

In Learning for the 21st Century, issued in 2003, the Partnership for 21st Century Skills (P21) updated and enhanced SCANS. Learning again builds on core subjects, but shows that 21st Century learning includes information and communication skills, thinking and problem-solving skills, interpersonal and self-directional skills, and the skills to utilize 21st Century tools such as information and communication technologies (ICT). But what sets Learning apart from all previous studies is its finding that assessment and feedback to students is the key to skill mastery.

In the US and other countries, particularly Europe and Asia, leaders are grappling with making schools that serve the needs of the 21st Century. In Singapore, where the national slogan is "Thinking Schools, Learning Nation", Tharman Shanmugaratnam, the minister of state for trade, industry and education, says that "one of the key adjustments under way is in the way we educate our young so as to develop in them a willingness to keep learning, and an ability to

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experiment, innovate, and take risks, Our ability to create and innovate will be Singapore's most important asset in [the] future." (July, 2002).

In the UK, the national government's \$80 Billion Building Schools for the Future (BSF) program aims to rebuild every secondary school in the country over a 10-15 year period. BSF's mission is "Working together to create world-class, 21st-century schools - environments which will inspire learning for decades to come and provide exceptional assets for the whole community."

So while we and others have a good picture of what kids need to learn and be able to do, key questions remain. How do they learn it? How do students know they know it? And what do schools look like where 21st Century Learning takes place?

Designing 21st Century Schools and Learning starts with "what knowledge and skills do students need for the 21st century?" But real design needs to go much further and address these questions:

- ✓ What learning curricula, activities, and experiences, foster 21st Century learning?
- ✓ What assessments for learning, school-based and national, foster student learning, engagement, and self-direction?
- ✓ What physical learning environments (classroom, school, and real world) foster 21st century student learning?
- ✓ How can technology support a 21st Century collaborative learning environment and support a learning community?

The key design issues might be illustrated this way:

Knowledge and Skills → Curricula → Assessments → Facilities → Technology

Every country has done a good job of articulating the knowledge and skills that students need, but few have developed or identified the curricula, assessments, facilities, and technology that would foster 21st Century Learning.

New Technology High School – A Case Study of a 21st Century School

Walk into a classroom at New Technology High School in Napa, CA, and you will see students at work -- students writing journals online, doing research on the internet, meeting in groups to plan and make their web sites and their digital media presentations, and evaluating their peers for collaboration and presentation skills. Another teacher's students may also be there, in a team-taught Interdisciplinary course. These activities have a name and a purpose. It's an example of Project-Based Learning and it's designed to engage students in learning deeply.

Despite its name, NTHS is not a technology school, although there is more technology at the school than any school you may ever have seen. NTHS was founded in 1996 as a 21st Century

School. A task force led by the business community but including educators and civic leaders studied best practices throughout the US and launched a school with that aim.

In its first years New Tech teachers defined the schools 8 Learning Outcomes: content standards, collaboration, critical thinking, oral communication, written communication, career preparation, citizenship and ethics, and technology literacy. These outcomes map to the SCANS standards, which inspired them, and also to more recent articulations of 21st Century Skills. The New Tech teachers designed them not to be a wall poster, or a compendium no one looks at. Instead, NTHS embeds these learning outcomes in all projects, assessments, and grade reports.

Students graduate from New Tech demonstrating mastery of the 8 Learning Outcomes through a Digital Portfolio. The portfolio, which New Tech calls a Professional Portfolio, is a public online document that is alive on the NTHS web site throughout the student's career at the school. It is a work-in-progress until the end of the senior year, when it is submitted for graduation.

Project- and Problem-Based Learning – Keys to 21st Century Learning

“We needed a new type of instruction that better reflected the goals we wanted each student to achieve, demonstrate, and document”, says Paul Curtis, one of the original lead teachers at NTHS and now Director of Curriculum for the New Technology Foundation.

NTHS teachers start each unit by throwing students into a realistic or real-world project that both engages interest and generates a list of things the student need to know. Projects are designed to tackle complex problems, requiring critical thinking. New Tech's strategy is simple:

- ✓ To learn collaboration, work in teams.
- ✓ To learn critical thinking, take on complex problems.
- ✓ To learn oral communication, present.
- ✓ To learn written communication, write.
- ✓ To learn technology, use technology.
- ✓ To develop citizenship, take on civic and global issues.
- ✓ To learn about careers, do internships.
- ✓ To learn content, research and do all of the above.

How do you build all this into the curriculum? It can be done if students work on projects that are designed to elicit collaboration, critical thinking, written communication, oral communication, work ethic, and other critical skills, while simultaneously meeting state or national content standards.

In traditional classrooms students typically work alone, work on short non-complex assignments that emphasize short-term content memorization, write for the teacher alone, and rarely make presentations.

Project- and problem-based learning takes a different approach:

1. Put students into teams of three or more students, who work on an in-depth project for three to eight weeks.
2. Start the project by introducing a complex entry question and scaffold the project with activities and new information that deepens the work.
3. Calendar the project through plans, drafts, timely benchmarks, and finally presentation by the team to an outside panel of experts drawn from parents and the community.
4. Provide timely assessments to students on their projects for content, oral communication, written communication, teamwork, critical thinking, and other critical skills.

At New Tech some examples of projects include presenting a plan to Congress on solving the oil crisis, addressing economic issues as a team of the President's economic advisors, or inventing, under contract from NASA, new sports that astronauts can play on the moon so they can get exercise.

Calendar is crucial. Few students, or adults, can work effectively without a clear timetable and benchmarks. At New Tech the calendar for each project, called the Course Agenda, is available online and linked to the project briefcase, which holds all the project resources, calendar, and assessment rubrics. The Project Briefcase organizes all project materials for student access, action, and project management.

Project-Based Learning is often confused with projects, which are short activities injected into traditional education to liven things as a culminating event for the unit. Real Project-Based Learning, by contrast, is deep, complex, and rigorous.

Many countries have had difficulties with Project-Based Learning in the past, when curricula was not designed effectively and scaffolded to insure that essential learning takes place. In Queensland, Australia, a new, major province-wide initiative in Project-Based Learning is called "Rich Tasks". In the UK, one school calls it "Total Learning".

How do students at New Tech High learn and master collaboration skills, a key 21st century Skill? For all projects, students work in project teams, with one student taking on the role of project manager. The project team develops a contract outlining the scope of work for each student member. Projects culminate with team reports and presentations. After the completion of the project, each member of the team evaluates their peers through a peer collaboration rubric.

At New Tech all teams have taken on a rule that if a student slacks they can be voted off the team. The penalty is that the student must then do the whole project by themselves.

Assessment for 21st Century Learning

In a recent Education Week Commentary Tony Wagner described a rubric that principals in Hawaii had developed to assess rigor in the classroom. The principals, Wagner writes, “began to realize that rigor has less to do with how demanding the material the teacher covers is than with what competencies students have mastered as a result of a lesson.” (“Rigor on Trial”, Commentary by Tony Wagner in Education Week, January 11, 2006). The group determined to define the level of rigor by posing these questions to students: Why is this important to learn? In what ways am I challenged to think in this lesson? How will I apply, assess, or communicate what I’ve learned? How will I know how good my work is and how I can improve it?

Project- and problem-based learning doesn’t work unless a learner get feedback to “know how good my work is and how I can improve it”. Current assessments don’t do the job. State testing and accountability is aimed at schools, not individual student learning, and reports only once a year, after students have moved on to other teachers. Periodic assessments in managed curriculums are done once a month and mainly provide information to teachers. A student can’t get better or become the manager of his own learning without constant, real-time assessment and feedback. This is called assessment for learning, as opposed to assessment for school, district, or classroom accountability.

Assessment for learning starts with outcomes, proceeds with projects, products and performances that map to the outcomes, and completes the loop with assessment and feedback to students:

Outcomes --> Projects --> Product and Performance --> Assessment/Feedback

Most schools give students a single grade for a course, often losing important data about the skills and abilities of the students. At NTHS student course grades are disaggregated into the component Learning Outcomes. Instead of a single composite grade for each project, subject or integrated course, the grade report for a project or a course shows separate and distinct grades for content, critical thinking, written communication, oral communication, technology literacy, and any of the other learning outcomes that are appropriate for the course. Students get a report card that reflects how well they are performing on 21st Century Knowledge and Skills. In that way the students knows exactly where they are performing well and where they are not.

At NTHS the gradebook is online, accessible by password, and “living”, i.e. it is updated whenever there is new information, not just at the end of term. Students are thus constantly aware of their strengths and weaknesses and can target their efforts towards improvement. This continuous and just-in-time feedback is critical in supplying the information that helps students become self-directed learners.

The assessment for learning feedback is also available online in real-time to teachers and parents, who can also easily identify student strengths and weaknesses and offer support to students.

NTHS has developed unique ways to assess certain 21st Century Skills. At the end of every project, students assess every member of their project team using an online Peer Collaboration rubric. Scores go to a database, where a student through a secure password can see his or her scores, although the evaluations are anonymous. The student can then publish these scores as evidence for his or her digital portfolio. A similar process is done with an online Presentation Evaluation rubric which is scored by teachers and visiting community experts.

Schools as Workplaces for 21st Century Students

If students are to be the workers, then they need classroom learning environments that are workplaces for both individual and group work, and that are equipped with the technology and tools they need to do their work. Traditional school classrooms are typically 750 to 1000 square feet for 30 or more students, providing an environment suited only to teacher-led instruction, particularly at the secondary school level.

Larger classrooms are needed that provide a students at work environment, involving computers, group work, planning, presentations, team teaching, etc. New Tech accomplishes this through double-size classrooms, 1400 to 1800 square feet, that house up to 50 students and 2 teachers in a team-taught interdisciplinary course. The room is divided into 2 general sections, either side-by-side or exterior ring to interior center. One section houses desktop or laptop computers, 1 per student, wired and/or wireless, for individual or small team work, and the other section houses flexible tables for small group work, planning, and doubles as a presentation space for student presentations and teacher-led planning activities or teacher lectures. No, teacher lectures are not outlawed; instead, they are delivered on a “need to know” basis.

New Tech High looks more like a modern high-tech office than a school. When one walks through New Tech’s glass-walled corridors, one sees students at work.

Enrollment is 400 students for grades 9-12. The smaller size helps to establish a more personal environment and a culture suited for individual and group work.

Technology and the 21st Century Classroom

Technology plays a critical role in supporting 21st Century learning environments. Providing one-to-one computing gives students and teachers the hardware and software tools to do their work. But even more profound is when technology, through the school’s network, provides a collaborative learning environment that houses curriculum, assessment rubrics, living gradebooks and communication tools.

Many schools and states in this country and others are experimenting with one-to-one computing for students and finding the results lacking. This is due to a traditional curricular approach that fails to engage students as directors of their own learning. Project- and problem-based learning, by contrast, can bring one-to-one computing to life.

By having their own computer and internet access, students at New Tech can research any topic, communicate with experts and teachers, write journals and reports, develop presentations through PowerPoint and video, and take responsibility to develop their Professional Digital

Portfolio demonstrating evidence of their mastery of the school's 21st Century Learning Outcomes.

In theory, technology isn't needed for project-based learning. However, technology enables students to research, plan, and communicate. Moreover, New Tech goes beyond one-to-one computing and provides a technology platform that serves as a Collaborative Learning Environment for students and teachers. This environment, the New Tech High Learning System™, comprises the curriculum, standards, assessment tools, and reporting tools of Napa New Technology High School (NTHS), all online on a common IBM Lotus Notes technology platform.

The Learning System is an enterprise solution for the whole school. For students it is a "student-facing" system, it is the medium through which they work and learn. It enables students to self-manage their work, collaborate with others, and see their assessments and grades on a daily basis. All projects include a course agenda or calendar, where teachers enter deadlines as well as activities for each day including links to resources and daily assignments.

The Learning System also immediately and dynamically publishes all the project materials to the web for access to the curriculum anywhere, anytime, by students and their parents.

And because all projects are housed online, they are available year-to-year even if teachers leave. Also the projects are shareable by teachers within a school, and between schools. Currently there are 14 schools nationally based on the New Tech High School model that are sharing projects. The network schools will increase to 28 in 2006.

21st Century Learners

NTHS is a different kind of school and it produces a different kind of student. Students report feeling safer, better known, challenged, more engaged and more motivated for postsecondary learning. A study that surveyed the school's eight graduation classes ("Postsecondary Student Success Study", 2005) strongly suggests that students feel New Tech High's use of project-based learning and focus on 21st century skills were important in preparing them for college, careers, and citizenship. 98 percent of NTHS' seniors report postsecondary enrollment plans, compared to 67 percent that the Napa Valley Unified School District reports. California and the US graduate 67% and 71% of high school students, respectively, of which 32% in California and 34% nationally are deemed college-ready.

Further the alumni study found that 40% of all NTHS graduates, and 37% of graduating girls, either pursue college study in, complete college study, or work in STEM (Science, Technology, Engineering, Math) careers, compared to 7% nationally. Women today constitute 45% of the workforce in the U.S., but hold just 12% of science and engineering jobs in business and industry.

New Tech's 21st Century Learners are articulate, powerful, self-directed, collaborators, and entrepreneurs.

The Globalization Challenge

Globalization is flattening the world and challenging the United States as never before, as Tom Friedman points out in his 2005 book, *The World is Flat*. Students in the U.S. and other advanced countries must move up the value chain and lead a new era of global cooperation as 21st century learners. Societies need citizens who are smarter, more creative, and more capable of leading, managing, collaborating and networking with productive people around the world.

Schools need to be totally redesigned to enable and facilitate 21st Century Learning. New Tech High School is one way of getting there. Countries need to upgrade their educational standards to world-class standards, moving curriculum to 100 percent in-depth project- and problem-based learning that involves teamwork, critical thinking and communication skills, authentically assessing for learning all these skills for immediate and active feedback to students, redesigning and reconstructing facilities and classrooms to enable a students at work environment for individual and collaborative work, and finally, using technology to bind this collaborative learning community together.

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How is the school changing in the new century? How does learning theory change? Currently, you can hear a lot of criticism that the classroom has not changed significantly compared to the last century or even like two centuries ago. Do the teachers succeed in modern changes? The purpose of the chapter is to summarize the current changes in didactics for the use of innovative teaching methods and study the understanding of changes by teachers. In this chapter, we consider four areas: the expansion of the subject of pedagogy, environmental approach to teaching, the digital generation and the cha The term "21st century" has become an integral part of educational thinking and planning for the future. Various studies have shown us that rote memorization is not an effective learning strategy and that teacher-centered classrooms (versus student-centered classrooms) may not be the most efficiently structured ones for student engagement. Schools will often work at accomplishing this by creating events for the school community, by encouraging students to join committees or take part in school projects, and by occasionally helping the community around them with activities such as food drives or neighborhood clean-ups. With the powers of technology and the internet, students of today can do even more. New Technology High School is a secondary school located in Napa, California. It is a public school of choice focusing on wall-to-wall project-based learning, student-centered culture, and 1:1 technology integration. It is the flagship school of the New Tech Network, a school design organization with nearly 200 schools in the United States and Australia. YouTube Encyclopedic. Through creating authentic real-world learning experiences for students, the school is able to deepen content knowledge, unlock 21st-Century skills, and develop habits of mind. Student-Centered Culture: Students are the driver of the school culture and their own learning experience. The school was founded on the principles of trust, respect, and responsibility.