The Intel® Innovator

Tools and Resources for Educators Winter 2006

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Need a guide to the wealth of information in *Designing Effective Projects*, part of the Intel® Innovation in Education Web site? Some pointers will help you start exploring. Read the article.

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Top Schools Share Best Practices

Identify what works, articulate what's unique, share what others can learn from, and believe in what you are doing. That's the advice this year's top winners have for future applicants to the Intel and Scholastic Schools of Distinction award program. The program annually recognizes 20 K-12 schools in the United States that implement innovative, replicable programs supporting positive educational outcomes. The winners in each of 10 categories of achievement serve as national models of excellence for other schools. Read the article.

Share Your Project Ideas

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Changing Minds

Transforming the Classroom With Thinking Tools

Teaching and technology are a potent mix in the classroom of Lynne Coté, a high school biology teacher. Coté likes to describe herself as "wired"-both energized in her teaching, and teaching in a classroom equipped with 37 laptop computers. One key to her excitement-and to an effective use of this technology with the science curriculum-is the suite of thinking tools from Intel® Innovation in Education. The online suite includes *Visual Ranking Tool*, *Seeing Reason Tool* and the newest, *Showing Evidence Tool*. "These tools are so powerful. They align perfectly with the way teachers should be doing things-developing projects that are student-centered and involve higher-order thinking," says Coté, a Senior Trainer for Intel® Teach to the Future, who teaches in Tucson, Arizona.

Coté uses the *Visual Ranking Tool* to ensure that her students understand the relative importance of elements in biological systems. This tool enables students to organize items into hierarchical relationships and demonstrate rationales for the rank orders they create. For example, when Coté's class studied biomes-life communities occurring in different ecological environments-she assigned student teams to create lists of items required for organisms to survive within different biomes. The students then ordered the lists from most-to-least important, justifying each choice. Later, the teams compared and discussed their lists.

Coté uses the *Seeing Reason Tool* in a similar manner-to ensure that her students understand how different elements in a biological system influence each other. *Seeing Reason* allows students to create maps showing causal relationships in a system. Students can show multiple relationships between components of the map, illustrating the relative importance that different causal factors carry in an outcome. Coté uses this tool, for example, in teaching relationships between photosynthesis and cellular respiration, cellular respiration and energy, and muscles and exercise.

Showing Evidence-A Powerful Thinking Tool

Intel's latest tool, *Showing Evidence*, is Coté's favorite, and that of her students. This tool enables students to construct well-reasoned arguments, defended with credible evidence.

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Last year, teams of Coté's students chose to study one of eight controversial biotechnology topics: reproductive technology, privacy and confidentiality, cloning, patenting genes, genetically engineered plants and animals, gene therapy, DNA forensics, and genetic testing for inherited diseases. Each team researched a topic, and constructed arguments supported with evidence.

The *Showing Evidence Tool* helped the students "see" concretely whether they had supported their claims. They shared their conclusions with other teams, thus exposing the whole class to all topics. Later, based on their research, they drafted congressional bills relevant to biotechnology.

During this project, students were so engaged that they used *Showing Evidence* from home, and were still talking about the project six months later. Several students, who had strong opinions, changed their position based on compelling evidence they uncovered themselves-a first in Coté's 17 years of teaching. Next year, Coté plans to use the tool to teach a section on evolution.

Coté, who teaches the Intel Teach to the Future Workshop on Teaching Thinking with Technology, hopes teachers in all disciplines will see possibilities for using the thinking tools in their classrooms. English teachers can teach students how to organize and write entire papers using *Showing Evidence*, she suggests. Social studies and government teachers can use *Visual Ranking* as a means for discussing elections and the relative importance of different issues to different candidates. "All of the tools are wonderful, and every teacher could use them," says Coté.

Learn more

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Generation Genius

Intel ISEF Onscreen

Generation Genius, a new documentary film, follows seven remarkable students on their journey to the 2005 Intel International Science and Engineering Fair (Intel ISEF). Produced by the Discovery Channel, and airing on the Science Channel, this film witnesses the hard work and determination of these students:

- Friends and high school seniors Rhett Rumery, John Thurmon, and Lucas Cavin from Chillicothe, Missouri who build a scuba leg prosthesis for above-the-knee amputees.
- Identical twins Rachel and Brittany Koffer from Herndon, Virginia-at 14 years old, among Intel ISEF's youngest competitors. Their project investigates whether the older twin is more dominant and competitive than the younger one.
- Courtney Rafes, a Denton, Texas senior who divides her time between school, horseback riding, and cheerleading. Her project involves using ultrasound to pinpoint dangerous weaknesses or cracks in railroad tracks.
- Alison Siler of Charlotte, North Carolina, a talented young singer and piano player, whose project investigates the relationship between estrogen and weight gain.

Over the course of one week, Generation Genius tracks these competitors as they travel from their home states to Intel ISEF in Phoenix, Arizona. The seven finalists mingle with students from all over the world, sightsee, and prepare their projects for competition day. As the judging nears, their nerves are tested.

Generation Genius airs on the Science Channel on December 11, 17, and 25.

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Ask an Expert

Robin Fogarty: Learning from the Real World

For the past 20 years, Chicago native Robin Fogarty has traveled the world as a consultant and author, leading workshops and seminars in curriculum design and professional development. She has trained principals, administrators, teachers, and staff developers in Russia, Australia, Singapore, Great Britain, and the Netherlands.

In one of her many books, *Problem-Based Learning and Other Curriculum Models*, Fogarty presents six curriculum models that use issues from the real world to help students develop the problem-solving tools they'll need throughout their lives.

Recently, Fogarty spoke to the *Intel® Innovator* about the critical importance of integrating higher-order thinking skills into every curriculum.

Why is it so important that curriculum is designed to develop students' higher-order thinking skills?

From my perspective, higher-order thinking skills should be the centerpiece of any curriculum. We live in a complex world, a global community, and an information-overload society. Teachers must engage young people in problems of the outside world and weave real-life skills into the curriculum-skills that will help them carry on with their lives in ways that are meaningful, purposeful, and helpful. If our kids can't think critically, problem-solve, make decisions, and decipher what's valuable information and what's frivolous, it's going to be a rough road ahead for them.

Why must teachers routinely require rigor in student performances, projects, and everyday assignments?

The idea of rigorous instruction that promotes higher-order thinking doesn't mean that classroom lessons are difficult; it means they are complex. Projects should include intricate tasks that help students develop life-long habits of mind: pride in their work, a sense of accomplishment in solving a problem, an understanding of what it means to persist, and a tolerance for ambiguity-are what the real world is all about. If we spoon-feed our kids quick answers, if they think there is only one right answer, they're never really going to learn effective habits of mind that will carry them through their lifes' journey.

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How do teachers create a "thoughtful" classroom that fosters higher-order thinking such as analysis and argumentation?

In the thoughtful classroom we bring several subject areas together in a problem-based learning unit that has relevancy, appeal, and age-appropriateness for the students. For example, a case study using the subject of lying asks questions that force young people to look at their own behavior: Is it ever appropriate to tell a lie? Is omission of information a lie? Is it okay to tell a white lie to avoid hurting someone's feelings? Depending on grade level, a teacher can bring in literary themes, social science research, and other materials to enrich the discussion of questions such as these.

Teachers participating in the Intel® Teach to the Future program have developed a set of project-based units that integrate technology and promote higher-order thinking. Can classroom teachers effectively integrate these units into their curriculum?

These comprehensive, kid-friendly unit plans are what I call "ready to wear": robust, rich, and rigorous. Teachers can select a unit appropriate to their grade level, look over the subject focus and instructional procedures, and tweak the material for their own classrooms. Every project-based unit uses the same template with Essential Question, Unit Questions, and Content Questions. Then the scenario takes students right into the problem-based learning piece where they are the stakeholders. It's make-believe, and that's what kids love.

What are inquiry models of curriculum and how do they connect with Intel units?

My book, *Problem-Based Learning and Other Curriculum Models* looks at what we call models of inquiry: problem-based learning where a teacher sets up a scenario and students become the stakeholders. Expeditionary learning, walkabouts, field trips, apprenticeships, internships-those are the ways we bring inquiry into the classroom. Students are not just learning in a static, rote-memory way, but are actively investigating.

Intel's unit plans present great examples of inquiry-based classroom projects that span all age groups, from "Pond Water and Pollywogs" for the five- to seven-year-olds, to "Go-Go Gadget: Invent a Machine" for 8- to 10-year-olds, to "Using Electricity on the Job!" for high school students.

The brain learns best by doing activities we traditionally consider extracurricular: reporting for the school newspaper, putting on a musical, creating the yearbook. These create memories that we carry with us from school. Such activities, which integrate learning into a real performance or project, are present in all the Intel unit plans, and should be the centerpieces of curriculum.

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Top Schools Share Best Practices

Top honors at the 2005 Intel and Scholastic Schools of Distinction awards gala went to the Academy of Allied Health and Science, a vocational high school in Neptune, New Jersey and John Stanford International School, a foreign language immersion elementary school in Seattle, Washington. These two were named "Best of the Best" among this year's 20 award winners, and received total prize money of $25,000 each.

When the Intel and Scholastic Schools of Distinction awards were announced in September, both schools were category winners for Collaboration-demonstrating a commitment to and recognition of the important role that external stakeholders play in supporting learning. The Academy of Allied Health and Science, administered by the Monmouth County Vocational School District, has constructed a health and science curriculum that includes a strong emphasis on community service. The curriculum at the John Stanford International School focuses on international education, foreign language immersion, and global citizenship.

The schools went on to earn "Best of the Best" titles because of comprehensive programs addressing technology, strong involvement of parents and the community, ongoing professional development, outstanding teamwork, and consistently high academic achievement.

"The best way to encourage educational excellence is to identify it, reward it, and disseminate the practices that lead to it," says Brenda Musilli, Intel director of education. "We hope these programs will inspire others."

Applications Open for 2005-2006 School Year

The John Stanford International School came to apply for the Schools of Distinction award through the recommendation of its grant committee. "We looked at the categories, at what makes our school work, what makes it unique, and how to articulate that. It's an honor to be recognized as a role model, and not just for other international schools. As lifelong learners we need to continue to see new things. This award program is a way other schools can see and benefit," says Karen Kodama, principal.

"Being a role model gives us an awesome sense of pride and responsibility," says Robert Cancro, principal of the Academy of Allied Health and Science. He believes applying for awards such as Schools of Distinction encourages self-reflection and honest evaluation-an opportunity to recognize strengths, correct weaknesses, and celebrate accomplishments. "In a society where education is

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under constant scrutiny, successes should be recognized, celebrated, and shared," he says.

Eighteen other recipients of the 2005 Intel and Scholastic Schools of Distinction award received $10,000 cash grants. The 20 winners also share prizes of curriculum materials, professional development resources, and software and hardware valued at more than $3 million.

Applications for the 2006 Intel and Scholastic Schools of Distinction awards are available at Schools of Distinction* where visitors can also find out more information on each winning school, and their programs and practices. The contest is open to K-12 public, private, charter, parochial, Department of Defense, and Bureau of Indian Affairs schools. The deadline to apply is January 5, 2006.

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Designing Effective Projects

A Guided Tour of the Expanded Web Site

"When projects start, I'm tearing around facilitating lots of activities at once. Project days are harder than paper and pencil days, but the kids are so charged, so deeply engaged, it's worth it." Lisa-Helen Shapiro, First grade teacher

Want to bring the excitement of projects to your classroom like Lisa-Helen Shapiro did? *Designing Effective Projects*, Intel's newly expanded online classroom resource for elementary and secondary teachers, can help you do that.

Dip into *Designing Effective Projects*, part of the Intel® Innovation in Education Web site, to gain deeper understanding of how the project-based instructional model engages students in authentic learning by weaving real-world problems into classroom studies. Read the latest research on higher-order thinking and why critical thinking skills are so important in the 21st century. Peruse 60 updated unit plans developed by a team of experienced teachers to give you exciting new tools and ideas for creating technology-rich projects. Learn how multiple assessment strategies focus the project work on important learning goals. Review an array of instructional approaches that keep students learning at a high level.

A deeper exploration of *Designing Effective Projects* will even take you behind the scenes in Shapiro's first-grade classroom to see how a traditional life science lesson on frogs was transformed into an exciting "thinking classroom" project relevant to students' lives.

To begin, take a look at the four main building blocks of *Designing Effective Projects*: "Project Design," "Thinking Skills," "Unit Plan Index," and "Instructional Strategies":

"Project Design" describes the benefits of project-based learning and offers five ways to help teachers think about instructional strategies that fit their own classroom and curriculum:

- "Characteristics of Projects" outlines the distinguishing traits of effective classroom projects. Within this section, "Inside Projects" analyzes four exemplary Intel Innovation in Education unit plans for different grade

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levels.

- "Benefits of Project Approaches" offers a historical overview of project-based learning, and provides a list of resources, research, and references.
- "Projects in Action" includes advice for teachers moving from traditional instruction to project-based approaches. Within this section, "Anatomy of a Project Plan" examines four classroom projects to illustrate the various ways teachers meet the challenges of this transition.
- "Curriculum-Framing Questions" explores how each unit plan is built around good questions that spark interest and connect students with "big ideas" to guide their learning.
- "Assessing Projects" presents multiple assessment scenarios, with ideas for planning, defining, and reaching assessment goals. Additional links lead to a close-up look at assessment plans for an elementary and a secondary classroom.

"Planning Projects" helps you design a project-based unit for your own classroom, or find ideas and ways to improve existing project-based units.

"Thinking Skills," the second building block of *Designing Effective Projects*, reviews current research that helps teachers "think about thinking." Follow the links for information on types of higher-order thinking skills, how beliefs and attitudes influence thinking, skills and strategies necessary for critical thinking and problem solving, and effective ways to address individual learning styles.

The "Unit Plan Index," with 60 examples of technology-rich classroom projects, is the heart of *Designing Effective Projects*. The viewing tool at the top of the page can take you straight to a unit that applies to the grade or age level of your classroom, or you can browse by subject. Projects are organized by grades around mathematics, science, language arts, social studies, and interdisciplinary studies.

"Instructional Strategies," the fourth component of *Designing Effective Projects*, explores the multiple instructional strategies proven to help students achieve success and learn at higher levels: prior knowledge, graphic organizers, cooperative learning, feedback, recognition, questioning, modeling, and managing technology.

A Behind-the-Scenes Look into a "Thinking Classroom"

Take a deeper look inside *Designing Effective Projects* to find two new features-"Anatomy of a Project Plan" and "Inside Projects"- that provide a detailed analysis of the Intel Innovation in Education unit plans.

"Anatomy of a Project Plan" examines how a standard curriculum unit can be transformed into a rich, project-based classroom lesson that engages students in authentic learning. Four unit plan examples, each for a different grade level, are used to illustrate how Essential Questions and Content Questions bring relevancy and excitement to the classroom, and how teachers identify and overcome the challenges involved in making the transition to project-based teaching.

For example, in the K-2 life science unit, "Pond Water and Pollywogs," Lisa-

Helen Shapiro's first-graders rear frogs from eggs and create an informative brochure for a new amphibian exhibit at the zoo. Instead of simply focusing on the environment and life cycle of frogs, however, Shapiro poses an Essential Question to make relevant, real-world connections for her students. The question-*Why do people say there is no place like home?*-helps her students think about "habitat" in a personal context-that of their own families.

One of the challenges Shapiro faced in teaching the unit was time management, which she handled by dividing students into small cooperative groups to help them stay focused on tasks, and calling on volunteer parents and upper-grade buddies to help with computer use and brochure design.

"Inside Projects" looks at four unit plans in even more detail, examining how each unit is student-centered, aligns with standards, poses important questions, carries relevance beyond the classroom, uses varied assessment practices, applies multiple and ongoing assessments, encourages authentic work, measures demonstrations of learning, promotes technology-enhanced learning, develops higher-order thinking skills, and employs varied instructional strategies.

For example, the analysis of "Pond Water and Pollywogs" highlights the fact that Shapiro used varied assessment strategies to measure student learning and performance. Each first-grader kept an observation journal to record the progress of the project. Feedback in the form of questions and comments kept students on track. Finally, a scoring guide created by the class at the beginning of the project was used to assess their final products: a mural, slideshow, and brochure for the local zoo.

To learn more, visit *Designing Effective Projects*