The Intel® Innovator

Tools and Resources for Educators Fall 2005

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How can technology be used to build students' thinking skills? In a new Intel® Teach to the Future workshop, teachers across the United States can explore easy and effective ways to use technology tools to develop critical thinking skills in today's student-centered classrooms. Read the article.

Marking a Milestone in Learning

Before the 100th Computer Clubhouse opened in Washington D.C., most of the members didn't have access to a computer. Now these kids are discovering what other members worldwide already know—that they're free to develop their personal interests through technology within a safe environment. Read the article.

Road Map to Science Fair Success

Get set for science fairs with a comprehensive curriculum and planning guide for middle school teachers. This guide includes hands-on activities that will help your student scientists prepare during the 30 weeks leading up to a fair. Read the article.

Ask an Expert

Grant Wiggins, coauthor of Understanding by Design, explains that teachers can essentially design, pilot, and debug curriculum to meet standards for intellectual performance, while using content intelligently. He also discusses the relevance of best practices and collaboration. Read the article.

Featured Resource

Plan for Effective Projects

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Workshop Builds Thinking Skills

Latest Offering from Intel® Teach to the Future Integrates Thinking Tools

In North Carolina, educators and state leaders are moving aggressively toward developing their students' 21st century skills. Teachers here are especially interested in resources for developing their students' higher-order thinking skills, according to Mary Lou Daily, technology consultant with the North Carolina Department of Public Instruction. So when the Intel® Teach to the Future Workshop on Teaching Thinking with Technology was launched earlier this year, North Carolina teachers were quick to enroll. "This professional development experience takes us to the place where we want to go with our students," Daily says.

The new workshop, including materials provided free of charge to districts across the United States, provides teachers with 24-40 hours of hands-on professional development in a technology lab. The curriculum begins with an overview of thinking skills. Then, teachers plan instructional units that integrate interactive thinking tools into student-centered learning. The workshop allows time for teachers to develop a standards-based unit that integrates the suite of thinking tools available from Intel® Innovation in Education. The suite currently includes the *Visual Ranking Tool*, the *Seeing Reason Tool*, and the *Showing Evidence Tool*.

"When you look at what is recommended for 21st century skills—particularly critical thinking, systems thinking, and sound reasoning—what better resources do you have than these thinking tools?" adds Daily. "The thinking tools are great, because they help students learn to collaborate, work as a team, and solve problems. This is exactly what we're looking for to help our students prepare for their future careers."

Thinking About Thinking

Tonya Crocker, a seventh-grade math teacher from North Carolina, participated in the Workshop on Teaching Thinking with Technology at the start of the summer. Higher-order thinking is already a strong focus in her classes. "The workshop provided me with technology tools to integrate into my lessons to direct the students to think about their thoughts," Crocker says.

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In teaching pre-algebra, for example, she encourages students to explain the thinking that goes into solving a problem. Now, she plans to use all three thinking tools to strengthen her students' "thinking about thinking." As Crocker explains: "*The Visual Ranking Tool* will be helpful in discovering the different avenues and approaches my students take when arriving at a solution to a problem. The *Seeing Reason Tool* will be useful in helping the students show and develop relationships between factors and concepts. The *Showing Evidence Tool* will be useful in helping my students prove why they support a certain hypothesis or claim."

Before attending the workshop, she adds, "I had my students thinking about these aspects of mathematics, but the tools provide an avenue of organization and proof of thoughts."

Troy Galloway, who teaches technology and business education to middle school students in North Carolina, says he gained new instructional ideas when he took the workshop this summer. For example, he uses project-based learning to teach his eighth-graders about marketing. Students write a business plan, develop a commercial, and design a business Web site. He envisions using the thinking tools to help students with brainstorming, organizing their ideas, collaborating, conducting research, and developing a solid plan for a business they would like to start. Galloway says the thinking tools "are invaluable in assisting students to break down processes and projects into pieces and to determine the next course of action."

Taking Thinking Deeper

Veteran teacher Margaret Bowerman, a Senior Trainer for Intel Teach to the Future, led the workshop that Galloway and Crocker attended. Nearly all the participants had already taken the Intel® Teach to the Future Essentials Course, which gave them a solid foundation in integrating technology into effective unit planning. "By the end of the workshop," she said, "they saw the value of learning about Essential Questions and thinking skills. Higher-order thinking is definitely something they are looking for, and this workshop will help them take student thinking deeper in their projects."

As a teacher, Bowerman appreciates how easy the thinking tools are to use. That means the classroom focus stays on the learning goals, not learning about technology. "The technology never interferes," she explains. She also likes the online workspace, which allows teachers to easily set up and manage student projects.

The structure of the workshop allows plenty of time to talk about pedagogy, Bowerman adds. "A lot of teachers want help with assessment," she says. "We talk about that in the workshop. What outcomes are they looking for? How will they know when they've been reached? How can they lead students there?"

Rhonda Langston, media coordinator for a North Carolina High School, sees opportunities to incorporate the thinking tools in site-based professional development. "I plan to use the thinking tools to train teachers to incorporate more critical thinking," she says. "Thinking critically does not come easy to some students. The thinking tools help provide students with a visual guide to make

critical thinking easier and more relevant."

Twenty-First Century Focus

North Carolina has emerged as a national leader in promoting a learning model that emphasizes 21st century thinking skills. Earlier this year, Governor Mike Easley announced the first-ever 21st Century Skills Center to help students acquire the knowledge and skills needed for success in the global economy. The state is the first in the nation to implement the framework for 21st century education developed by the Partnership for 21st Century Skills*. The framework emphasizes competencies such as information and communication technology literacy, critical thinking, communication, collaboration, global awareness, and business, economic, and civic literacy.

- Learn more about the Intel Teach to the Future Workshop on Teaching Thinking with Technology.
- Learn more about the free thinking tools from Intel Innovation in Education.

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Marking a Milestone in Learning

100th Computer Clubhouse Opens in Washington, D.C.

When a new Intel Computer Clubhouse opened in Washington, D.C., in May, the event marked an important milestone—it was the 100th Computer Clubhouse to open worldwide. But for the young people growing up in the community known as Anacostia, the arrival of a Computer Clubhouse in their neighborhood has meant something much more personal. “Technology is the future, and now it’s available to them,” says Andrea Copeland, who is the coordinator of the newest Computer Clubhouse, operated by the Boys and Girls Club of Greater Washington, FBR Branch.

Before this facility opened, Copeland estimates, “only about 10 percent of our members had access to computers at school or at home. This is definitely broadening their horizons.” The Computer Clubhouse and Boys and Girls Club facility is part of a brand-new community space called The Town Hall Education Arts and Recreation Campus (THEARC).

The newest Computer Clubhouse follows the successful model pioneered by the Museum of Science, Boston, in collaboration with the MIT Media Lab. The Intel Computer Clubhouse Network operates around the world in underserved communities traditionally lacking access to computers. Providing more than just access, the Computer Clubhouses inspire youth to develop their personal interests through technology, while learning to be designers and creators of technology. At Computer Clubhouses around the world, young people ages 8-18 are provided with a technology- rich, safe environment where they are free to direct their own learning.

Unique Learning Model

“The Intel Computer Clubhouse Network offers youth access to computers, but its uniqueness lies in its learning model,” said Intel Chairman of the Board Craig Barrett. “At the Computer Clubhouse, dedicated mentors guide and inspire youth to channel their creativity through technology in order to develop skills that can open doors to personal and professional achievement.”

At the new facility in Washington, D.C., for example, Computer Clubhouse

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members select their own activities. “It’s all by their choice,” Copeland explains. “They can make whatever they want.”

She typically greets new members by showing them the rich array of multimedia tools, from a sound recording studio to digital camera gear to a bank of computers where they can do animation, digital artwork, Web publishing, or whatever else they imagine. “I show them a few things to get them started, then they dive in,” Copeland says. Volunteers and mentors are also on hand to help answer questions.

In this relaxed atmosphere, young people often team up to share ideas. “They help each other. One member will make something, then teach another how to do it. It’s a laid-back atmosphere,” Copeland says, where learning about technology is as easy as talking to a friend. “For awhile, they were all superimposing their faces onto their favorite superstar’s body.” In the process, they were learning to work with digital photography and animation software. “They start out just messing around,” Copeland says, “but they end up mastering it.”

She also sees confidence increase when young people learn to use new tools and equipment to express themselves. “That’s only going to help them in the future,” Copeland says. One member, for example, is now imagining a career in architecture after discovering a talent for design.

To encourage creativity, Copeland is installing a “hall of fame” along one wall of the Computer Clubhouse. That’s where members can display their one-of-a-kind creations. “This is a place to show off the original—something that nobody else has ever done before.”

A Global Network

As part of the Intel® Innovation in Education initiative, Intel has invested US$32 million over five years to sponsor 100 Computer Clubhouses in 20 countries around the world.

To learn more about the Intel Computer Clubhouse Network, visit the Intel Innovation in Education Web site. Read more about the 100th Computer Clubhouse celebration.

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Road Map to Science Fair Success

A Guide for Teachers

What's the best way to get students ready for a successful science fair experience? New resources from Intel® Innovation in Education are available to help, including a comprehensive new guide for middle school teachers.

Intel ISEF Middle School Science Fair: A Guide for Teachers offers a comprehensive curriculum and planning guide. It provides teachers with a detailed road map, outlining planning considerations and hands-on activities for the 30 weeks leading up to a fair. Downloadable files include the complete teaching guide, plus an accompanying set of transparencies. The guide has been developed by a team of experienced science teachers and used in middle school outreach efforts in connection with the Intel International Science and Engineering Fair (Intel ISEF). Learn more.

Where do students get their ideas for the research projects they enter in events like Intel ISEF? *Profiles of Success*, a collection of stories about high school scientists from around the world, has just been updated with project examples from Intel ISEF 2005. Read more.

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Ask an Expert

Grant Wiggins: Teacher as Designer

With their landmark *Understanding by Design*, Grant Wiggins and Jay McTighe introduced thousands of teachers to backward design as a process for effective curriculum planning. The brand-new, expanded second edition of the book incorporates user feedback and real-life examples that illustrate how to develop classroom projects and use questioning to promote student understanding. Just in time for the new school year, Wiggins, a former teacher and coach, spoke with *The Intel® Innovator* about what he sees as the essential questions facing education today.

You have emphasized the importance of questions to guide curriculum design. What's so hard about asking good questions?

The asking and pursuing of good questions is not really possible by conventional definitions of curriculum, instruction, and assessment. In that view, curriculum is content, instruction is making sure the content is learned, and assessment is finding out if you learned it. So questions are either technical—what does it mean when you say this?—or trivial. The really interesting question is somehow seen as irrelevant. What does it mean when, instead, the curriculum is in grounded in questions? What happens when the teacher becomes a facilitator in the pursuing of very important questions?

How does the teacher's role change when you apply the process of backward design, or "starting with the end in mind"?

You have to understand a different job definition—it's a wholesale change in behavior. Your job as a teacher is no longer to cover content and make sure it's learned. Instead, your job is to meet standards for intellectual performance by asking questions and using content intelligently. We're still struggling toward a view of curriculum, instruction, and assessment that gets that right.

Is it fair to say that teachers are now becoming engineers of the learning environment?

We take the verb "design" seriously. In this new job description, teachers are designing curriculum, piloting it, debugging it. What teachers design is analogous

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to software. It may be low-tech, but a careful plan makes the learner more productive. That's exactly what a piece of software does. Software designers are doing backward design by definition—they're trying to cause something to occur. This is the big jump: when teachers understand that curriculum is not the input, but the means of achieving the output, then they can begin to see themselves as designers and coaches in accomplishing the goal of the design.

Do you see signs of progress in how teachers go about designing and delivering instruction?

Absolutely. If you look where we were in the 1970s, we've made significant strides. There's the realization today that there need to be robust standards, that everybody's not a lone ranger, and that there really is a literature of best practice. But we're still struggling with habits, attitudes, and perceptions that are big impediments. Teachers are in the throes of learning new habits and unlearning old habits; that's always going to be difficult. There better be lots of incentives and opportunities and reinforcements to make it worthwhile.

Such as?

Innovative leaders—who don't take no for an answer, who seed interesting projects, who light a fire under their best people. Teacher collaboration is also more than helpful; it's pretty mandatory. If you presume we're talking about a paradigm shift of thinking and habit reformation, then collaboration brings a strength in numbers, team spirit, the morale boost of working together. Given everything we know about how people work psychologically, it's almost always best to do this work collaboratively.

Intel® Innovation in Education offers teachers a large, online collection of standards-based unit plans and planning resources that they can adapt. What's the value of borrowing other teachers' ideas to suit your own classroom needs?

It's crazy to reinvent the wheel. A profession builds on best practices. We need access to thousands of good units, in every subject. As a teacher, you can start with a nice example, apply your creativity, and make it your own.

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Plan for Effective Projects

Expanded Resources Support Instructional Design

What does a classroom look like when higher-order thinking is going on? How can technology-rich projects help to generate deeper thinking? What role do questions play in guiding student-centered learning?

These are among the many questions answered in a rich new set of online resources. *Designing Effective Projects*, part of the Intel® Innovation in Education Web site, expands the free classroom resources available for elementary and secondary teachers. Teachers across grade levels and subject areas will find useful ideas, research highlights, and practical suggestions to guide every stage of learning, from unit planning to classroom management to assessment.

Developed by Teachers

Developed in collaboration with a team of experienced teachers, *Designing Effective Projects* addresses common questions about project-based learning and shows how to plan and implement classroom activities that engage students in authentic learning. The new content also takes an in-depth look at thinking skills, including an update to Bloom's taxonomy to better address 21st century skills.

The resources supplement an updated collection of nearly 60 unit plans, many of which have been developed by participants in the Intel® Teach to the Future professional development program. To support teachers who are creating student-centered classrooms, the new content provides detailed information about project design, thinking skills, and effective instructional strategies. *Designing Effective Projects* also takes into account the new roles required for the success of student-centered learning. Project-based learning creates new roles for the teacher, the student, and the technology, along with expanded opportunities for authentic learning.

Project Design

A new section called "Project Design," for example, paints a picture of effective project-based instruction. Although there are many kinds of classroom projects, effective ones share these characteristics:

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- Students are at the center of learning
- Projects focus on important learning objectives that are aligned with standards
- Projects are driven by Curriculum-Framing Questions
- Projects involve ongoing and multiple types of assessment
- Projects connect students to the real world
- Technology supports and enhances student learning
- Thinking skills are integral to student work
- Instructional strategies are varied and support multiple learning styles

Another new feature, called “Inside Projects,” annotates select unit plans to provide expanded information to support instruction. For example, one unit plan illustrates how varied instructional strategies can meet multiple learning styles.

Questioning strategies also receive considerable attention. Drawing on research by Grant Wiggins and others, *Designing Effective Projects* shows how good questions can transform the classroom and connect students with “big ideas” to guide their learning.

Thinking Skills

A section called “Thinking Skills” presents an updated framework to help teachers “think about thinking.” Bloom’s taxonomy, developed in 1956, remains the best-known framework. Education researchers have recently suggested updating the famous pyramid to accommodate 21st century skills such as collaboration, critical thinking, and problem solving.

With accessible examples, *Designing Effective Projects* shows what higher-order thinking skills such as metacognition and analysis look like in elementary and secondary classrooms. This section also examines the role of emotions in student thinking, and provides suggestions for accommodating diverse learning styles.

Providing a bridge from research to practice, the “Thinking Skills” section also shows how teachers can adapt their instruction to encourage students to use higher-order thinking. Specific unit plans are used to illustrate, for example, how a sixth-grade teacher might promote critical thinking in a project focusing on recycling. Sample dialogues show how teachers can guide students to develop metacognitive strategies for tackling new challenges. Instructional strategies show teachers how to adapt exemplary unit plans to meet their own learning goals.

What does a “thinking classroom” look like? *Designing Effective Projects offers* a tour of environments that encourage student thinking. The physical set up of a classroom, for example, can help to foster talk—an essential component of a thinking classroom. A flexible room arrangement will enable a teacher to vary learning activities, shifting from one-to-one conferences with students to student teamwork to whole-class discussions. Integrating technology to support learning can happen more easily in a classroom designed for easy access to computers and other learning tools. An effective teacher knows how to “engineer” a classroom to maximize this potential.

To learn more, visit *Designing Effective Projects*.