Preparing 21st Century Students
for a Global Society

An Educator's Guide to the "Four Cs"

nea NATIONAL EDUCATION ASSOCIATION

Great Public Schools for Every Student

Critical Thinking and Problem Solving

Critical thinking has long been a valued skill in society. Today, every student—not just the academically advanced—needs it. While critical thinking and problem solving used to be the domain of gifted students, now it's a critical domain for every student.

The Importance of Critical Thinking

The link between critical thinking and education is obvious: one can't learn well without thinking well. Critical thinking contributes to career success, but also to success in higher education. In research conducted for the Bill and Melinda Gates Foundation, University of Oregon professor David T. Conley finds that "habits of mind" such as "analysis, interpretation, precision and accuracy, problem solving, and reasoning" can be as or more important than content knowledge in determining success in college courses.[6]

Teaching critical thinking and problem solving effectively in the classroom is vital for students. Learning critical thinking leads students to develop other skills, such as a higher level of concentration, deeper analytical abilities, and improved thought processing.

Today's citizens must be active critical thinkers if they are to compare evidence, evaluate competing claims, and make sensible decisions. Today's 21st century families must sift through a vast array of information regarding financial, health, civic, even leisure activities to formulate plausible plans of action. The solutions to international problems, such as global warming, require highly developed critical thinking and problem-solving abilities.

In everyday work, employees must employ critical thinking to better serve customers, develop better products, and continuously improve themselves within an ever-changing global economy. Economists Frank Levy and Richard Mundane have described the new world of work in which the most desirable jobs—the ones least likely to be automated or outsourced—are those that require *expert thinking* and *complex communication*.[7] According to the *AMA 2010 Critical Skills Survey*, 73.3 percent of business executives polled identified critical thinking as a priority for employee development, talent management, and succession planning.[8]

Definition of Critical Thinking

Critical thinking and problem-solving can be defined in many ways, but P21 defines critical thinking as follows:[9]

Reason Effectively

▶ Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

▶ Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

▶ Effectively analyze and evaluate evidence, arguments, claims, and beliefs

▶ Analyze and evaluate major alternative points of view

▶ Synthesize and make connections between information and arguments

▶ Interpret information and draw conclusions based on the best analysis

▶ Reflect critically on learning experiences and processes

Solve Problems

▶ Solve different kinds of unfamiliar problems in both conventional and innovative ways

▶ Identify and ask significant questions that clarify various points of view and lead to better solutions

(See the "critical thinking rubric" created by the Catalina Foothills School District as an example: http://rubrics.metiri.wikispaces.net/file/view/ Catalina_Foothills_Critical_Thinking_Rubric-1.doc)

Related to Other Cs

While the importance of critical thinking is paramount, its connection to the other Cs is equally important. Leading experts on critical thinking stress its connection to creative thinking skills. According to philosophers Richard Paul and Linda Elder, "…sound thinking requires both imagination and intellectual standards."

When one engages in high-quality thinking, one functions both critically and creatively; one produces and assesses, generates and judges the products of his or her thought.[10]

Critical thinking also draws on other skills, such as communication and information literacy, to examine, then analyze, interpret, and evaluate it.

According to educator Thomas Hoerr, the very notion of intelligence has changed. We no longer rely on the limits of our single mind to access the information resources we need to solve problems.[11] Problem solving has always involved teamwork and cooperation. Today, however, open source programs, wikis, blogs, and other Web 2.0 technologies enable total strangers divided by space and time to collaborate. Successful problem solving in the 21st century requires us to work effectively and creatively with computers, with vast amounts of information, with ambiguous situations, and with other people from a variety of backgrounds.

Ways to Integrate Critical Thinking into Your Classroom

P21 forged alliances with key national organizations that represent the core academic subjects, including social studies, English, science, geography, world languages, mathematics, and the arts. These collaborations resulted in the 21st Century Skills Maps that illustrate the intersection between core subjects and 21st Century Skills. This section includes examples of what critical thinking skills might look like in core academic content classrooms. These examples, drawn primarily from the aforementioned content maps, demonstrate how critical thinking and problem solving can be integrated into classroom teaching and learning across a variety of grade levels and disciplines.

Communication

Expressing thoughts clearly, crisply articulating opinions, communicating coherent instructions, motivating others through powerful speech—these skills have always been valued in the workplace and in public life. But in the 21st century, these skills have been transformed and are even more important today.

The Importance of Communication

Students must be able to effectively analyze and process the overwhelming amount of communication in their lives today. Which information sources are accurate? Which ones are not? How can they be used or leveraged effectively?

The power of modern media and the ubiquity of communication technologies in all aspects of life make teaching strong communication skills even more important. While education has always emphasized fluent reading, correct speech, and clear writing, there is evidence that students are not mastering these most basic skills. In the report, *Are They Really Ready to Work?*, employers note that although oral and written communication are among the top four skills they seek in new hires, all graduates are lacking in these areas. High school graduates fare the worst, with 72 percent of employers citing this group's deficiency in writing in English, and 81 percent citing their deficiency in written communications. Almost half of employers said employees with two-year degrees were still lacking skills in these two areas, while over a quarter of employers felt four-year graduates continued to lack these skills.[12]

Additionally, there are now "global teams" that work together in business. Linguistically and culturally effective communication is essential to contribute successfully to these teams. And as technology gives rise to global work teams that span time zones, nations, and cultures, it is imperative that tomorrow's graduates communicate clearly and effectively in a variety of languages.

Communication skills are especially critical in the expanding service economy—estimated to be 81 percent of jobs by 2014—where relationships with customers and fellow employees are of vital importance. Linguistically and culturally effective listening, empathy, and effective communication skills are essential skills for every person in the service economy. Economists Levy and Mundane offer further evidence of the importance of communication in today's workplace. Because complex communication involves explanation, negotiation, and other forms of intense human interaction, jobs that require these skills are not as likely to be automated.[13]

Definition of Communication

Communication can be defined in many ways, but P21 defines communication skills as follows:[14]

Communicate Clearly

▶ Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts

▶ Listen effectively to decipher meaning, including knowledge, values, attitudes, and intentions

▶ Use communication for a range of purposes (e.g. to inform, instruct, motivate, and persuade)

▶ Use multiple media and technologies, and know how to assess impact and their effectiveness a priori

▶ Communicate effectively in diverse environments (including multilingual and multicultural)

A "communication rubric," created by the Amphitheater School District, can be found here: http://www.p21.org/route21/index. php?option=com_jlibrary&view=details&task=download&id=849

Communication and Collaboration

While it is important to emphasize communication skills, it can be difficult to separate them from the other Cs—especially collaboration. As represented in the 21st Century Skills Framework, communication competencies such as clearly articulating ideas through speaking and writing are closely related to collaboration skills, such as working effectively with diverse teams, making necessary compromises to accomplish a common goal, and assuming shared responsibility for collaborative work. Communication cannot be effective unless the message is received and understood.

Research backs up the importance—and interconnection—of communication and collaboration as well. In her work with young children, Professor Carol Seefeldt found that "social skills and communication skills go hand in hand. Children who look at the child they are talking with, who understand turn taking when communicating, and who know how to solve verbal conflicts, are those who make and keep friends easily."[15]

The communication/collaboration link is just as valid for adults as well. John Seeley Brown and Paul Duguid describe effective work teams as those in which "the talk and the work, the communication and the practice are inseparable."[16] For Daniel Pink, collaborative, empathic, and social skills—what he calls "high touch" aptitudes—along with the high concept aptitudes listed earlier, represent the "whole mind" that the future will prize.[17] It is important to consider how today's technologies shape words and images, as we receive many of our messages today through one or more digital devices. Thus, communication skills are intertwined with information, media, communication, and technology skills.

Ways to Integrate Communication into Your Classroom

P21 forged alliances with key national organizations that represent the core academic subjects, including social studies, English,

Collaboration

Collaboration is essential in our classrooms because it is inherent in the nature of how work is accomplished in our civic and workforce lives. Fifty years ago, much work was accomplished by individuals working alone, but not today. Much of all significant work is accomplished in teams, and in many cases, global teams.

The Importance of Collaboration

Sites like Wikipedia highlight how interconnected our world has become and emphasizes the benefits of collaborative work. The resulting products are those to which millions of users have contributed. The comprehensive nature of these articles reflects the collaborative culture of the site and demonstrates how people working together can produce extremely inclusive and valuable resources.

Generally, collaboration has been accepted as a skill that's essential to achieve meaningful and effective results. In the past decade, however, it has become increasingly clear that collaboration is not only important but necessary for students and employees, due to globalization and the rise of technology.

The Global Learning and Observations to Benefit the Environment (GLOBE) Program, a worldwide, hands-on, primary and secondary school-based science and education program, is an example of students collaborating with each other to impact global problems. GLOBE's vision promotes and supports students, teachers, and scientists to collaborate on inquiry-based investigations of the environment and the Earth system working in close partnership with NASA, the National Oceanic and Atmospheric Association (NOAA), and the National Science Foundation (NSF) Earth System Science Projects (ESSP's) in study and research about the dynamics of Earth's environment. Over 1.5 million students have participated in GLOBE, contributing more than 21 million measurements to the GLOBE database for use in their inquiry-based science projects. More projects like GLOBE are needed for students to be prepared for a global, technology-based workforce.[18]

Various scholars and authors have emphasized the importance of collaboration. Author James Surowiecki, for example, explains how we use the "wisdom of crowds" in the new economy by saying that "under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them." Surowiecki underscores the importance of collaboration by remarking that "… a large group of diverse individuals will come up with better and more robust forecasts and make more intelligent decisions than even the most skilled 'decision maker.'"[19] Diversity brings multiple individual and cultural perspectives into the collaboration. Not only does a collaborative effort create more holistic results than individual efforts,

but it also creates knowledge for a greater number of people.

As a result of students working collaboratively, the group can generate more knowledge, making collaboration a key ingredient to student success in today's global society.

Definition of Collaboration

Collaboration can be defined in many ways, but P21 defines collaboration as follows:[20]

Collaborate with Others

▸ Demonstrate ability to work effectively and respectfully with diverse teams

▸ Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

▸ Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

A "collaboration rubric," created by the New Technology High School, can be found here: http://www.p21.org/route21/index.php?option=com_jlibrary&view=details&task=download&id=382

Ways to Integrate Collaboration into Your Classroom

P21 forged alliances with key national organizations that represent the core academic subjects, including social studies, English, science, geography, world languages, mathematics, and the arts. These collaborations resulted in the 21st Century Skills Maps that illustrate the intersection between core subjects and 21st Century Skills. This section includes examples of what collaboration skills might

look like in core academic content classrooms. These examples, drawn primarily from the aforementioned content maps, demonstrate how collaboration skills can be integrated into classroom teaching and learning across a variety of grade levels and disciplines.

WORLD LANGUAGES – 4TH GRADE

Students team with another class in a target language country to identify and compare endangered species in both countries. Using basic information in the target language, the students collaborate to produce a multimedia informational presentation for their peers.

ARTS – 4TH GRADE

While rehearsing a piece in music class, students discuss as a group how each individual part (melody, descant, harmonic or rhythmic accompaniment) contributes to the musical effectiveness of the overall performance, and how all musicians must work together to create a satisfying whole. Students also experiment with and discuss how the director (whether student or teacher) communicates with the ensemble (gestures, head movements, facial expressions) to help shape performance.

SCIENCE – 8TH GRADE

Working in collaboration with other classes in the school, students investigate water runoff on their school grounds and use Global Positioning System (GPS) and Geographic Information System (GIS) technologies to create relevant maps. Students are assigned specific interdependent roles based on their interests and talents including background research, data gathering, GPS and GIS use, creating graphics, and communicating findings. Students meet in

Creativity and Innovation

In the past, Americans perceived creativity and innovation as secondary in our national curriculum. Today, creativity and innovation are key drivers in the global economy.

The Importance of Creativity

Author Daniel Pink remarked, "The future belongs to a very different kind of person with a very different kind of mind—creators and empathizers, pattern recognizers and meaning makers. These people...will now reap society's richest rewards and share its greatest joys."[21] If students leave school without knowing how to continuously create and innovate, they will be underprepared for the challenges of society and the workforce.

In today's world of global competition and task automation, innovative capacity and a creative spirit are fast becoming requirements for personal and professional success. Sir Kenneth Robinson, a leading thinker and speaker on creativity said, "Creativity is as important in education as literacy and we should treat it with the same status."[22]

According to Robert Sternberg of Tufts University, "Successful individuals are those who have creative skills, to produce a vision for how they intend to make the world a better place for everyone; analytical intellectual skills, to assess their vision and those of others; practical intellectual skills, to carry out their vision and persuade people of its value; and wisdom, to ensure that their vision is not a selfish one."[23]

In a world in which good design is increasingly used as a means of differentiating objects of mass production, creative design skills are highly desired in the labor force. As a result, entrance into a topnotch MFA program is now more competitive than getting into Harvard Business School.[24] Howard Gardner cites "the creating mind" as one of the five minds we'll need in the future. To cultivate such a mind, he says, we need an education that features "exploration, challenging problems, and the tolerance, if not active encouragement, of productive mistakes."[25] Similarly, author Richard Florida stated, "I call the age we are entering the creative age because the key factor propelling us forward is the rise of creativity as the primary mover of our economy."[26]

Perhaps Pink sums it up best, "In a world enriched by abundance but disrupted by the automation and outsourcing of white-collar work, everyone must cultivate an artistic sensibility. We may not all be Dali or Degas. But today we must all be designers."[27]

Definition of Creativity and Innovation

Creativity can be defined in many ways, but P21 defines creativity as follows:[28]

Think Creatively

▸ Use a wide range of idea creation techniques (such as brainstorming)

▸ Create new and worthwhile ideas (both incremental and radical concepts)

▸ Elaborate, refine, analyze, and evaluate original ideas to improve and maximize creative efforts

Work Creatively with Others

▸ Develop, implement, and communicate new ideas to others effectively

▸ Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work

▸ Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas

▸ View failure as an opportunity to learn; understand that creativity and innovation are part of a long-term, cyclical process of small successes and frequent mistakes

Implement Innovation

▸ Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

For another rubric that details creativity, refer to Catalina Foothills' interpretation of the skill in its "Critical and Creative Thinking" rubric, which can be found here: http://www.p21.org/route21/index.php?option=com_jlibrary&view=details&task=download&id=160

Relationship to Other Cs

Creativity is closely intertwined with some of the other skills previously identified. Innovation today has a social component and requires adaptability, leadership, teamwork, and interpersonal skills. Increasingly, today the capacity to innovate is linked to the ability to connect with others and with a facility for communication and collaboration.

Ways to Integrate Creativity into Your Classroom

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ARTS – 12TH GRADE

After studying a composer's work, students compose a theme, then create variations on that theme in that composer's style. Students notate their compositions using electronic software, orchestrate their compositions using