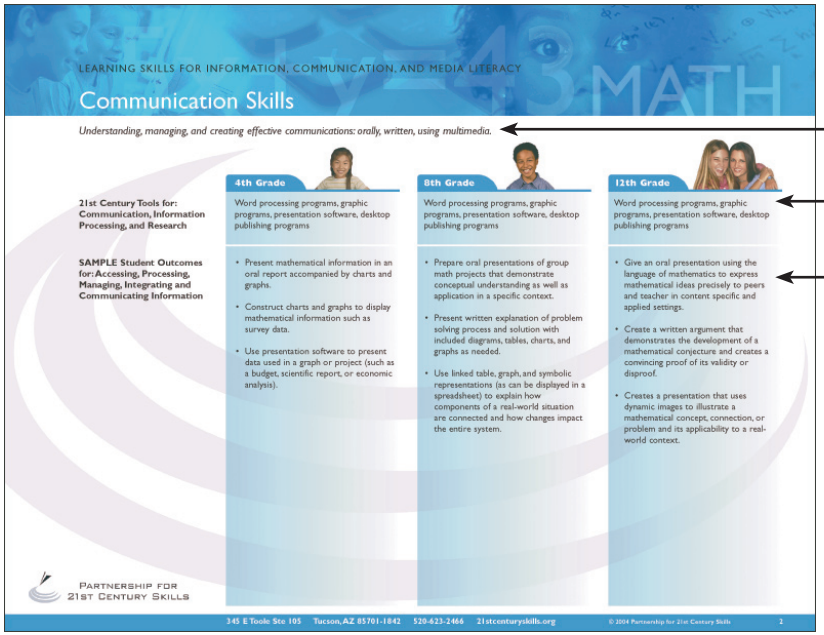
ICT Literacy Map

DESIGNED IN COOPERATION WITH THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

ICT Literacy Maps are the result of hundreds of hours of research, development and feedback from educators and business leaders across the nation. The Partnership has issued ICT Literacy Maps for the core subjects of Geography, Math, English and Science. These tools are available at www.21stcenturyskills.org/matrices/.

The Partnership for 21st Century Skills advocates for the integration of Information and Communication Technology (ICT) Literacy into K-12 education so that students can learn and achieve in the core academic subjects at much higher levels. The Partnership defines ICT Literacy as the use of 21st century tools to perform learning skills.

The Partnership has forged alliances with key national organizations that represent the core academic subjects, including English, Math, Science and Geography. As a result of these collaborations, the Partnership has developed a series of ICT Literacy Maps that illustrate the intersection between ICT Literacy and core academic subjects. The maps enable educators, administrators and policymakers to gain concrete examples of how ICT Literacy can be integrated into core subjects.



A Learning Skill + B 21st Century Tool = C ICT Literacy

An example from the Math ICT Literacy Map illustrates sample outcomes for teaching communication skills.

PARTNERSHIP FOR 21ST CENTURY SKILLS

LEARNING SKILLS FOR INFORMATION, COMMUNICATION, AND MEDIA LITERACY

Information and Media Literacy

Accessing and managing information. Integrating and creating information. Evaluating and analyzing information.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Communication, Information Processing, and Research	Newspapers, books, spreadsheets, graphing programs, calculators, computers, Internet, films, TV programs, Websites, databases, internet and digital libraries	Newspapers, books, spreadsheets, graphing programs, calculators, computers, Internet, films, TV programs, Websites, databases, internet and digital libraries	Newspapers, books, spreadsheets, graphing programs, calculators, computers, Internet, films, TV programs, Websites, databases, internet and digital libraries
SAMPLE Student Outcomes for: Accessing, Processing, Managing, Integrating and Communicating Information	• Access information from a variety of media sources. • Gather data such as taking surveys of their school or community population and create appropriate graphs to display the information. • Analyze and compare numerical data from a variety of age-appropriate sources such as newspapers and websites, and draw simple conclusions about the data.	• Find, access, and acquire the necessary data needed to address a question generated by students. • Formulate questions related to students' physical environment or two populations or cultures, design studies that can answer the questions, and collect appropriate data. • Analyze graphs and other data representations from the media relative to their truthfulness and ability to persuade/mislead a reader.	• Find and analyze data sets and collection processes with respect to the authenticity of the data and legitimacy of its use for various purposes. • Develop methods to collect univariate and bivariate data to describe trends within and between populations or local settings. • Use understanding of statistical techniques, sampling bias, and population parameters in simulated settings to study the effects on outcomes. Analyze these factors in published scientific or economic reports, and use knowledge of statistical techniques to evaluate the validity of the reports' findings.

Communication Skills

Understanding, managing, and creating effective communications: orally, written, using multimedia.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Communication, Information Processing, and Research	Word processing programs, graphic programs, presentation software, desktop publishing programs	Word processing programs, graphic programs, presentation software, desktop publishing programs	Word processing programs, graphic programs, presentation software, desktop publishing programs
SAMPLE Student Outcomes for: Accessing, Processing, Managing, Integrating and Communicating Information	• Present mathematical information in an oral report accompanied by charts and graphs. • Construct charts and graphs to display mathematical information such as survey data. • Use presentation software to present data used in a graph or project (such as a budget, scientific report, or economic analysis).	• Prepare oral presentations of group math projects that demonstrate conceptual understanding as well as application in a specific context. • Present written explanation of problem solving process and solution with included diagrams, tables, charts, and graphs as needed. • Use linked table, graph, and symbolic representations (as can be displayed in a spreadsheet) to explain how components of a real-world situation are connected and how changes impact the entire system.	• Give an oral presentation using the language of mathematics to express mathematical ideas precisely to peers and teacher in content specific and applied settings. • Create a written argument that demonstrates the development of a mathematical conjecture and creates a convincing proof of its validity or disproof. • Creates a presentation that uses dynamic images to illustrate a mathematical concept, connection, or problem and its applicability to a real-world context.

Critical Thinking and Systems Thinking

Use logical reasoning skills. Becoming numerate. Skillful in using various Problem-Solving strategies.

	4th Grade	8th Grade	12th Grade
			
21st Century Tools for: Thinking and Problem Solving	Word processing software, manipulatives, calculators, graphing calculators, spreadsheet software, probes, GPS, and geometry tool software.	Word processing software, manipulatives, calculators, graphing calculators, spreadsheet software, probes, GPS, and geometry tool software.	Word processing software, manipulatives, calculators, graphing calculators, spreadsheet software, probes, GPS, and geometry tool software.
SAMPLE Student Outcomes for: Thinking and Problem Solving	• Apply a variety of age-appropriate strategies to solve simple open-ended problems with real-life applications, such as comparison shopping, time-distance, or measurement and proportion problems. • Use word processing or online forums to record journal entries of their math experiences. • Use presentation software to share their problem-solving strategies.	• Solve problems using computation, customary and metric measurements, scale factors, ratios, and proportions • Create graphical representations of data using graphing calculators and spreadsheets.	• Employ more complex problem-solving methods to develop a deeper understanding of mathematics, such as simulating a construction project (within certain material & budget constraints). • Formulate, approach, and solve problems beyond those studied using a variety of problem-solving tools such as graphing calculators, probes, GPS, and geometry tool software.

Problem Identification, Formulation and Solution

Ability to identify, analyze, and solve problems.

	4th Grade	8th Grade	12th Grade
			
21st Century Tools for: Thinking and Problem Solving	Manipulatives, calculators, graphing calculators, Smart Boards, presentation software.	Manipulatives, calculators, graphing calculators, Smart Boards, presentation software.	Manipulatives, calculators, graphing calculators, Smart Boards, presentation software.
SAMPLE Student Outcomes for: Thinking and Problem Solving	• Plan, visualize, estimate, measure, test and revise their understanding of geometric shapes and measurement concepts. • Visually demonstrate, highlight and display various patterns and relationships among numbers using virtual whiteboards and calculators.	• Select and apply appropriate problem-solving strategies in an online group. • Solve real-life problems involving money, such as using existing e-commerce. • Use physical and digital models to demonstrate mathematical concepts . • Use calculators to solve computational problems.	• Apply an appropriate strategy to solve problems both individually and in a group. • Use estimation to determine the reasonableness of an answer and use word-processing software to explain the process. • Use physical and digital models to demonstrate mathematical concepts.

Creativity and Intellectual Curiosity

Develop and communicate ideas to others.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Thinking and Problem Solving	Digital cameras, laptop computers, multimedia presentation software, graphing calculators, probes/CBRs, Website development software	Digital cameras, laptop computers, multimedia presentation software, graphing calculators, probes/CBRs, Website development software	Digital cameras, laptop computers, multimedia presentation software, graphing calculators, probes/CBRs, Website development software
SAMPLE Student Outcomes for: Thinking and Problem Solving	• Use digital cameras to photograph representations of geometry concepts from their surroundings. • Transfer the photo images to create a math slide show. • Give a presentation for an audience to explain geometry concepts.	• Use mathematical understanding and problem-solving processes to identify a community problem (such as using a limited number of buses for an expanding student body). • Generate and analyze possible solutions for the community problem.	• Use graphing calculators and probes to collect and analyze environmental data (e.g., pH of streams) or contextual data (e.g., speed of cars in school zones). • Develop an audience-appropriate presentation that uses analysis, interpretation and display of data and related inferences to describe the situation and possible solutions.

Interpersonal and Collaborative Skills

Working well on a team. Exercising respect for diversity of opinions.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Interpersonal and Self-Directional Skills	Calculators, newspapers, Internet, spreadsheet programs, presentation software, video equipment	Calculators, newspapers, Internet, spreadsheet programs, presentation software, video equipment	Calculators, newspapers, Internet, spreadsheet programs, presentation software, video equipment
SAMPLE Student Outcomes for: Interpersonal and Self-Directional Skills	• Create an age-appropriate portfolio that includes a problem-solving situation related to real life. • Create a self-assessment for evaluating a variety of age-appropriate concepts, and provide a written reflection of their problem-solving process/thinking.	• Create an age-appropriate portfolio that includes a problem-solving situation related to real life. • Create a self-assessment for evaluating a variety of age-appropriate concepts, and provide a written reflection of their problem-solving process/thinking.	• Create a culminating project that demonstrates content knowledge and conceptual understanding in at least three distinct content areas; project should demonstrate problem-solving ability and ability to draw connections between mathematics content and real world settings.

Self-Direction

Monitoring one's own understanding and learning.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Interpersonal and Self-Directional Skills	Calculators, computers, books, newspapers	Calculators, computers, books, newspapers	Calculators, computers, books, newspapers
SAMPLE Student Outcomes for: Interpersonal and Self-Directional Skills	• Create an age-appropriate portfolio that includes a problem-solving situation related to real life. • Create a test with a variety of concepts, and a written reflection of their problem-solving process/thinking.	• Create an age-appropriate portfolio that includes a problem-solving situation related to real life. • Create a test with a variety of concepts, and a written reflection of their problem solving process/thinking.	• Create a culminating project that demonstrates content knowledge and conceptual understanding in at least three distinct content areas; project should demonstrate problem-solving ability and ability to draw connections between mathematics content and real world settings.

Accountability and Adaptability

Exercising personal responsibility and flexibility in various contexts. Setting and meeting high standards and goals for one's self and others.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Interpersonal and Self-Directional Skills	Internet, presentation software, word processing, desktop publishing	Internet, presentation software, word processing, desktop publishing	Internet, presentation software, word processing, desktop publishing
SAMPLE Student Outcomes for: Interpersonal and Self-Directional Skills	• Establish ongoing communication with students from other communities or countries (via letters, email, or electronic bulletin boards) to share math projects. • Develop and execute a plan to use measurements and a graphing program to collect and record accurate and complete data about the community playgrounds.	• Gather pertinent data from multiple sources to create a math game that reflects concepts from class and explain the game through appropriate channels (e.g., hand in manually; send as email attachment; or present orally). • Participate in national math competitions, where students are responsible for the quality of the data they submit. • Gather and critically analyze data from a variety of sources, and understand how and why data may not be consistent.	• Work on higher level mathematics that can be submitted to an agency outside the classroom (e.g., national contest, local newspaper, math bee). • Use online bulletin boards to engage in discussions of math concepts with people (students and/or experts) from around the world; demonstrate tolerance and respect for the points of view of others.

Social Responsibility

Acting responsibly with the interests of the larger community in mind. Demonstrating ethical behavior in personal, workplace and community contexts.

	4th Grade	8th Grade	12th Grade
21st Century Tools for: Interpersonal and Self-Directional Skills	Internet, presentation software, newspapers	Internet, presentation software, newspapers	Internet, presentation software, newspapers
SAMPLE Student Outcomes for: Interpersonal and Self-Directional Skills	• Children use age-appropriate mathematical and ICT skills to participate in a community service project.	• Incorporate math concepts into a community service project such as a recycling program – and research facts to determine how much of the recycled parts are used in various items.	• Identify a potential community issue that can be analyzed using a wide range of mathematical tools and develop an analysis plan. • Collect and analyze data, and develop a report presenting data and possible interventions to address local issues.

Partnership for 21st Century Skills