Technology Literacy

Each Iowa student will be empowered with the technological knowledge and skills to learn effective and live productively.

This vision, developed by the Iowa Core Curriculum 21st Century Skills Committee, reflects the fact that Iowans in the 21st century live in a global environment marked by a high use of technology, giving citizens and workers the ability to collaborate and make individual contributions as never before. Iowa's students live in a media-suffused environment, marked by access to an abundance of information and rapidly changing technological tools useful for critical thinking and problem solving processes. Therefore, technological literacy supports preparation of students as global citizens capable of self-directed learning in preparation for an ever-changing world.

Regardless of current realities, **literacy** in any context is defined as the ability "…to access, manage, integrate, evaluate, and create information in order to function in a knowledge society…" (ICT Literacy Panel, 2002) "….When we teach only for facts … (specifics)… rather than for how to go beyond facts, we teach students how to get out of date." (Sternberg, 2008) This statement is particularly significant when applied to technology literacy. The Iowa essential concepts for technology literacy reflect broad, universal processes and skills.

Although it is important that current technologies be integrated into all teachers' classroom practices and all students' experiences, it is also important to understand the broader implications of the transforming influence of technology on society. For example, creativity, innovation and systemic thinking are requirements for success in this environment. Technology is changing the way we think about and do our work. It has changed our relationships with information and given us access to resources, economic and professional, that were unimaginable just a few years ago

Technological advances also present societal challenges. It is essential that students have a deep understanding of technology literacy concepts in order to deal with technology's challenges and implications. It is also essential that educators partner with "…digital natives"…, teaching ways to mediate the challenges, and to realize the potential of technology literacy. (Palfrey and Gasser, 2008)

NOTE: The technology literacy essential concepts and skills are from the International Society for Technology in Education's National Educational Technology Standards for Students.

High School (9 – 12) Details and Examples

Essential Concept and/or Skill: ***Demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.***

Apply existing knowledge to generate new ideas, products, or processes.

- Students design, develop, create, and/or test self-generated digital learning objects that are accessible by as many users as possible, and demonstrate knowledge and skills related to curriculum content.

Create original works as a means of personal or group expression.

- Students individually or collaboratively create media-rich products to be displayed, published, or performed for a variety of audiences.

Use models and simulations to explore complex systems and issues.

- Students employ curriculum-specific, technology-based simulations to aid them in understanding complex, real-world systems. Simulation studies include formulating problems, developing models, running models, and analyzing outputs that help predict behaviors and outcomes.

Identify trends and forecast possibilities.

- Students investigate complex global issues, make informed choices based on capabilities and limitations of technology systems, resources, and services, and apply this learning to personal and workplace needs.

Illustration of ***Demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology*** in the ICLE's Rigor and Relevance Framework	
Preface to Activity: It is 2010 and energy prices have continued to skyrocket. It has become obvious, that in order to live comfortably, the students' family group needs to have a plan to supply their own personal power needs. Students consider new technologies their friend in this endeavor.	
Quadrant C Student groups follow their plan of investigation and create a model (physical, mathematical, etc.) to test the efficacy of their chosen power supply under various conditions. Run your model and analyze your data.	**Quadrant D** As a group, create a means to publish findings and share with others. An explanation of how the family group will use the power supply should be the framework for published works. Because works will appear on a class Web site, they must meet accessibility guidelines. Evaluation of the risks and benefits of your power supply method must be included.
Quadrant A As a small "family" group, students conduct an online search to find different means of supplying personal-use power. Before beginning work, as a class, generate a list of keywords to help in online searching. Digital research notes are required and Web sites are to be noted. Teacher note: Possible key search words: (solar power, nano solar, wind turbine, geothermal, hydrogen fuel cell, generators, ethanol)	**Quadrant B** The family group should choose a personal power supply method that is both sustainable and technologically innovative. The group formulates a plan for investigation to discover how technology will enhance the generation and/or use of their chosen power supply method. The plan should include investigation of both the capabilities and the limitations of the technology services.

Essential Concept and/or Skill: ***Use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.***

Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.

- Using technology, students interact and collaborate with peers, experts, and others to contribute to a content-related, media-rich knowledge base by compiling, synthesizing, producing, and disseminating information, models, and other creative works.

Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

- Students use technology tools and resources, including distance and distributed education, for effectively exchanging information with a variety of audiences in an array of media-rich formats.

Develop cultural understanding and global awareness by engaging with learners of other cultures.

- Students use a variety of existing online tools and emerging technologies for communicating with and learning about people of other cultures. Students investigate, communicate, and understand cultural norms manifested in music, literature, painting and sculpture, and theater and film, resulting in greater global awareness.

Appropriately contribute to project teams to produce original works or solve problems.

- Students share knowledge and skills with local or distance teams of peers, experts, or others using technological tools and resources to create collaborative works and/or innovative sustainable solutions.

Illustration of ***Use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others*** in the ICLE's Rigor and Relevance Framework	
Preface to Activity: Health care for students and their families has evolved in recent decades to include global interactions and options in many medical fields. X-rays are read by radiologists in countries across the world while patients sleep; pace-maker patients download data from their devices by telephone; surgeons perform procedures using robotic tools; diabetics report blood sugar levels to research facilities by e-mail, etc. Telemedicine is the use of telecommunications technology for medical diagnosis and patient care when the provider and client are separated by distance.	
Quadrant C Listen to all of the podcasts created by classmates; compile digital notes over the information presented; and create a comprehensive list of telemedicine examples. Using your notes and lists, compare traditional medicine with telemedicine, identifying the strengths and weaknesses of each and what effect the use of telemedicine might have on the future of health care.	**Quadrant D** Go to Wikipedia and read "About Wikipedia." Read for understanding about the structure of this free online encyclopedia and how you can add to its wealth of knowledge. As a small group, students contribute to the Wikipedia page for telemedicine. Student group analyzes the information given on the Wikipedia telemedicine page and determines what other information could be added to the page from their research and study. Group then writes a collaborative piece to be added to the telemedicine page. Before publishing the work, students choose a panel of reviewers and give rationale for their choices. Finally, have work reviewed by the chosen panel, edit work as necessary, and publish the piece on the Wikipedia telemedicine page.
Quadrant A As a class, generate keywords and questions you could use to research the concept of telemedicine. As a small group, investigate telemedicine using the keywords and questions generated by your class. **Teacher notes:** Possible investigation questions: What is telemedicine? What are examples of telemedicine happening around the world? How could telemedicine be used to enhance health care in students' foreseeable future?	**Quadrant B** As a small group, interview health experts about the uses of telemedicine in their areas of care. The experts can be from the local area, from across the country, or from around the world. Create a podcast to be uploaded on to the class Web site sharing your interview information.

Essential Concept and/or Skill: ***Apply digital tools to gather, evaluate, and use information.***

Plan strategies to guide inquiry.

- Students design a process which establishes criteria for selecting digital tools and resources to use for in-depth investigation of a real-world task and justify the selection based on efficiency and effectiveness.

Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

- Students model legal and ethical behaviors when using information and technology by properly selecting, acquiring, and citing resources for research, information analysis, problem solving, and decision making in content learning.

Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

- Students access information efficiently and effectively, evaluate information critically and competently, and use digital information and tools accurately and creatively for the issue or problem at hand.

Process data and report results.

- Students use technological tools to select, organize, and analyze data, convert that information into easily understood knowledge, and effectively convey the results to an intended audience.

Illustration of ***Apply digital tools to gather, evaluate, and use information*** in the ICLE's Rigor and Relevance Framework	
Preface to Activity: A group of business leaders are collectively looking to relocate their businesses to a community with a larger potential employee base. The students' community wants this group to relocate to their area. Students are asked to research the types of skills desired in potential employees; discover how the community can meet those needs; and present their findings to a board of community members.	
Quadrant C Produce and implement an online survey for community members using a free online survey tool to determine what skills they perceive they possess. Compare the results of your survey to the findings of your research on the specific skills the business group is looking for. Indicate specific skills that are prevalent in your community and skills that are not as common. Report your findings to the community group via the local Chamber of Commerce listserv. Evaluate the online survey and digital organizational tool to see they produced the information you needed to present useful information.	**Quadrant D** Based on the comparison of your research and community survey, determine employability strengths and weaknesses of potential employees in your community. Find areas (skills) where there are ample potential employees and where there is a deficit of potential employees. Develop a digital marketing campaign to attract potential employees with skills in areas of deficit to your community. An aspect of that campaign needs to include retaining current community members so as not to lose that bank of potential employees. Using any digital resources available, create an effective campaign that can be included on the community Web site or uploaded to YouTube! or other online resources to reach a wider audience. Or send the campaign to the group of business leaders to demonstrate what the community has to offer and is willing to do to attract their businesses.
Quadrant A Define "employability" and create a list of employability skills based on current research and information available from various resources, including but not limited to, print material, the Internet, industry publications/Web sites, and interviews with business leaders. Write an article to be included on the community Web site detailing your findings to inform the public.	**Quadrant B** Create a digital organizational tool to help you in your research to discover what specific skills are required for employees in each of the industries in the business group. Conduct your research and complete the organizational tool in a manner that allows you to report your findings to the community board in a concise and effective manner.

Essential Concept and/or Skill: ***Demonstrate critical thinking skills using appropriate tools and resources to plan and conduct research, manage projects, solve problems and make informed decisions.***

Identify and define authentic, real-world problems and significant questions for investigation.

- Students identify global issues and analyze capabilities and limitations of current and emerging technology resources in order to develop and refine investigatible questions.

Plan and manage activities to develop a solution or complete a project

- Students effectively use multiple technologies and resources to develop a systematic plan for conducting research in order to assess potential sustainable solutions, or to develop a complete product to demonstrate knowledge and skills.

Collect and analyze data to identify trends, solutions, or make informed decisions.

- Students use technology to gather appropriate data, analyze its application to a task, and assess its effectiveness in order to design, develop, and test possible solutions that assist students in making decisions.

Use multiple processes and diverse perspectives to explore alternative solutions.

- Students use multiple perspectives to analyze and evaluate information from a variety of technological resources. Students critically assess numerous solutions and investigate them from differing viewpoints.

Essential Concept and/or Skill: ***Understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.***

Advocate and practice safe, legal, and responsible use of information and technology at an age-appropriate level.

- Students use technology efficiently and in a manner that does not harm them or others. Their choices demonstrate and advocate for legal and ethical behaviors among peers, family, and community regarding the use of technology and information. Students understand the concept of acceptable use of copyrighted materials, and how disregarding intellectual property affects others.

Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.

- Students willingly and routinely use online resources to meet needs for collaboration, research, publication, communication, and productivity. Evidence for a positive attitude includes a proclivity to help others with the use of technology in their learning.

Demonstrate personal responsibility for lifelong learning.

- Students use their skills to identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. They use this knowledge to make informed choices among technology systems, resources, and services.

Exhibit leadership for digital citizenship.

- Students use their skills to identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. They use this knowledge to make informed choices among technology systems, resources, and services.

Illustration of ***Understand human, cultural, and societal issues related to technology and practice legal and ethical behavior*** in the ICLE's Rigor and Relevance Framework	
Preface to Activity: Intellectual property rights are a major issue because the Internet makes sharing information so easy.	
Quadrant C Analyze the factors affecting the price of recorded music. Assess the importance, validity, or limitations of each factor, and hypothesize how the cost of each factor could be minimized to reduce the final cost for the consumer.	**Quadrant D** You and your friends have organized a band and decided to sell your recordings. Describe the steps you would take to accomplish this goal and make the music available to others for purchase. Identify several steps you could take to ensure that your digital rights are protected and your profits from your recordings are maximized.
Quadrant A Create a report providing an overview of the current laws regarding the duplication and distribution of recorded music.	**Quadrant B** Create an overview of the current methods for legally obtaining music.

Essential Concept and/or Skill: ***Demonstrate a sound understanding of technology concepts, systems and operations.***

Understand and use technology systems

- Students adapt to evolving technology systems and apply them for everyday use. They also interpret the underlying structure of the system so it can be used for multiple purposes and applied to unique situations.

Select and use applications effectively and productively

- Students select and apply technology tools for research, information analysis, problem solving, and decision making. Students use technology tools and resources for managing and communicating personal and professional information (e.g., finances, schedules, addresses, purchases, correspondence).

Troubleshoot systems and applications.

- Students utilize a working knowledge of technology or technological support services to identify a problem/issue and its solution.

Transfer current knowledge to learning of new technologies.

- Students apply what they know of one technology to intuitively utilize other technologies.

Illustration of ***Demonstrate a sound understanding of technology concepts, systems and operations*** in the ICLE's Rigor and Relevance Framework	
Preface to Activity: Intellectual property rights are a major issue because the Internet makes sharing information so easy.	
Quadrant C Evaluate the effectiveness of two different CAD programs. Use two of them to draw the layout of your classroom and determine which program is more suitable and why.	**Quadrant D** Locate several examples of personal budgets and identify at least one positive and one negative aspect to each one. Select a potential career for yourself as you enter the job market, including a reasonable salary based on where you would like to live. Use examples of budgets you located to create your own budget based on your anticipated needs. Justify each expense in your budget. Do the same for a second budget reflecting where you would like to be 10 years later.
Quadrant A Teach a lesson to a group of elementary students demonstrating how to use a spreadsheet program. Utilize the elementary students' knowledge of word processing programs to teach them the basics of the spreadsheet program.	**Quadrant B** Research several careers you are interested in and report the average salary, market demand, and education requirements of each one.

Middle (6 – 8) Details and Example

Essential Concept and/or Skill: ***Demonstrate creative thinking in the design and development of innovative technology products and problem solving.***

- Design, develop, create, and/or test digital technology products.
- Individually or collaboratively create media-rich products and display, publish, or perform them for a variety of audiences.
- Use simulations to help understand complex, real-world systems, identify problems, develop models, and analyze the output.
- Investigate global issues and make informed choices based on knowledge of technology systems, resources, and services.

Essential Concept and/or Skill: ***Collaborate with peers, experts, and others using interactive technology.***

- Interact and collaborate with peers, experts, and others using technology.
- Contribute to a content knowledge base by creating, producing, and sharing information, models, and other creative works.
- Efficiently use technology tools and resources for communication and to access remote information and exchange it with a variety of audiences.
- Engage in learning activities with learners from other countries and/or cultures using telecommunication tools to create, produce, and share information, models, and other projects with a global or cultural focus.
- Share knowledge and skills with local or distant teams of peers, experts, or others using technology tools and resources to create group works and/or innovative solutions.

Essential Concept and/or Skill: ***Plan strategies utilizing digital tools to gather, evaluate, and use information.***

- Create a plan for the use of digital tools and resources to investigate a real-world issue.
- Locate, organize, analyze, evaluate, and synthesize information from a variety of sources and media and use this information in a legal and ethical manner.
- Evaluate resources in terms of their usefulness and validity for research.
- Use technological tools to select data and organize it into a format that is easily understood by others.

Essential Concept and/or Skill: ***Use critical thinking skills to conduct research, solve problems, and make informed decisions using appropriate technological tools and resources.***

- Identify real-world issues and analyze technological resources for developing and refining questions for investigation.
- Effectively use multiple technological resources to develop a systematic plan for conducting research. Develop possible solutions or a complete product to demonstrate knowledge and skills.
- Use technology to gather, analyze, and assess data and its effectiveness to design, develop and test possible solutions that assist students in making decisions.
- Analyze and evaluate information from a variety of perspectives and resources in order to assess multiple solutions and investigate them from differing viewpoints.

Essential Concept and/or Skill: ***Understand the legal and ethical issues of technology as related to individuals, cultures, and societies.***

- Use technology efficiently and in a manner that does not harm them or others.
- Demonstrate awareness of legal and ethical responsibilities when using copyrighted material, and how a disregard of legal and ethical responsibilities affects others.
- Use online resources to work with others to complete a task and accept responsibility for the results.
- Identify capabilities of contemporary technology resources.
- Develop examples of how technology systems and services can assist them in pursuing personal interests.

Essential Concept and/or Skill: ***Understand the underlying structure and application of technology systems.***

- Utilize technology for everyday use and understand how technology systems can be applied to various situations.
- Select and use technology applications to conduct research, solve problems and produce finished products.
- Identify the source of a problem with technology, and, if necessary, the appropriate support personnel needed.
- Apply knowledge of technology to explore other technologies and be able to identify commonalities among them.

Illustration of ***Understand the underlying structure and application of technology systems*** in the ICLE's Rigor and Relevance Framework	
Quadrant C Use a CADD program to design a piece of wooden furniture, providing sufficient details for a carpenter to construction the furniture item.	**Quadrant D** In a group, design a self-sufficient space colony that can support a population of 1000 humans. Use CADD software to design a 3-D model of the colony, and create a multimedia presentation of the colony plan.
Quadrant A Following the teacher demonstration, students will use the basic functions of a CADD program.	**Quadrant B** Using basic CADD functions, create a simple model to share with the class.

Intermediate (3 – 5) Details and Example

Essential Concept and/or Skill: ***Use technology resources to create original products, identify patterns and problems, make predictions, and propose solutions.***

- Demonstrate creative thinking to generate new ideas and products using a variety of technology tools and resources.
- Create and share new ideas, products, and processes related to curriculum content.
- Work individually and collaboratively to create, display, publish, or perform media-rich products.
- Use models and simulations to identify problems and propose solutions.
- Use technology resources to gather and depict data, recognize trends, and project outcomes.

Illustration of ***Use technology resources to create original products, identify patterns and problems, make predictions, and propose solutions*** in the ICLE's Rigor and Relevance Framework	
Quadrant C Choose two music-making technology tools and compare and contrast their uses. Identify the strengths and weaknesses of each.	**Quadrant D** Choose a music-making technology tool to create an original composition or live performance to share with the class.
Quadrant A Given a list of music-making technology tools, students will look up information online, write a report using text, images, and links to online sources.	**Quadrant B** Conduct a survey of students to identify and report what tools they use to create music (i.e., Guitar Hero, Garage Band). Using technology, create a chart to show the data.

Essential Concept and/or Skill: ***Use interactive technologies in a collaborative group to produce digital presentations or products in a curricular area.***

- Use a variety of technology tools to work collaboratively with others inside and outside the classroom.
- Use telecommunication tools efficiently to communicate information and ideas to multiple audiences.
- Access remote information using technology.
- Engage in learning activities with learners from other countries and/or cultures
- Appropriately contribute to project teams to produce original works or solve problems using technology.

Essential Concept and/or Skill: ***Utilize digital tools and resources to investigate real-world issues, answer questions, or solve problems.***

- Create a plan or process that utilizes digital tools and resources to investigate and answer issues, questions, or problems.
- Locate, organize, and ethically use information from a variety of sources and media.
- Access information for specific purposes, and assess the validity of the information source.
- Identify, select, and organize data. Discuss and describe the results.

Essential Concept and/or Skill: ***Use technological resources to develop and refine questions for investigation.***

- Choosing from a variety of real-world issues and/or problems, use technological resources to develop and refine questions for investigation.
- Use technological resources to conduct research and complete a project.
- Identify trends or solutions or assist students in making decisions.
- Identify and explore diverse perspectives and processes to find multiple solutions to problems.

Essential Concept and/or Skill: ***Understand and practice appropriate, legal, and safe uses of technology for lifelong learning.***

- Demonstrate awareness of the dangers of sharing personal information with others.
- Demonstrate an understanding of what electronic theft and plagiarism are and why they are harmful.
- Identify the positive values of using technology to accomplish tasks.
- Use technology to explore and pursue personal interests.
- Show others how to use new technologies, and use technology in a way that assists, rather than prevents, others from learning.

Essential Concept and/or Skill: ***Understand technology hardware and software system operations and their application.***

- Use everyday technology processes, hardware, and software
- Select the most efficient and appropriate technology tool for a specific task.
- Begin to identify the source of a problem with technology, and, if necessary, identify the appropriate support personnel.
- Apply prior knowledge of technologies to new technologies.

Primary (K – 2) Details and Example

Essential Concept and/or Skill: ***Use technology to create projects, identify patterns, and make predictions.***

- Use a variety of digital tools and media-rich resources to create projects.
- Use technology to illustrate and communicate original ideas related to curriculum content.
- Create multimedia products with support from teachers, family members, and/or student partners for the purpose of display, publication and/or performance.
- Use technology resources to identify problems, help recognize and describe patterns, make predictions and/or propose solutions.

Essential Concept and/or Skill: ***Use a variety of technology tools and media-rich resources to work collaboratively with others.***

- In a collaborative work group, use a variety of technologies to produce a digital presentation or product in a curriculum area.
- Use technology resources for communicating and sharing ideas with others.
- Participate in learning activities with or about learners from other countries and/or cultures.

Essential Concept and/or Skill: ***Utilize predetermined digital resources and tools to answer questions or solve problems.***

- Follow a plan of action to guide inquiry by using predetermined digital resources.
- Locate and organize information from a variety of sources and media.
- Review provided resources, explain why they are or are not useful, and use information appropriately.
- Identify, read, and report data from charts, graphs, and other sources.

Illustration of ***Utilize predetermined digital resources and tools to answer questions or solve problems*** in the ICLE's Rigor and Relevance Framework	
Preface to Activity: The community is examining the possibility of building a new zoo in their town. They want the students to provide information on which animals the children of the community think should be included in the zoo.	
Quadrant C Groups are assigned a traditional zoo animal. Using a variety of resources, both print and digital, each group researches the given animal and it's habitat. Create a description of the animal, what it's habitat should include, and why the animal is a good choice for the new zoo.	**Quadrant D** As a group, chose an animal to be included in the new zoo. Learn about the animal. Compose a description of why it would be a good choice for the zoo. Design a habitat, either on paper, with a drawing program, or in a 3D format (diarama), for the animal to live in at the zoo. Be sure to include all the things in the habitat the animal will need to survive. Also include any special requirements that might be necessary for viewing the animal at the zoo (an aquarium, an enclosed cage, etc.)
Quadrant A Using a variety of print and digital resources provided by the teacher, research an animal and write a report about the animal that could be included in the zoo. The report includes predetermined information.	**Quadrant B** Using a variety of print and digital resources provided by the teacher, research an animal of choice and create a product to demonstrate what has been learned about the animal and why it would be a good choice for the zoo.

Essential Concept and/or Skill: ***Use technological resources to investigate given questions or problems.***

- Use a variety of technology resources to explore questions or problems.
- Use technology to decide what information to locate and how to use that information to complete a project.
- Collect and explain data to identify commonalities or solutions to problems.
- Explore the different ways that problems may be solved.

Essential Concept and/or Skill: ***Understand and practice appropriate and safe uses of technology.***

- Understand that stealing information and things others have created is the same as stealing tangible items.
- Be aware of why it is unsafe for students to provide others with information about themselves.
- Demonstrate awareness of the importance of communicating with adults about things that might concern them.
- Understand why technology is useful in helping them complete a task.
- Use technology to explore personal interests.
- Demonstrate to others how to use technology tools in ways that assist, rather than prevent, others from learning.

Essential Concept and/or Skill: ***Understand basic technology hardware and software and their application.***

- Choose the most appropriate technology tool for a given task.
- Demonstrate a basic knowledge of how technology is supposed to function and know when it is not working properly.
- Know when to seek adult assistance for technology problems.
- Explore new technologies using existing skills and knowledge.