Georgia’s Academic Standards for Technology Education

Georgia Department Of Education
Kathy Cox
State Superintendent of Schools
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Kathy Cox
State Superintendent of Schools

James Woodard, Director
Career, Technical, and Agricultural Education Division
Georgia Department of Education

Ronald G. Barker
Program Specialist, Technology Education
Georgia Department of Education
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Message to the Teachers

Defining the Academic Standards

What are academic standards? Academic standards specify what students should know and be able to do. They provide specific evidence of the learning achieved as well as accurate targets for the teaching and learning goals and objectives. Georgia’s standards for Technology Education include content and performance standards.

Content standards refer to what students should know and be able to do. Performance standards tell how students will show or give evidence that they are meeting a standard.

Why are standards necessary? Standards serve as a directional compass for both teaching and learning. By setting high standards, students, parents, educators, government officials, and citizens know what students should have learned and what teachers should have taught at a given point in time. Without precise academic standards, both students and teachers may drift off course in their learning and instructional efforts. Clear statements about what students must know and be able to do are essential to ensure that our instructional programs provide students with the knowledge and skills necessary for success.

Why are state-level academic standards important? Public education has historically been a state responsibility. The state superintendent and the legislature are responsible for ensuring that all students have equal access to high-quality education programs. At minimum, this responsibility requires clear statements of what all students in the state should know and be able to do as well as evidence that students are meeting these expectations. In addition, academic standards form a basis on which to establish the content of a statewide assessment system.

Why does Georgia need its own academic standards? While educational needs may be similar among states, state values may differ. Georgia standards should reflect the collective values of the citizens of Georgia and be tailored to prepare students for economic opportunities that exist in Georgia, the nation, and the world.

Must a school or a school system adopt Georgia’s Academic Standards for Technology Education? Adopting the standards is voluntary, not mandatory. However, Georgia law requires that all public school systems adopt and implement the Quality Core Curriculum (QCC) as well as the Quality Basic Education (QBE) competencies. The academic standards were developed with the QCC and QBE competencies in mind and are designed to meet and exceed these competencies. Therefore, it would behoove educators to review and employ the standards as they work toward creating a quality instructional program.
**How will local school systems use the academic standards?** School systems may use the academic standards as guides for developing local grade-by-grade curricula. Implementing standards may require some school systems to upgrade school and system curriculums. In some cases, this may result in significant changes in instructional methods and materials, local assessment strategies, and professional development opportunities for teaching and administrative staff.

**What are the next steps beyond the academic standards?** There are several needs and options after the standards are implemented. It is understood that the standards by themselves will not sufficiently address or correct deficiencies in a technology education curriculum. As a follow-up to the standards, sample instructional activities and teaching vignettes will need to be developed to provide practical examples of how the standards can be met and employed. In addition, program evaluation strategies based on the standards will need to be designed, field tested, and implemented as a means of assessing and certifying the quality of instruction programs.

**How were the academic standards developed for Georgia?** The academic standards in this document represent the result of a three-phase educational research procedure. Phase-one focused on a comprehensive review of the academic literature pertaining to technology education curriculum designs and state curriculum goals as well as ongoing standards projects from other states and the national standards project. The result of this phase established a starting point for the Georgia standards. Phase two brought together educators and business and industry representatives from across the state to provide specific input on the educational benchmarks needed for technology education. Exemplary teachers, representing elementary, middle, and high schools, as well as teacher educators from collegiate programs provided valuable information that yielded criteria for developing the Georgia academic standards for Technology Education. In addition, business and industry representatives helped to guide the standards development by offering valuable suggestions that clarified the real-world needs for students as they prepare for their adult lives. This input was collected during two focus group meetings in January and February 1999. Phase three used the results from the focus group meetings to ascertain the perspectives of the entire technology education teacher population in Georgia. Teachers provided input on the proposed standards criteria, with the collective results yielding a prioritized list of academic standards for technology education.
Overview of Technology Education & Standards

The twenty-first century will bring new technologies that will be more complex, mature, and versatile than those we utilize today. The realities of what is on today’s drawing boards will undoubtedly reshape how we work, how we create, how we view the world, how we learn, and most importantly, what we must learn. We are now in a position to exercise options that were beyond our comprehension a mere decade ago. How we educate a generation that can comprehend, cope with, and direct these technologies is a challenge to which schools must respond. The need for literacy about this human effort, that is, the development and use of technical means, is the role of technology education. (Lauda, n.d.)

Technology education takes learning with technology one step farther than other disciplines. Technology becomes a school subject, and the ultimate goal is technological literacy for everyone. A student involved in a technology education curriculum would experience:

- Designing, developing, and utilizing technological systems.
- Working with open-ended, problem-based design activities.
- Applying technological knowledge and processes to real-world experiences using up-to-date resources.
- Working individually as well as in a team to solve problems.

Technology will not solve all of the problems in the future. In fact, technology may create some. If our children develop and use technology in the context of the community’s and nation’s goals and values, they will continue to offer each other even more ways to work, enjoy leisure, communicate, and organize their lives.

Teaching technology education to elementary, middle, and high school students is extremely important. Elementary, middle, and high school teachers play an important role in the development of technologically literate citizens.

Georgia’s Academic Standards for Technology Education should be integrated throughout the elementary and secondary education learning experience. Teaching technology provides tremendous opportunity for students to apply knowledge through design and the use of materials and processes to solve real-world problems systematically and to gain new knowledge from what they have learned. Critical thinking, team work, research and development, experimentation, and testing help deliver the goals of the technology education curriculum and enrich the entire learning and teaching process. Technology educators provide students with opportunities to develop their own perspectives of technology and its interrelationships with the world in which we live.
Academic Standards for Technology Education

- **Nature of Technology**
- **Human Ingenuity**
- **Technological Systems**
- **Impact of Technology**

**Content Standard**
**Nature of Technology**

*Rationale:* “As long as there have been people, there has been technology. Indeed, the techniques of shaping tools are taken as the chief evidence of the beginning of human culture. On the whole, technology has been a powerful force in the development of civilization, all the more so as its link with science has been forged. Technology, like language, ritual, values, commerce, and the arts, is an intrinsic part of a cultural system and it both shapes and reflects the system’s values. In today’s world, technology is a complex social enterprise that includes not only research, design, and crafts but also finance, manufacturing, management, labor, marketing, and maintenance.

“In the broadest sense, technology extends our abilities to change the world: to cut, shape, or put together materials; to move things from one place to another; to reach farther with our hands, voices, and senses. We use technology to try to change the world to suit us better. The changes may relate to survival needs such as food, shelter, or defense, or they may relate to human aspirations such as knowledge, art, or control. The results of changing the world are often complicated and unpredictable. They can include unexpected benefits, unexpected costs, and unexpected risks, any of which may fall on different social groups at different times. Anticipating the effects of technology is therefore as important as advancing its capabilities.” (Science for All Americans, 1992)

**Performance Standards**

*By the end of fifth grade, students will:*

1. Define and discuss technological literacy (appropriate levels).
2. Define technology (appropriate level).
3. Describe the difference between invention and innovation.
4. Investigate the concept of technological resources.
5. Describe the impacts of technology on careers (appropriate levels).
By the end of eight grade, students will:

1. Define technology (appropriate levels).
2. Define and discuss technological literacy (appropriate levels).
3. Identify and contrast the connections and differences between technology and other school disciplines.
4. Describe and discuss how technology involves the ability to solve problems logically and creatively.
5. Employ basic principles of technology to solve technological problems.
6. Analyze how cultures and groups value technology differently and how these values influence the development and acceptance of technology.
7. Properly utilize specific technological tools to solve a technological problem.

By the end of twelfth grade, students will:

1. Define technology.
2. Define and discuss issues associated with technological literacy.
3. Evaluate the moral and ethical issues humans face because of the significant modifications technology is making on the natural world.
4. Make logical career choices based on individual strengths and weaknesses.
5. Investigate how technology has emerged to shape the environment and society in the past, present, and future.
6. Define appropriate technology and suggest applications to various problems or opportunities.
7. Identify the role of personal belief systems in balancing the influence of technology on quality of life.
8. Explain the difference between revolutionary and evolutionary technological applications.
9. Illustrate and clarify how a society may not be able to exercise full control over its technological systems.
10. Utilize accepted methods of forecasting and projecting to develop scenarios of future technology needs and uses.
Content Standard
Human Ingenuity

Rationale: Humans have historically been involved in technological activity. We use our knowledge, physical ability, and technology to solve problems and seize opportunity. The design, development, and use of technological items are direct results of human resourcefulness. When a new technology is introduced and opportunities are acted upon, the technology begins to evolve, bringing more opportunity and still more problems to solve.

Technological items and processes are inspired by a need, an end result or just out of human curiosity. Students must be challenged to solve technological problems by drawing upon their knowledge to plan a solution, select the proper resources and processes, and create and then evaluate the solution.

Performance Standards
By the end of fifth grade, students will:

1. Follow step-by-step directions needed to solve particular technological problems.
2. Describe why teamwork is important when designing and producing products.
3. Identify career opportunities associated with technological systems.
4. Describe how modern inventions and innovations have evolved as a result of new knowledge and technology.
5. Examine products and processes and communicate how that product or process solved a human need or want.

By the end of eighth grade, students will:

1. Describe the advantages and disadvantages of working in a team as compared to working individually in design and problem-solving activities.
2. Identify career opportunities associated with problem solving and invention, as well as career opportunities that are created by technological change.
3. Apply a formal problem-solving process to arrive at a satisfactory solution to a technological problem.
4. Develop a timeline of advancements in technology.
5. Define the concepts of invention and innovation and discuss how each affect technological development.
6. Explain and demonstrate several solutions to a problem or opportunity using technological design, tools, careful planning, experimentation, and testing.
7. Predict possible outcomes of a selected technological system.

By the end of twelfth grade, students will:

1. Apply a formal problem-solving process to arrive at a satisfactory solution to a research-based technological problem.
2. Identify career opportunities associated with technology and created by technological change.
3. Apply basic engineering concepts in the design and creation of solutions to various problems or opportunities.
4. Solve technological problems and explain what actions were needed to reach the desired solutions.
5. Demonstrate the ability to convey technical data and information to other individuals through documentation and various methods of communication.
6. Identify opportunities for technological improvements that currently do not exist.
7. Plan a technological solution and select the proper resources to develop the technology and project the possible impacts (pros and cons) of this new technology on society, culture, or the environment.
8. Make logical choices about careers associated with technological problem solving and resource management.
9. Select and apply appropriate technological processes to alter the characteristics of material to make it useful in different situations.
10. Critically analyze the results of differing solutions to a research-based technology problem.
Content Standard
Technological Systems

Rationale: Technological systems have always been a part of daily life. Recently they have become more apparent because of their sophistication and influence. By coordinating and processing resources, these systems help to provide products and services such as food, clothing, shelter, entertainment, health care, security, and other necessities and comforts of life. Though often subtle, these systems are everywhere in our world and, without exception, they impact all of us.

Performance Standards
By the end of fifth grade, students will:

1. Differentiate between the terms “products” and “services”.
2. Describe various reasons technological systems may fail; such as, overuse, lack of proper maintenance or management, improper design, or other natural or unnatural factors that may occur.
3. Utilize tools to observe, measure, and make technological artifacts.
4. Identify parts of a technological device (e.g., mechanical, fluidal, electrical, thermal).
5. Identify the parts of a system and explain how the parts work together to allow the system to do things the individual parts are unable to do alone.

By the end of eighth grade, students will:

1. Explain how technological systems impact the world of work as well as normal daily life.
2. Discuss career opportunities related to technological systems.
3. Evaluate solutions to technological problems.
4. Develop a systems solution for common technological problems.
5. Disassemble a technical device and research the processes that were used in its development.
6. Analyze various technological systems and identify the ways in which they are controlled to produce a desired outcome.
6. Utilize the team concept to solve a technological problem.

By the end of twelfth grade, students will:

1. Apply the technological systems model to an integrated activity that encompasses communication, energy, manufacturing, construction, and/or transportation technologies.
2. Apply technological knowledge through technical drawing, planning, building, testing, and improving solutions to technological systems.
3. Develop a technological system to solve a given technological problem.
4. Design a management system to solve a research and development technology problem through lab-based activities and formalized problem-solving methods.
5. Analyze and critique a technological system for efficiency.
6. Evaluate logical career choices associated with technological systems.
7. Design a technological system utilizing ergonomics and economic principles.
8. Evaluate the interdependence of components in a technological system and identify those elements that are critical to correct functioning.
9. Apply scientific principles, engineering concepts, and technological systems in the solution of community-based problems.
10. Identify and explain the ways technological systems have evolved and will continue to evolve to satisfy human needs and desires.

Content Standard
Impact of Technology

Rationale: People develop and use technology to enhance their quality of life. Technologies like the automobile, nuclear power, genetic engineering, and factory automation have enhanced our mobility, enabled us to harness new energy resources, increased food production, reduced disease, and freed people from tedious or dangerous tasks. While each of these technologies has very distinct advantages, they also have clear disadvantages that need to be weighed carefully by those who live in a technological society. Given the rapid growth in technological capability, it is important that every citizen take an active role in promoting the common good by making informed decisions about the risks and benefits of technology. To be active citizens, students need to understand the positive and negative impacts of technology on society and the environment. They need to weigh carefully the benefits and risks of technologies and make informed decisions about technological issues.

Performance Standards
By the end of fifth grade, students will:
1. Describe how given technologies make life and work easier also how they may make them more complicated.
2. Identify the benefits and risks/damages of technology in their homes, schools, and communities.
3. Identify the technological tools that may impact career choices (e.g., computers, robotics, CAD).
4. Evaluate how advancements in technology has changed communication, construction, manufacturing, and transportation.
5. Investigate how technology has emerged to change society now and in the future.

By the end of eighth grade, students will:
1. Explain how the use of technology has changed many professions.
2. Discuss major technological developments and explain how these developments have shaped the world in which we live.
3. State the relationship technology has with other subject areas (language, math, science, and social studies).
4. Identify and explain the impact of technological advancements on historical events (e.g., automobile, television, telephone).
5. Identify ways to effect change in society through the use of technological advances.
6. Investigate the impacts of differing solutions to a relevant technological issue.
7. Investigate how the systems model component feedback relates to the impact technology has on the environment and society.

By the end of twelfth grade, students will:

1. Discuss the evolutionary processes of different forms of technology.
2. Identify ways to effect change in society through the use of technological advances while considering the impacts on society and the environment.
3. Investigate and collect, analyze, and synthesize data regarding technology’s impacts and consequences.
4. Identify ways in which technology threatens to dominate human activity in modern society.
5. Evaluate the guiding value of philosophy, religion, classical literature, history, and other aspects of our social and cultural heritage when making technological decisions.
6. Create design briefs that have as one of their components considerations regarding technological impacts.
7. Evaluate the effects on the environment for a given technological tool or system.
8. Identify social, cultural, economic, political, and environmental impacts of technical advancements.
9. Discuss the importance of making projections, studying scenarios, and making thoughtful decisions because of the direct and indirect effects technology will have on the future.
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Writing/Development Team
- Robert Wicklein
  Principal Investigator
  University of Georgia
- Jennifer St. Jacques
  University of Georgia
- Douglas Arnold
  University of Georgia

Focus Group Participants
- Teresa Coker, Consultant
  Coker Consulting
- April Mock, Teacher
  Screven County Elementary School
- Tracy Moore, Principal
  Clifton Elementary School
- Nancy Schafer, Teacher
  Clifton Elementary School
- Roger Ivey
  Creekland Middle School
- Ozzie Parrish
  Lilburn Middle School

Focus Group Participants (cont.)
- Phil Sisk
  Flat Rock Middle School
- Angela Powell
  Morrow Senior High School
- Rick Moore
  Stephenson High School
- David Roberson
  West Hall High School
- Creighton Alexander
  Georgia Southern State University
- Roger Hill
  University of Georgia
- Robert McMillen
  Nakanishi Manufacturing Corp.
- Jeffrey Hudspeth
  BBA Inc.
- Herbert Book
  Westinghouse Corp.

Georgia State Department of Education
- Ronald Barker
  Program Specialist,
  Technology Education

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For further information about Georgia’s Academic Standards for Technology Education or Technology Education in Georgia, contact:

Ronald G. Barker  
Program Specialist, Technology Education  
Georgia Department of Education  
1772 Twin Towers East  
Atlanta, Georgia 30334-5040

(404) 657-8316  
rbarker@doe.k12.ga.us