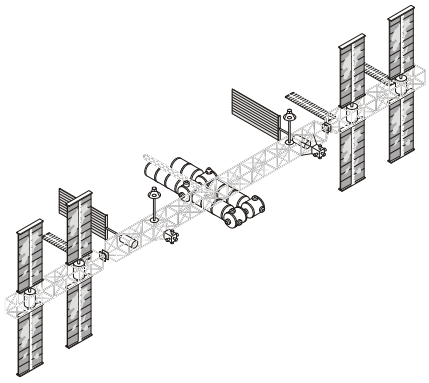
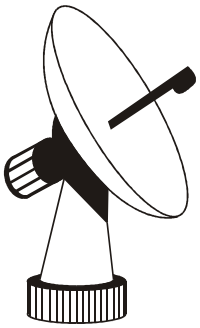
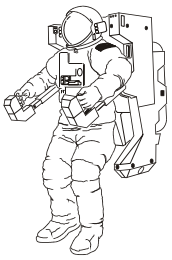
South Burlington School District



6-12 Technology Education Curriculum





Local Guidelines for Standards-Based Curriculum Implementation

Adopted by the Board of School Directors January 10, 2001

Technology Education:

6-8
Jay Hoffman
Richard Swanson

9-12
Stephen Barner
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District Mission Statement

The mission of the South Burlington School District, a community committed to excellence in education, is to ensure that each student possesses the knowledge, skills, and character to create a successful and responsible life. We will do this by building safe, caring, and challenging learning environments, fostering family and community partnerships, utilizing global resources, and inspiring life-long learning.

Table of Contents

Page

6-12 TECHNOLOGY EDUCATION CURRICULUM GUIDELINES

OVERVIEW

DEVELOPMENT

A committee of 6-12 teachers with expertise in the teaching of technology revised and aligned the Technology Education Curriculum to reflect new national, state and local standards.

IMPLEMENTATION

Grade level clusters (6-8, 9-12) of standards, content, classroom assessments and instructional guidelines follow the learning expectations at both levels. This curriculum information, along with the Learning Expectations, will be used by teachers to plan and carry out instruction.

ASSESSMENT

Assessment of student performance is carried out using classroom activities, demand tasks, and tests. No state or national assessments are applied to all students enrolled in technology education courses.

PROFESSIONAL DEVELOPMENT

Professional development for staff members is ongoing with courses, workshops, conferences and visitations to other schools. All staff members are active members of the Vermont Technology Education Association (VTEA), with several serving as officers or active members in this professional organization.

6-12 TECHNOLOGY EDUCATION PHILOSOPHY STATEMENT

Technology education is a comprehensive, experience-based curriculum in which students learn about technology, its evolution, systems, techniques, utilization, and social and cultural significance. It develops "technological literacy" by dealing with the ways in which ingenuity, processes, materials, devices, and mathematics are applied for solving problems to meet our needs and desires.

A central role of education is to offer a curriculum that provides students with basic understandings and skills needed to function effectively in society. Our democratic society is characterized by rapidly advancing technological developments. It is absolutely necessary for all people to understand technology if they are to function as informed voters, productive workers, and wise consumers of technological products and services.

Technologies spring from the human abilities to reason, solve problems, create, construct, and use materials imaginatively. Since these abilities are an integral part of our technological society, they must be developed in all students, regardless of their educational and career goals.

Experience in applying technology and in solving problems builds both the competence and confidence for effective interaction with technology. An understanding of the applications and functioning of technology systems is important for decision making in the arenas of careers, home, personal affairs, and government.

In today's high-tech society, all students should become technologically literate in order to become wise decision-makers. Technology education teaches through experiences in a "hands-on", cooperative environment using a systematic, problem-solving approach. Students exhibit an understanding of the nature of technology, major technology systems, and the resources used in technology. Through the application of technical skills, knowledge and processes, students should be able to solve problems in a systematic fashion. These skills should enable students to become wise consumers, productive members of our community, and contributors to the forces of change that shape our world.

NATIONAL TECHNOLOGY EDUCATION STANDARDS

Note: National standards for technology education did not exist at the time the Vermont Framework for Standards and Learning Opportunities was drafted. Since that time, the International Technology Education Association has established extensive standards for technology education in K-12 schools. The Vermont technology education standards, as defined in the framework, are a subset of these new national standards. Throughout this document, the national standards are referenced, as defined in the publication *Standards for Technological Literacy: Content for the Study of Technology.* Reston: ITEA, 2000.

The Nature of Technology Standards:

1. Students will develop an understanding of the characteristics and scope of technology.

2. Students will develop an understanding of the core concepts of technology.

3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

Technology and Society Standards:

4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.

5. Students will develop an understanding of the effects of technology on the environment.

6. Students will develop an understanding of the role of society in the development and use of technology.

7. Students will develop an understanding of the influence of technology on history.

Design Standards:

8. Students will develop an understanding of the attributes of design.

9. Students will develop an understanding of engineering design.

10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Abilities for a Technological World Standards:

11. Students will develop the abilities to apply the design process.

12. Students will develop the abilities to use and maintain technological products and systems.

13. Students will develop the abilities to assess the impact of products and systems.

The Designed World Standards:

14. Students will develop an understanding of and be able to select and use medical technologies.

15. Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.

16. Students will develop an understanding of and be able to select and use energy and power technologies.

17. Students will develop an understanding of and be able to select and use information and communication technologies.

18. Students will develop an understanding of and be able to select and use transportation technologies.

19. Students will develop an understanding of and be able to select and use manufacturing technologies.

20. Students will develop an understanding of and be able to select and use construction technologies.

TECHNOLOGY EDUCATION CURRICULUM

GRADES 6-8

I. THE NATURE OF TECHNOLOGY

Standards:

Students will develop an understanding of the:

- **Characteristics and scope of technology.**
- **Core concepts of technology.**
- **Relationships among technologies and the connections between technology and other fields of study.**

Learning Expectations & Content:

Students will:

1. **Experience the usefulness of technology**
   New products and systems can be developed to solve problems or to help do things that could not be done without the help of technology.
2. **Take part in the development of technology**
   The development of technology is a human activity and is the result of individual or collective needs and the ability to be creative.
3. **Engage in human creativity and motivation**
   Technology is closely linked to creativity, which has resulted in innovation.
4. **Create product demand**
   Corporations can often create demand for a product by bringing it onto the market and advertising it.
5. **Design and construct systems**
   Technological systems include input, processes, output, and, at times, feedback.
   Systems thinking involves considering how every part relates to others.
   An open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback.
   Technological systems can be connected to one another.
   Malfunctions of any part of a system may affect the function and quality of the system.
6. **Work with resources and requirements**
   Resources are the things needed to get the job done, such as tools and machines, materials, information, energy, people, capital, and time.
   Requirements are the parameters placed on the development of a product or system.

7. Make trade-offs

Trade-off is a decision process recognizing the need for careful compromises among competing factors.

8. Engage in processes

Different technologies involve different sets of processes.
Maintenance is the process of inspecting and servicing a product or system on a regular basis in order for it to continue functioning properly, to extend its life, or to upgrade its capability.

9. Apply controls

Controls are mechanisms or particular steps that people perform using information about the system that causes systems to change.

10. Observe interaction of systems

Technological systems often interact with one another.

11. Recognize the interrelation of technological environments

A product, system, or environment developed for one setting may be applied to another setting.

12. Appreciate the knowledge from other fields of study and technology

Knowledge gained from other fields of study has a direct effect on the development of technological products and systems

II. TECHNOLOGY AND SOCIETY

Standards:

Students will develop an understanding of the:

- **Cultural, social, economic, and political effects of technology.**
- **Effects of technology on the environment.**
- **Role of society in the development and use of technology.**

Learning Expectations & Content:

Students will:

1. **Develop attitudes toward development and use**
   The use of technology affects humans in various ways, including their safely, comfort, choices, and attitudes about technology's development and use.
2. **Recognize impacts and consequences**
   Technology, by itself, is neither good nor bad, but decisions about the use of products and systems can result in desirable or undesirable consequences.
3. **Discuss ethical issues**
   The development and use of technology poses ethical issues.
4. **Research influences on economy, politics, and culture**
   Economic, political, and cultural issues are influenced by the development and use of technology.
5. **Manage wastes**
   The management of waste produced by technological systems is an important societal issue.
6. **Use technologies to repair damage**
   Technologies can be used to repair damage caused by natural disasters and to break down waste from the use of various products and system.
7. **Weigh environmental vs. economic concerns**
   Decisions to develop and use technologies often put environmental and economic concerns in direct competition with one another.

8. **Recognize that development is driven by demands, values, and interests**
   Throughout history, new technologies have resulted from the demands, values, and interests of individuals, businesses, industries, and societies.

9. **Discuss the role of inventions and innovations**
   The use of inventions and innovations has led to changes in society and the creation of new needs and wants.

10. **Recognize social and cultural priorities**
    Social and cultural priorities and values are reflected in technological devices.

11. **Gage social acceptance and use of products and systems**
    Meeting societal expectations is the driving force behind the acceptance and use of products and systems.

12. **Understand the processes of inventions and innovations**
    Many inventions and innovations have evolved by using slow and methodical processes of tests and refinements.

13. **Recognize the specialization of labor**
    The specialization of function has been at the heart of many technological improvements.

14. **Describe the evolution of techniques, measurement, and resources**
    The design and construction of structures for service or convenience have evolved from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.

15. **Apply technological and scientific knowledge**
    In the past, an invention or innovation was not usually developed with the knowledge of science.

III. DESIGN

Standards:

- **Students will develop an understanding of the attributes of design.**
- **Students will develop an understanding of engineering design.**
- **Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.**

Learning Expectations & Content:

Students will:

1. **Recognize that design leads to useful products and systems**
   Design is a creative planning process that leads to useful products and systems.
2. **Understand that there is no perfect design**
   There is no perfect design.
3. **List requirements**
   Requirements for a design are made up of criteria and constraints.
4. **Engage in interactive design projects**
   Design involves a set of steps, which can be performed in different sequences and repeated as needed.
5. **Brainstorm**
   Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
6. **Model, test, evaluate, and modify**
   Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.
7. **Troubleshoot systems**
   Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system.
8. **Engage in invention and innovation**
   Invention is a process of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it.
9. **Experiment**
   Some technological problems are best solved through experimentation.

IV. ABILITIES FOR A TECHNOLOGICAL WORLD

Standards:

1. **Students will develop the abilities to apply the design process**
2. **Students will develop the abilities to use and maintain technological products and systems.**
3. **Students will develop the abilities to assess the impact of products and systems.**

Learning Expectations & Content:

Students will:

1. **Apply a design process**
   Apply a design process to solve problems in and beyond the laboratory-classroom.
2. **Identify criteria and constraints**
   Specify criteria and constraints for the design.
3. **Model a solution to a problem**
   Make two-dimensional and three-dimensional representations of the designed solution.
4. **Test and evaluate**
   Test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
5. **Make a product or system**
   Make a product or system and document the solution.
6. **Use information to see how things work**
   Use information provided in manuals, protocols, or by experienced people to see and understand how things work.
7. **Safely use tools to diagnose, adjust, and repair**
   Use tools, materials, and machines safely to diagnose, adjust, and repair systems.
8. **Use computers and calculators**
   Use computers and calculators in various applications.

9. **Operate systems**
   Operate and maintain systems in order to achieve a given purpose.

10. **Design and use instruments to collect data**
    Design and use instruments to collect data.

11. **Use collected data to find trends**
    Use data collected to analyze and interpret trends in order to identify the positive or negative effects of a technology.

12. **Identify trends**
    Identify trends and monitor potential consequence4s of technological development.

13. **Interpret and evaluate accuracy of information**
    Interpret and evaluate the accuracy of the information obtained and determine if it is useful.

V. THE DESIGNED WORLD

Standards:

Students will develop an understanding of and be able to select and use:

4. **Medical technologies.**
5. **Agricultural and related biotechnologies.**
6. **Energy and power technologies.**
7. **Information and communication technologies.**
8. **Transportation technologies.**
9. **Manufacturing technologies.**
10. **Construction technologies.**

Learning Expectations & Content:

Students will:

1. **Recognize advances and innovations in medical technologies**
   Advances and innovations in medical technologies are used to improve healthcare.
2. **Describe the importance of medical sanitation processes**
   Sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.
3. **Demonstrate an understanding of immunology**
   The vaccines developed for use in immunization require specialized technologies to support environments in which a sufficient amount of vaccines are produced.
4. **Demonstrate awareness about genetic engineering**
   Genetic engineering involves modifying the structure of DNA to produce novel genetic make-ups.
5. **Describe technological advances in agriculture**
   Technological advances in agriculture directly affect the time and number of people required to produce food for a large population.
6. **Describe specialized equipment and practices**
   A wide range of specialized equipment and practices is used to improve the production of food, fiber, fuel, and other useful products and in the care of animals.
7. **Discuss the relationship between biotechnology and agriculture**
   Biotechnology applies the principles of biology to create commercial products or processes.
8. **Design and manage artificial ecosystems**
   Artificial ecosystems are human-made complexes that replicate some aspects of the natural environment.

9. **Discuss the benefits and risks of refrigeration, freezing, dehydration, preservation, and irradiation.**
   The development of refrigeration, freezing, dehydration, preservation, and irradiation provide long-term storage of food and reduce the health risks caused by tainted food.

10. **Show that energy is the capacity to do work**
    Energy is the capacity to do work.
    Energy can be used to do work, using many processes.

11. **Design and construct devices that demonstrate that power is the rate at which energy is converted from one form to another**
    Power is the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.

12. **Build power systems**
    Power systems are used to drive and provide propulsion to other technological products and systems.

13. **Describe efficiency and conservation**
    Much of the energy used in our environment is not used efficiently.

14. **Work with information and communication systems**
    Information and communication systems allow information to be transferred from human to human, human to machine, and machine to human.

15. **Understand that communication systems encode, transmit, and receive information**
    Communication systems are made up of a source, encoder, transmitter, receiver, decoder, and destination.

16. **Describe factors influencing the design of a message.**
    The design of a message is influenced by such factors as the intended audience, medium, purpose, and nature of the message.

17. **Communicate using the language of technology**
    The use of symbols, measurements, and drawings promotes clear communication by providing a common language to express ideas.

18. **Design and operate transportation systems**
    Transporting people and goods involves a combination of individuals and vehicles.

19. **Recognize subsystems of a transportation system**
    Transportation vehicles are made up of subsystems, such as structural, propulsion, suspension, guidance, control, and support, that must function together for a system to work effectively.

20. **Recognize the role of governmental regulations**
    Governmental regulations often influence the design and operation of transportation systems.

21. **Discuss transportation processes**
    Processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions are necessary for the entire transportation system to operate efficiently.

22. **Work with manufacturing systems**
    Manufacturing systems use mechanical processes that change the form of materials through the processes of separating, forming, combining, and conditioning them.

23. **Create manufacturing goods**
    Manufactured goods may be classified as durable and non-durable.

24. **Apply manufacturing processes**
    The manufacturing process includes the designing, development, making, and servicing of products and systems.

25. **Discuss the use of chemical technologies**
    Chemical technologies are used to modify or alter chemical substances.

26. **Describe natural materials use**
    Materials must first be located before they can be extracted from the earth through such processes as harvesting, drilling, and mining.

27. **Market products**
    Marketing a product involves informing the public about it as well as assisting in selling and distributing it.

28. **Engage in construction design**
    The selection of designs for structures is based on factors such as building laws and codes, style, convenience, cost, climate, and function.

29. **Identify the role of foundations**
    Structures rest on a foundation.

30. **Describe the purpose of different structures**
    Some structures are temporary, while others are permanent.

31. **Construct systems and sub-systems**
    Buildings generally contain a variety of subsystems.

TECHNOLOGY EDUCATION CURRICULUM LEARNING OPPORTUNITIES

GRADES 6 –8

There are many curriculum activities that have been designed to help students meet the program standards of Technology Education. The following are activities used at each grade level. Instructors choose various activities when preparing for each class, and may not include them all.

Grade 6

Computer Skills:
Keyboarding
Word Processing
Spreadsheets
Data Processing
Internet
Peripherals
Networking

Grade 7

Bridge Building
Tower Building
CADD
Wind Powered Cars
Materials Testing
Mechanical Drawing – 2D
B/W Photography
Computer Skills

Grade 8

Digital Photography
Mechanical Drawing – 3D
Computer Skills
CO2 Powered Cars
Mag Lev
Rockets
Satellite Building
Weather
Sailboat Design
Egg Transport Vehicle

TECHNOLOGY EDUCATION ASSESSMENT PRACTICES

GRADES 6-8

Teachers will assess their students' progress by using some or all of the following strategies:

1. **Observations**
2. **Interviews**
3. **Student Work/Projects**
4. **Quizzes**
5. **Self-evaluations**
6. **Checklists**
7. **Rubrics**
8. **Peer assessment**
9. **Discussions**
10. **Tests**
11. **Practical Exams**
12. **Portfolios**

Technology Education Curriculum
Grades 9-12

Fine Metals

Fine metals is a nine-week exploratory course that uses sterling silver jewelry construction as a vehicle for development of problem solving, psychomotor, and research skills. This course introduces many young women to the Technology Education Department.

Note: Numbers and letters in parenthesis reference national standards as defined in the ITEA publication Standards for Technological Literacy, 2000.

Standards:

Students will develop an understanding of

- The core concepts of technology (2).

Students will develop the abilities to

- Apply the design process (11).

Learning Expectations & Content:

Students will:

1. Apply the core concepts of technology (2)
   1.1. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop (Y).
   1.2. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).
   1.3. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).
   1.4. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).

2. Apply the design process (11).
   2.1. Identify the design problem to solve and decide whether or not to address it (M).
   2.2. Identify criteria and constraints and determine how these will affect the design process (N).

2.3. Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product (O).

2.4. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed (P).

2.5. Develop and produce a product or system using a design process (Q).

2.6. Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual and written means, in addition to three dimensional models (R).

Assessment:

Student assessment is accomplished through the following instruments and methods:

- Checklists
- Worksheets / activities
- Quizzes
- Class participation

Learning Opportunities & Instructional Guidelines:

In order for students to achieve the goals of the academy program, the following must be provided:

- Sufficient tools and materials to complete course requirements.
- Safety devices and a safe environment in which to engage in class activities.

The teacher will provide:

- Learning environment appropriate to the tasks in which students are engaged.
- Instruction representing current and emerging metalworking technologies.
- Appropriate activities that support and enhance instruction.
- Variety of fair and representative assessments.
- Regular feedback on student performance.
- Performance exams.

Technology Education Curriculum
Grades 9-12

How Computers Work

How Computers Work is designed to give students a broader background "under the hood" of their computers. Students may elect to take CompTIA's A+ hardware certification test upon completion. This course is recommended prior to enrollment in the Cisco Networking Academy.

Standards:

Students will develop an understanding of

- The core concepts of technology (2).
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).
- Selection and use of information and communication technology (17).

Students will develop the abilities to

- Use and maintain technological products and systems (12).

Learning Expectations & Content:

Students will:

1. Apply core concepts of technology (2)
   - 1.1. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems (W).
   - 1.2. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).
   - 1.3. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).
   - 1.4. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).
2. Apply troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).
   - 2.1. Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace (I).
   - 2.2. Technological problems must be researched before they can be solved (J).

3. Use and maintain technological products and systems (12).
    3.1. Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques (L).
    3.2. Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it (M).
    3.3. Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision (N).
    3.4. Operate systems so that they function in the way they were designed (O).
    3.5. Use computers and calculators to access, retrieve, organize, process, maintain, interpret and evaluate data and information in order to communicate (P).
4. Select and use information and communication technology (17).
    4.1. Information and communication technologies include the inputs, processes and outputs associated with sending and receiving information (L).
    4.2. Information and communication systems can be used to inform, persuade, entertain, control, manage and educate (N).
    4.3. Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval and destination (O).

Assessment:

Student assessment is accomplished through the following instruments and methods:

- Notebook
- Worksheets
- Quizzes
- Projects
- Class participation

Learning Opportunities & Instructional Guidelines:

In order for students to engage in Web publishing, the following must be provided:

- Sufficient tools and materials to complete course requirements.
- Safety devices and a safe environment in which to engage in class activities.
- Sufficient computer workstations to require no more than three students to work together as a team.
- Presentation tools to allow demonstration, presentation and peer review.
- Protected, secure network storage.

The teacher will provide:

- Meaningful structure of increasingly challenging projects and activities.
- Instruction representing the latest widely-used Internet publishing technologies.
- Activities that underscore the context for learning.
- Variety of fair and representative assessments.
- Regular feedback and opportunity for peer review of student projects.

Technology Education Curriculum
Grades 9-12

InternetWorks

InternetWorks is a semester course that teaches students communication technology through the study of Internet publishing. The culminating activity is the creation of a comprehensive website for a real client. An example of the unit of study including the culminating activity is included in the appendix.

Standards:

Students will develop an understanding of

- The core concepts of technology (2).
- The cultural, social, economic, and political effects of technology (4).
- The influence of technology on history (7).
- The attributes of design (8).
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).
- Selection and use of information and communication technology (17).

Students will develop the abilities to

- Apply the design process (11).
- Use and maintain technological products and systems (12).

Learning Expectations & Content:

Students will:

5. Apply core concepts of technology (2)
   - 5.1. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems (W).
   - 5.2. Selecting resources involves tradeoffs between competing values, such as availability, cost, desirability, and waste (Z).
   - 5.3. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).
   - 5.4. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).
   - 5.5. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).

6. Recognize the cultural, social, economic, and political effects of technology (4).
    6.1. Ethical considerations are important in the development, selection and use of technologies (J).
7. Describe influences of technology on history (7).
    7.1. The Information Age places emphasis on the processing and exchange of information.
8. Demonstrate ability to apply the attributes of Design (8).
    8.1. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results (H).
    8.2. Design problems are seldom presented in a clearly defined form (I).
    8.3. The design needs to be continually checked and critiqued, and the ideas of the design must be refined and improved (J).
    8.4. Requirement of a design, such as criteria, constraints and efficiency, sometimes compete with each other.
9. Apply troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).
    9.1. Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace (I).
    9.2. Technological problems must be researched before they can be solved (J).
10. Apply the design process (11).
    10.1. Identify the design problem to solve and decide whether or not to address it (M).
    10.2. Identify criteria and constraints and determine how these will affect the design process (N).
    10.3. Refine a design by using prototypes and modeling to ensure quality, efficiency and productivity of the final product (O).
    10.4. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed (P).
    10.5. Develop and produce a product or system using a design process (Q).
    10.6. Evaluate final solutions and communicate…the design process… (R).

11. Use and maintain technological products and systems (12).
    11.1. Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques (L).
    11.2. Use computers and calculators to access, retrieve, organize, process, maintain, interpret and evaluate data and information in order to communicate (P).
12. Select and use information and communication technology (17).
    12.1. Information and communication technologies include the inputs, processes and outputs associated with sending and receiving information (L).
    12.2. Information and communication systems can be used to inform, persuade, entertain, control, manage and educate (N).
    12.3. Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval and destination (O).

Assessment:

Student assessment is accomplished through the following instruments and methods:

- Notebook
- Worksheets
- Quizzes
- Projects / Internet publications
- Class participation
- Performance exams

Learning Opportunities & Instructional Guidelines:

In order for students to engage in Web publishing, the following must be provided:

- Sufficient computer workstations to require no more than two students to work together as a team.
- Internet connectivity for all workstations.
- Appropriate web design and graphics software.
- Presentation tools to allow demonstration, presentation and peer review.
- Protected, secure network storage.
- Intranet publishing capabilities.
- Email

The teacher will provide:

- Meaningful structure of increasingly challenging projects and activities.
- Instruction representing the latest widely-used Internet publishing technologies.
- Activities that underscore the context for learning.
- Variety of fair and representative assessments.
- Regular feedback and opportunity for peer review of student projects.

Technology Education Curriculum
Grades 9-12

Networking Academy

The Networking Academy program is offered in cooperation with Cisco Systems, a leading provider of networking devices. The two-year academy provides students with a comprehensive multimedia text that is continually updated to keep it state-of-the-art. Students learn how local area networks and wide area networks are designed, constructed, maintained and repaired. The academy program prepares students for optional industry accepted certification exams.

Standards:

Students will develop an understanding of

- Characteristics and scope of technology (1).
- The core concepts of technology (2).
- The relationships among technologies… (3).
- The attributes of design (8).
- Engineering design (9).
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).
- Selection and use of information and communication technology (17).

Students will develop the abilities to

- Apply the design process (11).
- Use and maintain technological products and systems (12).

Learning Expectations & Content:

Students will:

1. Describe the characteristics and scope of technology (1).
   1.1. The rate of technological development and diffusion is increasing rapidly (K).
2. Demonstrate understanding of the core concepts of technology (2)
   2.1. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems (W).
   2.2. Selecting resources involves tradeoffs between competing values, such as availability, cost, desirability, and waste (Z).
   2.3. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).

2.4. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).

2.5. New technologies create new processes (CC).

2.6. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).

3. Recognize the relationships among technologies… (3).

3.1. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields (H).

4. Apply the attributes of Design (8).

4.1. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results (H).

4.2. Design problems are seldom presented in a clearly defined form (I).

4.3. The design needs to be continually checked and critiqued, and the ideas of the design must be refined and improved (J).

4.4. Requirement of a design, such as criteria, constraints and efficiency, sometimes compete with each other.

5. Engage in engineering design (9).

5.1. Established design principles are used to evaluate existing designs, to collect data, and to guide the design process (I).

5.2. The process of engineering design takes into account a number of factors (L).

6. Engage in troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).

6.1. Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace (I).

6.2. Technological problems must be researched before they can be solved (J).

7. Apply the design process (11).

7.1. Identify the design problem to solve and decide whether or not to address it (M).

7.2. Identify criteria and constraints and determine how these will affect the design process (N).

7.3. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed (P).

7.4. Evaluate final solutions and communicate…the design process… (R).

8. Use and maintain technological products and systems (12).

8.1. Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques (L).

8.2. Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it (M).

8.3. Troubleshoot, analyze and maintain systems to ensure safe and proper function and precision (N).

8.4. Operate systems so that they function in the way they were designed (O).

8.5. Use computers and calculators to access, retrieve, organize, process, maintain, interpret and evaluate data and information in order to communicate (P).

9. Select and use information and communication technology (17).

9.1. Information and communication technologies include the inputs, processes and outputs associated with sending and receiving information (L).

9.2. Information and communication systems allow information to be transferred from human to human, human to machine, machine to human, and machine to machine (M).

9.3. Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval and destination (O).

9.4. There are many ways to communicate information, such as graphic and electronic means (P).

Assessment:

Student assessment is accomplished through the following instruments and methods:

- Notebook / engineering journal
- Labs
- Quizzes
- Class participation
- Oral exams
- Performance exams

Learning Opportunities & Instructional Guidelines:

In order for students to achieve the goals of the academy program, the following must be provided:

- Sufficient computer workstations to allow each student to access a computer for online content.
- High-speed Internet connectivity for all workstations.
- Development lab of computers and Internetworking equipment.
- High-speed local area network.

The teacher will provide:

- Learning environment appropriate to the tasks in which students are engaged.
- Instruction representing current and emerging networking technologies.
- Appropriate activities that support and enhance online content.
- Variety of fair and representative assessments.
- Regular feedback on student performance.

Technology Education Curriculum
Grades 9-12

Photography

Photography is a nine-week exploratory course that uses black & white photography as a vehicle to teach students composition and the chemical and technological processes that are central to the field of photography.

Standards:

Students will develop an understanding of

- The core concepts of technology (2).
- The influence of technology on history (7).
- Selection and use of information and communication technology (17).

Students will develop the abilities to

- Apply the design process (11).
- Use and maintain technological products and systems (12).

Learning Expectations & Content:

Students will:

3. Apply the core concepts of technology (2)
   - 3.1. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop (Y).
   - 3.2. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).
   - 3.3. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).
   - 3.4. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).
4. Understand the influence of technology on history (7).
   - 4.1. Most technological development has been evolutionary, the result of a series of refinements to a basic invention (G).
   - 4.2. Throughout history, technology has been a powerful force in reshaping the social, cultural, political and economic landscape (I).

5. Use and maintain technological products and systems (12).
    5.1. Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques (L).
    5.2. Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it (M).
    5.3. Troubleshoot, analyze and maintain systems to ensure safe and proper function and precision (N).
    5.4. Operate systems so that they function in the way they were designed (O).
    5.5. Use computers and calculators to access, retrieve, organize, process, maintain, interpret and evaluate data and information in order to communicate (P).
6. Select and use information and communication technology (17).
    6.1. Information and communication technologies include the inputs, processes and outputs associated with sending and receiving information (L).
    6.2. Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval and destination (O).
    6.3. There are many ways to communicate information, such as graphic and electronic means (P).

Assessment:

Student assessment is accomplished through the following instruments and methods:

- Notebook / portfolio
- Worksheets / activities
- Quizzes
- Class participation

Learning Opportunities & Instructional Guidelines:

In order for students to achieve the goals of the academy program, the following must be provided:

- Sufficient cameras, enlargers and materials to complete course requirements.

The teacher will provide:

- Learning environment appropriate to the tasks in which students are engaged.
- Instruction representing current and emerging photographic technologies.
- Appropriate activities that support and enhance instruction.
- Variety of fair and representative assessments.
- Regular feedback on student performance.

Technology Education Curriculum
Grades 9-12

Research & Design Lab

The Research and Design Lab curriculum is a dynamic, always changing, always challenging problem-solving course. Each year, students compete in the University of Vermont's DesignTASC (Technology and Science Connection) competition. Many of the students in this course will continue in engineering or technology fields, and alumni point to this as a "real life skills" course.

Standards:

Students will develop an understanding of

- The core concepts of technology (2).
- The relationships among technologies… (3).
- The attributes of design (8).
- Engineering design (9).
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).

Students will develop the abilities to

- Apply the design process (11).
- Use and maintain technological products and systems (12).

Learning Expectations & Content:

Students will:

1. Apply the core concepts of technology (2)
   - 1.1. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems (W).
   - 1.2. Selecting resources involves tradeoffs between competing values, such as availability, cost, desirability, and waste (Z).
   - 1.3. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).
   - 1.4. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).
   - 1.5. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).
   - 1.6. Management is the process of planning, organizing and controlling work (EE).

2. Recognize the relationships among technologies… (3).

   2.1. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields (H).

3. Apply the attributes of Design (8).

   3.1. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results (H).

   3.2. The design needs to be continually checked and critiqued, and the ideas of the design must be refined and improved (J).

   3.3. Requirement of a design, such as criteria, constraints and efficiency, sometimes compete with each other.

4. Engage in engineering design (9).

   4.1. Established design principles are used to evaluate existing designs, to collect data, and to guide the design process (I).

   4.2. Engineering design is influenced by personal characteristics, such as creativity, resourcefulness and the ability to visualize and think abstractly (J).

   4.3. A prototype is a working model used to test a design concept by making actual observations and necessary adjustments (K).

   4.4. The process of engineering design takes into account a number of factors (L).

5. Apply troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).

   5.1. Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace (I).

   5.2. Technological problems must be researched before they can be solved (J).

6. Apply the design process (11).
   6.1. Identify the design problem to solve and decide whether or not to address it (M).
   6.2. Identify criteria and constraints and determine how these will affect the design process (N).
   6.3. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed (P).
   6.4. Develop and produce a product or system using a design process (Q).
   6.5. Evaluate final solutions and communicate…the design process… (R).

7. Use and maintain technological products and systems (12).
   7.1. Use computers and calculators to access, retrieve, organize, process, maintain, interpret and evaluate data and information in order to communicate (P).

Assessment

Student assessment is accomplished through the following instruments and methods:

- Notebook
- Drawings / products
- Quizzes
- Performance tasks
- Class participation

Learning Opportunities & Instructional Guidelines:

In order for students to achieve the goals of the technical drawing course, the following must be provided:

- Safe work environment and appropriate safety equipment.
- Sufficient and appropriate materials for design activities.

The teacher will provide:

- Learning environment appropriate to the tasks in which students are engaged.
- Instruction designed to help students develop two and three dimensional visualization skills.
- Appropriate activities that address course topics.
- Variety of fair and representative assessments.
- Regular feedback on student performance.

Technology Education Curriculum
Grades 9-12

Technical Drawing

Technical drawing offers a variety of learning opportunities designed to develop visualization skills, special awareness and experience with the design process. Emphasis is placed on freehand sketching and Computer Aided Drafting and Design (CADD). Traditional drafting board work is no longer a part of this program.

Standards:

Students will develop an understanding of

- The core concepts of technology (2).
- The relationships among technologies… (3).
- Effects of technology on the environment (5).
- The attributes of design (8).
- Engineering design (9).
- The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).
- Selection and use of information and communication technology (17).

Students will develop the abilities to

- Apply the design process (11).
- Use and maintain technological products and systems (12).

Learning Expectations & Content:

Students will:

8. Apply the core concepts of technology (2)
   - 8.1. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems (W).
   - 8.2. Selecting resources involves tradeoffs between competing values, such as availability, cost, desirability, and waste (Z).
   - 8.3. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development (AA).
   - 8.4. Optimization is an ongoing process or methodology of designing or making a product and is dependent on criteria and constraints (BB).
   - 8.5. New technologies create new processes (CC).

8.6. Quality control is a planned process to ensure that a product, service, or system meets established criteria (DD).

8.7. Management is the process of planning, organizing and controlling work (EE).

9. Recognize the relationships among technologies… (3).

9.1. Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields (H).

10. Describe the effects of technology on the environment (5).

10.1. Decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment.

11. Apply the attributes of Design (8).

11.1. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results (H).

11.2. Design problems are seldom presented in a clearly defined form (I).

11.3. The design needs to be continually checked and critiqued, and the ideas of the design must be refined and improved (J).

11.4. Requirement of a design, such as criteria, constraints and efficiency, sometimes compete with each other.

12. Engage in engineering design (9).

12.1. Established design principles are used to evaluate existing designs, to collect data, and to guide the design process (I).

12.2. Engineering design is influenced by personal characteristics, such as creativity, resourcefulness and the ability to visualize and think abstractly (J).

12.3. A prototype is a working model used to test a design concept by making actual observations and necessary adjustments (K).

12.4. The process of engineering design takes into account a number of factors (L).

13. Apply troubleshooting, research and development, invention and innovation, and experimentation in problem solving (10).

    13.1. Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace (I).

    13.2. Technological problems must be researched before they can be solved (J).

    13.3. Many technological problems require a multidisciplinary approach (L).

14. Apply the design process (11).

    14.1. Identify the design problem to solve and decide whether or not to address it (M).

    14.2. Identify criteria and constraints and determine how these will affect the design process (N).

    14.3. Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed (P).

    14.4. Develop and produce a product or system using a design process (Q).

    14.5. Evaluate final solutions and communicate…the design process… (R).

15. Use and maintain technological products and systems (12).

    15.1. Use computers and calculators to access, retrieve, organize, process, maintain, interpret and evaluate data and information in order to communicate (P).

16. Select and use information and communication technology (17).

    16.1. Information and communication technologies include the inputs, processes and outputs associated with sending and receiving information (L).

    16.2. Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval and destination (O).

    16.3. There are many ways to communicate information, such as graphic and electronic means (P).

Assessment

Student assessment is accomplished through the following instruments and methods:

- Notebook
- Drawings / products
- Quizzes
- Performance tasks
- Class participation
- Performance exams

Learning Opportunities & Instructional Guidelines:

In order for students to achieve the goals of the technical drawing course, the following must be provided:

- Sufficient computer workstations to allow each student to access a computer for drawing and research.
- High-speed Internet connectivity for all workstations.
- Appropriate CADD, design, flowcharting and Geographic Information Systems (GIS) software.
- High-speed local area network.
- Large-format printing/plotting capability.
- Design space.

The teacher will provide:

- Learning environment appropriate to the tasks in which students are engaged.
- Instruction designed to help students develop two and three dimensional visualization skills.
- Appropriate activities that address course topics.
- Variety of fair and representative assessments.
- Regular feedback on student performance.

Sample Standards-Based Unit of Study

Exploring Geographic Information Systems

Stephen Barner, South Burlington High School

Unit Overview

Geographic Information Systems (GIS) are computer databases that relate data spatially. This unit provides a variety of opportunities for students to discover GIS, become familiar with its basic functions, and use GIS to investigate their own community. Additionally, use of a GPS (Geographic Positioning System) location unit adds the ability for students to locate their own data points within a GIS database.

After a series of introductory activities, designed to introduce students to a basic understanding of GIS software, students work with local datasets of their own community. Students gather information by locating key points within their community with a GPS unit, entering this data into the GIS database, and, finally, use this information to develop a proposal for their community. A variety of proposals are possible. In this unit, students make a proposal for the location of a recreation path.

Rationale

Geographic Information Systems (GIS) are computer-based tools that are used to create and analyze maps. Almost any data that has a spatial component can be represented, queried and manipulated in a GIS system. Examples of GIS datasets include topography, waters and waterways, political boundaries, and transportation routes. Less obvious datasets include subsurface improvements, such as pipelines, geological formations, soil types and aquifers. But wait, there is more—orthophotos, population patterns, any demographic information, such as age distribution, income level, teen pregnancy rates. Even such things as historical sites, animal habitat, and even deer wintering areas can be described in a GIS system.

Data sets can be obtained from a variety of sources. Since GIS is used extensively in municipal planning, large amounts of data are available for free or at the cost of duplication from state and local authorities. Often, valuable local data is available for free download using a standard Web browser.

GIS is an affordable technology to integrate into classroom instruction. Professional GIS systems are quite expensive, but streamlined GIS software is available for little or no charge, and major GIS software companies are making some of their professional software available at prices within the budget of almost any school. The hardware necessary to run GIS software effectively can currently be found in almost every school in Vermont.

GIS can be a valuable tool in helping students of all ages develop spatial awareness. By controlling their view of the data, combining different datasets, and creating simple and complex queries, students can uncover relationships that would otherwise be hidden. Students develop a systems model of thinking as they discover ways in which datasets are interrelated spatially.

GIS can be an interest generator to encourage students to engage in a formal design process. The high level of engagement that students demonstrate when working with data related to the environment and community in which they live can be leveraged to address community concerns and development.

As the world becomes more interconnected, the ability to manage and interpret data, and to relate the derived information to the environment in which we live, will become important skills. Young people will benefit from the development of spatial awareness in both their work and in making decisions about environmental and geopolitical issues.

The Essential Question

How can GIS be used as a planning tool to design a community resource that will provide maximum benefit for the least cost and with minimal disruption to the existing community? In this unit, our focus will be to locate a recreation path in our town. Any number of other scenarios are also possible. One might direct students to pick a community or regional topic to research and make a proposal or report. Keeping the issue local is important to provide students the opportunity to relate the largely two-dimensional representation of a GIS system with the three-dimensional environment in which they live.

The Culminating Task

In the culminating task, students use local data to make a proposal that will affect their own community. In this particular example, students are asked to develop a proposal for a recreation path through their town. An emphasis is placed on using a formal problem-solving process to determine the best route for the recreation path. Considerations will include impacts on the environment, properties crossed, notable town resources that will be accessible from the path, access for users and scenic views. Students will brainstorm considerations and will investigate these using GIS data from available from state and local sources and from their own investigations.

Objectives

Students will:

1. Develop spatial awareness by investigating mapping applications and using maps to describe and interpret their environment.
2. Learn to manipulate a GIS system, including:
    a. Create and add data to a map
    b. Capture photographic images and embed into a map
    c. Use mapping tools as cartographic clip-art engines
    d. Produce electronic publications and presentations incorporating personal maps and charts
    e. Use actual GIS data that describes the local community to design local solutions
    f. Share data and images, as well as projects, with others, using Internet technologies.
3. Apply a formal problem-solving process to address a design challenge.
4. Gather data using GPS and incorporate this data into their GIS solution.
5. Gather data using digital photography and incorporate into their proposal.
6. Present completed proposal to an audience.

Vermont State Standards and Evidence Central to the Unit

1.15 Students use verbal and nonverbal skills to express themselves effectively.

2.2 Students use reasoning strategies, knowledge, and common sense to solve complex problems related to all fields of knowledge. This is evident when students:

bb. Evaluate approaches for effectiveness and make adjustments;
cc. Consider, test, and justify more than one solution;
dd. Find meaning in patterns and connections; and

7.2 Students design and conduct a variety of their own investigations and projects. These should include:

- Questions that can be studied using the resources available;
- Recommendations, decisions, and conclusions that are based on evidence.
- Results that are communicated appropriately to audiences; and
- Reflections and defense of conclusions and recommendations from other sources, and peer review.

This is evident when students:

dd. Complete a data study based on civic, economic, or social issues;
h. Study decision options in business or public planning that involve issues of optimizations, trade off, cost-benefit projections, and risks;

7.17 Students apply knowledge and understanding of technological systems to respond to a variety of issues. This is evident when students:

ddd. Evaluate complex technological outputs based on the original design specifications, and create modifications to improve that system.

7.18 Students understand that people control the outputs and impacts of our expanding technological solutions in the area of…construction…transportation… This is evident when students:

dd. Propose a technological solution in which both the positive and negative consequences of technology are considered.

7.19 Students use technological/engineering processes to design solutions to problems.

aaa . Create a design solution: Build on specifications, with an understanding of the constraints (e.g., cost, weight, environment), and tolerances that affect performance; Include mathematical and/or mechanical models of their design; Include steps and sequences for efficiently building a prototype or product that conforms to the specifications; Test the prototype; Use the results to modify the design; and
bb . Understand that the sequence in which these steps occur is critical to the efficiency and effectiveness of a solution.**bbb.** Evaluate and adjust a design process, responding to the unique characteristics of a specific problem.

Advance Organizer/Assessment

1. **Introduction to electronic mapping:** Students investigate a variety of mapping applications, using the Internet. Students pick from a list of topics, review material online, then develop and present their findings back to the class in a jigsaw activity.

   Standards: 7.18, aaa

   Assessment: Presentation. Factor: 7%

   Time: Classes 1&2

2. **Discovering GIS:** Students investigate applications of GIS by reading an online introductory text.

   Standards: 2.2, ee; 7.2, h

   Assessment: Worksheet, Factor: 5%

   Time: Class 3

3. **Introduction to GIS:** Students complete an online tutorial that leads them through the basics of using GIS software.

   Standards: N/A

   Assessment: Printed layouts (3). Factor: 2 % each (pass/fail)

   Time: Classes 4, 5, 6

4. **Design & Problem-Solving:** Introduction: Students learn a formal design process, based on the Thayer Engineering School problem-solving model.

   Standards: 7.19 bb.

   Assessment: Draft problem-solving matrix, worksheet. Factor: 3% each

   Time: Class 7

5. **Design & Problem-Solving:** Evaluating: Students modify a formal design process to fit the requirements of a specific design task.

   Standards: 7.19, bbb.

   Assessment: Self and teacher assessment rubric. Factor: 10 %

   Time: Classes 8, 9

6. **Accessing Local Data: Students learn how to create projects using datasets created by local** and state entities that describe their own community.

   Standard: 7.2

   Assessment: ArcView report (pass/fail). Factor: 2%

   Time: Class 10

7. **Working with Orthophotos:** Students learn to add orthophotos to their projects while developing a proposal to improve access to a natural area in their community.

   Standard: 7.2

   Assessment: ArcView report (pass/fail). Factor: 2%

   Time: Class 11

8. Adding Annotations and Marking-up GIS projects: Students learn to modify a GIS project using drawing and annotation features of ArcView. Students complete their proposal for improved access to a natural area.

Standard: 7.2

Assessment: ArcView report (pass/fail). Factor: 2%

Time: Class 12

9. Designing the Solution: Students create a map of their community using data and selecting from themes provided by the city planning and zoning office. Students add data to this map gathered through a hand-held GPS unit and indicate their design solution on the map.

Standards: 2.2, cc, ee; 7.17, ddd; 7.19, aaa, bbb

Assessment: GIS maps (3), report describing data, decisions & choice, problem-solving matrix, supporting materials. Factor: 40%

Time: Classes 13, 14, 15, 16

10. Presenting the Proposal: Students create a PowerPoint presentation and present their proposals to the class and representatives of the city planning and zoning office.

Standards: 1.15, 7.18, dd

Assessment: Presentation checklist. Factor: 20%

Time: Classes 17, 18

(Note: The complete unit may be accessed online at http://sbhs.sburl.k12.vt.us/~steve)

Sample Middle School Assessment Rubric

TECHNOLOGY EDUCATION

ASSESSMENT RUBRIC

Criteria / Scale	**Just getting Started**	**Not quite, but close**	**You're there (meets the standards)**	**Wow! Exceeds Standards**
Followed Directions/ Cooperative	Not Listening or paying attention to written or oral directions.	Focused, but is still unclear on the material.	Successfully follows directions. Cooperative attitude.	Helps classmates. Pleasure to work with. Completed full checklist.
Contributes equally in a team setting	Uncooperative with peers and prefers to work alone.	Attempting to communicate and work on a common goal with others. But still has some difficulty interacting.	Works well with others. Accepts leadership roles and understands compromise.	Enjoys group work and helping others. Encourages group members.
Completed checklist for Production	Completed little or none of checklist requirements.	Completed almost all requirements.	Completed checklist for final product.	
Does/does not capture concept	No understanding.	Some understanding. Needs further explanation and encouragement.	Full understanding of concepts. Able to complete task without constant reminders.	Completed project with little or no teacher aid. Full understanding of concepts.
Demonstrates Problem Solving Skills	Unable to handle small problems that arise during production such as group tension.	Some ability in problem solving but strong need for teacher assistance.	Able to solve problems that arise within the group. Able to handle more than one problem at a time.	Shows extraordinary problem solving skills. Strong asset to group.
Final Production	Completed little or none of the criteria.	Showed some understanding of criteria and was able to complete a product.	Completed product meeting all teacher and Vermont standards.	Exceeds standards in all areas.
Grade	D or F	C or B	A or B	A+

Sample Middle School Self-Assessment

COMMUNICATIONS TECHNOLOGY

SELF ASSESSMENT

Directions: For each of the following personal development traits, rate yourself according to the scale given. Put an "X" in the appropriate boxes.

	Personal Development	Always	Sometimes	Never
1.	**Demonstrates respect for self and others**			
2.	**Develops and meets goals**			
3.	**Demonstrates decision making skills**			
4.	**Performs effectively in a group**			
5.	**Demonstrates dependability**			
6.	**Demonstrates problem solving skills**			
7.	**Participates in classroom discussion**			
8.	**Completes assignments on time**			

Web Site Evaluation Rubric/Rating Scale
Tech Physics Problem Solving Web Site Assessment

1.Content			**Score**
No comparison with principles of Physics. 3 or fewer vocabulary words used.	Some comparison with principles of Physics. 6 or more vocabulary words used correctly in context.	Good comparison with principles of Physics. 12 or more vocabulary words used correctly in context.	___
2. Resources			
Use of copyrighted work without permission	Most work by others cited or linked. Some permissions attained.	Work by others cited on separate page. Work used with permission.	___
3. Navigation			
Most links do not work. Links not related to page topic. Links not current:out of date.	Most links work. Not more than one error 404 message. Relation to topic not clear. Links somewhat current.	All links work. Links related to topic. Links current and up-to-date.	___
4. Format			
Single page format. No anchors or frames.	Frames format, links work within frames.	Pull down menus and frames used. New windows open for outside links.	___
5. Images			
No original graphics. Graphics not related to page topic.	Some original graphics. Some relation to topic.	All original graphics. All images related to topic.	___
6. Technical			
Slow load time:over 60k. Large image size. Lots of animations. No compression of .gifs or .jpegs.	Reasonable load time:40-60k. Medium sized images. Few animations. Some file compression used for .gifs and .jpegs.	Fast load time:less than 40k. Judicious use of images and animations. Fully compressed. gifs and .jpegs.	___
7. Text colors			
Choices blend or clash with background choices causing reading difficulty. Links and visited links not delineated.	Choices result in readability with background colors. Links and visited links discernable.	Choices complimentary to background colors. Links and visited links clear and noticeable.	___
8. Spelling/Grammar			
Misspelled words. Errors in word usage common. No message conveyed.	Few misspelled words. Few errors in word usage. Hazy message conveyed.	No misspelled words. No errors in word usage. Clear message conveyed.	___

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